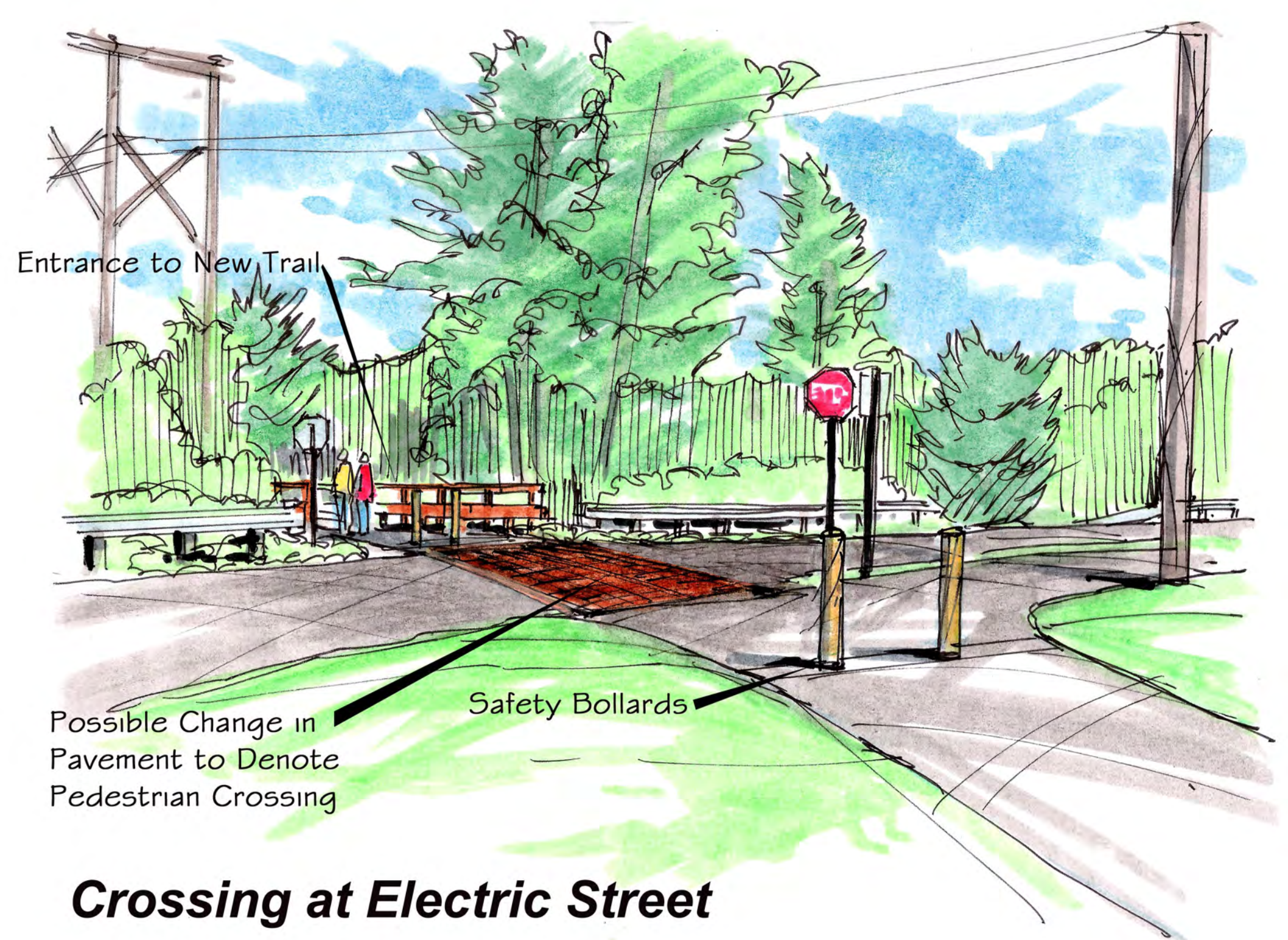
APPENDIX F

Project Renderings



Crossing at Electric Street

PISCATAQUOG RIVER TRAIL
PHASE IV
MANCHESTER, NEW HAMPSHIRE

KNOWLES DESIGN
landscape architecture
graphics, renderings & design solutions

Intersecting Trails

APPENDIX G

Engineer's Estimate of Probable Construction Costs

Hoyle, Tanner & Associates, Inc.
150 Dow Street
Manchester, NH 03101 (603) 669-5555

Calc. By:	STJ/WRD	Date:	5/2011
Chck. By:	MJL	Date:	5/2011
Chck. By:		Date:	
Chck. By:		Date:	

Piscataquog Trail Phase IV - Alternate No. 1 - Trestle Rehabilitation
Engineers Estimate of Probable Construction Costs
HTA Project No. 093143/NHDOT Project No. 14412A; Federal Project No. X-A000(907)

ITEM NO	ITEM DESCRIPTION	Quantity		Cost	
		Unit	Amount	Unit	Total
201.1	CLEARING AND GRUBBING (F)	A	0.5	4,500	$2,250
203.1	COMMON EXCAVATION	CY	610	15	$9,150
203.6	EMBANKMENT-IN-PLACE (F)	CY	220	25	$5,500
214	FINE GRADING	U	1	5,000	$5,000
304.1	SAND (F)	CY	90	20	$1,800
304.2	GRAVEL (F)	CY	90	25	$2,250
304.3	CRUSHED GRAVEL (F)	CY	60	25	$1,500
304.31	CRUSHED GRAVEL FOR SHIMMING	CY	580	35	$20,300
403.11	HOT BITUMINOUS PAVEMENT, MACHINE METHOD	TON	205	100	$20,500
403.12	HOT BITUMINOUS PAVEMENT, HAND METHOD	TON	32	130	$4,160
604.51	RECONSTRUCTING/ADJUSTING SEWER MANHOLES	EA	2	750	$1,500
606.001	8" BOLLARDS - CONCRETE FILLED	EA	3	750	$2,250
606.002	TIMBER GUARDRAIL	LF	550	65	$35,750
606.002	SPLIT RAIL FENCE	LF	540	22	$11,880
615.03	TRAFFIC SIGN TYPE C (F)	SF	3	150	$450
618.6	UNIFORMED OFFICERS	$	1	4,400	$4,400
628.2	SAWED BITUMINOUS PAVEMENT	LF	20	5	$100
632.02	RETROREFLECTIVE PAINT PAVEMENT MARKING, SYMBOL OR WORD	SF	60	6	$360
641	LOAM	CY	400	20	$8,000
645.2	MATTING FOR EROSION CONTROL	SY	230	5	$1,150
645.531	SILT FENCE	LF	400	5	$2,000
646.31	TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	SY	2420	3	$7,260
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	1	2,500	$2,500
		SUBTOTAL TRAIL PORTION			**$150,010**
209.201	GRANULAR BACKFILL (BRIDGE) (F)	CY	20	40	$800
502	REMOVAL OF EXISTING BRIDGE STRUCTURE	U	1	15,000	$15,000
510.1	PILE DRIVING EQUIPMENT	U	1	10,000	$10,000
510.31	FURNISHING TIMBER BEARING PILES	LF	250	17.50	$4,375
510.32	DRIVING TIMBER BEARING PILES	LF	250	10	$2,500
520.001	CONCRETE CLASS AAA	CY	6	800	$4,800
520.7	CONCRETE BRIDGE DECK	CY	15	2,200	$33,000
534.3	WATER REPELLENT (SILANE/ SILOXANE)	GAL	10	75	$750
544.31	REINFORCING STEEL, EPOXY COATED (CONTRACTOR DETAILED)	LB	1540	4	$6,160
544.7	SYNTHETIC FIBER REINFORCEMENT (F)	LB	80	10	$800
550.1	STRUCTURAL STEEL (F)	U	1	7,500	$7,500
563.1	BRIDGE RAIL (F)	LF	375	200	$75,000
568.01	STRUCTURAL TIMBER (EPOXY REPAIR)	EA	6	900	$5,400
568.02	STRUCTURAL TIMBER (BRACING)	MBM	0.68	15,000	$10,200
568.03	STRUCTURAL TIMBER (CAP BEAM)	MBM	0.8	24,000	$19,200
568.04	STRUCTURAL TIMBER (BENT #6 CRIBBING)	U	1	15,000	$15,000
568.05	STRUCTURAL TIMBER (MISC. REPAIRS)	U	1	5,000	$5,000
571	POINTING STONE MASONRY	U	1	10,000	$10,000
592.1	MECHANICALLY STABILIZED EARTH RETAINING WALL	SF	780	35	$27,300
692	MOBILIZATION	U	1	45,000	$45,000
1002.1	REPAIRS OR REPLACEMENTS AS NEEDED - BRIDGE STRUCTURES	$	1	10,000	$10,000
		SUBTOTAL BRIDGE PORTION			**$307,785**

SUBTOTAL BRIDGE AND TRAIL PORTIONS	$458,000
CONTINGENCY (15%)	$68,700
CONSTRUCTION TOTAL FOR NHDOT FY PLANNING	**$526,700**
CITY SHARE (20%)	**$ 105,340.00**
NHDOT SHARE (80%)	**$ 421,360.00**

K:\093143\data\Eng Study\[EstOfCost_Piscataquog.xls]Option 1_w_Breakdown

This Engineers Estimate of Probable Construction Costs is based on the anticipated scope of work, as well as HTA's experience with similar projects and understanding of current industry trends. The estimate has not been based on a final design for this project, and as such, it is intended to be preliminary in nature. It should be noted that changes in material or labor costs in the construction industry could impact the project cost in either direction

Hoyle, Tanner & Associates, Inc.
150 Dow Street
Manchester, NH 03101 (603) 669-5555

Calc. By:	STJ/WRD	Date:	5/2011
Chck. By:	MJL	Date:	5/2011
Chck. By:		Date:	
Chck. By:		Date:	

Piscataquog Trail Phase IV - Alternate No. 3 - New Steel Truss Bridge
Engineers Estimate of Probable Construction Costs
HTA Project No. 093143/NHDOT Project No. 14412A; Federal Project No. X-A000(907)

ITEM NO	ITEM DESCRIPTION	Quantity		Cost	
		Unit	Amount	Unit	Total
201.1	CLEARING AND GRUBBING (F)	A	0.5	4,500	$2,250
203.1	COMMON EXCAVATION	CY	610	15	$9,150
203.6	EMBANKMENT-IN-PLACE (F)	CY	220	25	$5,500
214	FINE GRADING	U	1	5,000	$5,000
304.1	SAND (F)	CY	90	20	$1,800
304.2	GRAVEL (F)	CY	90	25	$2,250
304.3	CRUSHED GRAVEL (F)	CY	60	25	$1,500
304.31	CRUSHED GRAVEL FOR SHIMMING	CY	580	35	$20,300
403.11	HOT BITUMINOUS PAVEMENT, MACHINE METHOD	TON	205	100	$20,500
403.12	HOT BITUMINOUS PAVEMENT, HAND METHOD	TON	32	130	$4,160
604.51	RECONSTRUCTING/ADJUSTING SEWER MANHOLES	EA	2	750	$1,500
606.001	8" BOLLARDS - CONCRETE FILLED	EA	3	750	$2,250
606.002	TIMBER GUARDRAIL	LF	550	65	$35,750
606.002	SPLIT RAIL FENCE	LF	540	22	$11,880
615.03	TRAFFIC SIGN TYPE C (F)	SF	3	150	$450
618.6	UNIFORMED OFFICERS	$	1	4,400	$4,400
628.2	SAWED BITUMINOUS PAVEMENT	LF	20	5	$100
632.02	RETROREFLECTIVE PAINT PAVEMENT MARKING, SYMBOL OR WORD	SF	60	6	$360
641	LOAM	CY	400	20	$8,000
645.2	MATTING FOR EROSION CONTROL	SY	230	5	$1,150
645.531	SILT FENCE	LF	400	5	$2,000
646.31	TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	SY	2420	3	$7,260
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	1	2,500	$2,500
		SUBTOTAL TRAIL PORTION			**$150,010**
209.201	GRANULAR BACKFILL (BRIDGE) (F)	CY	20	40	$800
502	REMOVAL OF EXISTING BRIDGE STRUCTURE	U	1	45,000	$45,000
520.001	CONCRETE CLASS AAA	CY	7	800	$5,600
569.5	ENGINEERED PEDESTRIAN BRIDGE SUPERSTRUCTURE	U	1	265,000	$265,000
571	POINTING STONE MASONRY	U	1	10,000	$10,000
592.1	MECHANICALLY STABILIZED EARTH RETAINING WALL	SF	780	35	$27,300
692	MOBILIZATION	U	1	55,000	$50,000
		SUBTOTAL BRIDGE PORTION			**$403,700**

