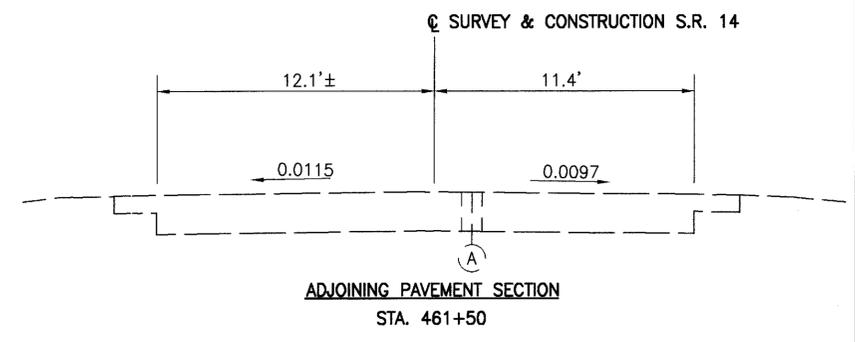
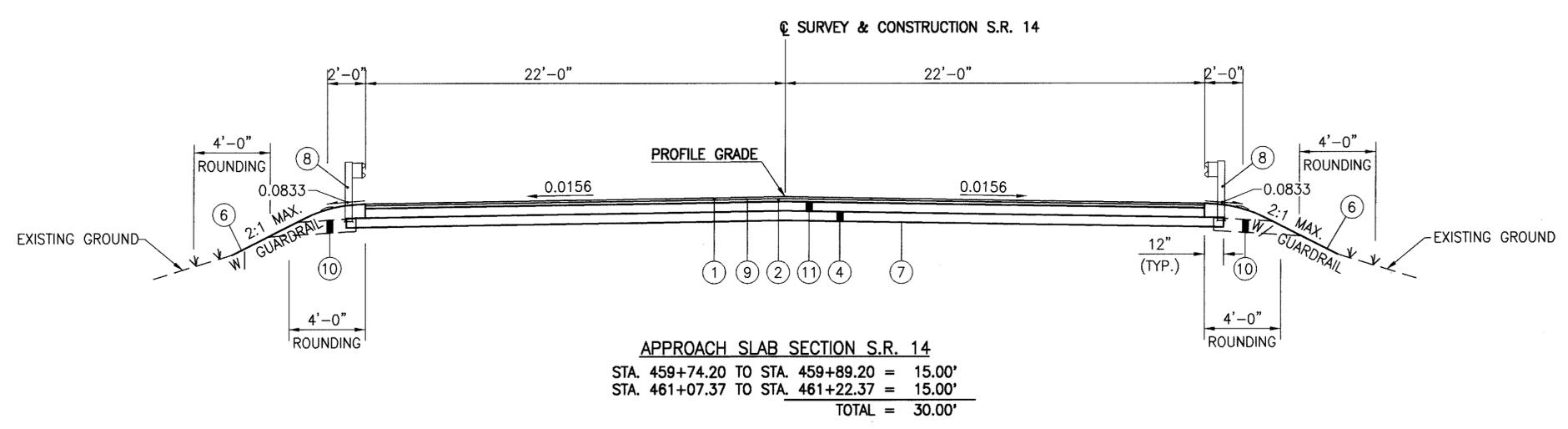
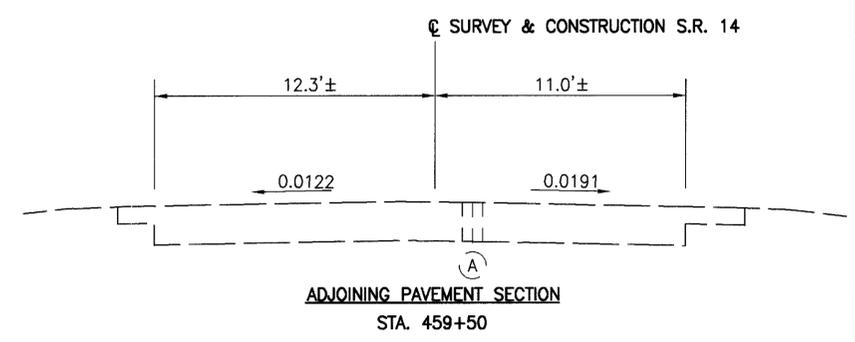
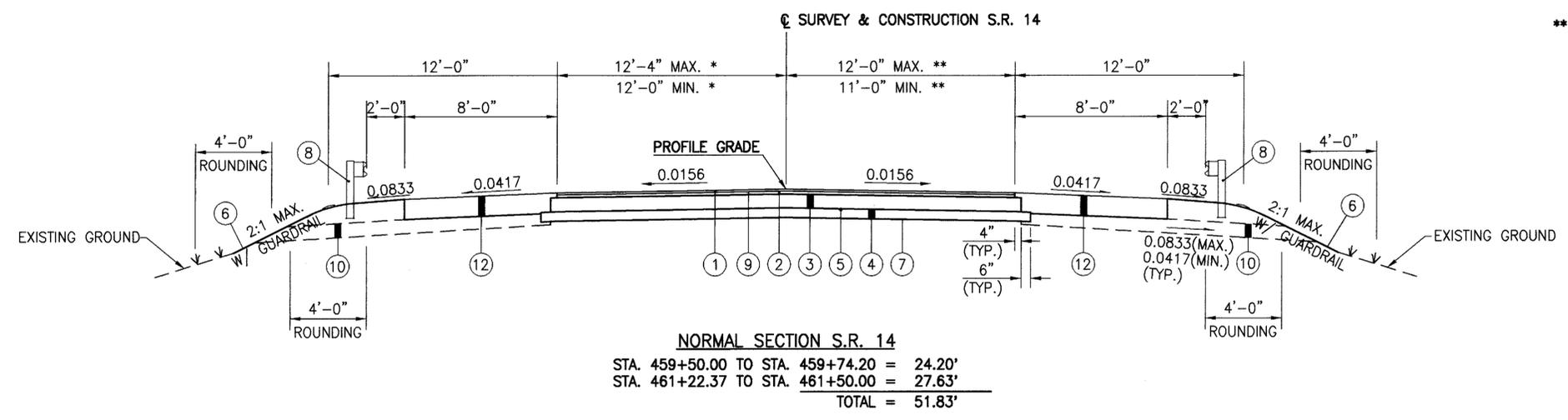
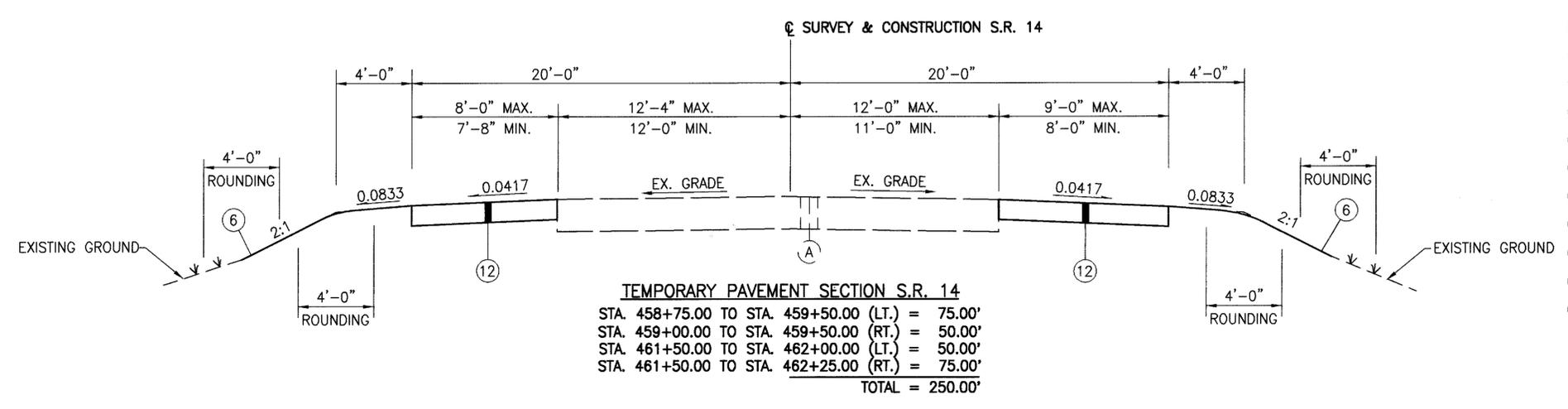




\* TAPER FROM 12.3± (LT.) AT STA. 459+50 TO 12.0' (LT.) AT STA. 459+65 &  
 TAPER FROM 12.0' (LT.) AT STA. 461+35 TO 12.1± (LT.) AT STA. 461+50  
 \*\* TAPER FROM 11.0± (RT.) AT STA. 459+50 TO 12.0' (RT.) AT STA. 459+65 &  
 TAPER FROM 12.0' (RT.) AT STA. 461+35 TO 11.4± (RT.) AT STA. 461+50



- LEGEND**
- ① ITEM 448 1 1/4" ASPHALT CONCRETE, SURFACE COURSE, TYPE 1, PG64-22, AS PER PLAN
  - ② ITEM 448 1 3/4" ASPHALT CONCRETE, INTERMEDIATE COURSE, TYPE 2, PG64-22
  - ③ ITEM 301 9" BITUMINOUS AGGREGATE BASE
  - ④ ITEM 304 6" AGGREGATE BASE
  - ⑤ ITEM 408 BITUMINOUS PRIME COAT @ 0.4 GAL/YD<sup>2</sup>
  - ⑥ ITEM 659 SEEDING AND MULCHING
  - ⑦ ITEM 203 SUBGRADE COMPACTION
  - ⑧ ITEM 606 GUARDRAIL, TYPE 5
  - ⑨ ITEM 407 TACK COAT FOR INTERMEDIATE COURSE
  - ⑩ ITEM 605 AGGREGATE DRAIN
  - ⑪ ITEM 611 APPROACH SLAB, (T= 12")
  - ⑫ ITEM 615 TEMPORARY PAVEMENT, CLASS B, AS PER PLAN
  - Ⓐ EXISTING ASPHALT PAVEMENT (9" REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT, 5.5" ASPHALT, AND 6" AGGREGATE BASE)



TYPICAL SECTIONS

COL - 14 - 8.70

Drawing: C:\PROJECT\50372\50372TYP.DWG

ROUNDING

THE ROUNDING AT SLOPE BREAK POINTS SHOWN ON THE TYPICAL SECTIONS APPLY TO ALL CROSS-SECTIONS EVEN THOUGH OTHERWISE SHOWN.

UTILITIES

LISTED BELOW ARE ALL UTILITIES LOCATED WITHIN THE PROJECT CONSTRUCTION LIMITS TOGETHER WITH THEIR RESPECTIVE OWNERS:

ELECTRIC, VILLAGE OF COLUMBIANA GAS: COLUMBIA GAS OF OHIO  
WATER, & 28 WEST FRIEND STREET 14827 OYSTER ROAD  
SANITARY: COLUMBIANA, OHIO 44408 ALLIANCE, OHIO 44601-2932  
PHONE NO.: (330) 482-2173 PHONE No.: (330) 829-5637

PHONE: AT&T COMMUNICATIONS, INC.  
229 W. 7th STREET  
CINCINNATI, OHIO 45202  
PHONE NO.: (513) 784-3238

THE LOCATIONS OF THE UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE OBTAINED FROM THE OWNERS AS REQUIRED BY SECTION 153.64 O.R.C.

CLEARING AND GRUBBING

ALL TREES AND STUMPS SPECIFICALLY MARKED FOR REMOVAL WITHIN THE CONSTRUCTION LIMITS SHALL BE REMOVED UNDER THE LUMP SUM BID FOR ITEM 201, CLEARING AND GRUBBING. THE FOLLOWING IS AN APPROXIMATE ESTIMATE OF THE NUMBER OF TREES AND STUMPS TO BE REMOVED.

SIZE	NO. TREES	NO. STUMPS	TOTAL
18"	1	1	1

WORK LIMITS

THE WORK LIMITS SHOWN ON THESE PLANS ARE FOR PHYSICAL CONSTRUCTION ONLY. THE INSTALLATION AND OPERATION OF ALL TEMPORARY TRAFFIC CONTROL AND TEMPORARY TRAFFIC CONTROL DEVICES REQUIRED BY THESE PLANS SHALL BE PROVIDED BY THE CONTRACTOR WHETHER INSIDE OR OUTSIDE THESE WORK LIMITS.

CONTINGENCY QUANTITIES

THE CONTRACTOR SHALL NOT ORDER MATERIALS OR PERFORM WORK FOR ITEMS DESIGNATED BY PLAN NOTE TO BE USED "AS DIRECTED BY THE ENGINEER" UNLESS AUTHORIZED BY THE ENGINEER. THE ACTUAL WORK LOCATIONS AND QUANTITIES USED FOR SUCH ITEMS SHALL BE INCORPORATED INTO THE FINAL CHANGE ORDER GOVERNING COMPLETION OF THIS PROJECT.

ELEVATION DATUM

ALL ELEVATIONS ARE BASED ON NAVD 88 DATUM.

SEEDING AND MULCHING

SEEDING AND MULCHING SHALL BE APPLIED TO ALL AREAS OF EXPOSED SOIL BETWEEN THE RIGHT-OF-WAY LINES, AND WITHIN THE CONSTRUCTION LIMITS FOR AREAS OUTSIDE THE RIGHT-OF-WAY LINES COVERED BY WORK AGREEMENT OR SLOPE EASEMENT. QUANTITY CALCULATIONS FOR ITEM 659, SEEDING AND MULCHING, ARE BASED ON THESE LIMITS.

WATERING PERMANENT SEEDED AREAS

THE FOLLOWING ESTIMATED QUANTITIES ARE TO BE USED AS DIRECTED BY THE ENGINEER TO PROMOTE GROWTH AND TO CARE FOR THE PERMANENT SEEDED AREAS, AS PER 659.09: (FOR CALCULATION SEE SHEET 8)

659 WATER	1 M. GAL.
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EROSION CONTROL

ITEM 601 IS PROVIDED IN THE PLANS FOR EROSION CONTROL. THE ENGINEER SHALL CHECK AND NON-PERFORM QUANTITIES OR ADJUST LOCATIONS AND QUANTITIES OF THIS ITEM WHERE INDICATED BY FIELD CONDITIONS DURING CONSTRUCTION. IN ADDITION, THIS ITEM SHALL MEET THE REQUIREMENT OF 108.04.

BRUSH REMOVAL

BRUSH SHALL BE REMOVED UNDER THE STRUCTURE AND FROM 20 FEET EACH SIDE OF THE STRUCTURE. PAYMENT SHALL BE INCLUDED IN THE LUMP SUM BID FOR ITEM 201, CLEARING AND GRUBBING.

ITEM 605. AGGREGATE DRAINS

AGGREGATE DRAINS SHALL BE PLACED AS SHOWN ON SHEET 8.

PART-WIDTH CONSTRUCTION

BECAUSE OF THE NECESSITY TO BUILD THIS PROJECT UNDER TRAFFIC AND TO CONSTRUCT THE FULL PAVEMENT WIDTH IN STAGES, EXTREME CARE SHALL BE TAKEN TO PREVENT THE CONSTRUCTION OF A BUTT JOINT IN THE BASE COURSES. LONGITUDINAL JOINTS SHALL BE LAPPED AS SHOWN ON STANDARD CONSTRUCTION DRAWING BP-3.1M.

ITEM 407 - TACK COAT FOR INTERMEDIATE COURSE

THE RATE OF APPLICATION OF THE 407 TACK COAT SHALL BE SUBJECT TO ADJUSTMENT AS DIRECTED BY THE ENGINEER. FOR ESTIMATING PURPOSES ONLY, THE PLAN QUANTITIES INDICATE AN AVERAGE APPLICATION RATE OF:

407, TACK COAT FOR INTERMEDIATE COURSE 0.075 GAL/SQ.YD.

ITEM 448 - ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG 64-22, AS PER PLAN

MATERIALS FURNISHED FOR FINE COARSE AGGREGATES USED IN THIS ITEM SHALL EXCLUDE ALL STONE AND CRUSHED CARBONATE STONE.

CONNECTION BETWEEN EXISTING AND PROPOSED GUARDRAIL

WHEN IT IS NECESSARY TO SPLICE PROPOSED GUARDRAIL TO EXISTING GUARDRAIL, ONLY THE EXISTING GUARDRAIL SHALL BE CUT, DRILLED, OR PUNCHED. THE CONNECTION SHALL BE MADE USING A "W-BEAM RAIL SPLICE" AS SHOWN ON AASHTO M 180. PAYMENT SHALL BE INCLUDED IN THE CONTRACT PRICE FOR THE RESPECTIVE GUARDRAIL ITEMS.

TEMPORARY SOIL EROSION AND SEDIMENT CONTROL

THE FOLLOWING ESTIMATED QUANTITIES ARE TO BE PLACED BY THE CONTRACTOR WITH THE ENGINEERS CONCURRENCE FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES:

877 TEMPORARY PERIMETER, DITCH CHECK OR INLET 650 FT.  
PROTECTION FILTER FABRIC FENCE

TEMPORARY PAVEMENT MARKINGS

THE ROAD SHALL NOT BE OPENED TO TRAFFIC UNTIL EITHER THE PERMANENT OR TEMPORARY MARKINGS ARE IN PLACE. TEMPORARY MARKINGS SHALL BE PROVIDED AS DIRECTED BY THE ENGINEER. IF ITEM 642 PAVEMENT MARKINGS ARE IN PLACE PRIOR TO OPENING THE ROAD TO TRAFFIC THIS ITEM SHALL BE NONPERFORMED.

ITEM	DESCRIPTION	QUANTITY	UNIT
614	TEMPORARY CENTER LINE, CLASS I, 740.06, TYPE 1,	0.17	MILE
614	TEMPORARY EDGE LINE, CLASS I, 740.06, TYPE 1,	0.22	MILE

NOTIFICATION OF WORK ZONE LANE RESTRICTIONS

THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST EIGHTEEN (18) DAYS PRIOR TO IMPLEMENTING ANY WORK ZONE RESTRICTIONS THAT WILL REDUCE THE WIDTH OR VERTICAL CLEARANCE OF ANY LANE ON WHICH TRAFFIC WILL BE MAINTAINED DURING CONSTRUCTION. THE ENGINEER SHALL IMMEDIATELY NOTIFY THE DISTRICT ROADWAY SERVICES MANAGER TO ADVISE THE OFFICE OF HIGHWAY MANAGEMENT OF THE RESTRICTIONS.

CONVERSION OF STANDARD CONSTRUCTION DRAWINGS

THE METRIC STANDARD DRAWINGS REFERENCED IN THIS PLAN SHALL BE CONVERTED TO ENGLISH UNITS USING THE SI (METRIC) TO ENGLISH CONVERSION FACTORS PROVIDED IN SECTION 109.011 OF THE 1997 CONSTRUCTION AND MATERIALS SPECIFICATIONS. THE APPENDIX OF ASTM E 380 SHALL BE UTILIZED FOR ANY ADDITIONAL CONVERSION FACTORS REQUIRED. CONVERSIONS SHALL BE APPROPRIATELY PRECISE AND SHALL REFLECT STANDARD INDUSTRY ENGLISH VALUES WHERE SUITABLE.

STREAM CHANNEL EXCAVATION

THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PREVENT ANY INCIDENTAL DISCHARGES ASSOCIATED WITH THE EXCAVATION AND HAILING OF MATERIAL FROM THE STREAM CHANNEL. THIS PERTAINS TO ANY EXCAVATION OPERATIONS SUCH AS, FOUNDATION PIER OR ABUTMENT EXCAVATION, CHANNEL CLEAN OUT, EXCAVATION FOR ROCK CHANNEL PROTECTION AND REMOVAL OF ANY TEMPORARY FILL ASSOCIATED WITH CONSTRUCTION OPERATIONS.

DEMOLITION DEBRIS

THE CONTRACTOR SHALL TAKE PRECAUTIONS TO AVOID AND/OR LIMIT DEMOLITION DEBRIS FROM ENTERING THE STREAM. ANY MATERIAL THAT DOES FALL INTO THE STREAM SHALL BE REMOVED AS SOON AS POSSIBLE.

TEMPORARY STREAM CROSSING

WHERE THE STREAM CROSSING FORDS ARE REQUIRED FOR EQUIPMENT CROSSING, THE CROSSING SHALL CONSIST OF CLEAN NONTXIC GRANULAR OR ROCK MATERIAL, PROPERLY MAINTAINED TO PREVENT EROSION, WITH PROVISIONS FOR CONVEYANCE OF ANTICIPATED HIGH FLOWS, AND SHALL NOT IMPEDE THE MOVEMENT OF AQUATIC LIFE. ROCK OR GRANULAR MATERIAL SHALL BE ROCK AS PER 203.02 OR DUMP ROCK FILL TYPE A, B, C, OR D AS PER 601.07, EXCEPT ALL MATERIALS SHALL BE RETAINED ON THE 1/2" SEIVE. THIS TEMPORARILY PLACED MATERIAL SHALL BE REMOVED AND THE STREAM BOTTOM RESTORED TO NEAR NATURAL CONDITIONS WHEN THE WORK IS COMPLETED. CONSTRUCTION SHALL BE IN ACCORDANCE WITH PART 330, APPENDIX A, SPECIAL CATEGORIES OF DISCHARGES - NATIONALLY PERMITTED, PARAGRAPH (A14), ROAD CROSSINGS FILLS - THE FEDERAL REGISTER - U.S. CORPS OF ENGINEERS FINAL REGULATIONS, CURRENT EDITION.