SUBTOTAL BRIDGE AND TRAIL PORTIONS	$554,000
CONTINGENCY (15%)	$83,100
CONSTRUCTION TOTAL FOR NHDOT FY PLANNING	**$637,100**
CITY SHARE (20%)	**$ 127,420.00**
NHDOT SHARE (80%)	**$ 509,680.00**

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Hoyle, Tanner & Associates, Inc.
150 Dow Street
Manchester, NH 03101 (603) 669-5555

Calc. By:	STJ/WRD	Date:	5/2011
Chck. By:	MJL	Date:	5/2011
Chck. By:		Date:	
Chck. By:		Date:	

Piscataquog Trail Phase IV - Alternate No. 4 - Dover Covered Bridge
Engineers Estimate of Probable Construction Costs
HTA Project No. 093143/NHDOT Project No. 14412A; Federal Project No. X-A000(907)

ITEM NO	ITEM DESCRIPTION	Quantity		Cost	
		Unit	Amount	Unit	Total
201.1	CLEARING AND GRUBBING (F)	A	0.5	4,500	$2,250
203.1	COMMON EXCAVATION	CY	610	15	$9,150
203.6	EMBANKMENT-IN-PLACE (F)	CY	220	25	$5,500
214	FINE GRADING	U	1	5,000	$5,000
304.1	SAND (F)	CY	90	20	$1,800
304.2	GRAVEL (F)	CY	90	25	$2,250
304.3	CRUSHED GRAVEL (F)	CY	60	25	$1,500
304.31	CRUSHED GRAVEL FOR SHIMMING	CY	580	35	$20,300
403.11	HOT BITUMINOUS PAVEMENT, MACHINE METHOD	TON	205	100	$20,500
403.12	HOT BITUMINOUS PAVEMENT, HAND METHOD	TON	32	130	$4,160
604.51	RECONSTRUCTING/ADJUSTING SEWER MANHOLES	EA	2	750	$1,500
606.001	8" BOLLARDS - CONCRETE FILLED	EA	3	750	$2,250
606.002	TIMBER GUARDRAIL	LF	550	65	$35,750
606.002	SPLIT RAIL FENCE	LF	540	22	$11,880
615.03	TRAFFIC SIGN TYPE C (F)	SF	3	150	$450
618.6	UNIFORMED OFFICERS	$	1	4,400	$4,400
628.2	SAWED BITUMINOUS PAVEMENT	LF	20	5	$100
632.02	RETROREFLECTIVE PAINT PAVEMENT MARKING, SYMBOL OR WORD	SF	60	6	$360
641	LOAM	CY	400	20	$8,000
645.2	MATTING FOR EROSION CONTROL	SY	230	5	$1,150
645.531	SILT FENCE	LF	400	5	$2,000
646.31	TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	SY	2420	3	$7,260
699	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	1	2,500	$2,500
		SUBTOTAL TRAIL PORTION			**$150,010**
209.201	GRANULAR BACKFILL (BRIDGE) (F)	CY	20	40	$800
502	REMOVAL OF EXISTING BRIDGE STRUCTURE	U	1	45,000	$45,000
520.001	CONCRETE CLASS AAA	CY	7	800	$5,600
569.9	RELOCATE EXISTING COVERED BRIDGE	U	1	105,000	$105,000
569.91	REPAIRS TO EXISTING COVERED BRIDGE	U	1	39,000	$39,000
569.92	MODIFICATIONS TO EXISTING COVERED BRIDGE	U	1	55,000	$55,000
571	POINTING STONE MASONRY	U	1	10,000	$10,000
592.1	MECHANICALLY STABILIZED EARTH RETAINING WALL	SF	780	35	$27,300
692	MOBILIZATION	U	1	55,000	$45,000
		SUBTOTAL BRIDGE PORTION			**$332,700**

SUBTOTAL BRIDGE AND TRAIL PORTIONS	$483,000
CONTINGENCY (15%)	$72,450
CONSTRUCTION TOTAL FOR NHDOT FY PLANNING	**$555,450**
CITY SHARE (20%)	**$ 111,090.00**
NHDOT SHARE (80%)	**$ 444,360.00**

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This Engineers Estimate of Probable Construction Costs is based on the anticipated scope of work, as well as HTA's experience with similar projects and understanding of current industry trends. The estimate has not been based on a final design for this project, and as such, it is intended to be preliminary in nature. It should be noted that changes in material or labor costs in the construction industry could impact the project cost in either direction.

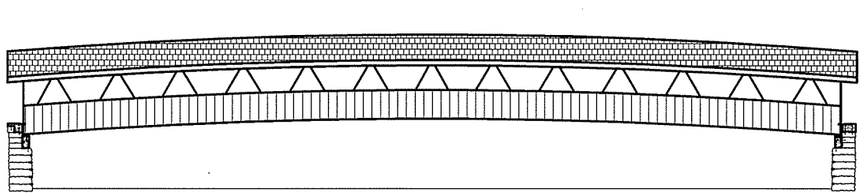
APPENDIX H

Dover Covered Bridge Plans

CVR

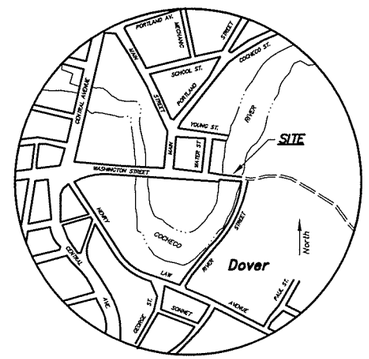
95063
CITY OF DOVER, N.H.
PEDESTRIAN BRIDGE

CONTRACT NO. 2
PLANS FOR PEDESTRIAN BRIDGE OVER COCHECO RIVER IN DOVER, N.H.
PREPARED FOR THE CITY OF DOVER, N.H.



APPROVED BY:

STEVEN STANCEL, CITY PLANNER
CITY OF DOVER, N.H.



VICINITY MAP
SCALE: 1" = ±500'

H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

DATE: OCTOBER 27, 1995
REVISED: NOVEMBER 9, 1995

PLANS IN SET:

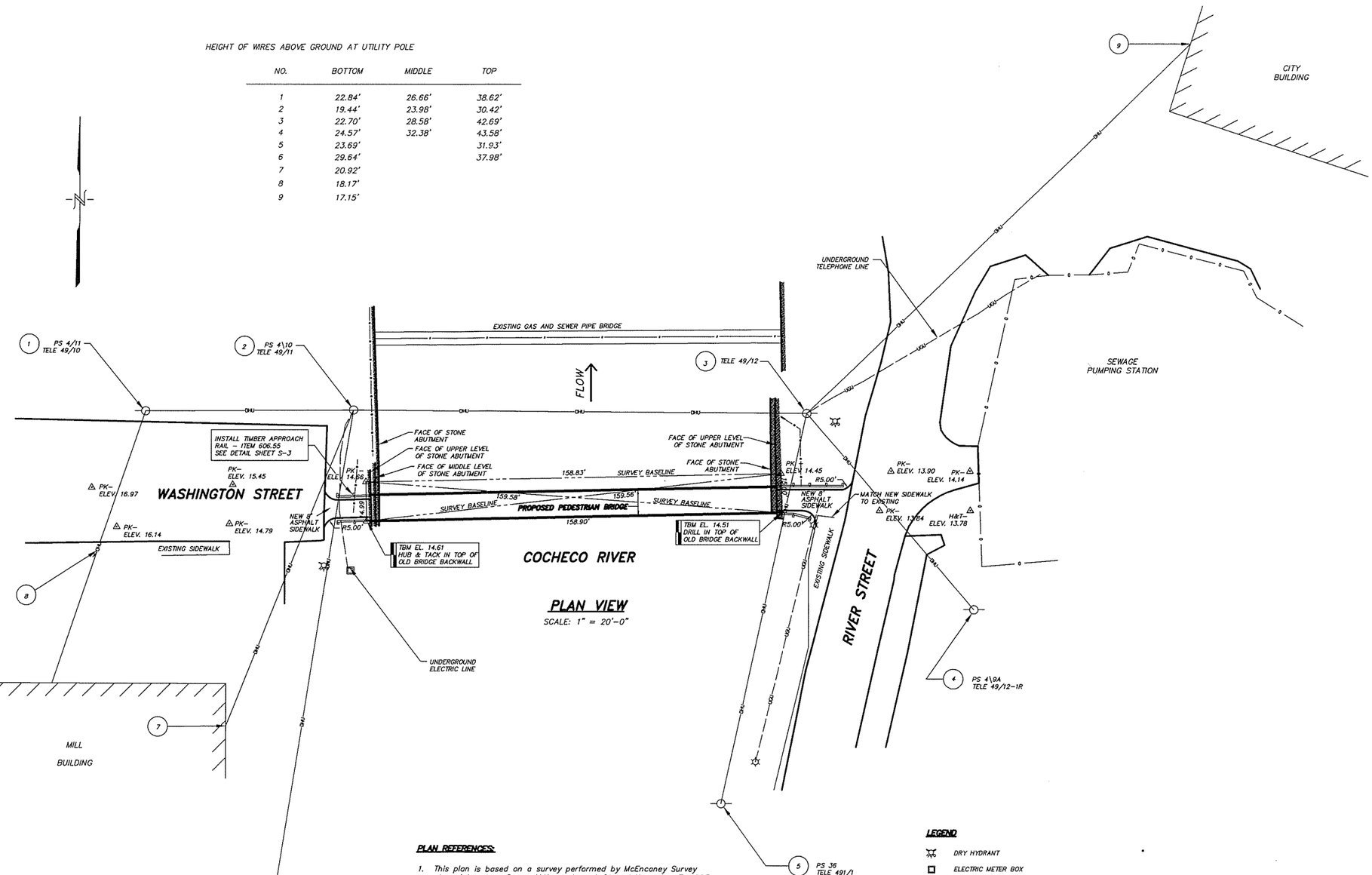
SP-1	SITE PLAN
S-1	ELEVATION VIEW
S-2	STRUCTURAL DETAILS
S-3	STRUCTURAL DETAILS

SP-1
SHEET 2 OF 5

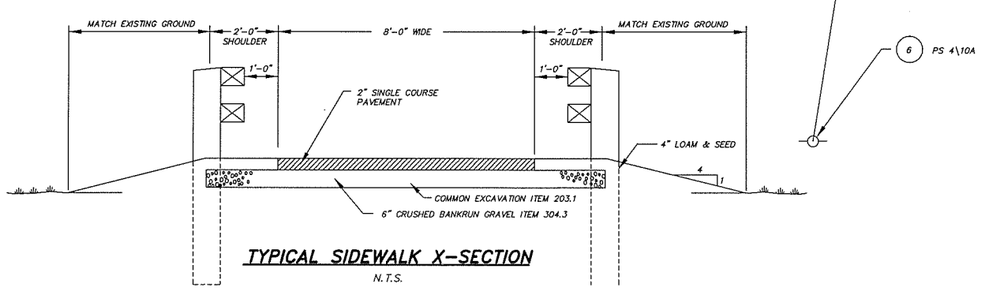
95063
CITY OF DOVER

HEIGHT OF WIRES ABOVE GROUND AT UTILITY POLE

NO.	BOTTOM	MIDDLE	TOP
1	22.84'	26.66'	38.62'
2	19.44'	23.98'	30.42'
3	22.70'	28.58'	42.69'
4	24.57'	32.38'	43.58'
5	23.69'		31.93'
6	29.64'		37.98'
7	20.92'		
8	18.17'		
9	17.15'		



PLAN VIEW
SCALE: 1" = 20'-0"



TYPICAL SIDEWALK X-SECTION
N.T.S.