WETLAND PLAN NOTE

A WETLAND AREA HAS BEEN IDENTIFIED WITHIN CLOSE PROXIMITY OF THIS PROJECT. THIS WETLAND IS LOCATED APPROXIMATELY 95 FEET LEFT OF CENTERLINE AT STATION 459+75 AND IS ENTIRELY OUTSIDE OF THE PROJECT'S CONSTRUCTION LIMITS (SEE PLAN SHEET 14). THE CONTRACTOR SHALL EXERCISE CAUTION TO ASSURE THAT NO IMPACTS OCCUR TO THE WETLAND AREA. ANY ACTIVITIES OCCURRING IN THIS WETLAND AREA WOULD REQUIRE SPECIAL PERMITS FROM THE US CORPS OF ENGINEERS AND/OR THE OHIO EPA. OBTAINING SUCH PERMITS WOULD BE THE RESPONSIBILITY OF THE CONTRACTOR.

ANY OTHER SITE PROPOSED BY THE CONTRACTOR FOR OFF PROJECT ANCILLARY CONSTRUCTION (STAGING AREAS, WASTE LOCATIONS, AND/OR BORROW LOCATIONS) SHALL FIRST BE INVESTIGATED BY THE CONTRACTOR FOR ENVIRONMENTAL SENSITIVITY. ANY SITES THAT ARE DETERMINED TO BE SENSITIVE IN NATURE SHALL NOT BE DISTURBED UNLESS CLEARANCE IS MADE THROUGH THE APPROPRIATE CONTROLLING AGENCY/OFFICE AND ALL FEDERAL, STATE, AND LOCAL LAWS ARE COMPLIED WITH, INCLUDING BUT NOT LIMITED TO THE CLEAN WATER ACT AND ITS AMENDMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENGAGING AN ENVIRONMENTAL CONSULTING FIRM ACCEPTABLE TO THE DEPARTMENT TO FIELD SURVEY, EVALUATE, AND CLEAR THE ENVIRONMENTALLY SENSITIVE SITE WITH THE US ARMY CORPS OF ENGINEERS AND/OR THE OHIO EPA.

THIS DOES NOT SET PRECEDENCE THAT THE DEPARTMENT WILL ALWAYS PUT THIS NOTICE IN ALL ENVIRONMENTALLY SENSITIVE PROJECTS. ENVIRONMENTAL DOCUMENT IS ALWAYS AVAILABLE UPON REQUEST.

INSTREAM WORK

INSTREAM WORK WILL BE LIMITED WHERE PRACTICABLE AND ONLY CLEAN NON-ERODABLE MATERIAL WILL BE USED FOR FORDS AND COFFERDAMS. THIS TEMPORARY PLACED MATERIAL WILL BE REMOVED AND THE STREAM BOTTOM RESTORED TO NEAR NATURAL CONDITIONS WHEN THE WORK IS COMPLETED.

EROSION AND SEDIMENT CONTROL

THE SPECIFICATIONS SET FORTH IN THE MOST CURRENT VERSION OF ODOT'S CONSTRUCTION AND MATERIAL SPECIFICATIONS, LOCATION AND DESIGN MANUAL, AND STANDARD DRAWINGS WILL BE USED TO ENSURE ADEQUATE EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION.

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ITEM 614 MAINTAINING TRAFFIC

A MINIMUM OF ONE LANE TRAFFIC IN EACH DIRECTION SHALL BE MAINTAINED AT ALL TIMES BY USE OF THE EXISTING, TEMPORARY PAVEMENT, AND COMPLETE PAVEMENT.

ACCESS TO DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES.

LENGTH AND DURATION OF LANE CLOSURES AND RESTRICTIONS SHALL BE AT THE APPROVAL OF THE ENGINEER. IT IS THE INTENT TO MINIMIZE THE IMPACT TO THE TRAVELING PUBLIC. LANE CLOSURES OR RESTRICTIONS OVER SEGMENTS OF THE PROJECT IN WHICH NO WORK IS ANTICIPATED WITHIN A REASONABLE TIME FRAME, AS DETERMINED BY THE ENGINEER, SHALL NOT BE PERMITTED. THE LEVEL OF UTILIZATION OF MAINTENANCE OF TRAFFIC DEVICES SHALL BE COMMENSURATE WITH THE WORK IN PROGRESS.

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH ITEM 614 AND OTHER APPLICABLE PORTIONS OF THE SPECIFICATIONS, AS WELL AS THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS SHALL BE INCLUDED IN THE LUMP SUM CONTRACT PRICE FOR ITEM 614, MAINTAINING TRAFFIC.

TRENCH FOR WIDENING

TRENCH EXCAVATION FOR BASE WIDENING SHALL BE ONLY ON ONE SIDE OF THE PAVEMENT AT A TIME. THE OPEN TRENCH SHALL BE ADEQUATELY MAINTAINED AND PROTECTED WITH DRUMS OR BARRICADES AT ALL TIMES. PLACEMENT OF PROPOSED SUBBASE AND BASE MATERIAL SHALL FOLLOW AS CLOSELY AS POSSIBLE BEHIND EXCAVATION OPERATIONS. THE LENGTH OF WIDENING TRENCH WHICH IS OPEN AT ANY ONE TIME SHALL BE HELD TO A MINIMUM AND SHALL AT ALL TIMES BE SUBJECT TO APPROVAL OF THE ENGINEER.

PLACEMENT OF ASPHALT CONCRETE

TWO-WAY TRAFFIC SHALL BE MAINTAINED AT ALL TIMES EXCEPT THAT ONE-WAY TRAFFIC WILL BE PERMITTED FOR MINIMUM PERIODS OF TIME CONSISTENT WITH THE REQUIREMENTS OF THE SPECIFICATIONS FOR PROTECTION OF COMPLETED ASPHALT CONCRETE COURSES.

DUST CONTROL

THE CONTRACTOR SHALL FURNISH AND APPLY WATER AND CALCIUM CHLORIDE FOR DUST CONTROL AS DIRECTED BY THE ENGINEER. THE FOLLOWING CONTINGENCY QUANTITIES HAVE BEEN INCLUDED FOR DUST CONTROL PURPOSES.

616, WATER ————— 1 M.GAL.  
616, CALCIUM CHLORIDE ——— 0.10 TON

ITEM 622. PORTABLE CONCRETE BARRIER:

IT IS ANTICIPATED THAT THE SAME BARRIER WILL BE USED IN VARIOUS STAGES OF CONSTRUCTION, MOVEMENT OF THE CONCRETE BARRIER BETWEEN STAGES SHALL BE ACCOMPLISHED IN ONE WORKING DAY. FLAGGERS SHALL BE UTILIZED FOR PROTECTION OF VEHICULAR TRAFFIC UNTIL MOVEMENT OF THE BARRIER IS COMPLETE. ALL COSTS INVOLVED IN REMOVING AND REINSTALLING THE CONCRETE BARRIER WILL BE INCLUDED IN THE PRICE FOR ITEM 622, PORTABLE CONCRETE BARRIER.

ITEM 614. BARRIER REFLECTORS

BARRIER REFLECTORS AND/OR OBJECT MARKERS SHALL BE INSTALLED ON ALL PORTABLE CONCRETE BARRIER USED FOR TRAFFIC CONTROL. BARRIER REFLECTORS, OBJECT MARKERS AND THEIR INSTALLATION SHALL CONFORM TO THE APPROPRIATE PROPOSAL NOTE AND ITEM 626 EXCEPT THAT THE SPACING SHALL BE 25 FEET.

ITEM 614. TEMPORARY PAVEMENT, AS PER PLAN

THE TEMPORARY PAVEMENT SHALL BE CLASS B, AND SHALL REMAIN IN PLACE AFTER THE COMPLETION OF STAGE I AND STAGE II.

CALCULATED  
WMA  
CHECKED  
DC

MAINTENANCE OF TRAFFIC NOTES

COL - 14 - 8.70

4  
33

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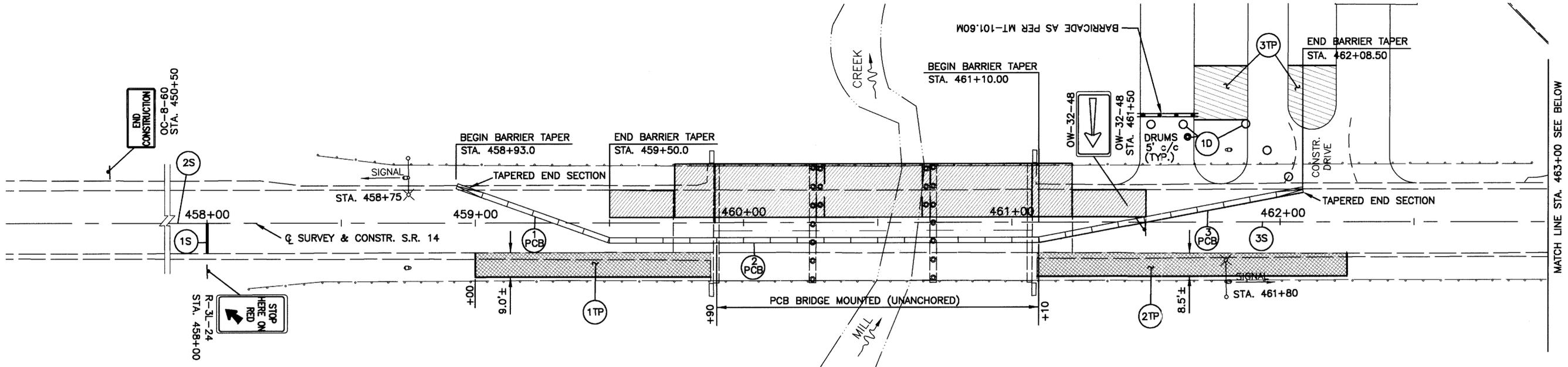
40  
20  
0  
FOR HORIZONTAL SCALE 1" = 40'

CALCULATED  
WAA  
CHECKED  
DO

MAINTENANCE OF TRAFFIC STAGE I

COL - 14 - 8.70

5  
33



**NOTE**  
FOR THE LEAD-IN SIGNING PLACEMENT SEE STD. MT-96.11M.

**ESTIMATED QUANTITIES**

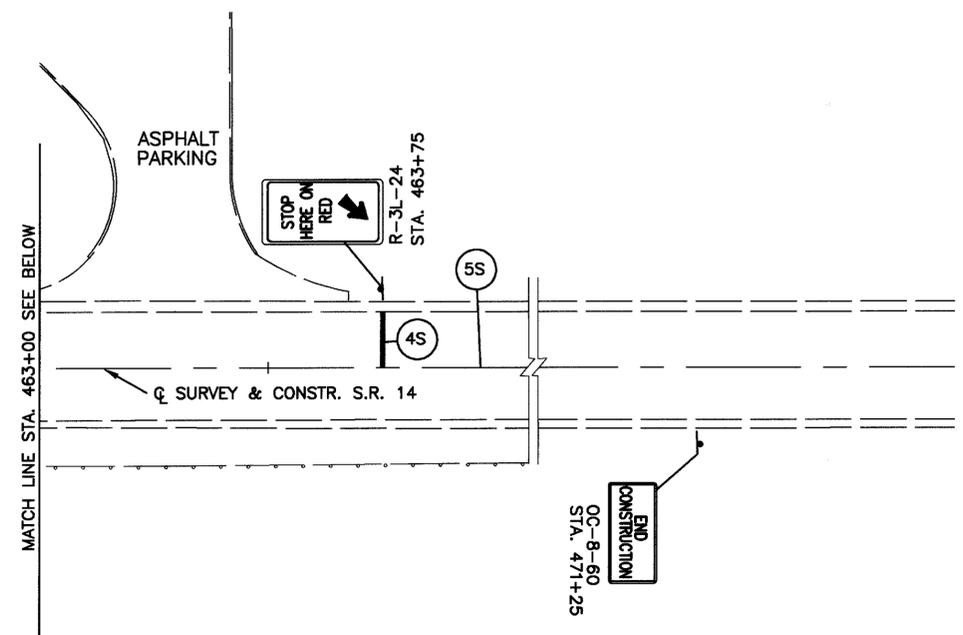
REF. NO.	STATION TO STATION	SIDE	614	614	614	614	614	614	615	622	622
			MINI DRUM	BARRIER REFLECTORS, TYPE B2	OBJECT MARKERS	TEMPORARY CENTER LINE CLASS I, 740.06, TYPE I	TEMPORARY EDGE LINE, CLASS I, 740.06, TYPE I	TEMPORARY STOP LINE, CLASS I, 740.06, TYPE I	TEMPORARY PAVEMENT CLASS B, AS PER PLAN	PORTABLE CONCRETE BARRIER, 32"	PORTABLE CONCRETE BARRIER, 32" BRIDGE MOUNTED
			EACH	EACH	EACH	MILE	MILE	FT.	SQ.YD.	FT.	FT.
1S	458+00.0	RT.						12			
2S	456+50.0 - 458+00.0	CL				0.03					
3S	461+10.0 - 462+08.5	L&R					0.02				
4S	463+75.0	LT.						12			
5S	463+75.0 - 465+25.0	CL				0.03					
1PCB	458+93.0 - 459+90.0	L&R		5	10					100	
2PCB	459+90.0 - 461+10.0	RT.		5	10						120
3PCB	461+10.0 - 462+08.5	L&R		5	10					100	
* 1TP	459+00.0 - 459+90.0	RT.							90		
* 2TP	461+10.0 - 462+25.0	RT.							109		
* 3TP	461+70.0 - 462+21.0	LT.							88		
1D	461+70.0 - 462+21.0	LT.	5								
TOTAL CARRIED TO SHEET 6			5	15	30	0.06	0.02	24	287	200	120

**TRAFFIC SIGNAL EQUIPMENT**  
TRAFFIC SIGNAL CONTROL EQUIPMENT SHALL BE CAPABLE OF VEHICLE DETECTION AND OF PROVIDING VARIABLE GREEN TIMES. VEHICLE DETECTION CAN BE ACCOMPLISHED BY LOOPS SAWN IN THE PAVEMENT, MAGNETIC TYPE DETECTORS, MICROWAVE, OR OTHER ACCEPTABLE MEANS.

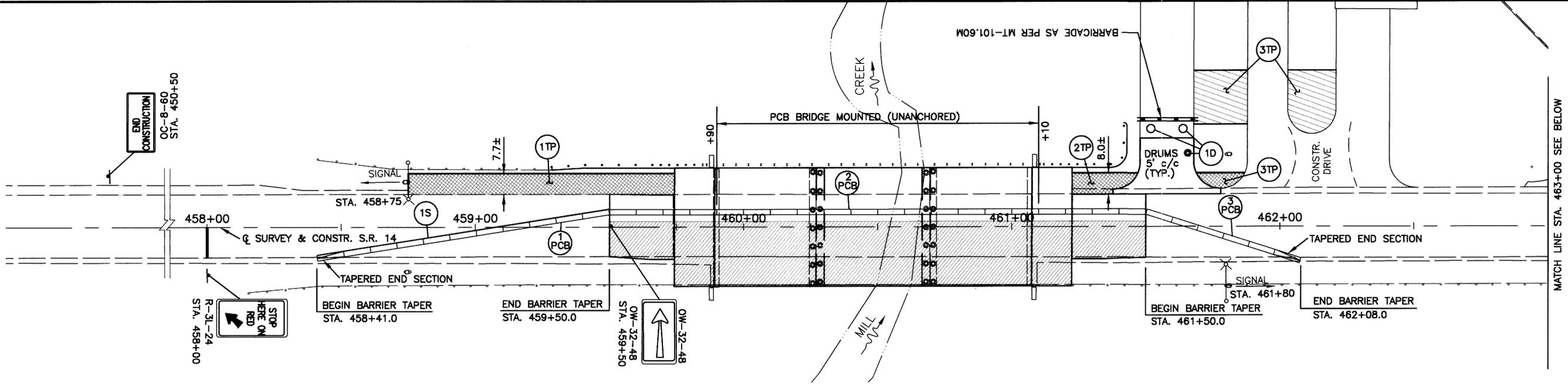
INTERVAL	SIGNAL TIMING					
	1	2	3	4	5	6
LENGTH (SECONDS)	16	40	4	16	40	4
CYCLE = 120 SEC.	$\downarrow_R \uparrow_R$	$\downarrow_G \uparrow_R$	$\downarrow_Y \uparrow_R$	$\downarrow_R \uparrow_R$	$\downarrow_R \uparrow_G$	$\downarrow_R \uparrow_Y$

- WORK AREA
- TEMPORARY PAVEMENT, CLASS B, AS PER PLAN TO REMAIN IN PLACE AFTER COMPLETION OF STAGE I & II.
- TEMPORARY PAVEMENT, CLASS B, AS PER PLAN TO BE REMOVED AFTER COMPLETION OF STAGE I.

**\* TEMPORARY PAVEMENT COMPUTATIONS**  
 STA. 459+00 TO STA. 459+90:  $(90.0 \times 9.0)/9 = 90$  SQ.YD.  
 STA. 461+10 TO STA. 462+25:  $(115.0 \times 8.5)/9 = 109$  SQ.YD.  
 STA. 461+70 TO STA. 462+21:  $(20.0 \times 20.0 + 18.0 \times 22.0)/9 = 88$  SQ.YD.



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NOTE  
 FOR THE LEAD-IN SIGNING PLACEMENT SEE STD. MT-96.11M.

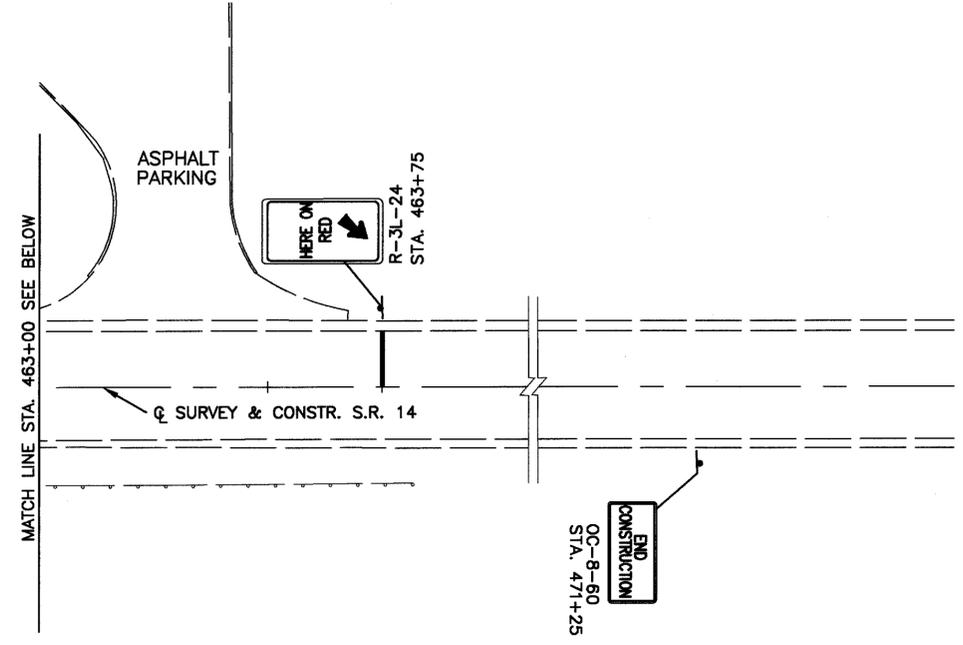
ESTIMATED QUANTITIES											
REF. NO.	STATION TO STATION	SIDE	614	614	614	614	614	614	615	622	622
			MINI DRUM	BARRIER REFLECTORS, TYPE B2	OBJECT MARKERS	TEMPORARY CENTER LINE, CLASS 1	TEMPORARY EDGE LINE, CLASS 1	TEMPORARY STOP LINE, CLASS 1	TEMPORARY PAVEMENT CLASS B, AS PER PLAN	PORTABLE CONCRETE BARRIER, 32"	PORTABLE CONCRETE BARRIER, 32" BRIDGE MOUNTED
			EACH	EACH	EACH	MILE	MILE	FT.	SQ.YD.	FT.	FT.
1S	458+41.0 - 459+50.0	L&R					0.02				
1D	461+45.0 - 461+68.0	LT.	2								
1PCB	458+41.0 - 459+90.0	L&R		6	12					150	
2PCB	459+90.0 - 461+10.0	LT.		5	10						120
3PCB	461+10.0 - 462+08.0	L&R		5	10					100	
* 1TP	458+75.0 - 459+74.0	LT.							85		
* 2TP	461+22.0 - 461+45.0	LT.							18		
* 3TP	461+68.0 - 461+87.0	LT.							9		
TOTAL THIS SHEET			2	16	32		0.02		112	250	120
TOTAL FROM SHEET 5			5	15	30	0.06	0.02	24	287	200	120
GRAND-TOTAL CARRIED TO SHEET 7			7	31	62	0.06	0.04	24	399	450	240

**TRAFFIC SIGNAL EQUIPMENT**  
 TRAFFIC SIGNAL CONTROL EQUIPMENT SHALL BE CAPABLE OF VEHICLE DETECTION AND OF PROVIDING VARIABLE GREEN TIMES. VEHICLE DETECTION CAN BE ACCOMPLISHED BY LOOPS SAWN IN THE PAVEMENT, MAGNETIC TYPE DETECTORS, MICROWAVE, OR OTHER ACCEPTABLE MEANS.

INTERVAL	SIGNAL TIMING					
	1	2	3	4	5	6
LENGTH (SECONDS)	16	40	4	16	40	4
CYCLE = 120 SEC.	↓ R   ↑ R	↓ G   ↑ R	↓ Y   ↑ R	↓ R   ↑ R	↓ R   ↑ G	↓ R   ↑ Y

- WORK AREA
- TEMPORARY PAVEMENT, CLASS B, AS PER PLAN TO REMAIN IN PLACE AFTER COMPLETION OF STAGE I & II.
- TEMPORARY PAVEMENT, CLASS B, AS PER PLAN TO BE REMOVED AFTER COMPLETION OF STAGE I.

\* TEMPORARY PAVEMENT COMPUTATIONS  
 STA. 458+75 TO STA. 459+74: (99.0 x 7.7)/9 = 85 SQ.YD.  
 STA. 461+22 TO STA. 461+45: (20.5 x 8.0)/9 = 18 SQ.YD.  
 STA. 461+68 TO STA. 461+87: (12.6 x 6.4)/9 = 9 SQ.YD.



RAISED PAVEMENT MARKERS TABLE											
STATIONING (FROM-TO)	SIDE	SPACING ( FT. )	TYPE A			STATIONING (FROM-TO)	SIDE	SPACING ( FT. )	TYPE A		
			W	Y	Y/Y				W	Y	Y/Y
STAGE I						STAGE II					
456+50.0 - 458+00.0	CL	5' C/C			31	458+00.0 - 461+50.0	LT	5' C/C	71	71	
463+75.0 - 465+25.0	CL	5' C/C			31	461+50.0 - 463+75.0	LT	5' C/C	46		
458+00.0 - 459+50.0	RT	5' C/C	31			459+50.0 - 461+50.0	LT	5' C/C	41	41	
459+50.0 - 463+75.0	RT	5' C/C	86	86							
459+50.0 - 461+50.0	RT	5' C/C	41	41							
SUB-TOTALS			158	127	62				158	112	
TOTALS CARRIED TO SHEET 7			617								

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SHEET NUMBER						ITEM	ITEM EXT.	QUAN.	UNIT	DESCRIPTION	SEE SHT. NO.
3	4	6	8	11							
ROADWAY											
LUMP						201	11000	LUMP		CLEARING AND GRUBBING	
			148			202	22900	148	SQ. YD.	APPROACH SLAB REMOVED	
			135			202	23000	135	SQ. YD.	PAVEMENT REMOVED	
			90			202	32700	90	SQ. YD.	GUTTER REMOVED	
			632			202	38000	632	LIN.FT.	GUARDRAIL REMOVED	
			8			202	54000	8	EACH	RAISED PAVEMENT MARKER REMOVED	
				519		203	12000	519	CU. YD.	EXCAVATION NOT INCLUDING EMBANKMENT CONSTRUCTION	
				72		203	20000	72	CU. YD.	EMBANKMENT	
			283			203	50000	283	SQ. YD.	SUBGRADE COMPACTION	
			237.5			606	13000	237.5	LIN.FT.	GUARDRAIL, TYPE 5	
			4			606	3512.4	4	EACH	BRIDGE TERMINAL ASSEMBLY, TYPE 3 (MODIFIED)	30-33
EROSION CONTROL											
			477			601	32204	477	CU. YD.	ROCK CHANNEL PROTECTION, TYPE C WITH FABRIC FILTER	
				307		659	10000	307	SQ. YD.	SEEDING AND MULCHING	
			0.03			659	20000	0.03	TONS	COMMERCIAL FERTILIZER	
			0.14			659	30000	0.14	TON	AGRICULTURAL LIMING	
1						659	35000	1	M.GAL.	WATER	
650						877	30000	650	LIN.FT.	TEMPORARY PERIMETER, DITCH CHECK OR INLET PROTECTION FILTER FABRIC FENCE	
DRAINAGE											
			24			605	31100	24	LIN.FT.	AGGREGATE DRAIN	
PAVEMENT											
			45			301	46000	45	CU. YD.	BITUMINOUS AGGREGATE BASE, PG64-22	
			56			304	20000	56	CU. YD.	AGGREGATE BASE	
			22			407	14000	22	GAL.	TACK COAT FOR INTERMEDIATE COURSE	
			56			408	10000	56	GAL.	BITUMINOUS PRIME COAT	
			16			448	46050	16	CU. YD.	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, PG 64-22	
			12			448	47021	12	CU. YD.	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG 64-22, AS PER PLAN	3
			147			611	10000	147	SQ. YD.	REINFORCED CONCRETE APPROACH SLAB, (T=12")	
MAINTENANCE OF TRAFFIC											
			617			614	12800	617	EACH	TEMPORARY RAISED PAVEMENT MARKER	
			31			614	13302	31	EACH	BARRIER REFLECTOR, TYPE B2	
			62			614	13350	62	EACH	OBJECT MARKERS	
			7			614	13500	7	EACH	MINI DRUM	
0.17		0.06				614	21200	0.23	MILE	TEMPORARY CENTER LINE, CLASS I, 740.06, TYPE I	
0.22		0.04				614	22200	0.26	MILE	TEMPORARY EDGE LINE, CLASS I, 740.06, TYPE I	
		24				614	26400	24	LIN.FT.	TEMPORARY STOP LINE, CLASS I, 740.06, TYPE I	
		399				615	25001	399	SQ. YD.	TEMPORARY PAVEMENT, CLASS B, AS PER PLAN	4
	1					616	10000	1	M.GAL.	WATER	
	0.10					616	20000	0.10	TON	CALCIUM CHLORIDE	
		450				622	40020	450	LIN.FT.	PORTABLE CONCRETE BARRIER, 32"	
		240				622	40040	240	LIN.FT.	PORTABLE CONCRETE BARRIER, 32", BRIDGE MOUNTED	
TRAFFIC CONTROL											
			8			621	00100	8	EACH	RAISED PAVEMENT MARKER	
			7			626	00100	7	EACH	BARRIER REFLECTOR, TYPE A	
			3			630	85000	3	EACH	REMOVAL OF GROUND MOUNTED SIGN AND STORAGE	
			3			630	86002	3	EACH	REMOVAL OF GROUND MOUNTED POST SUPPORT AND DISPOSAL	
			0.22			642	00100	0.22	MILE	EDGE LINE, TYPE I	
			0.17			642	00300	0.17	MILE	CENTER LINE, TYPE I	
FOR STRUCTURE QUANTITIES SEE SHEET 16/33											
LUMP						614	11000	LUMP		MAINTAINING TRAFFIC	
						623	10000	LUMP		CONSTRUCTION LAYOUT STAKES	
						624	10000	LUMP		MOBILIZATION	
						806	16000	6	MONTH	FIELD OFFICE, TYPE A	

CALCULATED  
WMA  
CHECKED  
DR

GENERAL SUMMARY

COL - 14 - 8.70

7  
33

PAVEMENT CALCULATIONS

ITEM		203		301		304		407		408	
STATION TO STATION	TYPICAL	SUBGRADE COMPACTION	SQ. YD.	BITUMINOUS AGGREGATE BASE	CU. YD.	AGGREGATE BASE	CU. YD.	TACK COAT FOR INTERMEDIATE COURSE	GAL.	PRIME COAT	GAL.
459+50.00 TO 459+65.00	TAPER	$(11.3+11.0+12.0+12.0)/2 \times 15.00/9$	38.58	$(11.6+11.3+12.3+12.3)/2 \times 15.00 \times 9/12/27$	9.90	$(12.1+11.8+12.8+12.8)/2 \times 15.00 \times 6/12/27$	6.88	$(11.3+11.0+12.0+12.0)/2 \times 15.00 \times 0.075/9$	2.89	$(11.6+11.3+12.3+12.3)/2 \times 15.00 \times 0.4/9$	15.83
459+65.00 TO 459+74.20	NORMAL	$(12.0+12.0) \times 9.20/9$	24.53	$(12.3+12.3) \times 9.20 \times 9/12/27$	6.29	$(12.8+12.8) \times 9.20 \times 6/12/27$	4.36	$(12.0+12.0) \times 9.20 \times 0.075/9$	1.84	$(12.3+12.3) \times 9.20 \times 0.4/9$	10.06
459+74.20 TO 459+89.20	APP. SLAB	$(22.0+22.0) \times 15.00/9$	73.33			$(23.0+23.0) \times 15.00 \times 6/12/27$	12.78	$(22.0+22.0) \times 15.00 \times 0.075/9$	5.50		
461+07.37 TO 461+22.37	APP. SLAB	$(22.0+22.0) \times 15.00/9$	73.33			$(23.0+23.0) \times 15.00 \times 6/12/27$	12.78	$(22.0+22.0) \times 15.00 \times 0.075/9$	5.50		
461+22.37 TO 461+35.00	NORMAL	$(12.0+12.0) \times 12.63/9$	33.68	$(12.3+12.3) \times 12.63 \times 9/12/27$	8.63	$(12.8+12.8) \times 12.63 \times 6/12/27$	5.99	$(12.0+12.0) \times 12.63 \times 0.075/9$	2.53	$(12.3+12.3) \times 12.63 \times 0.4/9$	13.81
461+35.00 TO 461+50.00	TAPER	$(12.0+12.0+12.1+11.4)/2 \times 15.00/9$	39.58	$(12.3+12.3+12.4+11.7)/2 \times 15.00 \times 9/12/27$	10.15	$(12.8+12.8+12.9+12.2)/2 \times 15.00 \times 6/12/27$	7.04	$(12.0+12.0+12.1+11.4)/2 \times 15.00 \times 0.075/9$	2.97	$(12.3+12.3+12.4+11.7)/2 \times 15.00 \times 0.4/9$	16.23
TOTALS TO GENERAL SUMMARY			283		35		50		22		56

PAVEMENT CALCULATIONS

ITEM		448		448		611	
STATION TO STATION	TYPICAL	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, PG 64-22	CU. YD.	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG 64-22, AS PER PLAN	CU. YD.	APPROACH SLAB	SQ. YD.
459+50.00 TO 459+65.00	TAPER	$(11.3+11.0+12.0+12.0)/2 \times 15.00 \times 1.75/12/27$	1.88	$(11.3+11.0+12.0+12.0)/2 \times 15.00 \times 1.25/12/27$	1.34		
459+65.00 TO 459+74.20	NORMAL	$(12.0+12.0) \times 9.20 \times 1.75/12/27$	1.19	$(12.0+12.0) \times 9.20 \times 1.25/12/27$	0.85		
459+74.20 TO 459+89.20	APP. SLAB	$(22.0+22.0) \times 15.00 \times 1.75/12/27$	3.56	$(22.0+22.0) \times 15.00 \times 1.25/12/27$	2.55	$(22.0 + 22.0) \times 15.00/9$	73.33
461+07.37 TO 461+22.37	APP. SLAB	$(22.0+22.0) \times 15.00 \times 1.75/12/27$	3.56	$(22.0+22.0) \times 15.00 \times 1.25/12/27$	2.55	$(22.0 + 22.0) \times 15.00/9$	73.33
461+22.37 TO 461+35.00	NORMAL	$(12.0+12.0) \times 12.63 \times 1.75/12/27$	1.64	$(12.0+12.0) \times 12.63 \times 1.25/12/27$	1.17		
461+35.00 TO 461+50.00	TAPER	$(12.0+12.0+12.1+11.4)/2 \times 15.00 \times 1.75/12/27$	1.92	$(12.0+12.0+12.1+11.4)/2 \times 15.00 \times 1.25/12/27$	1.37		
TOTALS TO GENERAL SUMMARY			14		10		147

DRIVEWAY @ STA. 461+60

ITEM	CALCULATION
448	$1 \times 1/4" / 12 \times 497 \text{ S.F.} / 27 = 1.92 \text{ CU.YD.}$
448	$1 \times 1/2" / 12 \times 497 \text{ S.F.} / 27 = 2.30 \text{ CU.YD.}$
301	$6" / 12 \times 497 \text{ S.F.} / 27 = 9.20 \text{ CU.YD.}$
304	$4" / 12 \times 497 \text{ S.F.} / 27 = 6.07 \text{ CU.YD.}$
TOTALS TO GENERAL SUMMARY SHEET 7	

ITEM 605 - AGGREGATE DRAIN

STA.	SIDE	LENGTH	STA.	SIDE	LENGTH
459+75	LT.	5.0	459+50	RT.	14.0
			461+25	RT.	5.0
SUB-TOTAL		5.0	SUB-TOTAL		19.0
TOTAL TO GENERAL SUMMARY 24'					

ITEM 626 BARRIER REFLECTOR, TYPE A

L1 = STA.459+28.48 - STA.461+42.87 = 215'  
 L2 = STA.459+03.47 - STA.461+68.18 = 265'

NO. OF BARRIER REFLECTORS (N)=(L1/100+1)+(L2/100+1) =

TOTAL TO GENERAL SUMMARY 7

ITEM 642, CENTER LINE, TYPE I

ITEM 642, EDGE LINE, TYPE I

STATION TO STATION	ITEM 642, CENTER LINE, TYPE I	ITEM 642, EDGE LINE, TYPE I
456+50.00 TO 465+25.00	875	
458+00.00 TO 463+75.00		1150
TOTALS TO GENERAL SUMMARY	0.17 MILE	0.22 MILE

ESTIMATED QUANTITIES

REF. NO.	SHT. NO.	STATION TO STATION	SIDE	202	202	202	202	202	601	606	606	621	630	630
				APPROACH SLAB REMOVED	PAVEMENT REMOVED	GUTTER REMOVED	GUARDRAIL REMOVED	RAISED PAVT. MARKER REMOVED						
				SQ.YD.	SQ.YD.	SQ.YD.	LIN.FT.	EACH	CU.YD.	LIN.FT.	EACH	EACH	EACH	EACH
1R	9	459+28.34 TO 462+94.00	LT.				366							
2R	9	459+03.33 TO 461+68.81	RT.				266							
3R	9	459+74.20 TO 459+89.20	L&R	74										
4R	9	461+07.37 TO 461+22.37	L&R	74										
5R	9	459+50.00 TO 459+74.20	L&R		63									
6R	9	461+22.37 TO 461+50.00	L&R		72									
7R	9	459+70.58	LT.										1	1
8R	9	459+75.21	RT.										1	1
9R	9	461+14.30	RT.										1	1
10R	9	459+90.88 TO 460+24.69	RT.			23								
11R	9	459+90.88 TO 460+24.69	LT.			23								
12R	9	460+73.92 TO 461+05.64	RT.			22								
13R	9	460+73.92 TO 461+05.64	LT.			22								
1G	9	459+28.48 TO 459+84.71	LT.							56.25	1			
2G	9	459+03.47 TO 459+84.71	RT.							81.25	1			
3G	9	461+11.87 TO 461+42.87	LT.							43.75	1			
4G	9	461+11.87 TO 461+68.18	RT.							56.25	1			
1P	9	458+00.00 TO 463+75.00	CL					8				8		
1D *	9	459+89.20 TO 460+38.16	L&R						230					
2D **	9	460+51.26 TO 461+07.37	L&R						247					
TOTALS TO GENERAL SUMMARY				148	135	90	632	8	477	237.5	4	8	3	3

ROCK CHANNEL PROTECTION COMPUTATIONS

\* 2815.0 FT.<sup>2</sup> (AREA) x 2 FT. (THICKNESS) x 1.1 (SLOPE)/27 = 230 CU.YD.  
 \*\* 3022.0 FT.<sup>2</sup> (AREA) x 2 FT. (THICKNESS) x 1.1 (SLOPE)/27 = 247 CU.YD.

ITEM 659 COMMERCIAL FERTILIZER

ITEM 659 WATER

ITEM 659 AGRICULTURAL LIMING

307 SQ. YD. x 9 S.F./1 S.Y. x 20 #/1000 S.F. x 1 TON/2000#	307 SQ. YD. x 9 S.F./1 S.Y. x 120 GAL./1000 S.F. x 2/1000 GAL.	307 SQ. YD. x 9 S.F./1 S.Y. x 100 #/1000 S.F. x 1 TON/2000#
TOTAL TO GENERAL SUMMARY	0.03 TON	TOTAL TO GENERAL NOTES
		1 MGAL.
TOTAL TO GENERAL SUMMARY		0.14 TON

CALCULATIONS

COL - 14 - 8.70

8  
33



FOR HORIZONTAL SCALE 1" = 20'

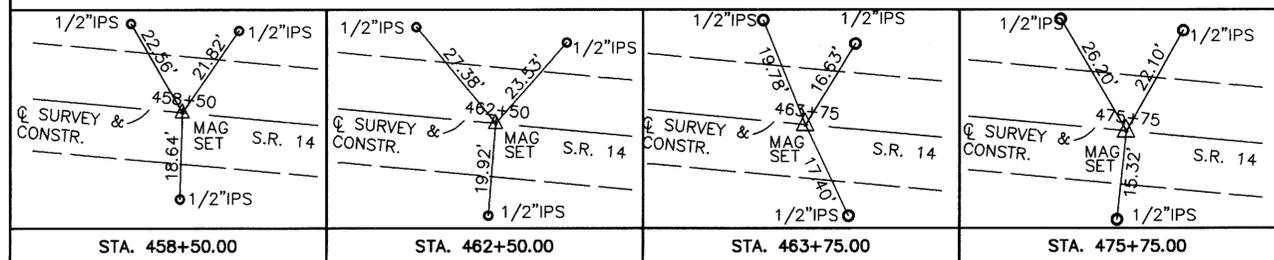
CALCULATED  
WAA  
CHECKED  
DO

PLAN AND PROFILE SHEET  
STA. 457+80 TO STA. 463+20

COL - 14 - 8.70

9  
33

REFERENCE POINTS

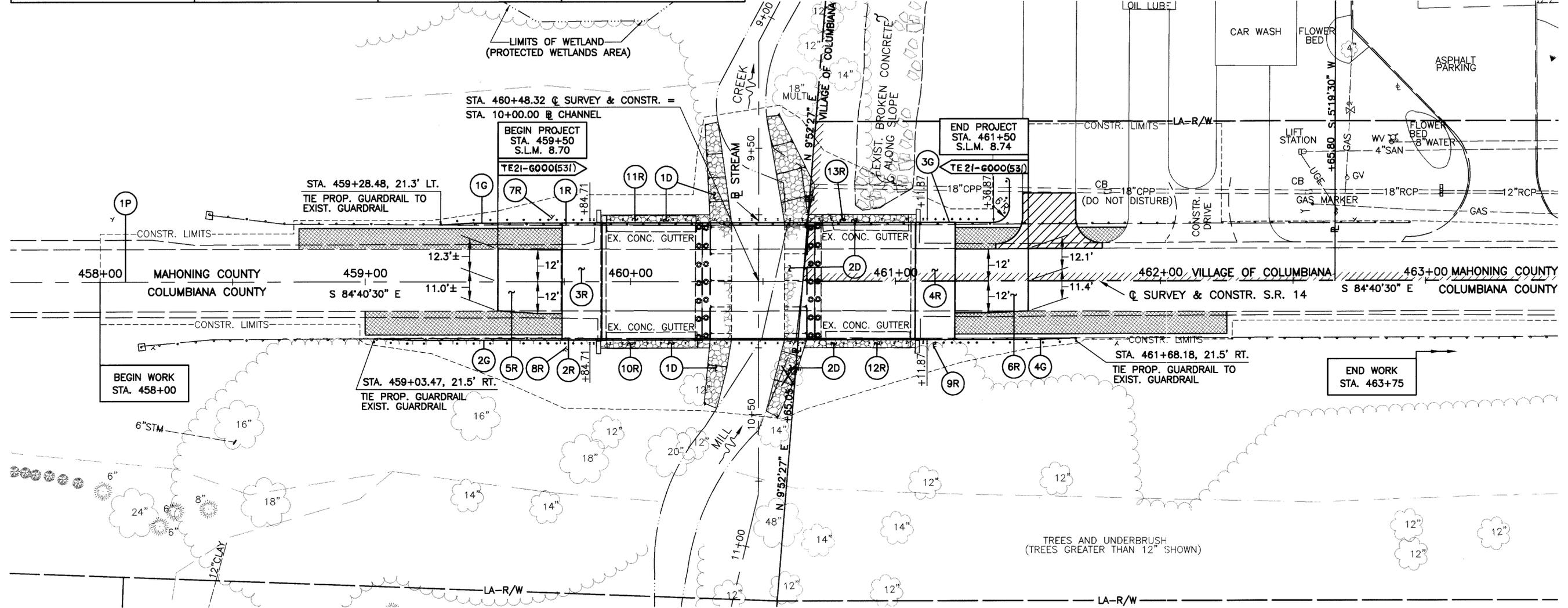


LEGEND:

- TEMPORARY PAVEMENT TO REMAIN IN PLACE
- DRIVEWAY = 497 S.F.  
1 1/4" 448 ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG 64-22, AS PER PLAN  
1 1/2" 448 ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, PG 64-22  
6" 301 BITUMINOUS AGGREGATE BASE  
4" 304 AGGREGATE BASE