PLAN REFERENCES:

1. This plan is based on a survey performed by McEncaney Survey Associates, Inc., Dover, N.H. on August 21 and November 7, 1995.

GENERAL NOTES:

1. The City of Dover has purchased a pre-manufactered timber truss pedestrian bridge to be placed on rehabilitated existing stone abutments. The General Contractor shall provide all labor and materials to rehabilitate the existing abutments, construct the new bridge seats and backwalls, install anchor bolts and base plates and do all work necessary to install the bridge. The General Contractor shall also construct the sidewalks as shown.

2. The General Contractor will be responsible for receiving, unloading erecting and installing the entire bridge. He will be responsible for coordinating shipping, assembly, and erection with Chick Industrial fo Silver Lake, N.H., the bridge manufactorer telephone 1-800-552-8955.

3. The bridge erection method will be the responsibility of the General Contractor. He shall provide all false work, temporary bracing, timber cribs, piers etc. necessary for the work. If the method of erection requires movement of any utility lines, he shall notify the City and the affected utilities prior to any work. The General Contractor shall also be responsible for any permits necessary to work in the Cocheco River.

4. **Underground Gas Lines are known to exist in the vicinity of the proposed bridge. The contractor shall contact the Gas Utility for their location.**

LEGEND

- DRY HYDRANT
- ELECTRIC METER BOX
- FENCE
- UTILITY POLE
- LIGHT POLE
- SURVEY CONTROL
- OHU — OVERHEAD UTILITIES
- UGU — UNDERGROUND UTILITIES

NO.	REVISION	DATE	BY
2	UTILITIES ADDED AND SIDEWALK RELOCATION	12/7/95	ALH
1	CONTRACT NO. 2	11/9/95	HEB

FILE: 95063SP.DWG
Plotted 12/07/1995. 15:29

SITE PLAN
COCHECO RIVER PEDESTRIAN BRIDGE
PREPARED FOR THE CITY OF DOVER

H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

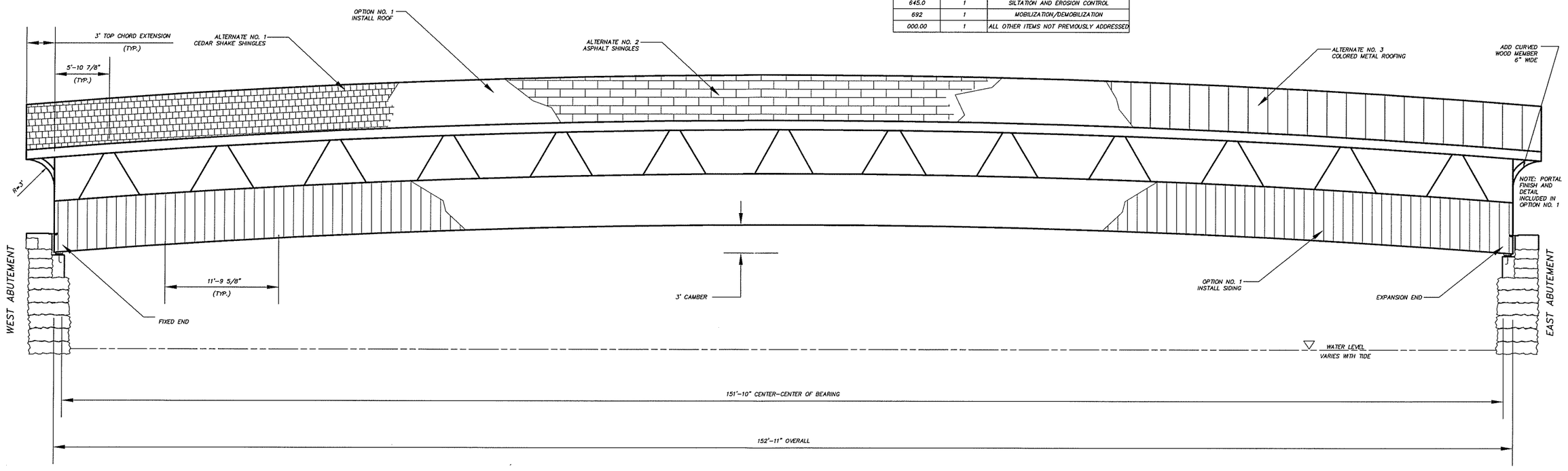
SURVEYED BY	KM
DESIGNED BY	ALH
DRAWN BY	ALH/RMG
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	
DATE	27 OCT 95
	95063
	SP-1
	SHEET 2 OF 5

S-1
SHEET 2 OF 4

95063
CITY OF DOVER, N.H.
PEDESTRIAN BRIDGE

QUANTITIES TABLE

ITEM NO.	QTY.	DESCRIPTION
203.1	15 C.Y.	COMMON EXCAVATION
206.2	4 C.Y.	STRUCTURAL ROCK REMOVAL
304.3	15 C.Y.	CRUSHED GRAVEL
500.1	1	INSTALLATION/ERECTION OF PRE-MANUFACTURED BRIDGE
520.12	7 C.Y.	CLASS "A" CONCRETE
544	550 LB.	REINFORCING STEEL
548	2	NEOPRENE BEARING PADS
550.3	1	STRUCTURAL STEEL (A36)
568.1	81	ROOF TRUSSES (INCL. BRACING)
568.2	2560 S.F.	PLYWOOD SHEATHING
568.3	1760 S.F.	R.S. WOOD SIDING
568.4	115 S.F.	1x6 CLAPBOARDS
568.5	1	PINE TRIM DETAILS
568.6	615 L.F.	BRIDGE HAND RAIL
571	250 S.F.	CLEAN AND POINT EXISTING MASONRY
600.1	2560 S.F.	METAL ROOFING
600.2	2560 S.F.	CEDAR SHAKE SHINGLES
600.3	2560 S.F.	ASPHALT SHINGLES
600.4	1	PAINT/STAIN
606.55	75 L.F.	TIMBER BRIDGE APPROACH RAIL
608.12	62 S.Y.	2" BITUMINOUS SIDEWALK
641.04	5 C.Y.	LOAM 4" DEEP
644.7	50 S.Y.	SEED
645.0	1	SILTATION AND EROSION CONTROL
692	1	MOBILIZATION/DEMOBILIZATION
000.00	1	ALL OTHER ITEMS NOT PREVIOUSLY ADDRESSED



SOUTH ELEVATION

SCALE: 1" = 5'-0"

BASE BID

Provide all labor, equipment and materials to erect completed bridge minus roof and siding, including temporary braces for the top chord.

OPTION NO. 1

Provide all labor, equipment and materials to install siding, roof trusses and sheathing, bracing and portal finish and details.

ALTERNATE NO. 1 – Amount for Cedar Shake roofing

ALTERNATE NO. 2 – Amount for Asphalt Shingle roofing

ALTERNATE NO. 3 – Amount for Colored Metal roofing

GENERAL NOTES:

1. All material and workmanship shall be in accordance with the State of New Hampshire Department of Public Works and Highways Specifications for Road and Bridge Construction, dated 1990 with applicable addendum unless note otherwise.
2. Design live load: 7,000 lb. vehicle load, snow load – 30 psf. Pedestrian load – 85 psf.
3. The owner will have the work area fully cleared and grubbed prior to commencing work.
4. All structural steel and miscellaneous metal plates shall conform to astm A588 or ASTM A36 galzanized unless noted otherwise.
5. All structural steel connections shall be made with 5/16" fillet welds unless noted otherwise. All welding and fabrication shall conform to the requirements of AASHTO/AWS D1.5-94 bridge welding code.
6. Weld rods shall be E7018 electrode.
7. Concrete used in abutment walls shall conform to NHDOT class "A", having a minimum compressive stress of 3000psi @ 28 days. Concrete shall have an air entrainment of 4 to 7%.
8. All exposed edges of concrete shall have a 3/4" chamfer.
9. Concrete reinforcing steel shall conform to ASTM A615, grade 60.
10. Lap all reinforcing splices by 30 bar diameters.
11. All reinforcing steel shall be bent cold.
12. Anchor bolts shall be galvanized conforming to ASTM A615, grade 60.
13. All timber shall have a maximum moisture content of 19%. timber shall be treated with pentachlorophenol type a system to a minimum net retention of 0.6pcf.
14. Concrete cover measured from the face of the reinforcing steel shall be 2 inches unless noted otherwise.
15. Dowel holes drilled into existing stone shall be drilled 3/4" diameter larger than the bar diameter and grouted with nonshrink mortar or epoxy.

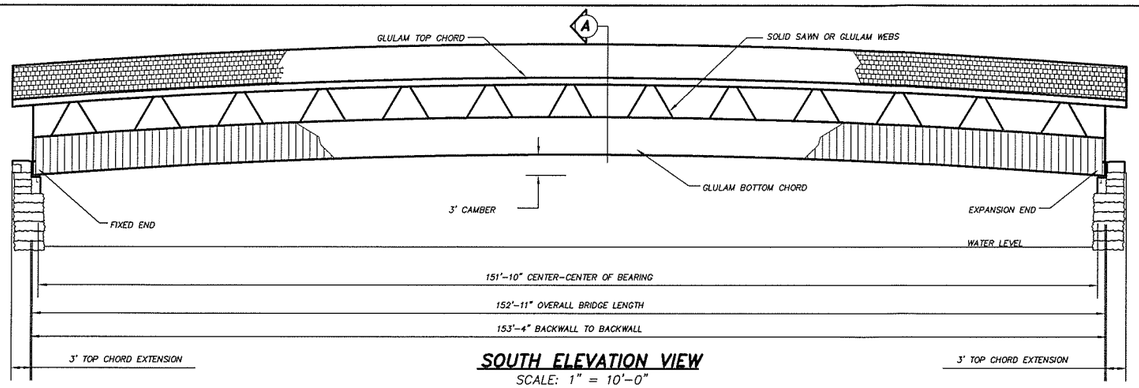
NO.	REVISION	DATE	BY
1	CONTRACT NO. 2	11/7/95	HEB

FILE: Plotted 11/09/1995, 1801

COCHECO RIVER PEDESTRIAN BRIDGE
PREPARED FOR
THE CITY OF DOVER

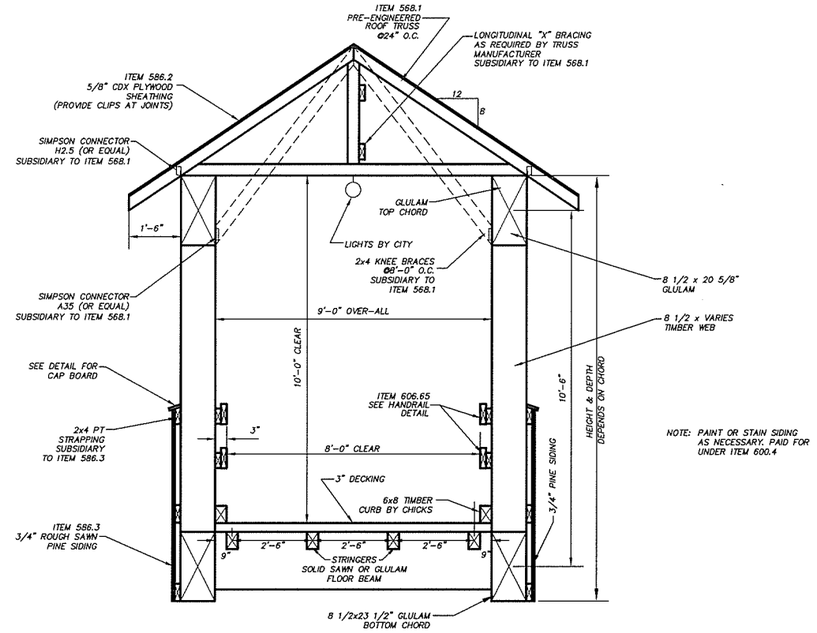
H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