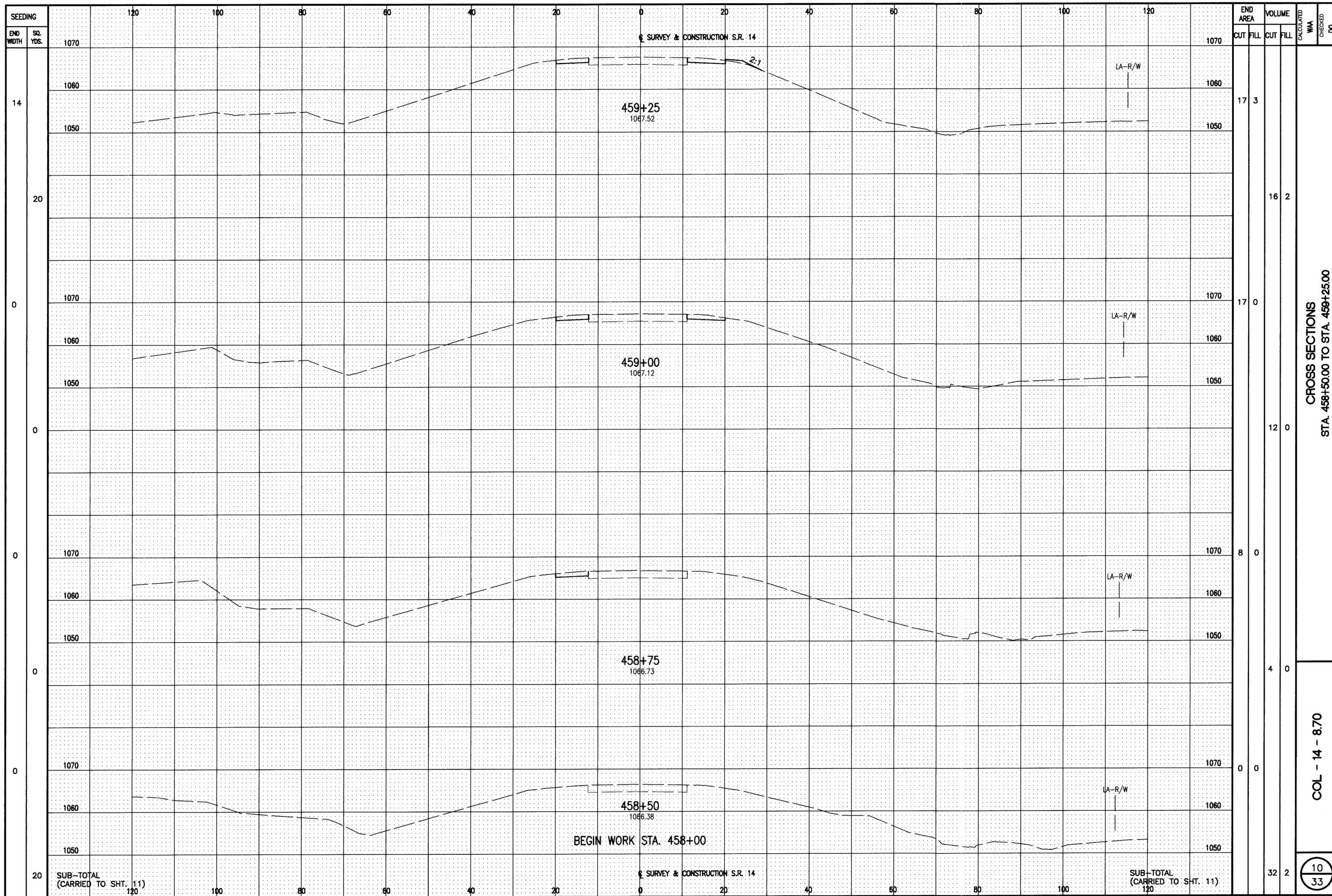
NOTES:

- FOR LIMITS OF ROCK CHANNEL PROTECTION SEE SHT. 14
- FOR QUANTITIES & CALCULATIONS SEE SHEET 8



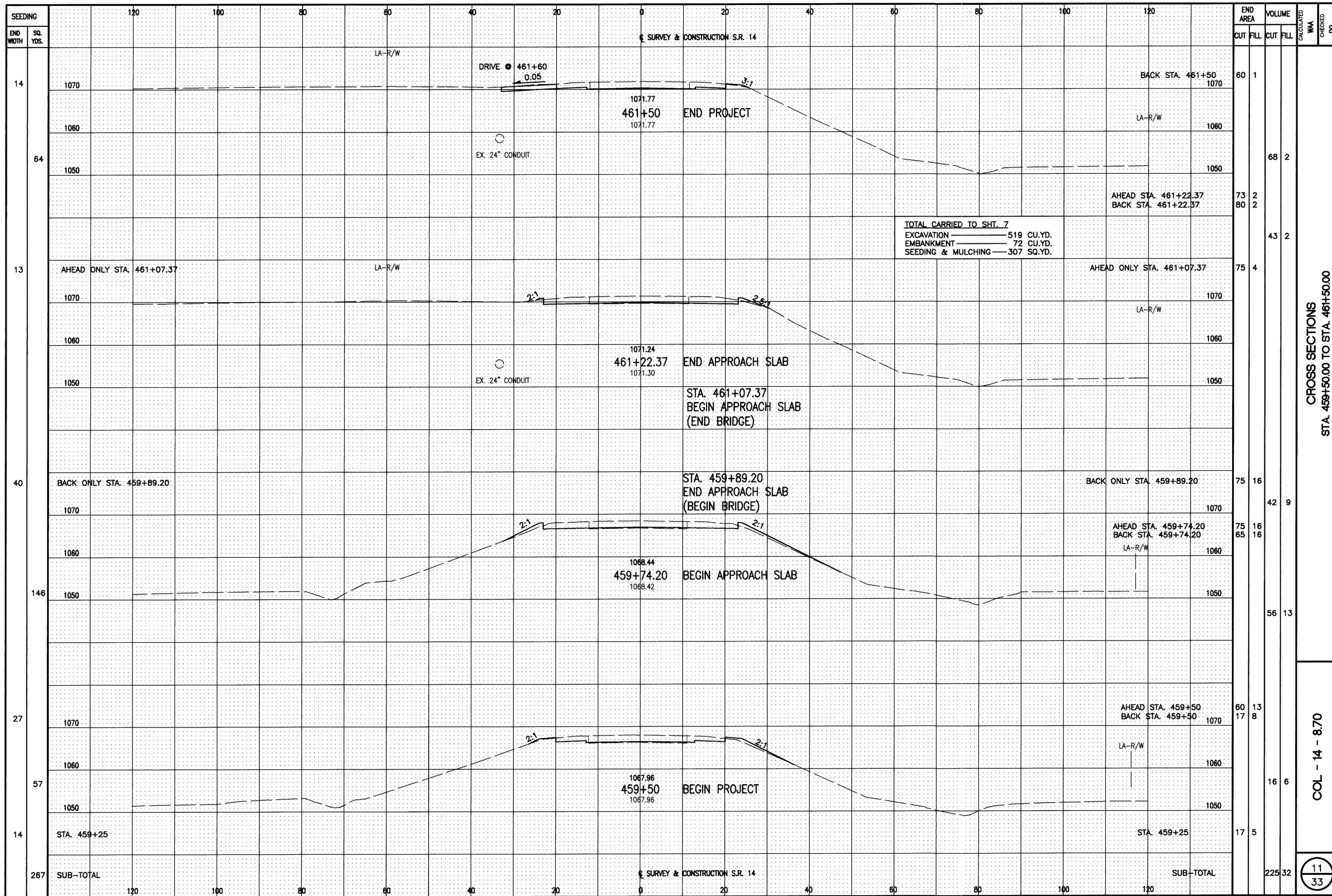
1080	B.M. #1: CHISLED '□' ON SW CORNER OF CONCRETE GUARDRAIL POST ANCHOR @ STA. 458+39.85, 23.94' LT. ELEV. = 1065.28										B.M. #2: CHISLED '□' ON SW CORNER OF CATCH BASIN @ STA. 461+78.65, 32.23' LT. ELEV. = 1071.12										1080									
1070											BRIDGE LIMITS = 118.17'										1070									
1060											BUTT END JOINT										1060									
1050											ROCK CHANNEL PROTECTION TYPE C, 2'-0" THICK WITH FABRIC FILTER (TYP)										1050									
1040											EXISTING STRUCTURE TYPE: THREE SPAN CONTINUOUS STEEL ROLLED BEAM BRIDGE ON CAPPED PILE ABUTMENTS AND CAPPED PILE PIERS ROADWAY: 44'-2" O/O SLAB, 44'-0" F/F GUARDRAIL SPAN: 3 SPANS @ 36'±-45'±-36'± C/C BEARINGS ALIGNMENT: TANGENT SKEW: 0' LOADING: S-20-46 APPROACH SLABS: AS-1-54 (15' LONG) WEARING SURFACE: BITUMINOUS										1040									
	1065.75	1066.05	1066.38	1066.73	1067.12	1067.52	1067.96	1068.42	1068.91	1069.39	1069.86	1070.34	1070.82	1071.30	1071.77	1072.19	1072.62	1073.09	1073.53	1073.97	1074.43									
	458+00					459+00					460+00					461+00					462+00					463+00				

Drawing: C:\PROJECT\50372\50372PNP.DWG



CROSS SECTIONS  
 STA. 458+50.00 TO STA. 459+25.00

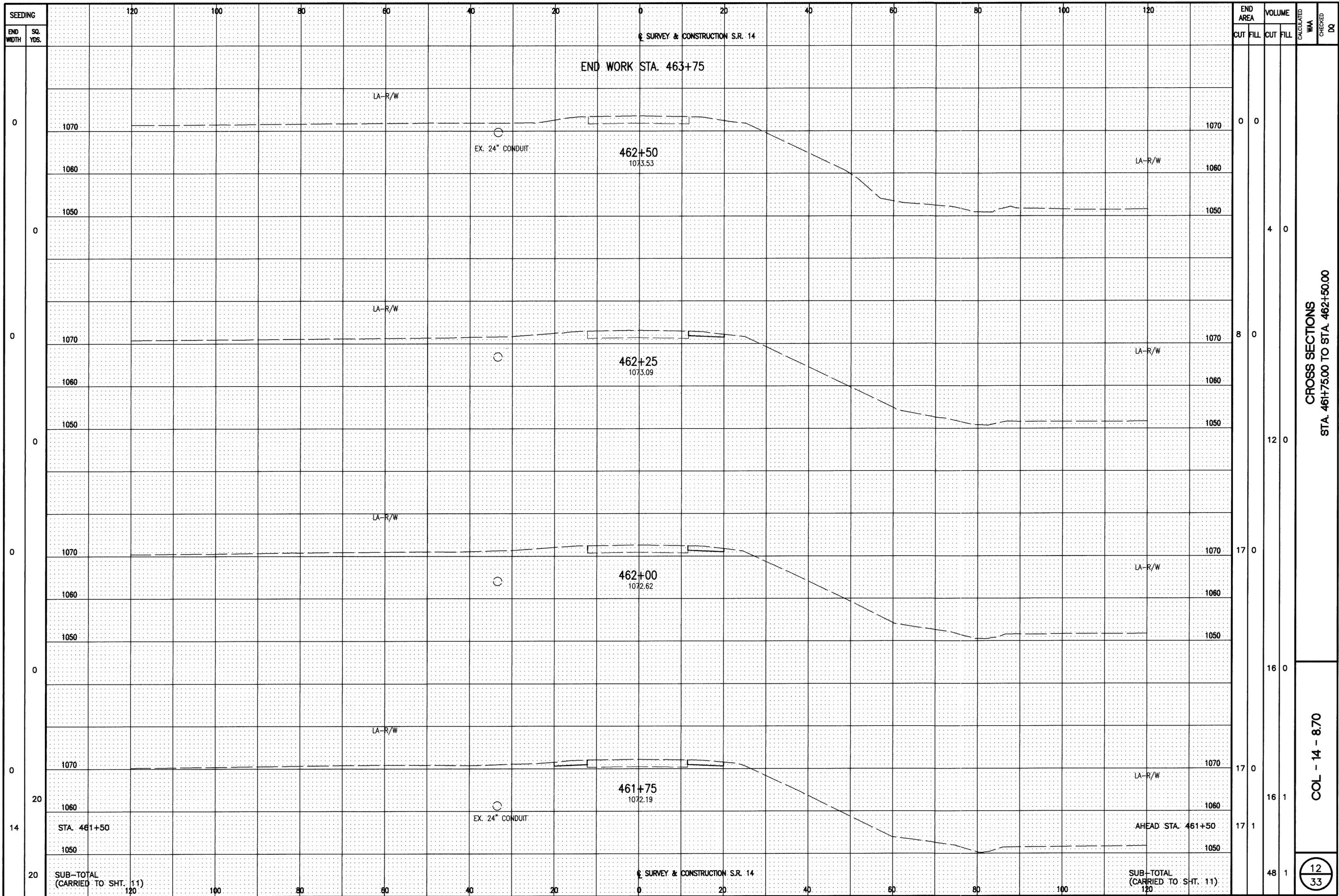
COL - 14 - 8.70



CROSS SECTIONS  
STA. 459+50.00 TO STA. 461+50.00

COL - 14 - 8.70

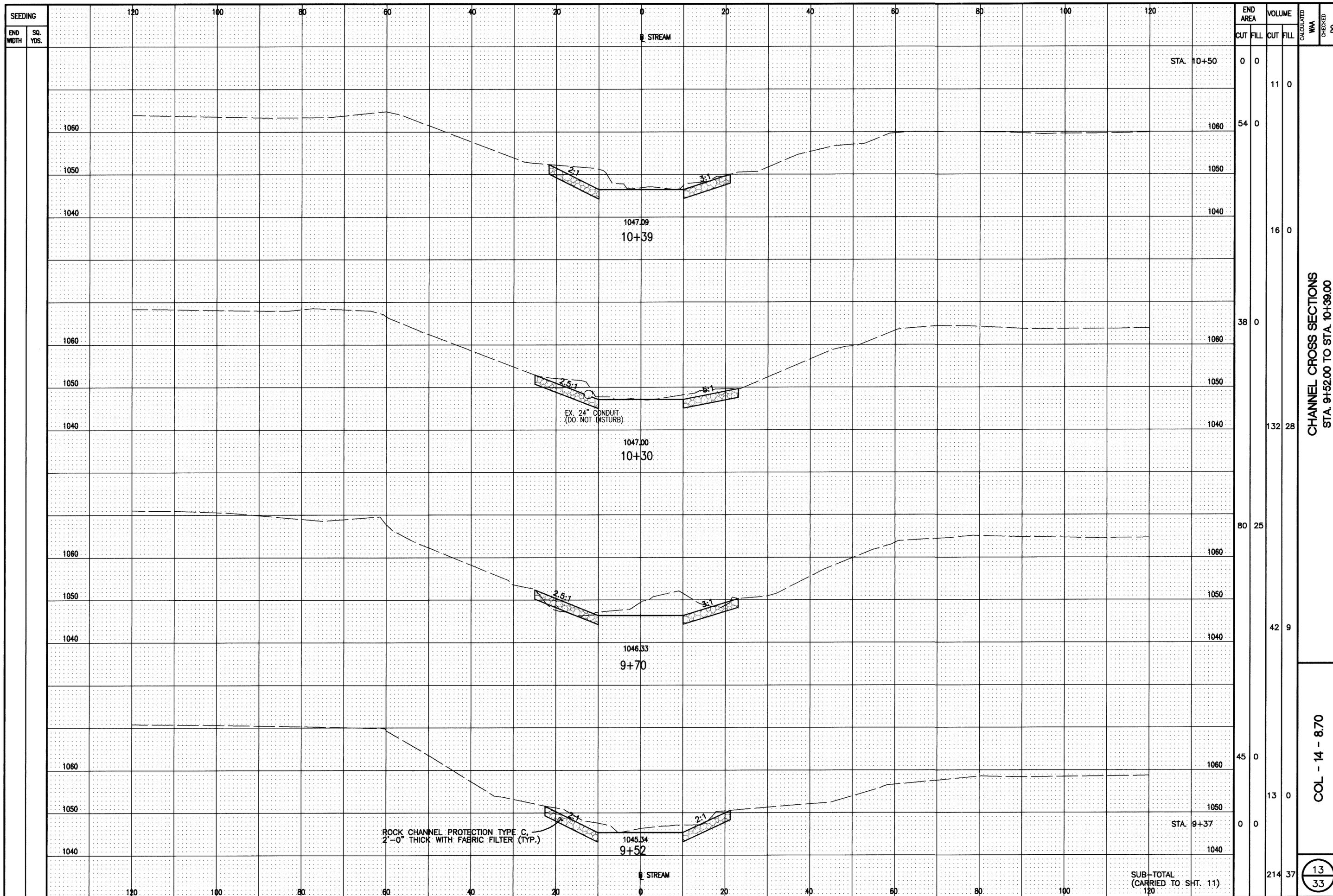
11  
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CROSS SECTIONS  
 STA. 461+75.00 TO STA. 462+50.00

COL - 14 - 8.70

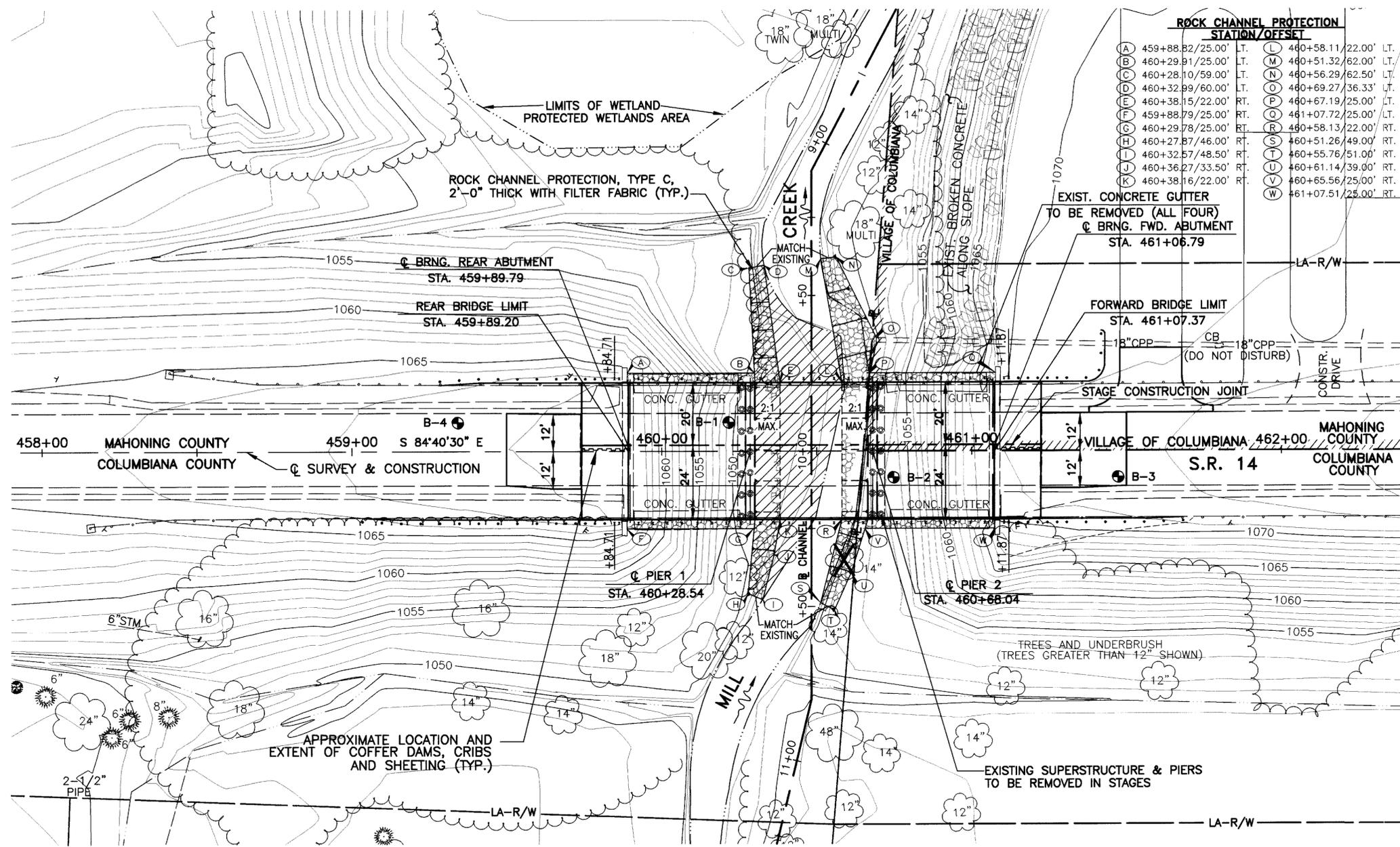
12  
33



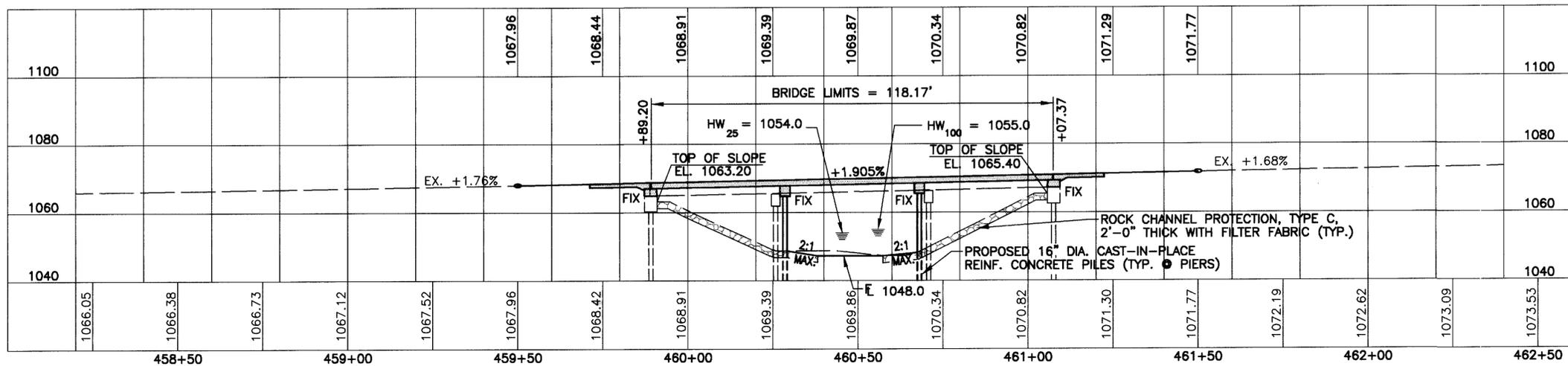
CHANNEL CROSS SECTIONS  
 STA. 9+52.00 TO STA. 10+39.00

COL - 14 - 8.70

13  
33



**PLAN**



**PROFILE ALONG Q SURVEY AND CONSTRUCTION**

**LEGEND:**  
 ● APPROXIMATE BORING LOCATION  
 ▨ EXCAVATION

**NOTES:**  
 1- EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS-SECTIONS.  
 2- FOR PROPOSED WORK NOTES SEE SHEET 4 OF 16.

**REFERENCE POINTS**

1/2" IPS	1/2" IPS	1/2" IPS	1/2" IPS
1/2" IPS	1/2" IPS	1/2" IPS	1/2" IPS
STA. 463+75.00	STA. 475+75.00		

B.M. #1: CHISLED '□' ON SW CORNER OF CONCRETE GUARDRAIL POST ANCHOR ● STA. 458+39.85, 23.94' LT. ELEV. = 1065.28  
 B.M. #2: CHISLED '□' ON SW CORNER OF CATCH BASIN ● STA. 461+78.65, 32.23' LT. ELEV. = 1071.12

**TRAFFIC DATA**

CURRENT A.D.T. (2000) = 7800  
 DESIGN YEAR A.D.T. (2020) = 10600  
 CURRENT AVERAGE DAILY TRUCK TRAFFIC = 234

**HYDRAULIC DATA**

DRAINAGE AREA: 5 SQ. MILES  
 EXISTING WATERWAY AREA: 1320 SQ. FT.  
 PROPOSED WATERWAY AREA: 1588 SQ. FT.  
 Q<sub>25</sub> = 1140 C.F.S. Q<sub>100</sub> = 1580 C.F.S.  
 V<sub>25</sub> = 5.9 FT./SEC. V<sub>100</sub> = 7.0 FT./SEC.  
 HW<sub>25</sub> = 1054.0 HW<sub>100</sub> = 1055.0  
 HW<sub>25</sub> CLEARS BOTTOM OF SUPERSTRUCTURE BY 13.4'

**PILE DATA**

LOCATION	TYPE	ESTIMATED AVERAGE PAY LENGTH	ESTIMATED PILE TIP ELEVATION
PIER 1	16" CIP R.C. PILE	75'	996.5
PIER 2	16" CIP R.C. PILE	75'	998.5

**EXISTING STRUCTURE**

TYPE: THREE SPAN CONTINUOUS STEEL ROLLED BEAM BRIDGE ON CAPPED PILE ABUTMENTS AND CAPPED PILE PIERS  
 ROADWAY: 44'-2" O/O SLAB, 44'-0" F/F GUARDRAIL  
 SPAN: 3 SPANS @ 36'±-45'±-36'± C/C BEARINGS  
 ALIGNMENT: TANGENT  
 SKEW: 0°  
 LOADING: S-20-46  
 APPROACH SLABS: AS-1-54 (15' LONG)  
 WEARING SURFACE: BITUMINOUS

**PROPOSED STRUCTURE**

TYPE: THREE SPAN NON-COMPOSITE PRESTRESSED BOX BEAMS ON EXISTING CAPPED PILE ABUTMENTS AND NEW CAPPED PILE PIERS  
 ROADWAY: 44'-0" F/F GUARDRAIL  
 SPAN: 3 SPANS @ 38'-38'-38' C/C BEARINGS  
 ALIGNMENT: TANGENT  
 SKEW: 0°  
 LOADING: HS20-44 AND THE ALTERNATE MILITARY LOADING  
 CROWN: 0.016  
 APPROACH SLABS: AS-1-81 (15' LONG)  
 WEARING SURFACE: 2.5" ASPHALT CONCRETE  
 LATITUDE: N 40°54'00" LONGITUDE: W 80°42'10"

DESIGN AGENCY: COLUMBIANA COUNTY ENGINEERING CONSULTANTS, INC. 840 MICHIGAN AVE., COLUMBUS, OH 43215  
 DATE: 11/99  
 REVIEWED: JU 1501445  
 DRAWN: DO  
 DESIGNED: YSJ  
 CHECKED: RT  
 COLUMBIANA COUNTY STA. 459+89.20 TO STA. 461+07.37  
 SITE PLAN BRIDGE NO. COL-14-0871 OVER MILL CREEK  
 COL - 14 - 870  
 1/16  
 14/33

Drawing: c:\project\50372\50372sit.dwg

# GENERAL NOTES

**DESIGN SPECIFICATIONS:**

THIS STRUCTURE CONFORMS TO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996 INCLUDING THE INTERIM SPECIFICATIONS THRU 1999 AND THE O.D.O.T BRIDGE DESIGN MANUAL.

**REFERENCE SHALL BE MADE TO THE FOLLOWING STANDARD DRAWINGS:**

AS-1-81 DATED 9-15-94  
 DS-1-92 DATED 12-15-94  
 PSBD-1-93 DATED 3-4-94  
 TST-1-99 DATED 07-06-99

**AND TO THE FOLLOWING SUPPLEMENTAL SPECIFICATIONS:**

842 DATED 01-06-99 899 DATED 01-06-99  
 865 DATED 01-06-98  
 906 DATED 5-5-98  
 908 DATED 1-6-99

**DESIGN LOADING:**

HS20-44 AND THE ALTERNATE MILITARY LOADING.

**DESIGN STRESSES:**

CONCRETE CLASS S - COMPRESSIVE STRENGTH 4500 P.S.I. (SUPERSTRUCTURE)  
 CONCRETE CLASS C - COMPRESSIVE STRENGTH 4000 P.S.I. (SUBSTRUCTURE)

**CONCRETE FOR PRESTRESSED BEAMS:**

MIN. COMPRESSIVE STRENGTH AT 28 DAYS  $F'_c = 5500$  P.S.I.  
 MIN. COMPRESSIVE STRENGTH AT TIME OF INITIAL PRESTRESS = 4000 P.S.I.  
 UNIT STRESS 2200 P.S.I. COMPRESSION, 444 P.S.I. TENSION.

**REINFORCING STEEL:**

ASTM A615, A616 OR A617, GRADE 60 MINIMUM YIELD STRENGTH 60,000 P.S.I. FOR PRESTRESSED BEAMS

**PRESTRESSING STRAND:**

ASTM A416, GRADE 270 1/2" DIA, SEVEN WIRE, UNCOATED, LOW RELAXATION STRAND.  $F'_s = 270,00$  P.S.I.  
 INITIAL STRESS = 0.75  $F'_s$

**DECK PROTECTION METHOD:**

TYPE 3 WATERPROOFING  
 ASPHALT CONCRETE OVERLAY  
 SEALING OF CONCRETE SURFACES  
 STEEL DRIP STRIP

**PILE DESIGN LOADS (ULTIMATE BEARING VALUE):**

THE ULTIMATE BEARING VALUE IS 73 TONS PER PILE FOR THE 16" DIAMETER CAST-IN-PLACE REINFORCED CONCRETE PIER PILES. THE PIER PILES SHOULD BE DRIVEN TO A ULTIMATE BEARING VALUE OF 90 TONS PER PILE. THE ADDITIONAL 17 TONS OF ULTIMATE BEARING VALUE IS DUE TO THE POSSIBILITY OF LOSING FRICTIONAL RESISTANCE TO SCOUR.

**PIER PILES**

14 PILES 70 FT. LONG, ESTIMATED LENGTH  
 14 PILES OF ORDER LENGTH 75 FT. LONG  
 14 SPLICES

**UTILITY LINES:**

ALL EXPENSE INVOLVED IN RELOCATION (INSTALLING) THE AFFECTED UTILITY LINES SHALL BE BORNE BY THE UTILITY(IES). THE CONTRACTOR AND THE UTILITY(IES) ARE TO COOPERATE BY ARRANGING THEIR WORK IN SUCH A MANNER THAT INCONVENIENCE TO EITHER WILL BE HELD TO A MINIMUM.

**ITEM 202, PORTIONS OF STRUCTURE REMOVED, OVER 20 FEET SPAN, AS PER PLAN**

**DESCRIPTION:**

THIS WORK SHALL CONSIST OF THE REMOVAL OF CONCRETE DECKS INCLUDING SIDEWALKS, PARAPETS, RAILINGS, DECK JOINTS, OTHER APPURTENANCES FROM STEEL SUPPORTING SYSTEMS (BEAMS, GIRDERS, CROSS FRAMES, ETC.), PORTIONS OF SUBSTRUCTURE AND ANY OTHER ITEM REQUIRED TO BE REMOVED TO ACCOMMODATE THE WORK OF THIS PROJECT BUT NOT SPECIFICALLY CALLED OUT IN THE PLANS. CARE SHALL BE TAKEN DURING DECK REMOVALS TO PROTECT PORTIONS OF SUCH SYSTEMS THAT ARE TO BE SALVAGED AND INCORPORATED INTO THE

PROPOSED STRUCTURE. IN THIS RESPECT, THE USE OF EXPLOSIVES, HEADACHE BALLS AND/OR HOE RAM TYPE OF EQUIPMENT IS PROHIBITED.

**PROTECTION OF TRAFFIC**

PRIOR TO DEMOLITION OF ANY PORTIONS OF THE EXISTING SUPERSTRUCTURE, THE CONTRACTOR SHALL SUBMIT PLANS FOR THE PROTECTION OF TRAFFIC (VEHICULAR, PEDESTRIAN, BOAT, ETC.) ADJACENT TO AND/OR UNDER THE STRUCTURE TO THE DIRECTOR FOR APPROVAL. THESE PLANS SHALL INCLUDE PROVISIONS FOR ANY DEVICES AND STRUCTURES THAT MAY BE NECESSARY TO ENSURE SUCH PROTECTION. TEMPORARY VERTICAL CLEARANCES SPECIFIED ON THE PLANS OR IN THE PROPOSAL SHALL BE MAINTAINED AT ALL TIMES EXCEPT AS OTHERWISE APPROVED BY THE DIRECTOR.

**SUBSTRUCTURE CONCRETE REMOVAL**

SHALL BE BY MEANS OF APPROVED PNEUMATIC HAMMERS EMPLOYING POINTED AND BLUNT CHISEL TOOLS. HYDRAULIC HOE-RAM TYPE HAMMERS WILL NOT BE PERMITTED. THE WEIGHT OF THE HAMMER SHALL NOT BE MORE THAN 35 POUNDS FOR REMOVAL WITHIN 18 INCHES OF PORTIONS TO BE PRESERVED. OUTSIDE THE 18 INCHES LIMIT, A HAMMER HEAVIER THAN 35 POUNDS, BUT NOT TO EXCEED 90 POUNDS, MAY BE USED AT THE APPROVAL OF THE ENGINEER. PNEUMATIC HAMMERS SHALL NOT BE PLACED IN DIRECT CONTACT WITH REINFORCING STEEL THAT IS TO BE RETAINED IN THE REBUILT STRUCTURE.

**UNCLASSIFIED EXCAVATION**

PAYMENT FOR UNCLASSIFIED EXCAVATION BEHIND THE EXISTING ABUTMENT BACKWALL AND WINGWALLS EXTENSIONS SHALL BE INCLUDED WITH ITEM 202, PORTIONS OF STRUCTURE REMOVED, AS PER PLAN.

UNCLASSIFIED EXCAVATION SHALL BE IN ACCORDANCE WITH 503 EXCEPT THAT THE BACKFILL MATERIAL BEHIND THE ABUTMENTS SHALL BE PLACED IN 6-INCH LIFTS AND COMPACTED IN ACCORDANCE WITH 304.04.

**PAYMENT**

THIS WORK WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE BID, WHICH PRICE AND PAYMENT SHALL BE FULL COMPENSATION FOR ALL, LABOR EQUIPMENT, MATERIALS AND INCIDENTALS NECESSARY TO COMPLETE THE WORK IN CONFORMANCE WITH THESE REQUIREMENTS, WITH PERTINENT PROVISIONS OF 202, AND TO THE SATISFACTION OF THE ENGINEER.

**EXISTING STRUCTURE VERIFICATION:**

DETAILS AND DIMENSIONS SHOWN ON THESE PLANS PERTAINING TO THE EXISTING STRUCTURE HAVE BEEN OBTAINED FROM PLANS OF THE EXISTING STRUCTURE AND FROM FIELD OBSERVATIONS AND MEASUREMENTS. CONSEQUENTLY, THEY ARE INDICATIVE OF THE EXISTING STRUCTURE AND THE PROPOSED WORK BUT THEY SHALL BE CONSIDERED TENTATIVE AND APPROXIMATE. THE CONTRACTOR IS REFERRED TO CMS SECTIONS 102.05, 105.02 AND 513.02.

CONTRACT BID PRICES SHALL BE BASED UPON A RECOGNITION OF THE UNCERTAINTIES DESCRIBED ABOVE AND UPON A PREBID EXAMINATION OF EXISTING STRUCTURE BY THE CONTRACTOR. HOWEVER, ALL PROJECT WORK THE SHALL BE BASED UPON DETAILS AND DIMENSIONS WHICH HAVE BEEN VERIFIED BY THE CONTRACTOR IN THE FIELD.

**REPLACEMENT OF EXISTING REINFORCING STEEL:**

ANY EXISTING REINFORCING BARS WHICH ARE TO BE INCORPORATED INTO THE NEW WORK AND WHICH ARE MADE UNUSABLE BY THE CONTRACTOR'S CONCRETE REMOVAL OPERATIONS, SHALL BE REPLACED WITH NEW STEEL. ANY EXISTING REINFORCING BARS DEEMED BY THE ENGINEER TO BE UNUSABLE BECAUSE OF CORROSION SHALL BE REPLACED WITH NEW STEEL. COST OF ALL REINFORCING STEEL SHALL BE INCLUDED WITH ITEM 842 CLASS C CONCRETE ABUTMENT, AS PER PLAN ITEM.

**ITEM 503, COFFERDAMS, CRIBS AND SHEETING, AS PER PLAN:**

TEMPORARY SHORING SHALL BE USED TO ACCOMPLISH THE PROPOSED CONSTRUCTION IN STAGES. THE DESIGN OF THE TEMPORARY SHORING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, BE DESIGNED BY A REGISTERED ENGINEER, AND CONFORM WITH 501.05. FOR APPROVAL, FIVE COPIES OF THE DRAWINGS SHALL BE SUBMITTED TO THE DIRECTOR AND CONCURRENTLY, ONE COPY TO THE OFFICE OF STRUCTURAL ENGINEERING. CONSTRUCTION OF THE SHORING SHALL NOT BEGIN UNTIL AFTER WRITTEN APPROVAL HAS BEEN RECEIVED FROM THE DIRECTOR. PORTIONS OF THE TEMPORARY SHORING COMPOSED OF STEEL OR CONCRETE MAY BE LEFT IN PLACE AT THE DISCRETION OF THE ENGINEER. PORTIONS COMPOSED OF OTHER MATERIALS SHALL BE REMOVED PRIOR TO COMPLETION OF THE WORK.

**ITEM 842 CLASS C CONCRETE, ABUTMENT, AS PER PLAN**

INSTALL A 3 FEET WIDE STRIP, 1 INCH THICK, GENERAL PURPOSE, HEAVY DUTY NEOPRENE SHEET WITH NYLON FABRIC REINFORCEMENT AT LOCATIONS SHOWN IN THE PLANS. SECURE THE 3 FEET WIDE NEOPRENE SHEETING TO THE CONCRETE WITH 1.25" X 1/8" (LENGTH X SHANK DIA.) GALVANIZED BUTTON HEAD SPIKE THROUGH A 1 INCH OUTSIDE DIAMETER, 1/8" GALVANIZED WASHER. MAXIMUM FASTENER SPACING IS 9 INCHES. OTHER SIMILAR GALVANIZED DEVICES WHICH WILL NOT DAMAGE EITHER THE NEOPRENE OR THE CONCRETE MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.

THE NEOPRENE SHEETING SHALL BE 1 INCH THICK GENERAL PURPOSE, HEAVY DUTY NEOPRENE SHEET WITH NYLON FABRIC REINFORCEMENT. THE SHEETING SHALL BE "FAIRPRENE NUMBER NN-0003", BY E.I. DUPONT DE NEMOURS AND COMPANY, INC., "WINGPRENE" BY THE GOODYEAR TIRE AND RUBBER COMPANY, OR AN APPROVED ALTERNATE.

PAYMENT FOR LABOR, MATERIALS AND INSTALLATION OF THESE ITEMS SHALL BE INCLUDED IN ITEM 842, CLASS C CONCRETE, ABUTMENT, AS PER PLAN.

<p><b>GENERAL NOTES</b>                  BRIDGE NO. COL-14-0871                  OVER MILL CREEK</p>	<p>COL - 14 - 870</p>	<p>2 / 16</p>	<p>15 33</p>
DESIGN AGENCY COLUMBUS ENGINEERING CONSULTANTS, INC. 840 MICHIGAN AVE., COLUMBUS, OH 43215 TEL: (614) 228-3519 FAX: (614) 228-3500	DATE 11/99	REVIEWED JU STRUCTURE FILE NUMBER 1501445	DRAWN CEC REVISION RT

COMPUTED BY : YSJ      DATE : 09/09/99  
 CHECKED BY : RT      DATE : 11/02/99

ESTIMATED QUANTITIES

ITEM	ITEM EXT.	TOTAL	UNIT	DESCRIPTION	ABUTS.	PIER	SUPER	GEN	AS PER PLAN SHEET NO.
202	11002	LUMP		PORTION OF STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN				LUMP	[2/16]
448	46050	27	CU. YD.	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, PG 64-22			27		
448	47020	20	CU. YD.	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG 64-22			20		
503	11101	LUMP	LUMP	COFFERDAMS, CRIBS AND SHEETING, AS PER PLAN	LUMP				[2/16]
505	11100	LUMP	LUMP	PILE DRIVING EQUIPMENT MOBILIZATION				LUMP	
507	00700	1050	LIN FT.	16" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED		1050			
507	00750	980	LIN FT.	16" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN		980			
507	50500	14	EACH	STEEL PILE SPLICES (16" CAST-IN-PLACE CONCRETE PILES)		14			
512	33010	624	SQ. YD.	TYPE 3 WATERPROOFING			624		
SPECIAL	51267502	122	SQ. YD.	SEALING OF CONCRETE SURFACES (EPOXY)*	53	19	50		
SPECIAL	51631300	88	LIN FT.	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM			88		
516	44001	132	EACH	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY			132		
				NEOPRENE 6" X 10" X 1"					
517	76300	254.32	LIN FT.	RAILING, MISC.:TWIN STEEL TUBE BRIDGE RAILING			254.32		
518	21230	LUMP		POROUS BACKFILL WITH FILTER FABRIC	LUMP				
SPECIAL	51822300	234	LIN FT.	STEEL DRIP STRIP *			234		
518	40000	108	LIN FT.	6" PERFORATED CORRUGATED PLASTIC PIPE, 707.33	108				
518	40010	65	LIN FT.	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS, 707.33	65				
842	34000	7	CU. YD.	CLASS S CONCRETE, SUPERSTRUCTURE			7		
842	42500	36	CU. YD.	CLASS C CONCRETE, PIER CAP		36			[2/16]
842	45701	32	CU. YD.	CLASS C CONCRETE, ABUTMENT, AS PER PLAN	32				
865	10030	33	EACH	PRESTRESSED CONCRETE NONCOMPOSITE BOX BEAM BRIDGE MEMBERS, LEVEL 1, B17-48 (L=38'-0" C/C BEARINGS)			33		

\* SEE PROPOSAL NOTE

DESIGN AGENCY  
 COLUMBUS ENGINEERING CONSULTANTS, INC.  
 840 MICHIGAN AVE., COLUMBUS, OH 43215  
 FAX: (614) 228-3519 TEL: (614) 228-3500