SURVEYED BY	N/A
DESIGNED BY	ALH/HEB
DRAWN BY	ALH
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	27 OCT 95
	95063
	S-1
	SHEET 3 OF 5



SOUTH ELEVATION VIEW

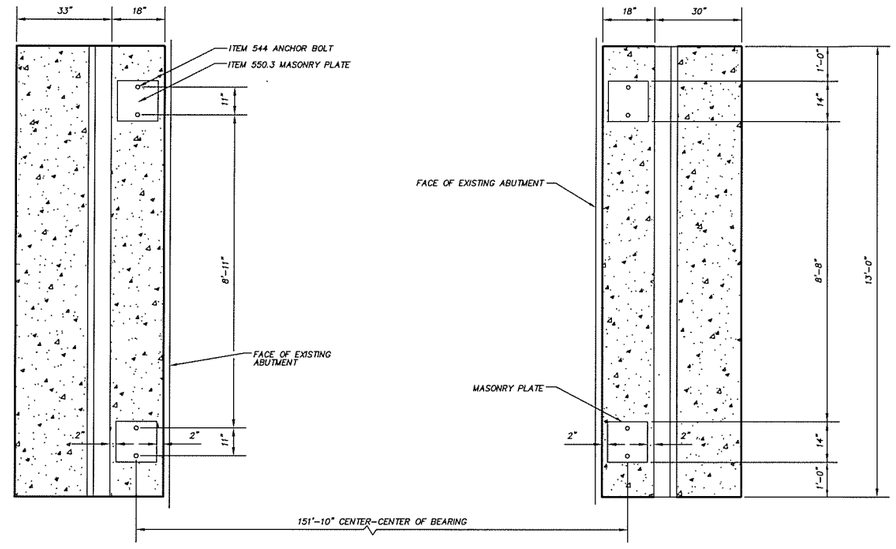
SCALE: 1" = 10'-0"



NOTE: PAINT OR STAIN SIDING AS NECESSARY. PAID FOR UNDER ITEM 600.4

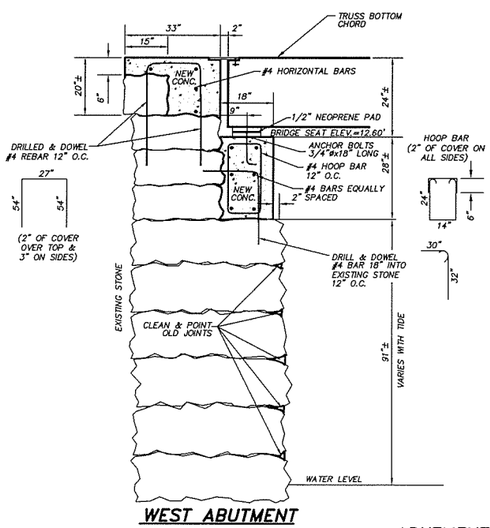
CROSS-SECTION A

N.T.S.



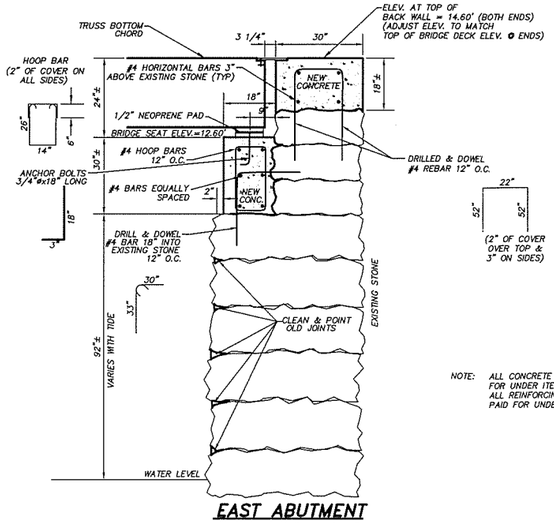
ABUTMENT PLAN

SCALE: 1/2" = 1'-0"



WEST ABUTMENT

SCALE: 1/2" = 1'-0"

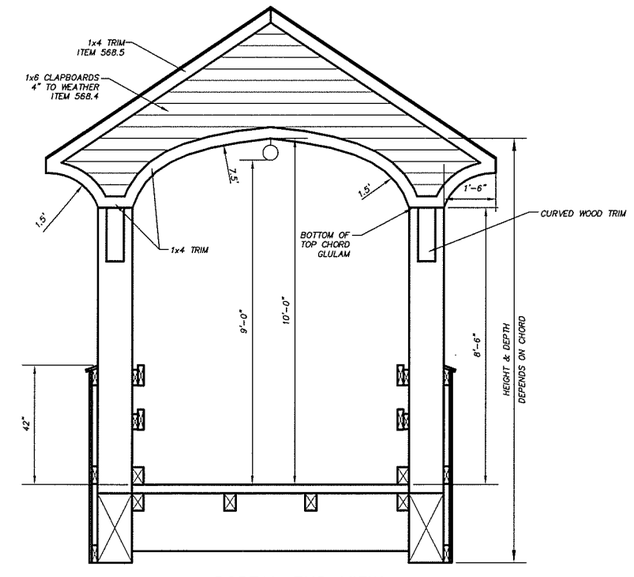


EAST ABUTMENT

SCALE: 1/2" = 1'-0"

NOTE: ALL CONCRETE PAID FOR UNDER ITEM 520.12
ALL REINFORCING STEEL PAID FOR UNDER ITEM 544.0

ABUTMENT ELEVATIONS



NOTE: GENERAL CONTRACTOR TO PROVIDE A HALF SCALE MOCKUP OF PORTAL FOR APPROVAL BY THE CITY PRIOR TO ACTUAL CONSTRUCTION

PORTAL END VIEW

N.T.S.

NO.	REVISION	DATE	BY
1	CONTRACT NO. 2	11/9/95	HEB

FILE: Plotted: 11/09/1995, 13:46

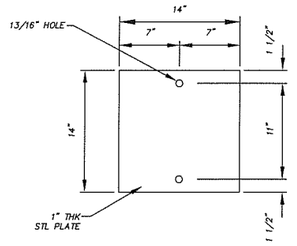
COCHECO RIVER PEDESTRIAN BRIDGE
PREPARED FOR
THE CITY OF DOVER

SURVEYED BY	N/A
DESIGNED BY	HEB/ALH
DRAWN BY	ALH
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	10/27/95
	95063
	S-2
	SHEET 4 OF 5

HEB
H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

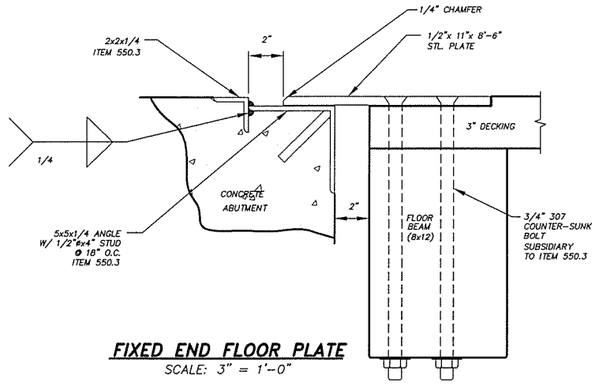
S-2
SHEET 4 OF 5

95063
CITY OF DOVER, N.H.
PEDESTRIAN BRIDGE



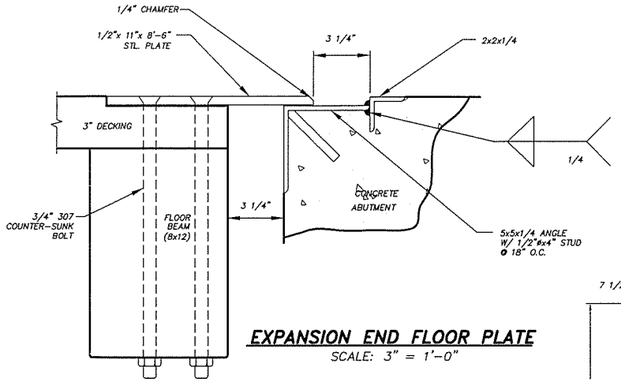
MASONRY PLATE DETAILS

REQUIRES 4
SCALE: 1 1/2" = 1'-0"



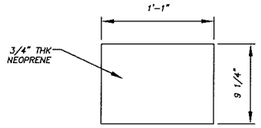
FIXED END FLOOR PLATE

SCALE: 3" = 1'-0"



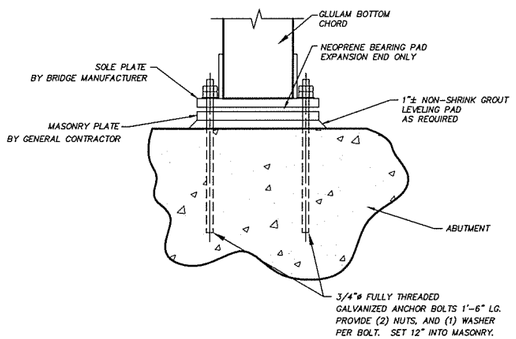
EXPANSION END FLOOR PLATE

SCALE: 3" = 1'-0"



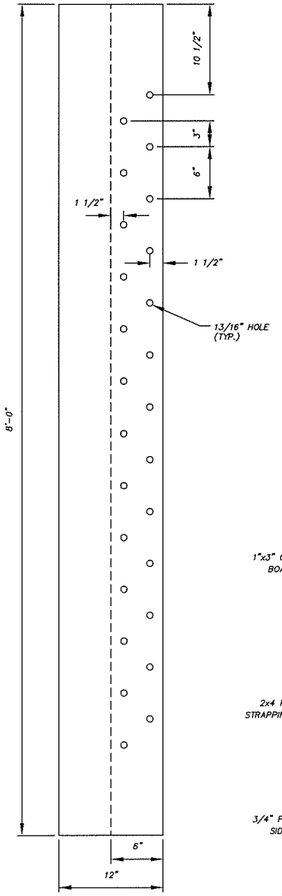
NEOPRENE PAD

(2 REQUIRED)
SCALE: 1 1/2" = 1'-0"



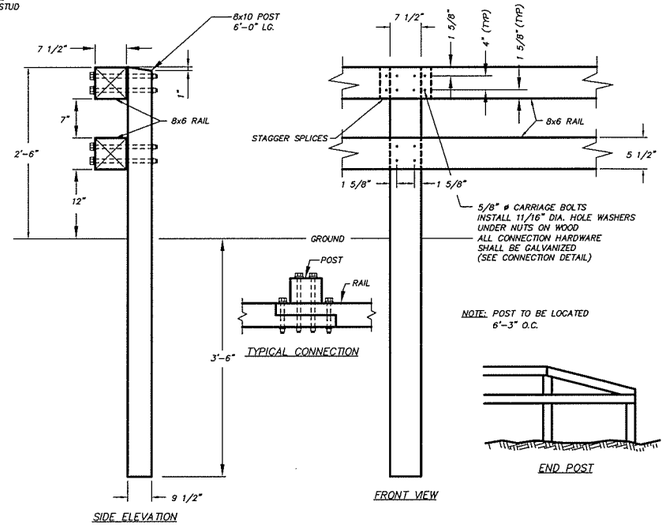
BEARING DETAIL

SCALE: 3" = 1'-0"



END PLATE

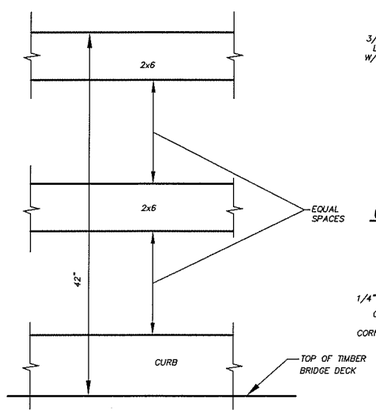
(MAKE 2)
SCALE: 1 1/2" = 1'-0"
ITEM 550.3



ITEM 606.5267

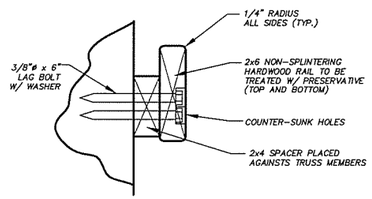
TIMBER GUARD RAIL DETAIL

NO SCALE



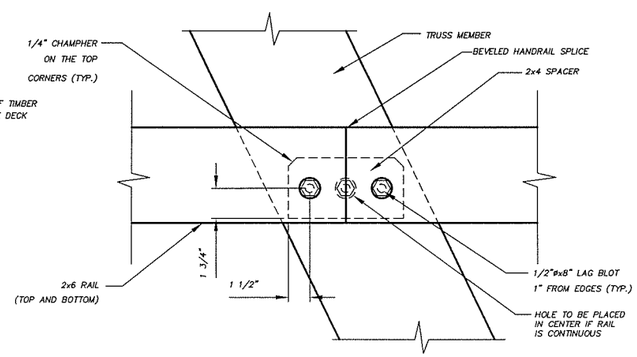
HANDRAIL ELEVATIONS

SCALE: 1 1/2" = 1'-0"



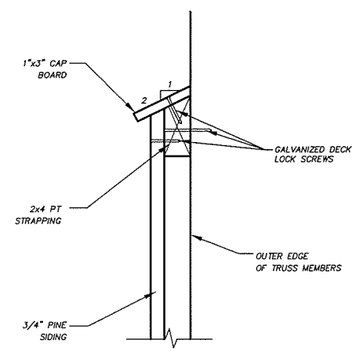
CROSS-SECTION OF HANDRAIL

SCALE: 3" = 1'-0"



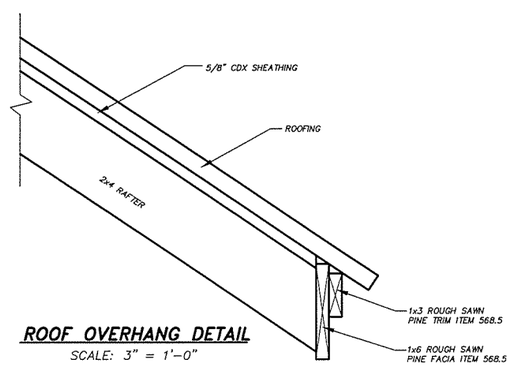
HANDRAIL CONNECTION DETAIL

SCALE: 3" = 1'-0"



CAP BOARD DETAIL

SCALE: 3" = 1'-0"



ROOF OVERHANG DETAIL

SCALE: 3" = 1'-0"

NO.	REVISION	DATE	BY
1	CONTRACT NO. 2	11/9/95	HEB

FILE: Plotted: 11/09/1995, 14:14

DETAILS FOR COCHECO RIVER PEDESTRIAN BRIDGE
PREPARED FOR
THE CITY OF DOVER

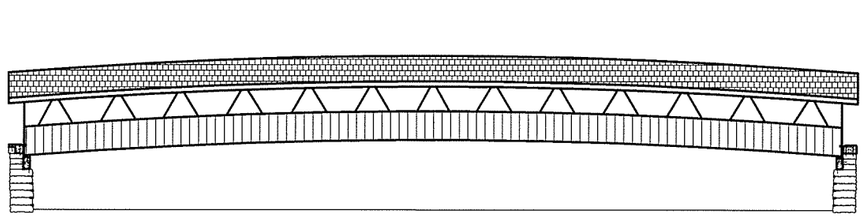
H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

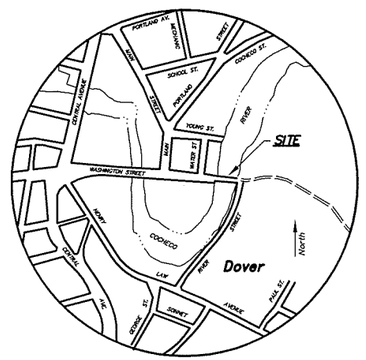
SURVEYED BY	N/A
DESIGNED BY	HEB/ALH
DRAWN BY	ALH
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	27 OCT 95
	95063
	S-3
	SHEET 5 OF 5

CVR

95063A
CITY OF DOVER, N.H.
PEDESTRIAN BRIDGE

SHOP DRAWINGS
OF THE
COCHECO RIVER PEDESTRIAN BRIDGE
OVER THE COCHECO RIVER
IN DOVER, N.H.





VICINITY MAP
SCALE: 1" = ±500'

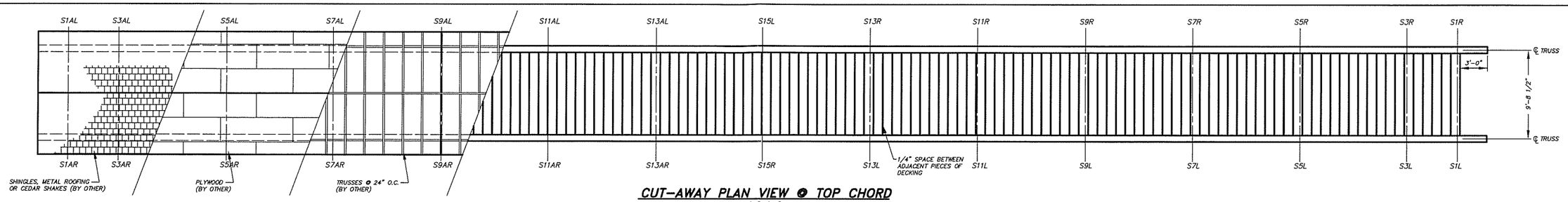
H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

DATE: DECEMBER 4, 1995

PLANS IN SET:

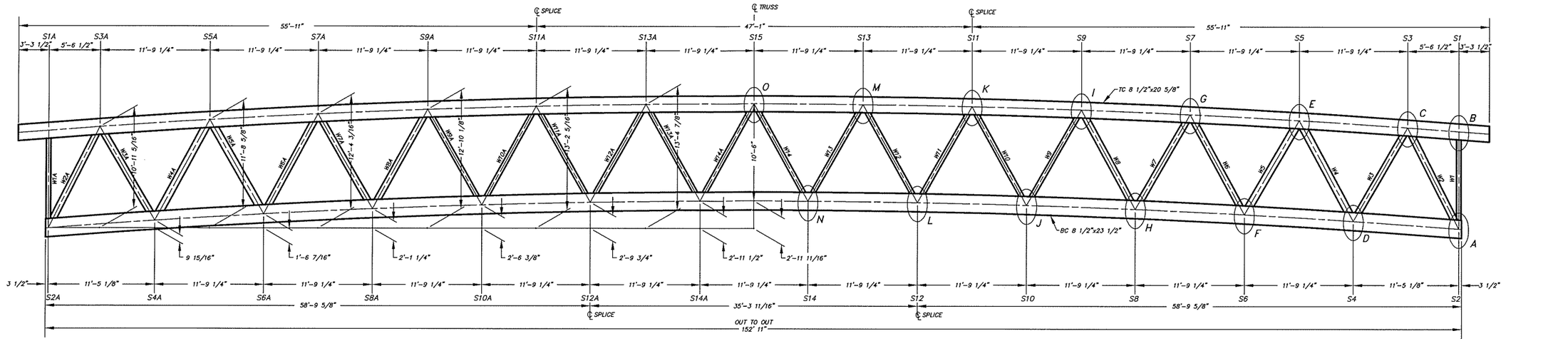
S-1	SHOP DRAWINGS
S-2	SHOP DRAWINGS
S-3	SHOP DRAWINGS
S-4	SHOP DRAWINGS

FILE: 95063SCVR.DWG
Plotted: 12/01/95, 9:45



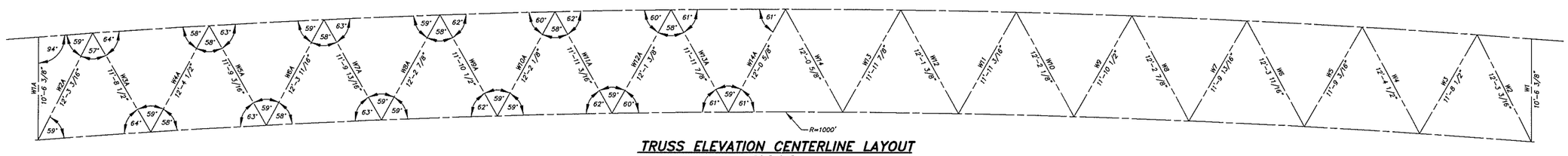
CUT-AWAY PLAN VIEW @ TOP CHORD

3/16"=1'-0"



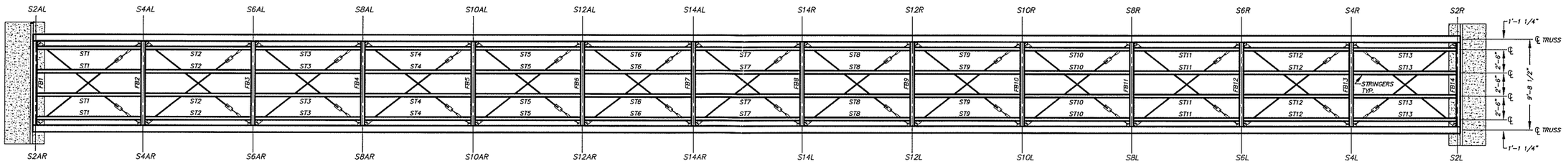
TRUSS ELEVATION

3/16"=1'-0"
(ROOF REMOVED FOR CLARITY)



TRUSS ELEVATION CENTERLINE LAYOUT

3/16"=1'-0"



PLAN VIEW @ BOTTOM CHORD

3/16"=1'-0"

TRUSS WEB MEMBER SIZES

MEMBER	SIZE	SPECIES
W1A, W1	8 1/2 x 6	DOUGLAS FIR SAWN LUMBER
W2A, W2, W3A, W3	8 1/2 x 8 1/4	DOUGLAS FIR GLULAM
W4A, W4, W5A, W5	8 1/2 x 10	DOUGLAS FIR SAWN LUMBER
W6A, W6, W7A, W7, W8A, W8	8 1/2 x 8	DOUGLAS FIR SAWN LUMBER
ALL OTHER WEB MEMBERS	8 1/2 x 6	DOUGLAS FIR SAWN LUMBER

NO.	REVISION	DATE	BY

FILE: 95063ACI.DWG
Plotted: 11/21/1995, 13:10

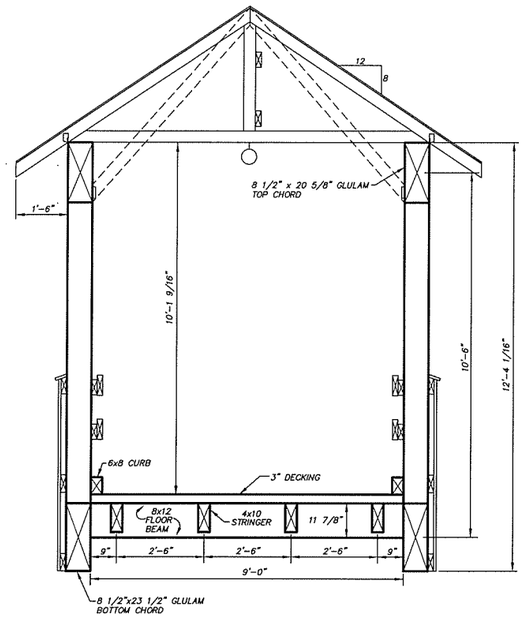
SHOP DRAWINGS OF COCHECO RIVER PEDESTRIAN BRIDGE PREPARED FOR CHICK INDUSTRIAL PACKAGING

H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

SURVEYED BY	N/A
DESIGNED BY	ALH
DRAWN BY	RMG
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	21 NOV 95
	95063A
	S-1
	SHEET 1 OF 4