DATE  
 11/99  
 REVIEWED  
 JJ  
 STRUCTURE FILE NUMBER  
 1501445

DRAWN  
 CEC  
 REVISIONS

DESIGNED  
 YSJ  
 CHECKED  
 RT

ESTIMATED QUANTITIES  
 BRIDGE NO. COL-14-0871  
 OVER MILL CREEK

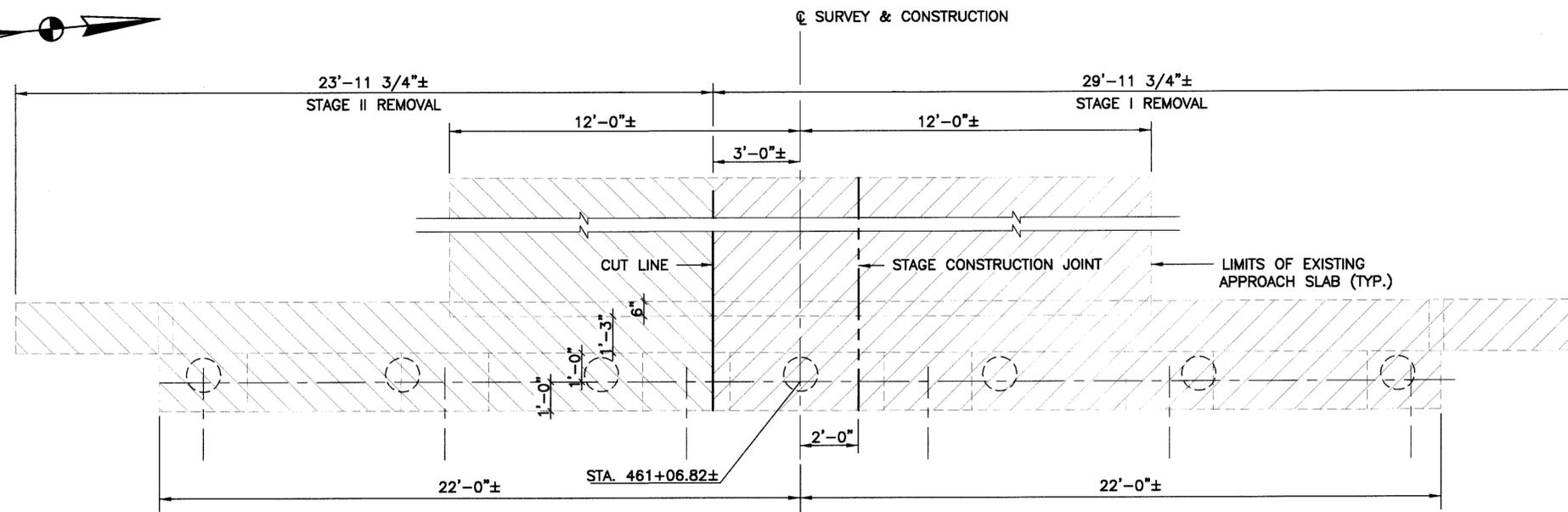
COL - 14 - 8.70

3 / 16

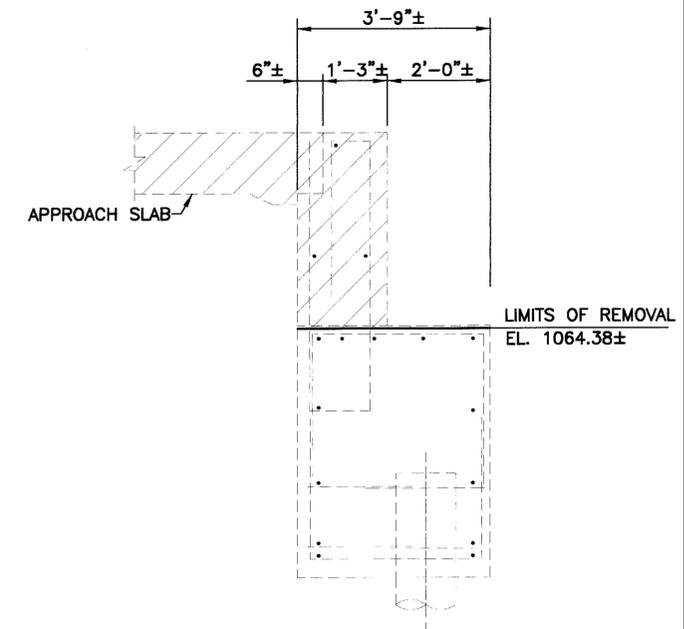
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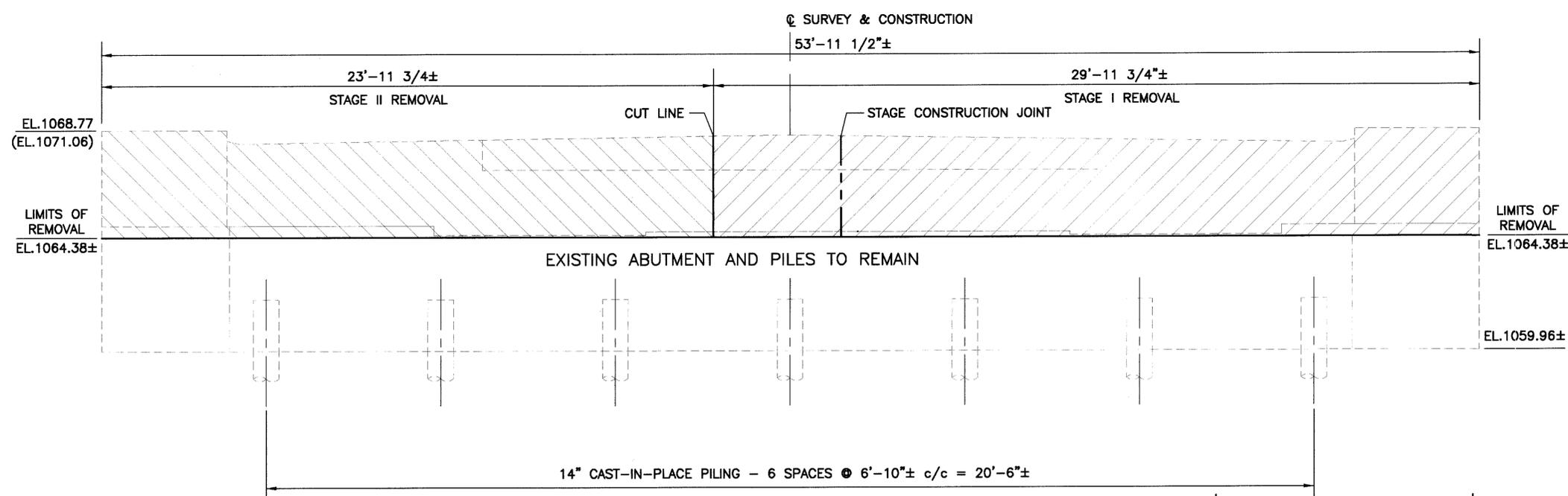




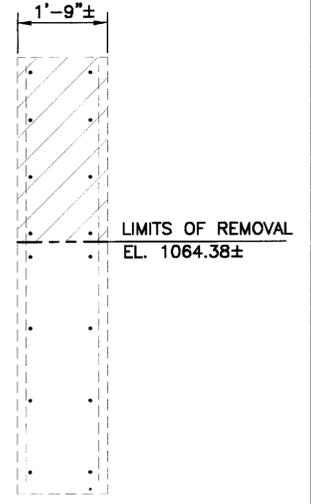
**REAR ABUTMENT PLAN**



**SECTION A-A**



**REAR ABUTMENT ELEVATION**

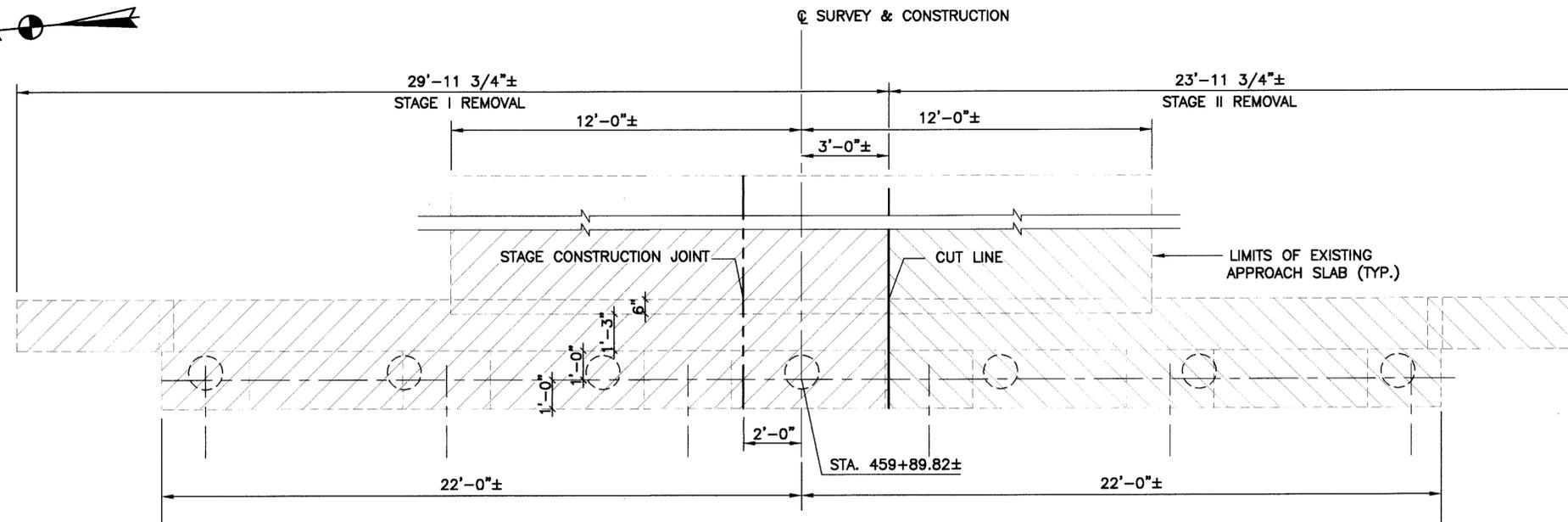


**SECTION B-B**

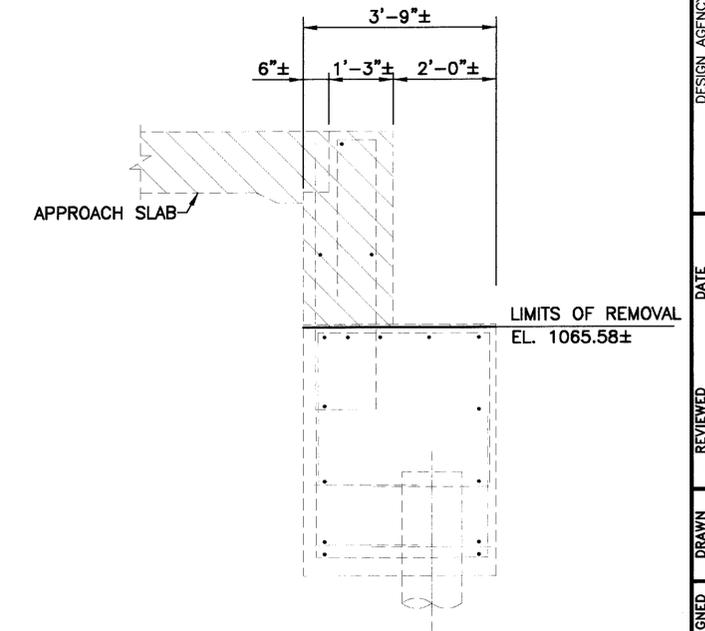
- AREA OF EXISTING ABUTMENT TO BE REMOVED - STAGE I
- AREA OF EXISTING ABUTMENT TO BE REMOVED - STAGE II

DESIGN AGENCY COLUMBUS ENGINEERING CONSULTANTS, INC. 840 MICHIGAN AVE., COLUMBUS, OH 43215 TEL: (614) 228-3500 FAX: (614) 228-3519	DATE 11/99	STRUCTURE FILE NUMBER 1501445
DRAWN CEC	REVIEWED JJ	REVISIONS 1501445
DESIGNED YSJ	CHECKED RT	REAR ABUTMENT REMOVAL DETAIL BRIDGE NO. COL-14-0871 OVER MILL CREEK
COL - 14 - 870		
5 / 16		
18 33		

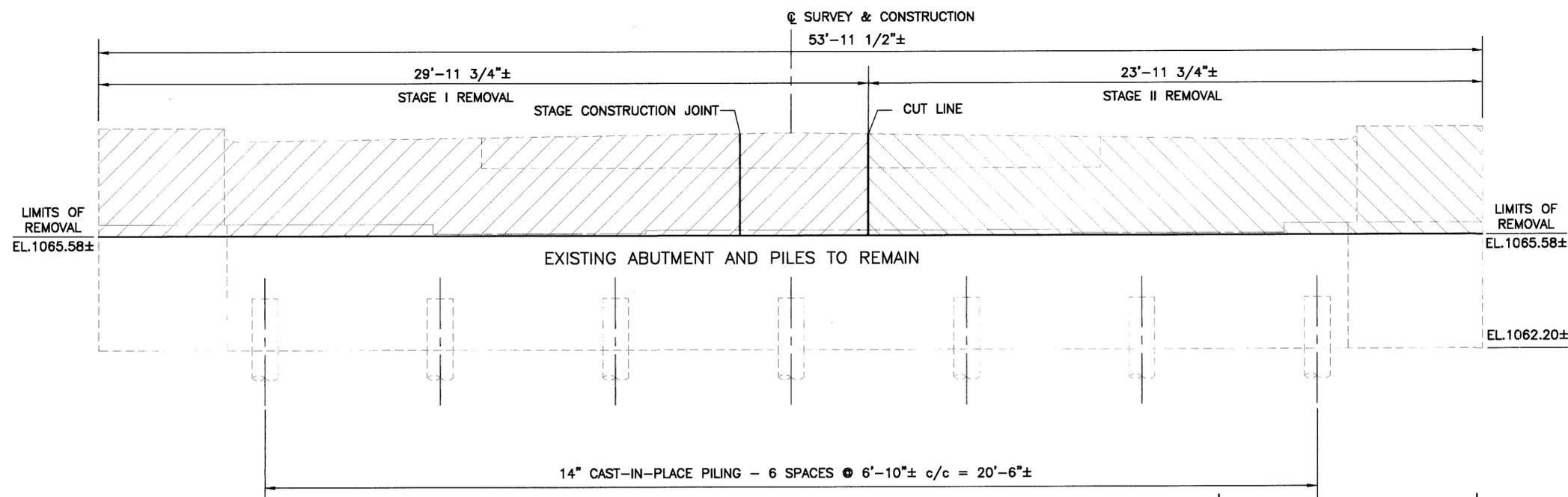
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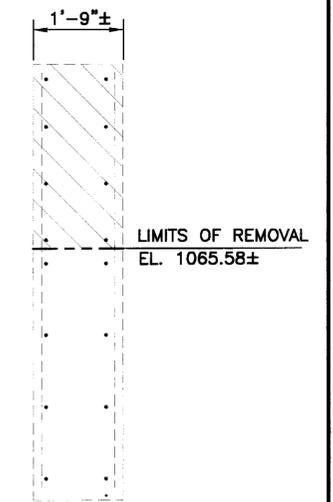
**FORWARD ABUTMENT PLAN**



**SECTION C-C**



**FORWARD ABUTMENT ELEVATION**



**SECTION D-D**

- AREA OF EXISTING ABUTMENT TO BE REMOVED - STAGE I
- AREA OF EXISTING ABUTMENT TO BE REMOVED - STAGE II

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DESIGN AGENCY  
COLUMBUS ENGINEERING CONSULTANTS, INC.  
840 MICHIGAN AVE., COLUMBUS, OH 43215  
TEL: (614) 228-3519 FAX: (614) 228-3500

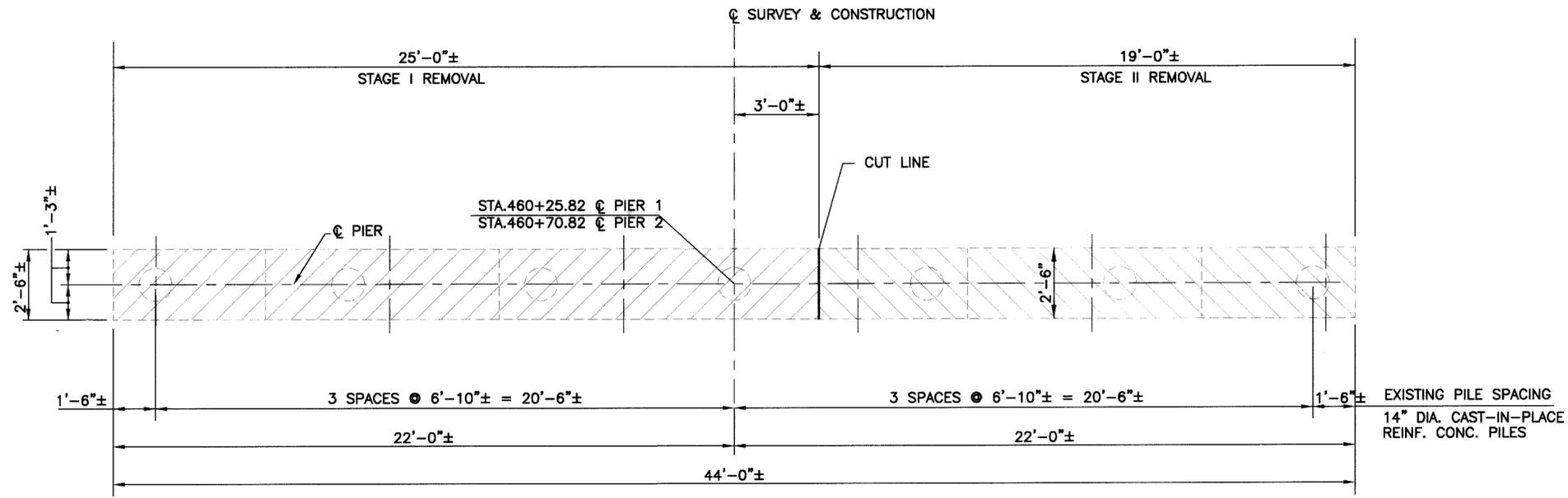
DATE	11/99
REVIEWED	JJ
DRAWN	CEC
DESIGNED	YSJ
CHECKED	RT
STRUCTURE FILE NUMBER	1501445

**FORWARD ABUTMENT REMOVAL DETAIL**  
BRIDGE NO. COL-14-0871  
OVER MILL CREEK

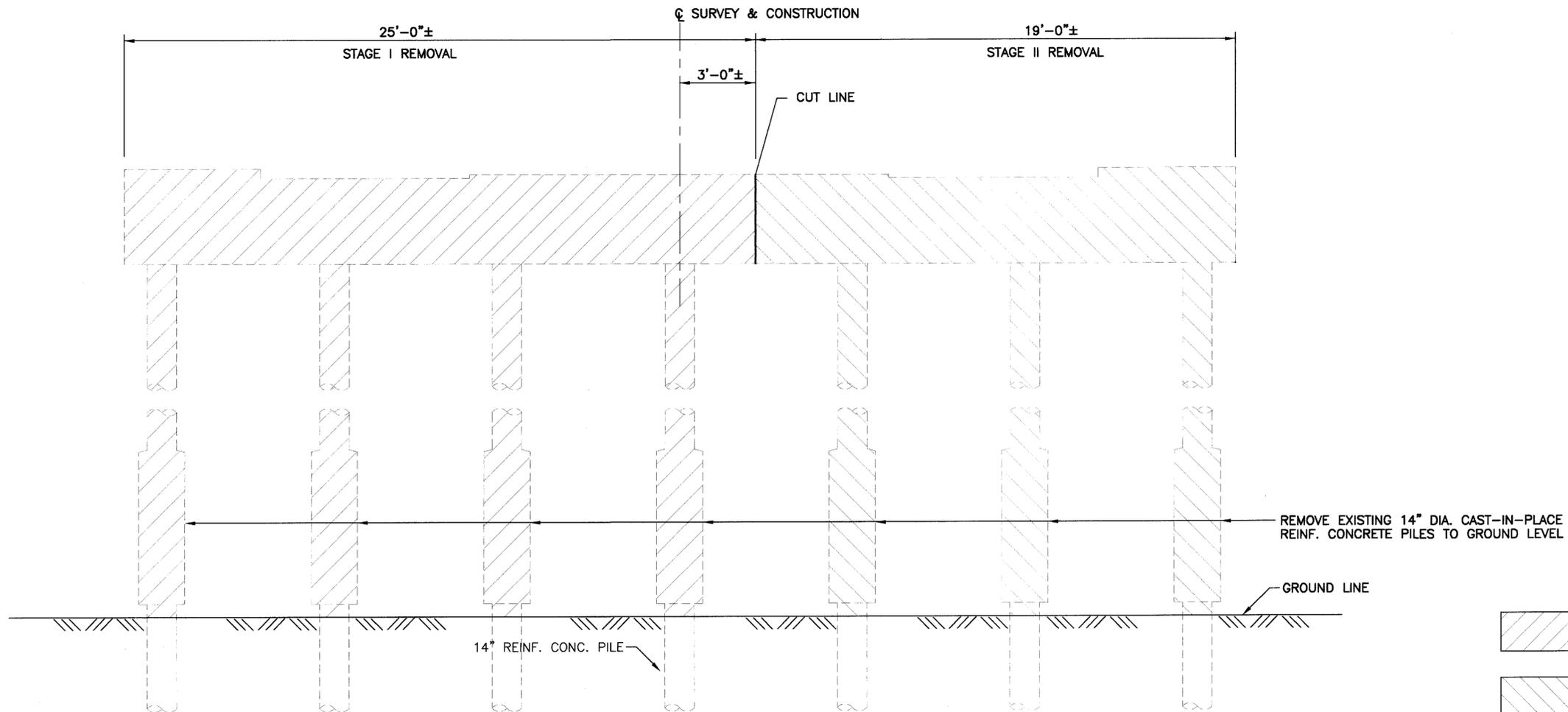
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6 / 16