95063A
CITY OF DOVER, N.H.
PEDESTRIAN BRIDGE

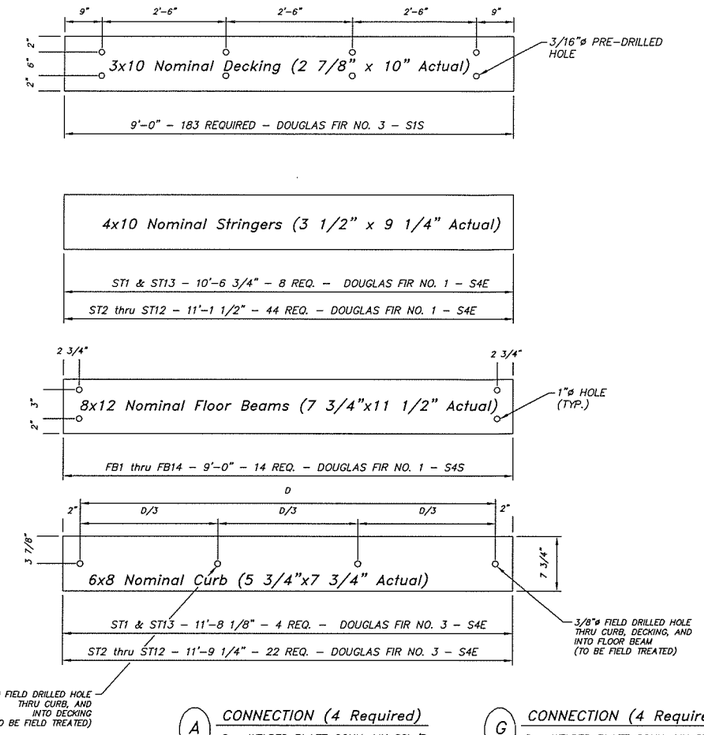
S-1
SHEET 1 OF 4



TYPICAL BRIDGE SECTION

SCALE: 1/2" = 1'-0"

CUT PIECE DIAGRAM



CUT PIECE CHORD DIAGRAM

8 1/2" x 23 1/2" Glulam Bottom Chord

58'-9 5/8" - 4 REQUIRED - DOUGLAS FIR - S4S

8 1/2" x 23 1/2" Glulam Bottom Chord

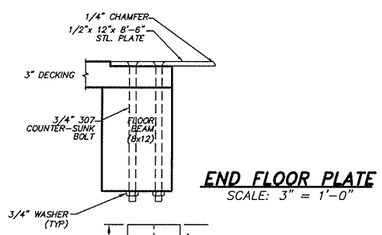
35'-3 11/16" - 2 REQUIRED - DOUGLAS FIR - S4S

8 1/2" x 20 5/8" Glulam Top Chord

55'-11" - 4 REQUIRED - DOUGLAS FIR - S4S

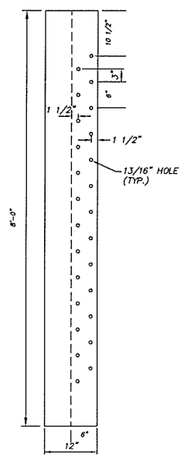
8 1/2" x 20 5/8" Glulam Top Chord

47'-1" - 2 REQUIRED - DOUGLAS FIR - S4S



END FLOOR PLATE

SCALE: 3" = 1'-0"



END PLATE

(MAKE 2)
N.T.S.

A CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S2L/R
18 1"ø x 10 1/2" MACHINED BOLTS
24 1"ø CUT WASHERS
2 3/4"ø x 9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

B CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S1L/R
4 1"ø x 10 1/2" M.B.
4 1"ø CUT WA.

C CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S3L/R
29 1"ø x 10 1/2" M.B.
38 1"ø CUT WA.

D CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S4L/R
34 1"ø x 10 1/2" M.B.
44 1"ø CUT WA.
2 3/4"øx9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

E CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S5L/R
29 1"ø x 10 1/2" M.B.
42 1"ø CUT WA.

F CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S6L/R
30 1"ø x 10 1/2" M.B.
44 1"ø CUT WA.
2 3/4"øx9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

G CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S7L/R
23 1"ø x 10 1/2" M.B.
34 1"ø CUT WA.

H CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S8L/R
24 1"ø x 10 1/2" M.B.
32 1"ø CUT WA.
2 3/4"ø x 9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

I CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S9L/R
16 1"ø x 10 1/2" M.B.
24 1"ø CUT WA.

J CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S10L/R
17 1"ø x 10 1/2" M.B.
26 1"ø CUT WA.
2 3/4"øx9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

K CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S11L/R
14 1"ø x 10 1/2" M.B.
20 1"ø CUT WA.

L CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S12L/R
70 1"ø x 10 1/2" M.B.
14 1"ø CUT WA.
2 3/4"øx9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

M CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S13L/R
8 1"ø x 10 1/2" M.B.
8 1"ø CUT WA.

N CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S14L/R
8 1"ø x 10 1/2" M.B.
8 1"ø CUT WA.
2 3/4"ø x 9" M.B.
*1 FLOOR BEAM HANGER ON INSIDE PLATE CONN.

O CONNECTION (4 Required)

2 WELDED PLATE CONN. MK S15L/R
8 1"ø x 10 1/2" M.B.
8 1"ø CUT WA.

* SEE SHEET 4 FOR FLOOR BEAM DETAIL

STRINGER TO FLOOR BEAM (104 Required)

1 HDR B410 SIMPSON CONNECTOR OR EQUAL (END REACTION = 1800 lbs.)
4 16d NAILS
2 10d NAILS

ROD BRACE CONNECTION (52 Required)

1 1"ø x 2 1/2" M.B.

DECK TO STRINGER CONNECTION (732 Required)

2 GALVANIZED 60d WIRE SPIKE NAILS

CURB CONNECTION (26 Required)

2 1/2"ø x 14" LAG BOLT
2 1/2"ø x 10" LAG BOLT

DESIGN CRITERIA:

Truss type:	Warren
Span:	152 ft - 11 inches bottom chord overall 151 ft - 10 inches bottom chord center - center of bearing
Truss height:	Top of deck to bottom of roof trusses 10 ft - 0 inches clear
Clear width:	8 ft - 0 inches (curb - curb)
Camber:	3' - 0" at center of span

LOADING CRITERIA:

Dead load	Based on actual material weights
Pedestrian live load	85 pounds per square foot
Snow plow vehicle	7000 pounds (3500 lbs/axle)
Snow load	30 pounds per square foot
Wind load	25 pounds per square foot

MATERIAL REQUIREMENTS:

Glulam Chords:	Douglas Fir or Southern Pine Allowable bending stress Fb = 2400 psi, Modulus of elasticity E = 1.7 x E6 F_T = 1400 psi, F_{cp} = 1600 psi and $F_{c\perp}$ = 650 psi Industrial appearance grade with 100% waterproof glue. Surfaced 4 sides (S4S). Completely fabricated, sawn and drilled prior to treatment. Manufacture Glulaminate lumber according to AITC specification 117-87.
Sawn Lumber:	Douglas Fir or Eastern Hemlock Grade as noted to meet stress requirements. Surfaced as noted and completely fabricated, sawn and drilled prior to treatment. Manufacture according to AITC specification 108-80.
Pressure Treatment:	Glulam beams and sawn lumber will be pressure treated with Pentachlorophenol 0.3 pcf retention per AWPA specifications and AITC 109-84.
Field Treatment:	Treat all field cuts and bores with Copper Napthanate in accordance with AWPA specification M4.
Hardware:	All steel hardware to connect the bridge superstructure together to be galvonized ASTM A36 or Cor-ten weathering steel. Hot dip galvanize all steel after fabrication. Hot dip galvanize all hardware. This includes all gusset plates, braces, clip angles, hangers, rods, double grip spikes, and all miscellaneous nuts and bolts. Mark each assembly using plywood turnplates. All welds per AWS specifications by certified welders.
Bearings:	Furnish steel bearing plates. Neoprene bearing pads and anchor bolts by City.
Roofing & Siding:	To be furnished and installed by the City.
Shop Drawings & Engineering Calcs	To be furnished by the manufacturer, revised as requested by the Engineer and to bear the seal of a New Hampshire licensed professional engineer (structural).

NOTICE:

The lumber and glulam on this project are pressure treated with pentachlorophenol which insures a long and useful service life. Workmen should use common sense in handling these treated timbers. Avoid direct skin contact with the preservative by wearing gloves, long sleeve shirts and, when appropriate, a face mask.

Timber treated with Pentachlorophenol may exhibit a blooming of the dried crystals on the wood surfaces for several weeks after installation. These crystals can be brushed or washed off the surfaces of the bridge subject to public contact, such as railings and other surfaces. The blooming will discontinue as the wood reaches equilibrium with the atmospheric conditions.

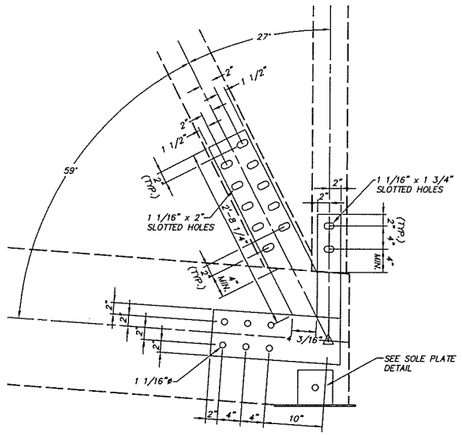
NO.	REVISION	DATE	BY
1	ADDED CURB CONNECTION, DIM. OF STRINGERS, DIM. OF BOLTS	12/4/95	ALH

FILE: 95063A-C2.DWG
Plotted 12/05/1995, 14:17

SHOP DRAWINGS OF COCHECO RIVER PEDESTRIAN BRIDGE PREPARED FOR CHICK INDUSTRIAL PACKAGING

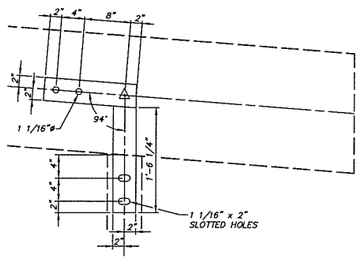
H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

SURVEYED BY	N/A
DESIGNED BY	ALH
DRAWN BY	RMG
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	4 DEC 95
	95063A
	S-2
	SHEET 2 OF 4



(A) WELDED PLATE CONNECTOR

(S2L & S2AL) & Opposite hand (S2AR & S2R)
1"=1'-0"
(8 REQUIRED)
(SEE FLOOR BEAM HANGER DETAIL, SHT 4)

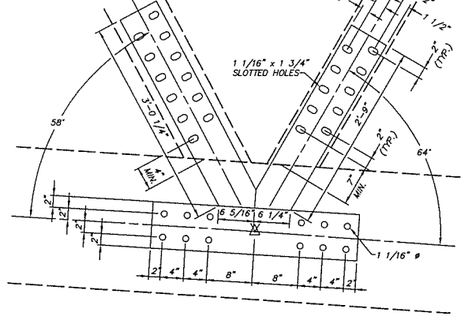


(B) WELDED PLATE CONNECTOR

(S1L & S1AL) & Opposite hand (S1AR & S1R)
1"=1'-0"
(8 REQUIRED)

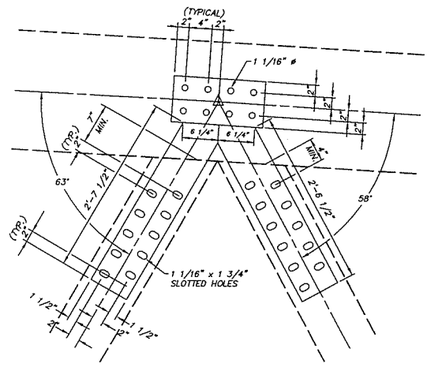
(C) WELDED PLATE CONNECTOR

(S3L & S3AL) & Opposite hand (S3AR & S3R)
1"=1'-0"
(8 REQUIRED)