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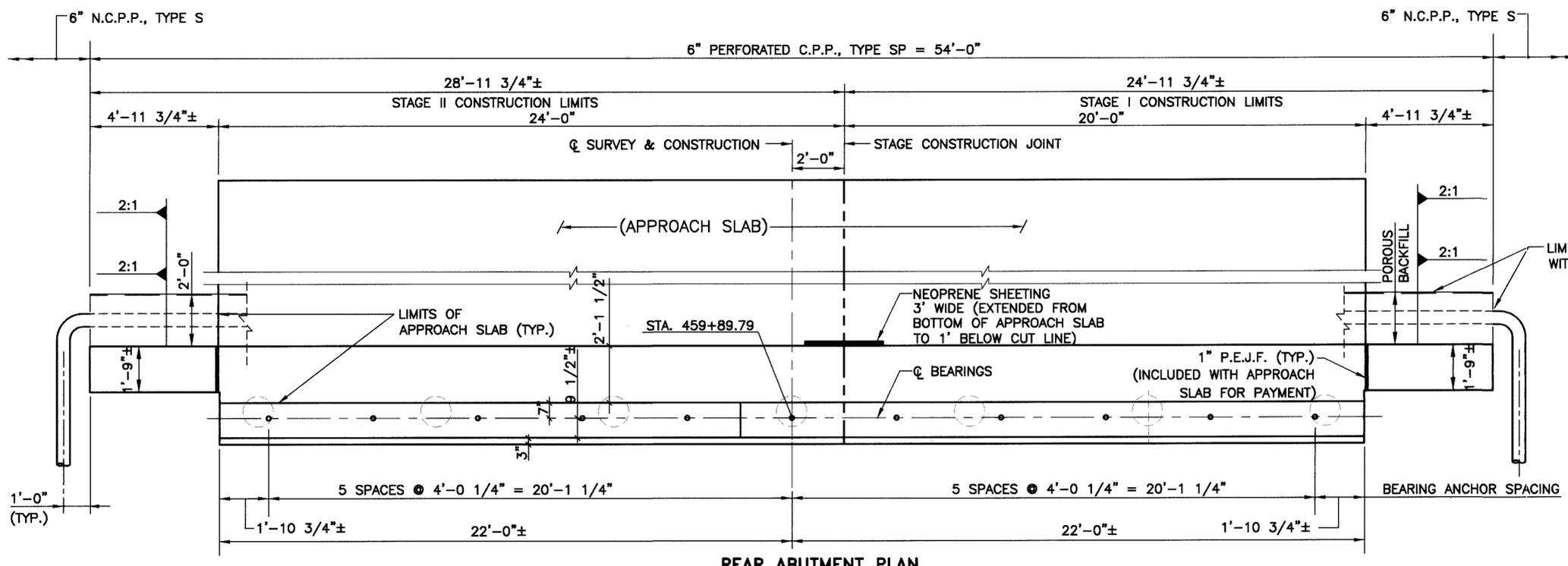
**PIER PLAN - PIERS 1 & 2**



**ELEVATION**

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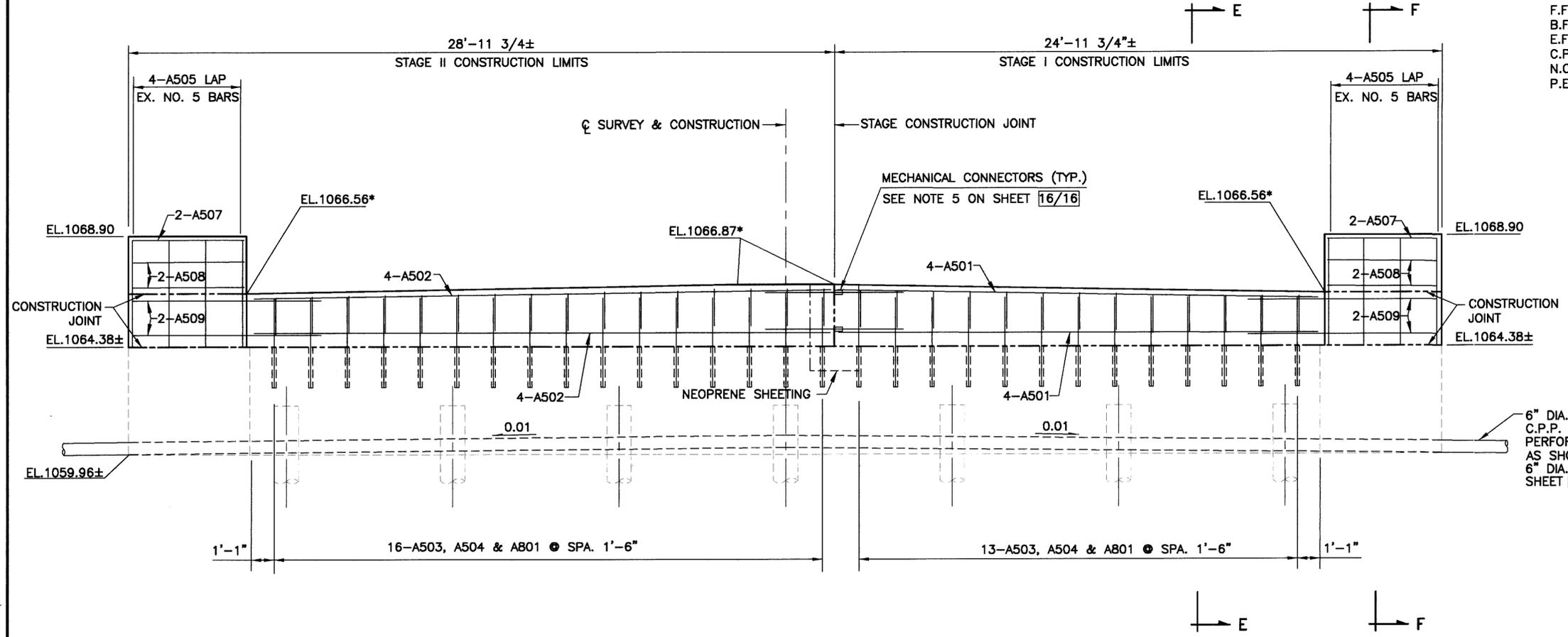
<b>STAGE REMOVAL DETAIL - PIERS</b> BRIDGE NO. COL-14-0871 OVER MILL CREEK	
<b>COL - 14 - 8.70</b>	7 / 16
20 33	
DESIGNED YSJ CHECKED RT	DRAWN CEC REVISED
REVIEWED JU STRUCTURE FILE NUMBER 1501445	DATE 11/99
DESIGN AGENCY COLUMBUS ENGINEERING CONSULTANTS, INC. 840 MICHIGAN AVE., COLUMBUS, OH 43215 FAX: (614) 228-3519    TEL: (614) 228-3500	



**REAR ABUTMENT PLAN**

**NOTES:**  
 \* ELEVATIONS ARE GIVEN AT  $\odot$  BEARINGS  
 FOR SECTIONA E-E AND F-F, SEE SHEET **10/16**

**ABBREVIATIONS:**  
 F.F. = FRONT FACE  
 B.F. = BACK FACE  
 E.F. = EACH FACE  
 C.P.P. = CORRUGATED POLYETHYLENE PIPE  
 N.C.P.P. = NON-PERFORATED CORRUGATED POLYETHYLENE PIPE  
 P.E.J.F. = PREFORMED EXPANSION JOINT FILLER

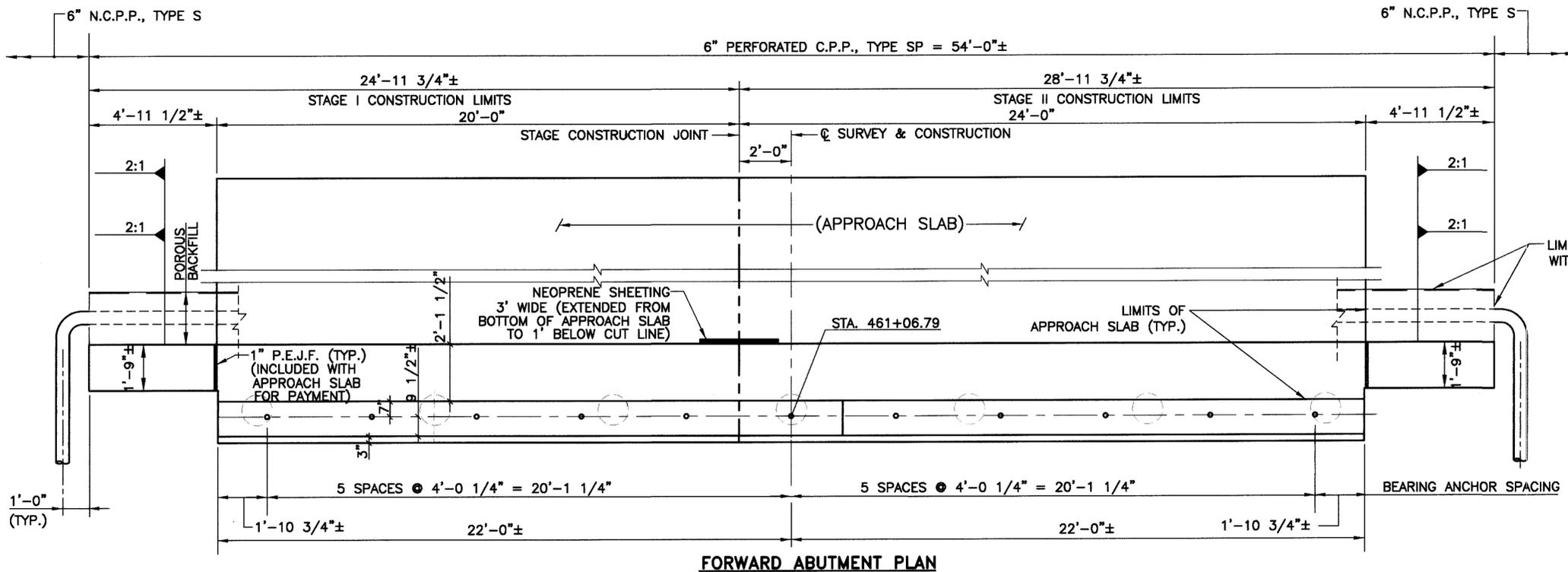


**REAR ABUTMENT ELEVATION**

6" DIA. NON-PERFORATED C.P.P. AT ENDS SPLICED TO PERFORATED PIPE AND OUTLET AS SHOWN IN TERMINATION OF 6" DIA. N.P.C.P.P. DETAIL ON SHEET **10/16** (TYP.)

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DESIGNED YSJ	DRAWN CEC	REVIEWED JJ	DATE 11/99
CHECKED RT	REVISED	STRUCTURE FILE NUMBER 1501445	DESIGN AGENCY COLUMBIAN ENGINEERING CONSULTANTS, INC. 840 MICHIGAN AVE., COLUMBUS, OH 43215 TEL: (614) 228-3519 FAX: (614) 228-3500
<b>REAR ABUTMENT DETAILS</b> BRIDGE NO. COL-14-0871 OVER MILL CREEK			
COL - 14 - 870			
8 / 16			
21 33			



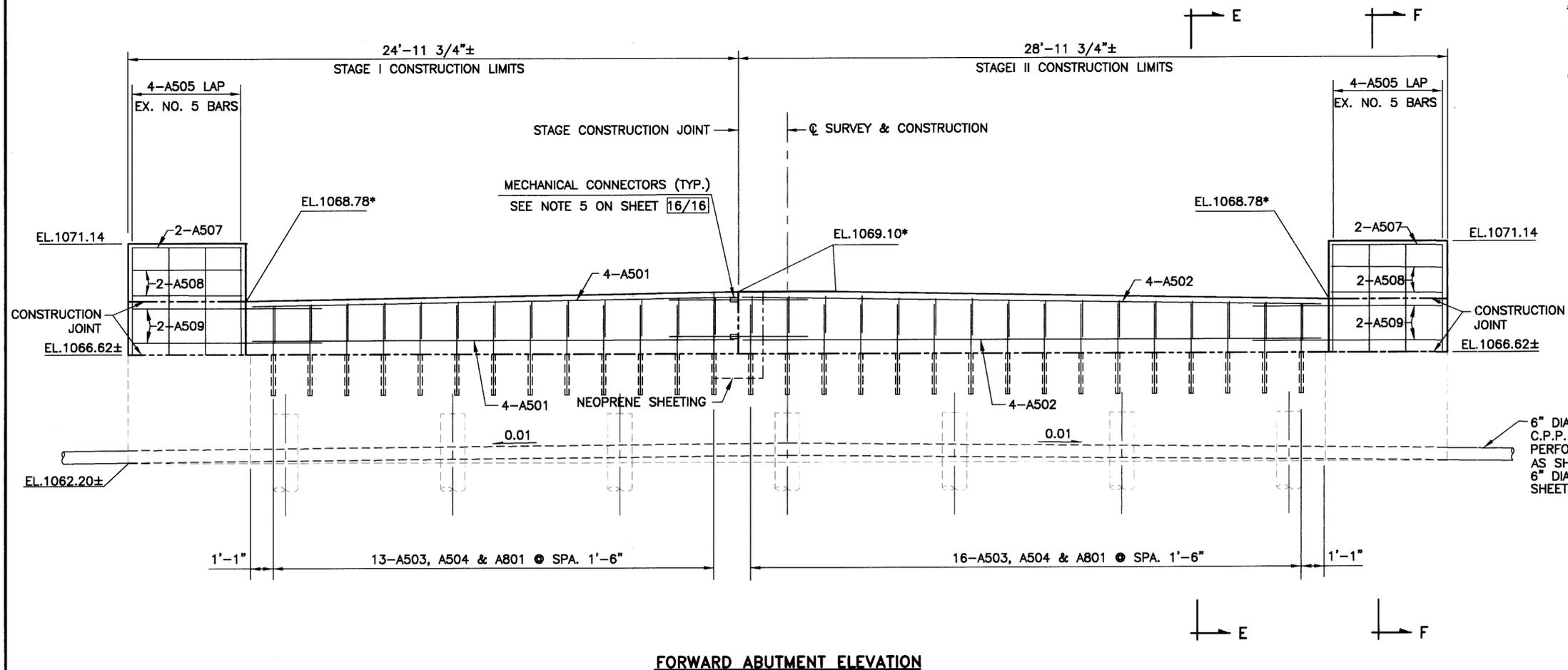
**FORWARD ABUTMENT PLAN**

**NOTES:**

- \* ELEVATIONS ARE GIVEN AT  $\odot$  BEARINGS
- FOR SECTIONA E-E AND F-F, SEE SHEET **10/16**

**ABBREVIATIONS:**

- F.F. = FRONT FACE
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- P.E.J.F. = PREFORMED EXPANSION JOINT FILLER



**FORWARD ABUTMENT ELEVATION**

6" DIA. NON-PERFORATED C.P.P. AT ENDS SPLICED TO PERFORATED PIPE AND OUTLET AS SHOWN IN TERMINATION OF 6" DIA. N.P.C.P.P. DETAIL ON SHEET **10/16** (TYP.)



DESIGN AGENCY  
COLUMBUS ENGINEERING CONSULTANTS, INC.  
840 MICHIGAN AVE., COLUMBUS, OH 43215  
TEL: (614) 228-3519 FAX: (614) 228-3500

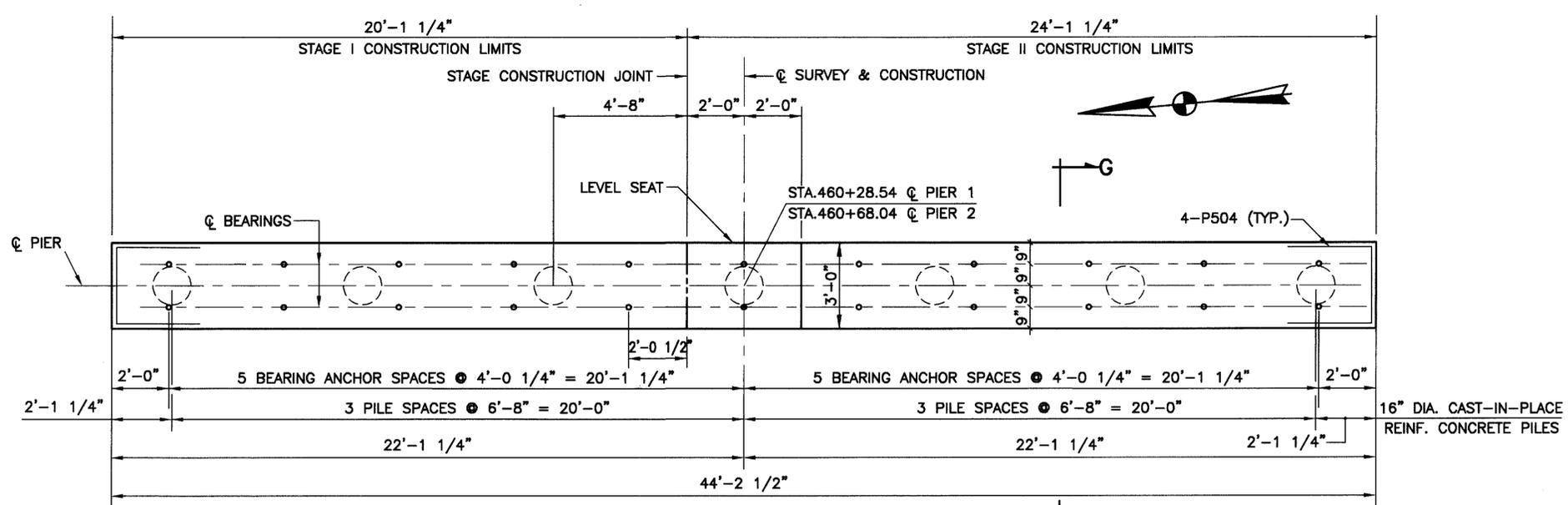
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YSJ  
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RT

STRUCTURE FILE NUMBER  
1501445

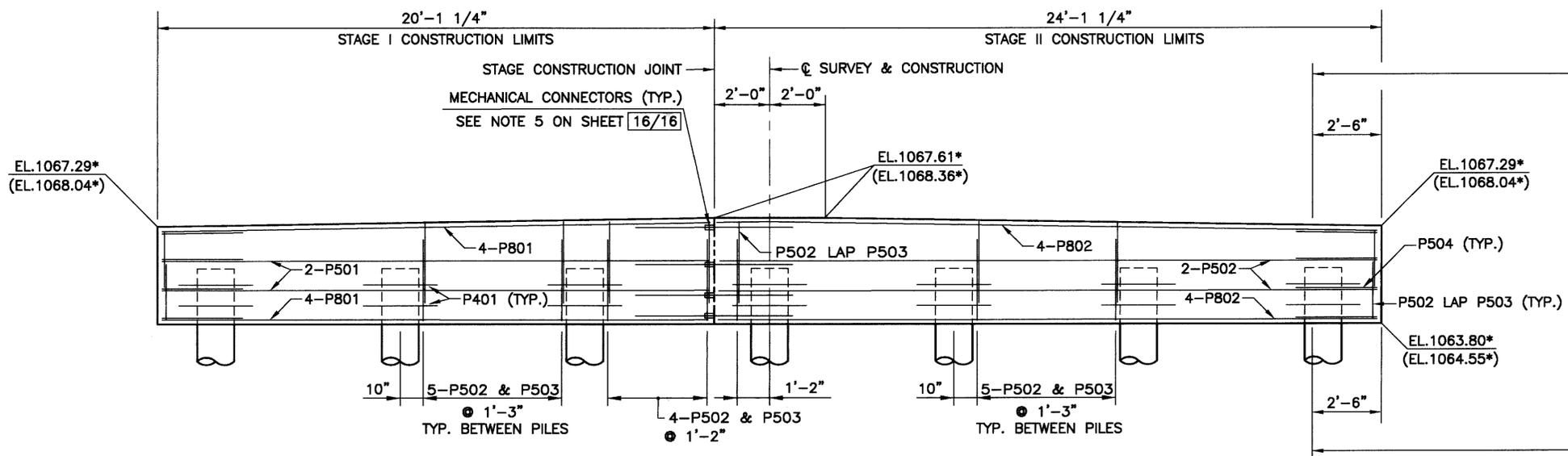
**FORWARD ABUTMENT DETAILS**  
BRIDGE NO. COL-14-0871  
OVER MILL CREEK

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PLAN



ELEVATION



EL.1067.29\*  
(EL.1068.04\*)

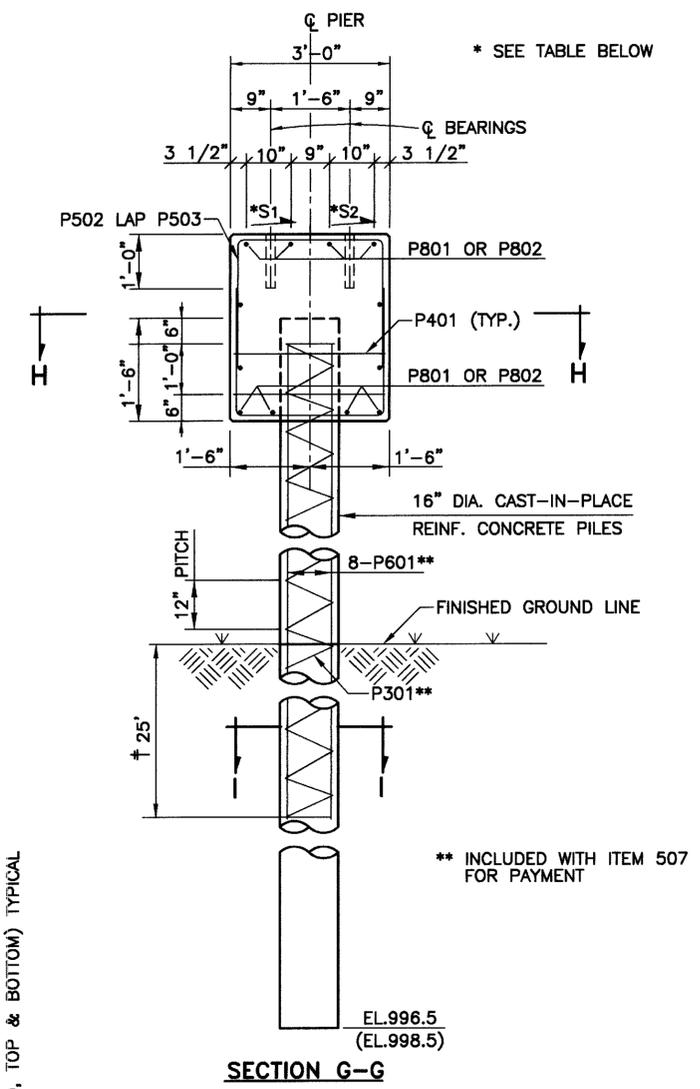
EL.1067.61\*  
(EL.1068.36\*)

EL.1067.29\*  
(EL.1068.04\*)

EL.1063.80\*  
(EL.1064.55\*)

**BRIDGE SEAT REINFORCING :**  
REINFORCING STEEL IN THE VICINITY OF THE BRIDGE SEAT SHALL BE ACCURATELY PLACED TO AVOID INTERFERENCE WITH THE DRILLING OF ANCHOR BAR HOLES.