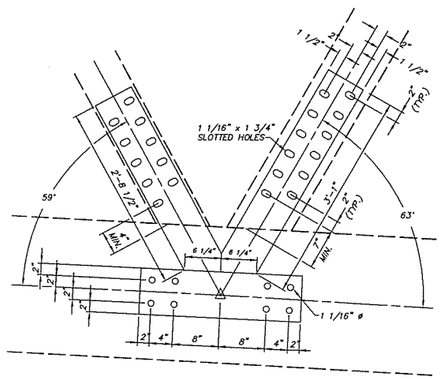
(D) WELDED PLATE CONNECTOR

(S4L & S4AL) & Opposite hand (S4AR & S4R)
1"=1'-0"
(8 REQUIRED)



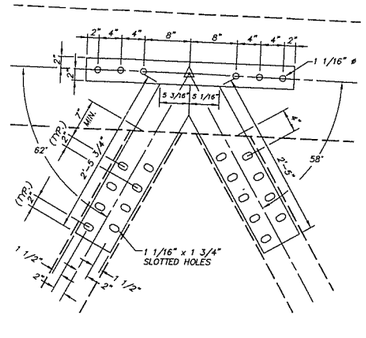
(E) WELDED PLATE CONNECTOR

(S5L & S5AL) & Opposite hand (S5AR & S5R)
1"=1'-0"
(8 REQUIRED)



(F) WELDED PLATE CONNECTOR

(S6L & S6AL) & Opposite hand (S6AR & S6R)
1"=1'-0"
(8 REQUIRED)



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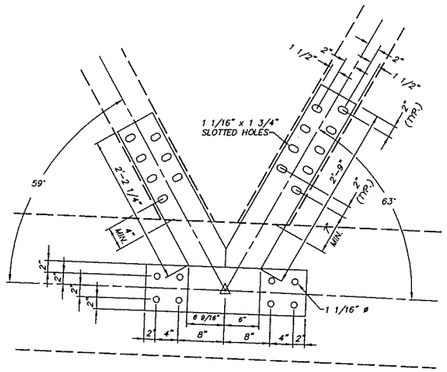
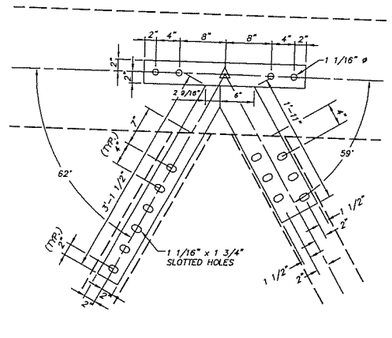
1"=1'-0"
(8 REQUIRED)



(H) WELDED PLATE CONNECTOR

(S8L & S8AL) & Opposite hand (S8AR & S8R)
1"=1'-0"
(8 REQUIRED)



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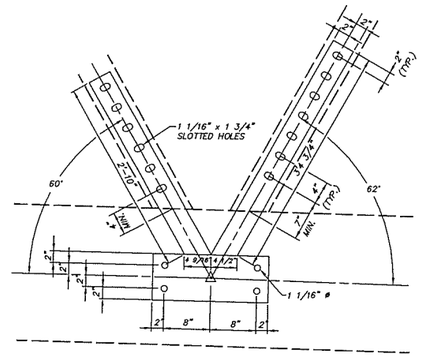
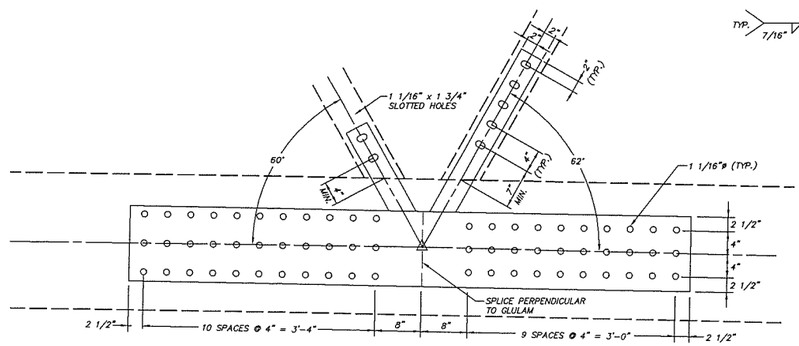
(S9L & S9AL) & Opposite hand (S9AR & S9R)
1"=1'-0"
(8 REQUIRED)



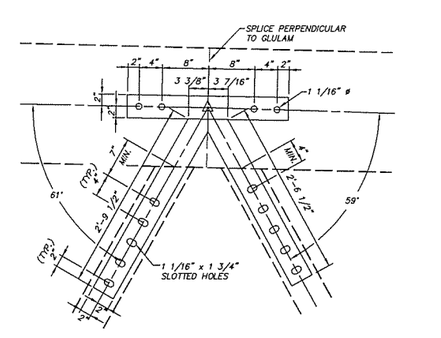
(J) WELDED PLATE CONNECTOR

(S10L & S10AL) & Opposite hand (S10AR & S10R)
1"=1'-0"
(8 REQUIRED)



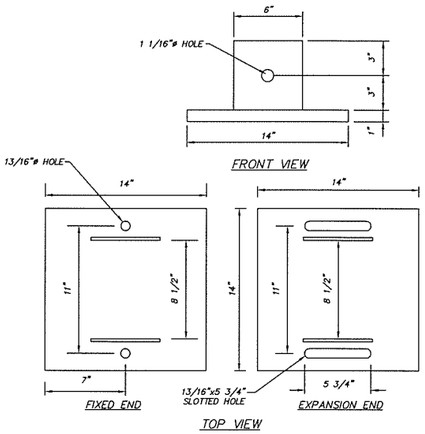
(L) WELDED SPLICE PLATE CONNECTOR

(S12L & S12AL) & Opposite hand (S12AR & S12R)
1"=1'-0"
(8 REQUIRED)



(K) WELDED PLATE CONNECTOR

(S11L & S11AL) & Opposite hand (S11AR & S11R)
1"=1'-0"
(8 REQUIRED)



SOLE PLATE DETAIL

(2 FIXED END AND 2 EXPANSION END REQUIRED
1"=1'-0"
(SEE END FLOOR BEAM HANGER DETAILS FOR LOCATIONS ON BOTTOM CHORD; SHEET 4)

NOTES:

1. All welded plate connectors are to be 1/4" A36 steel plate to be hot dipped galvanized after fabrication.
2. All welds are to be full penetration ground smooth unless otherwise noted.
3. See floor beam hanger detail on sheet 4 for placement of hangers on welded connectors.
4. Washers to be placed only on both sides of slotted holes in welded plate connectors.

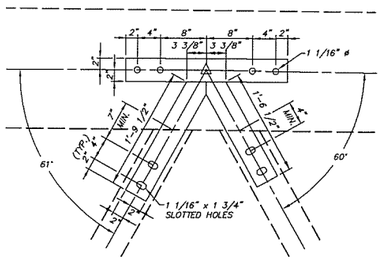
NO.	REVISION	DATE	BY
1	ADDED DIMENSIONS	12/5/95	SAB

FILE: 95063ACL.DWG
Plotted: 12/12/1995, 14:25

SHOP DRAWINGS OF COCHECO RIVER PEDESTRIAN BRIDGE PREPARED FOR CHICK INDUSTRIAL PACKAGING

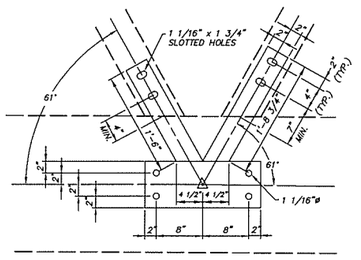
H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

SURVEYED BY	N/A
DESIGNED BY	ALH
DRAWN BY	RMG
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	4 DEC 95
	95063A
	S-3
	SHEET 3 OF 4



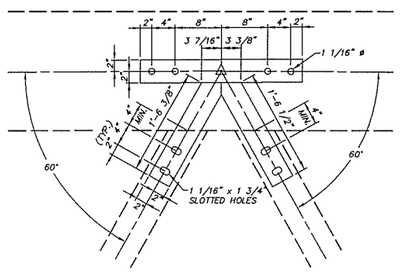
(M) WELDED PLATE CONNECTOR

(S13L & S13AL) & Opposite hand (S13AR & S13R)
1"=1'-0"
(8 REQUIRED)



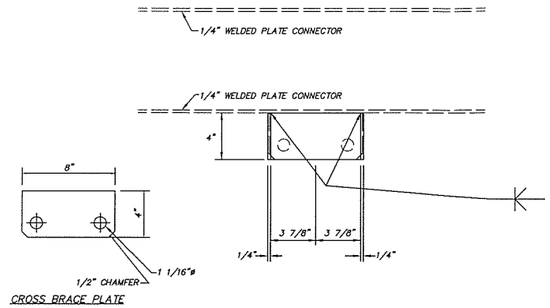
(N) WELDED PLATE CONNECTOR

(S14L & S14AL) & Opposite hand (S14AR & S14R)
1"=1'-0"
(8 REQUIRED)

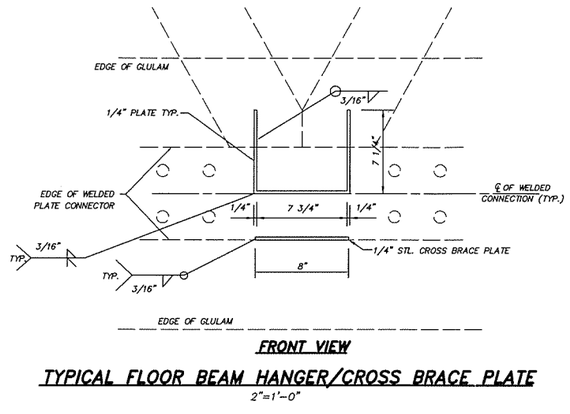


(O) WELDED PLATE CONNECTOR

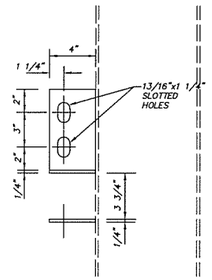
(S15L & S15AL)
1"=1'-0"
(4 REQUIRED)



TOP VIEW



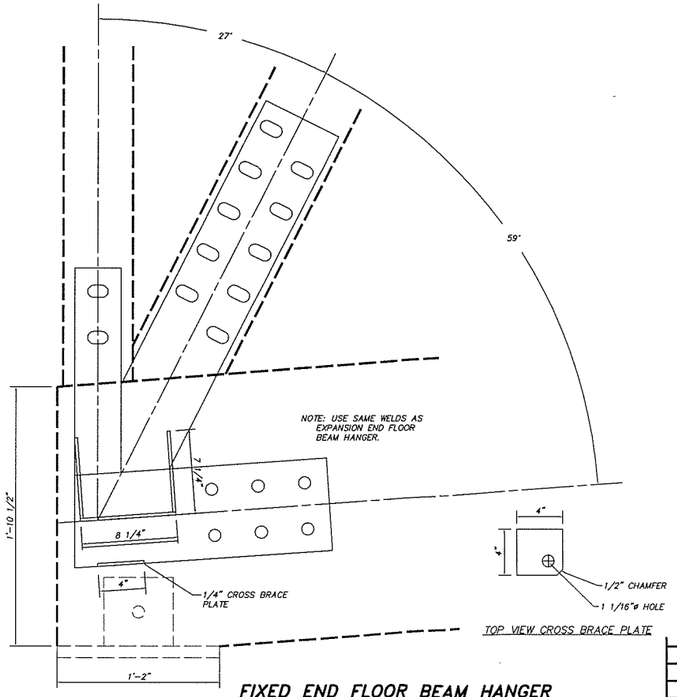
FRONT VIEW



SIDE VIEW

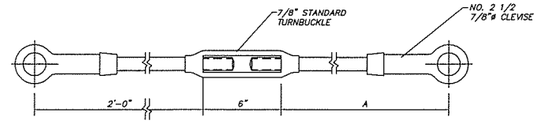
TYPICAL FLOOR BEAM HANGER/CROSS BRACE PLATE

2"=1'-0"



FIXED END FLOOR BEAM HANGER

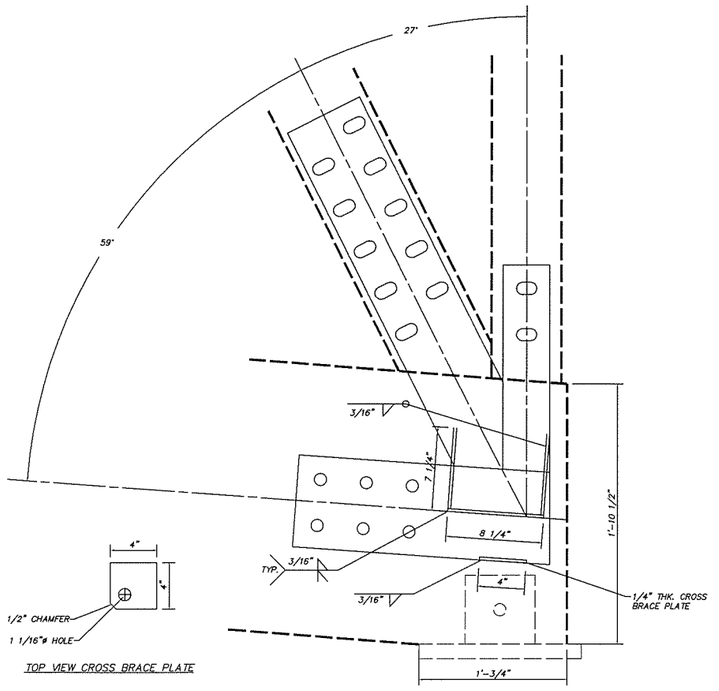
2"=1'-0"



S2 TO S4 A = 12'-5/8" ROD LENGTHS; 1'-11 1/2", 12'-0"
S4 TO S14 A = 12' - 3 7/8" ROD LENGTHS; 1'-11 1/2", 12'-2 1/4"

TYPICAL CROSS BRACE

N.T.S.



EXPANSION END FLOOR BEAM HANGER

2"=1'-0"

NO.	REVISION	DATE	BY
1	ADDED DIMENSIONS, CHG'D CONNECTION O	12/5/95	SAB

FILE: 95063ACK.DWG
Plotted: 12/05/1995, 14:09

SHOP DRAWINGS
OF
COCHECO RIVER PEDESTRIAN BRIDGE
PREPARED FOR
CHICK INDUSTRIAL PACKAGING

H.EDMUND BERGERON
CIVIL ENGINEERS, P.A.
NORTH CONWAY, N.H.
(603) 356-6936

SURVEYED BY	N/A
DESIGNED BY	ALH
DRAWN BY	RMG
CHECKED BY	HEB
SCALE	AS SHOWN
FIELD BOOK	N/A
DATE	4 DEC 95
	95063A
	S-4
	SHEET 4 OF 4

S-4
SHEET 4 OF 4

95063A
CITY OF DOVER, N.H.
PEDESTRIAN BRIDGE

APPENDIX I

Glossary

GLOSSARY

The following glossary is provided to assist the reader with this report. Not all terms provided herein have necessarily been used in the context of the report.

AASHTO: American Association of State Highway & Transportation Officials

Abutment: The outermost end supports on a bridge, which carry the load from deck to ground.

Approach: The part of the bridge that carries traffic from the land to the main parts of the bridge.

Approach Span: The span or spans connecting the abutment with the main span or spans.

Beam: A rigid, usually horizontal, member whose primary function is to carry a transverse load, i.e., a load that causes bending.

Bearing: A device at the ends of beams that is placed on top of a pier or abutment. The ends of the beam rest on the bearing.

Bedrock: The solid rock layer beneath sand, silt or clay.

Bed Timbers: Timber components typically located between the top of an abutment or pier and the underside of the truss bottom chord. Intended to serve as sacrificial components they are easily replaced when deteriorated from rot, thus protecting truss components from similar deterioration.

Bent: Part of a bridge substructure. A rigid frame commonly made of reinforced concrete or steel that supports a vertical load and is placed transverse to the length of a structure. Bents are commonly used to support beams and girders. An end bent is the supporting frame forming part of an abutment.

Camber: A positive, upward curve built into a beam or truss that compensates for some of the vertical load and anticipated deflection.

Cantilever: A projecting beam or member supported only on one end.

Cast-in-Place: Concrete poured within formwork on site to create a structural element in its final position.

Chord: A member at the top or bottom of a truss between which the vertical posts and diagonal braces are positioned.

Column: A vertical, structural element, strong in compression.

Column Cross Brace: Transverse brace between two main longitudinal members.

Compression: The stress resulting from a pushing force on a member, which tends to shorten it (the opposite of tension).

Compression Member: An engineering term that describes a timber or other truss member that is subjected to squeezing or pushing. Also see tension member.

Continuous Span Beam Bridge: A simple bridge made by linking one beam bridge to another; some of the longest bridges in the world are continuous span beam bridges.

Concrete: A mixture of stone, sand, cement, and water that hardens into a stone like substance.

Dead Load: The weight of a structure itself, including the weight of fixtures or equipment permanently attached to it.

Deck: The roadway portion of a bridge, including shoulders. Most bridge decks are constructed as reinforced concrete slabs, but timber decks are still seen in rural areas and open-grid steel decks are used in some movable bridge designs.

Deflection: The displacement of a structural member or system under load.

Diaphragm: Bracing that spans between the main beams or girders of a bridge or viaduct and assists in the distribution of loads.

Diagonal: A sloping structural member of a truss or bracing system.

End Post: The outwardmost vertical or angled compression member of a truss.

Fascia: The visible, exterior face of a structure, usually superstructure. Examples are the exterior beam of a structure may be called the fascia beam.

Fatigue: Cause of structural deficiencies, usually due to repetitive loading over time.

Fill: Earth, stone or other material used to raise the ground level, form an embankment or fill the inside of an abutment, pier or closed spandrel.

Flanges: The upper and lower parts of an "I" shaped beam or girder.

Floor Beam: Horizontal members that are placed transversely to the major beams, girders or trusses; used to support the deck.

Footing: The bottom portion of an abutment or pier, which is usually wider than the stem of the abutment or pier transmit bridge loads to the ground.

Forms: Temporary structures or molds made of wood, metal, or plastic used when placing concrete to ensure that it is shaped to its desired final form.

Formwork: A total system of support for freshly placed concrete, including the mold and all supporting members, hardware, and necessary bracing. Formwork must be strong enough to support the considerable weight and pressure of wet concrete without bending or breaking.

Guardrail: Structural barrier which is meant to keep vehicular traffic from leaving the roadway in the event of an accident. Guardrail may be steel beam with steel or wooden posts, concrete barriers or numerous other types.

Gusset Plate: A metal plate used to unite multiple structural members of a truss.

Headwall: Stone or concrete wall above a culvert, which retains earthen roadway fill.

Knee Brace: Additional support connecting the deck with the main beam that keeps the beam from buckling outward. Commonly made from plates and angles.

Lateral Bracing: Members used to stabilize a structure by introducing diagonal connections.

Live Load: The moving load on a structure, including the weight of people, cars, and equipment, but not including wind load.

Load: Weight distribution throughout a structure; loads caused by wind, earthquakes and gravity affect how weight is distributed throughout a structure.

Lower Chord: The bottom horizontal member of a truss.

Masonry: Construction of stone and mortar. Concrete masonry involves the use of concrete masonry units, commonly, but incorrectly, referred to as “Cinder Blocks”.

Member: Any individual angle, beam, plate or other single component, which is a part of the overall bridge structure.

National Environmental Policy Act of 1969 (NEPA): Legislation requiring that any project using federal funding or requiring federal approval (including transportation projects) examine the effects of alternative choices on the environment before a decision is made.

NHDOT: New Hampshire Department of Transportation

Pack Rust: Pack rust is a thick build-up of corrosion product that tends to develop between the surfaces of closely joined, unprotected metal objects, such as built-up bridge members in trusses. Pack rust is known to create tremendous prying force between the built-up sections which can eventually fracture bolts or rivets.

Parapet: A low wall along the outside edge of a bridge deck used to protect vehicles and pedestrians

Pier: The middle supporting structure between two or more spans.

Pile: A structural element that is driven vertically into the ground to support a bridge. Pilings, or groups of piles, are used as a base on which to build abutments or piers.

Pile Bent: A row of driven or placed piles with a pile cap to hold them in their correct positions.

Pointing: A repair of stone abutments, which consists of putting mortar into joints between the stones.

Q_{50}- 50-Year storm event, an event that has a 2% chance of being exceeded in any one year.

Railing: A fence-like construction built at the outermost edge of the roadway or the sidewalk portion of a bridge to protect pedestrians and vehicles.

Reaction: The resistance of a support against the pressure of a loaded member.

Redundancy: A structural condition where there are more elements of support than are necessary for stability.

Reinforced Concrete: Concrete that has been hardened onto embedded metal, usually steel, in the form of rods, bars, or mesh. The tensile strength of steel and the compression strength of concrete render a member capable of sustaining heavy stresses of all kinds over considerable spans.

Reinforcing Steel: Steel rods, which are placed in concrete to give it additional strength.

Rip Rap: Gabions, stones, blocks of concrete or other protective covering material of like nature deposited upon river and stream beds and banks, lake, tidal or other shores to prevent erosion and scour by water flow, wave or other movement .

Scour: The erosion of submerged piers and abutments or the soil beneath them from fast-flowing water.

Section Loss: The amount of an original member which has been lost due to heavy rust scale or rot and has reduced its strength because of that loss.

Shear: The sliding of one layer of a material relative to another layer.

Simple Span: A span in which the effective length is the same as the length of the spanning structure. The spanning superstructure extends from one vertical support, abutment or pier to another without crossing over an intermediate support or creating a cantilever.

Skew: When the superstructure is not perpendicular to the substructure, a skew angle is created. The skew angle is the acute angle between the alignment of the superstructure and the alignment of the substructure.

Spalling: Areas of concrete where the surface has been affected by salt or other factors and has begun to break away.

Span: The distance a bridge extends between two supports.

Specifications: A document that explains all material and construction requirements of the bridge structure to be constructed, usually used by engineers or architects in the planning stages of construction.

Stringers: Members that run in the same direction as the traffic and which are underneath the riding surface and provide support for the riding surface.

Substructure: The substructure consists of all parts that support the superstructure. The main components are:

- Abutments or end-bents
- Piers or interior bents
- Footings
- Piling

Superstructure: The superstructure consists of the components that actually span the obstacle the bridge is intended to cross. It includes:

- Bridge deck,
- Structural members (steel girders, concrete beams, etc.)
- Parapets, handrails, sidewalk, lighting and drainage features

Tension: The stress resulting from a pulling force on a member, which tends to extend it (the opposite of compression).

Tension Member: Any timber or rod of a truss that is subjected to pull or stretch.

Trestle: A bridge structure consisting of spans supported upon frame bents.

Truss: Lengths of timber, iron, or steel framed together, usually in the form of triangles, to bridge a space economically without bending.

Upper Chord: Top chord of a truss.

Upstream Face: The side of a bridge that is against the water.

Vertical Curve: A sag or crest in the profile of a roadway.

Voids: Holes in a stone abutment caused when a stone falls out.

Waterway: The available width for the passage of water beneath a bridge.

Wearing Surface: The topmost layer of material applied upon a roadway to receive the traffic loads and to resist the resulting disintegrating action; also known as wearing course.

Web: The center vertical part of an "I" shaped beam or girder.

Weephole: A hole in a concrete retaining wall to provide drainage of the water in the retained soil.

Wingwalls: A retaining wall that is a part of an abutment and used to keep the fill from falling into the stream.

X-Bracing: A form of additional supports for the piling of a bridge. The timbers are placed in a "criss-cross" pattern joining the supporting piling.

Yield: Permanent deformation that a metal piece takes when it is stressed beyond the elastic limit.

Yield Stress: The stress at which noticeable, suddenly increased deformation occurs under slowly increasing load.

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