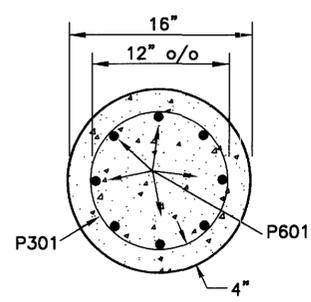
\* ELEVATIONS ARE GIVEN AT  $\phi$  PIER.  
ELEVATIONS IN ( ) ARE FOR PIER 2.



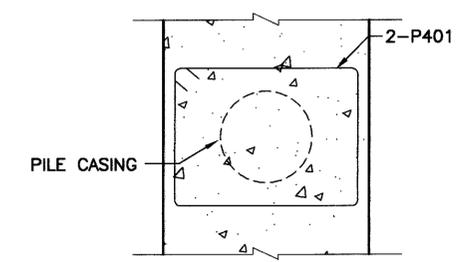
SECTION G-G

(† NO REINFORCEMENT IS REQUIRED BELOW THIS LEVEL)

PIER NO.	S1	S2
1	3/16" / FT.	5/16" / FT.
2	3/16" / FT.	5/16" / FT.



SECTION I-I



SECTION H-H

DESIGN AGENCY: COLUMBUS ENGINEERING CONSULTANTS, INC. 840 MICHIGAN AVE., COLUMBUS, OH 43215 TEL: (614) 228-3519 FAX: (614) 228-3500

DATE: 11/99  
REVIEWED: JJ  
DRAWN: CEC  
DESIGNED: YSJ  
CHECKED: RT

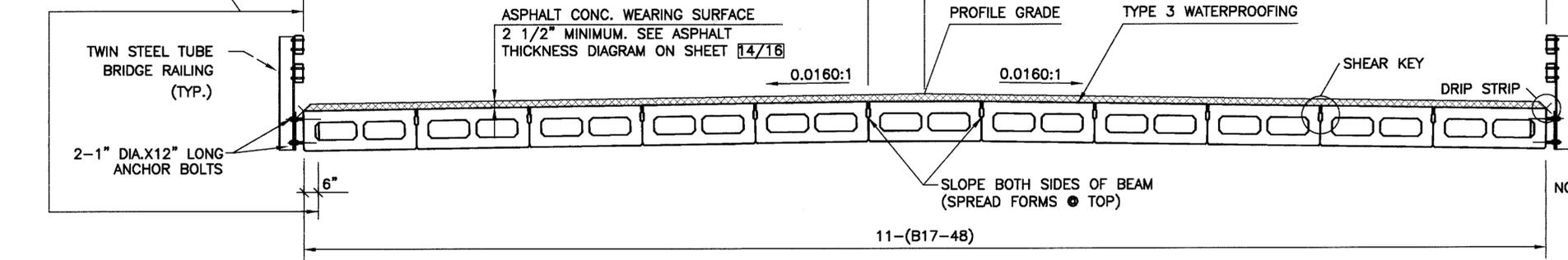
STRUCTURE FILE NUMBER: 1501445

PIER DETAILS  
BRIDGE NO. COL-14-0871  
OVER MILL CREEK

COL - 14 - 8.70

11 / 16  
24  
33

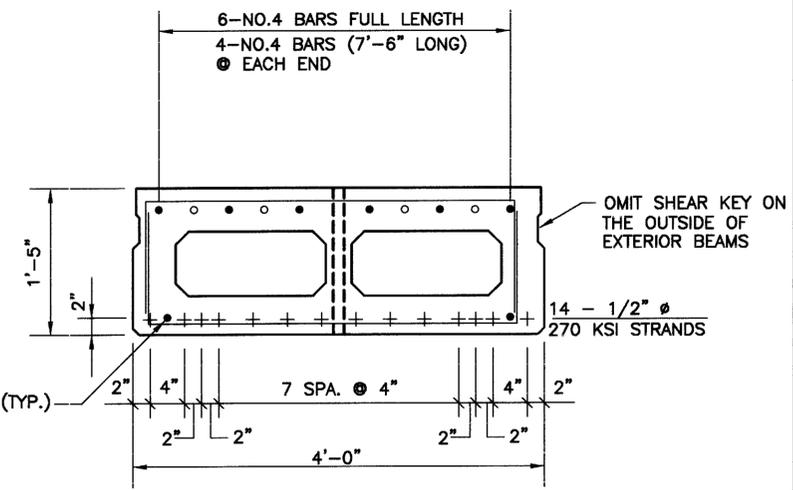
SEALING OF CONCRETE SURFACES, EPOXY (TYP.)



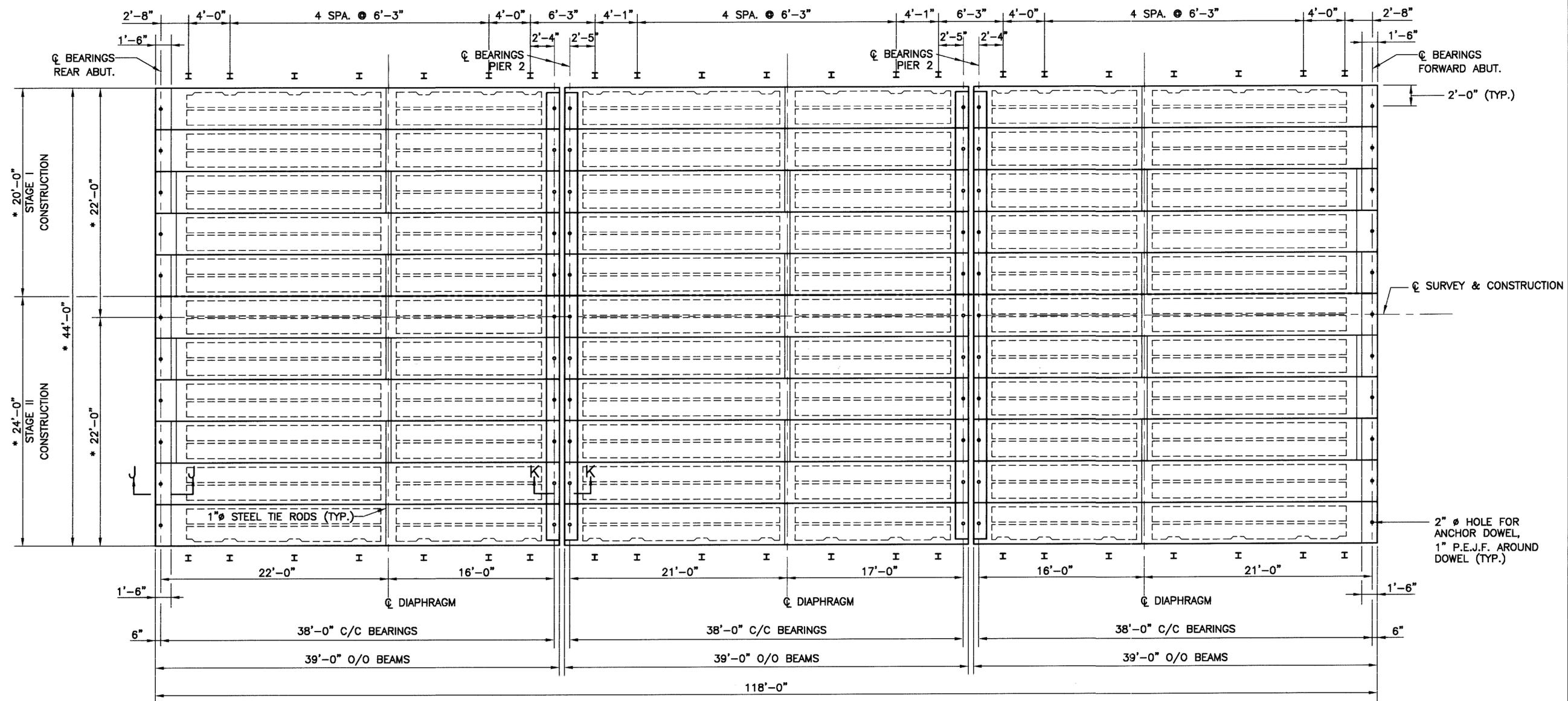
\* PLUS FIT-UP

**TRANSVERSE SECTION**

NOTES: FOR SHEAR KEY DETAILS SEE SHEET 13/16  
 FOR DRIP STRIP DETAILS SEE STD. DWG. DS-1-92.  
 FOR TWIN STEEL TUBE BRIDGE RAILING DETAILS SEE STD. DWG. TST-1-99.  
 FOR SECTIONS J-J & K-K SEE SHEET 13/16



**B17-48  
SPAN NO.1**



**BEAM LAYOUT**

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DESIGN AGENCY  
 COLUMBIAN ENGINEERING CONSULTANTS, INC.  
 840 MICHIGAN AVE., COLUMBUS, OH 43215  
 TEL: (614) 228-3500  
 FAX: (614) 228-3519

DATE  
 11/99  
 JJ  
 STRUCTURE FILE NUMBER  
 1501445

REVIEWED  
 JJ  
 DRAWN  
 CEC  
 CHECKED  
 RT

**SUPERSTRUCTURE DETAILS**  
 BRIDGE NO. COL-14-0871  
 OVER MILL CREEK

**COL - 14 - 870**

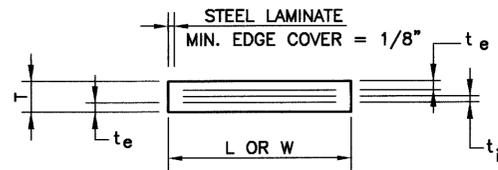
12 / 16  
 25  
 33

ELASTOMERIC BEARING PAD DATA										
LOCATION	BRNG. TYPE	L	W	T	n	ti	te	DESIGN LOAD		
								DL	LL	TOTAL
ALL SUPPORTS	FIXED	6"	10"	1"	3	0.225"	0.160"	9.0 KIPS	13.0 KIPS	22.0 KIPS

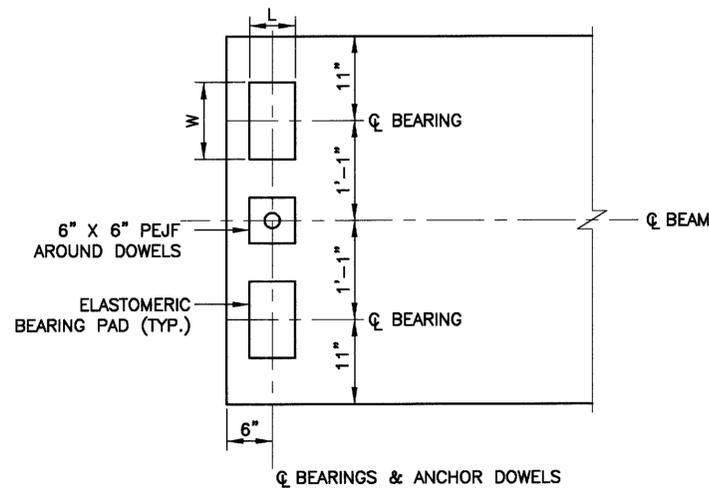
ti = THICKNESS OF INTERNAL LAYER  
te = THICKNESS OF EXTERNAL LAYER  
T = TOTAL THICKNESS OF ELASTOMERIC BEARING  
N = NO. OF STEEL LAMINATES  
INTERNAL STEEL LAMINATE THICKNESS = 0.0747"

**ELASTOMERIC BEARINGS**

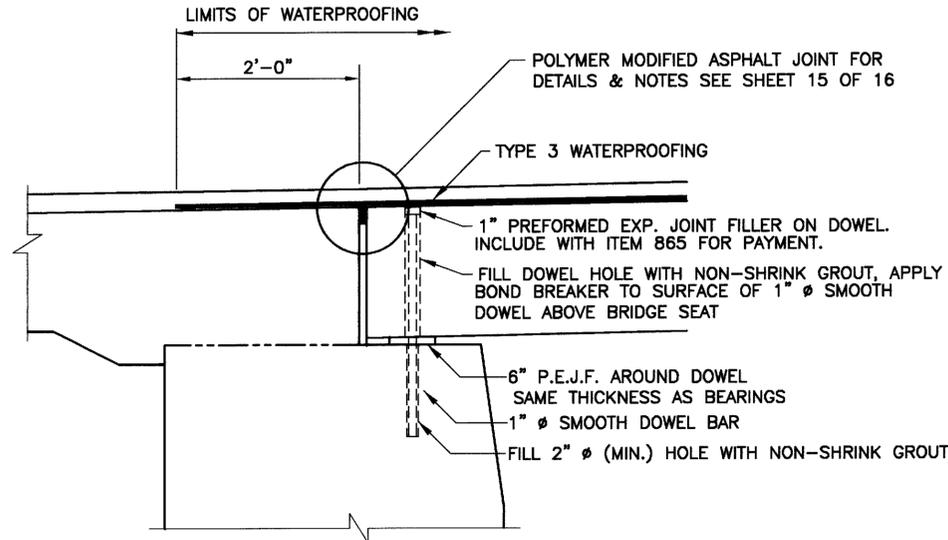
ELASTOMERIC BEARINGS SHALL COMPLY WITH ITEM 516 AND AASHTO STANDARD SPECIFICATIONS FOR BRIDGES, SECTION 18, BEARING DEVICES, DIVISION II, CONSTRUCTION, ARTICLES 18.4.5.1 AND 18.5.6.2. BEARINGS SHALL BE GRADE 3, 50-DUROMETER ELASTOMER, AND SHALL BE SUBJECTED TO THE LOAD TESTING REQUIREMENTS DEFINED IN ARTICLE 18.7.4.5 OF THE DOCUMENT LISTED ABOVE. BEARINGS WERE DESIGNED UNDER SECTION 14.6.1. OF SECTION 14, BEARINGS, DIVISION I, DESIGN. TESTING SHALL BE INCLUDED IN THE PRICE BID FOR THE BEARINGS, EACH.



**LAMINATED ELASTOMERIC BEARING  
50 DUROMETER**

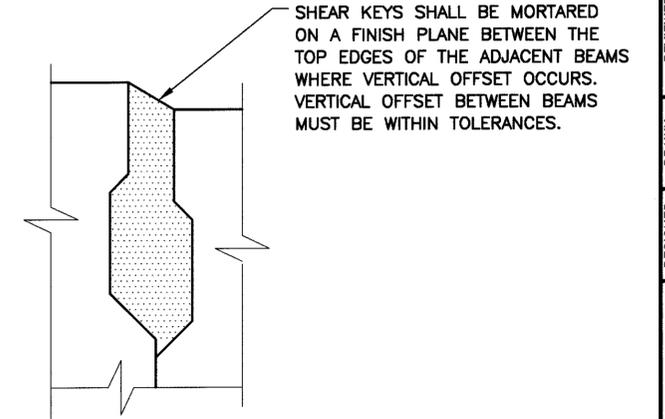


**BEARING PAD LAYOUT**

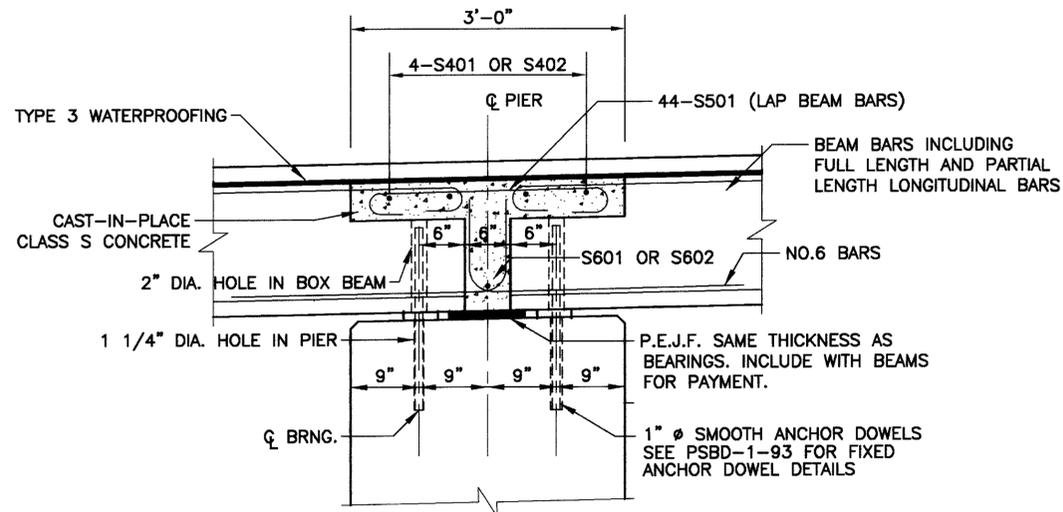


**SECTION J-J**

FOR LOCATION OF SECTION J-J, SEE SHEET 12 OF 16



**SHEAR KEY DETAIL**



**SECTION K-K**

FOR LOCATION OF SECTION K-K, SEE SHEET 12 OF 16

D:\Project\50372-columbian-columbian\50372C01SUP.DWG

DESIGN AGENCY  
COLUMBIAN ENGINEERING CONSULTANTS, INC.  
840 MICHIGAN AVE., COLUMBUS, OH 43215  
FAX: (614)228-3519 TEL: (614)228-3500

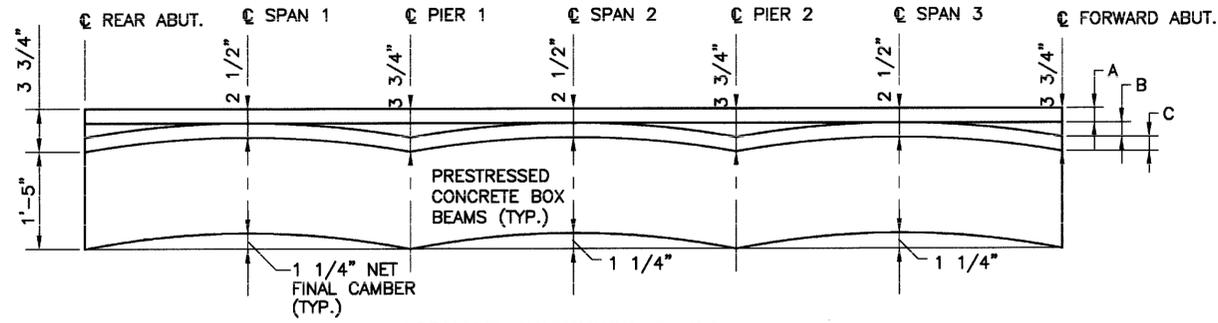
DATE  
11/99  
REVIEWED  
JJ  
STRUCTURE FILE NUMBER  
1501445  
DRAWN  
CEC  
CHECKED  
YSJ  
DESIGNED  
RT

SUPERSTRUCTURE DETAILS  
BRIDGE NO. COL-14-0871  
OVER MILL CREEK

COL - 14 - 870

13 / 16

26  
33



**ASPHALT THICKNESS DIAGRAM**

- A = 1 1/4" UNIFORM THICKNESS, 448 SURFACE COURSE
- B = VARIABLE THICKNESS, 448 LEVELING COURSE
- C = 1 1/4" UNIFORM THICKNESS, 448 INTERMEDIATE COURSE

**NOTES:**

CALCULATED CAMBER AT THE TIME OF PAVING INCLUDING ALLOWANCE FOR CAMBER GROWTH DUE TO CREEP IS 1 3/8".

CALCULATED DEFLECTION DUE TO WEIGHT OF SURFACE COURSE AND RAILING IS 1/8". CORRECTION OF VERTICAL CURVE IS 0". NET FINAL CAMBER IS 1 1/4". THIS IS 1 1/4" IN EXCESS OF THE AMOUNT REQUIRED TO PLACE THE TOP OF BEAM PARALLEL TO PROFILE GRADE. THIS EXCESS AMOUNT SHALL BE COMPENSATED FOR BY THICKENING THE 448 LEVELING COURSE FROM 1 1/4" AT CENTER OF SPAN TO 2 1/2" AT ENDS OF SPAN.

ASPHALT CONCRETE SURFACE COURSE SHALL CONSIST OF A VARIABLE THICKNESS OF 448 LEVELING COURSE AND 1 1/4" THICKNESS OF 448 SURFACE COURSE. THE 448 INTERMEDIATE COURSE SHALL BE PLACED IN TWO OPERATIONS. THE FIRST COURSE SHALL BE OF 1 1/4" UNIFORM THICKNESS. THE SECOND COURSE SHALL BE FEATHERED TO PLACE THE SURFACE PARALLEL TO AND 1 1/4" BELOW FINAL PAVEMENT SURFACE ELEVATIONS.

**TOP OF DECK ELEVATIONS TABLE**

SPAN NO.	LOCATION	LEFT DECK FASCIA		PROFILE GRADE		RIGHT DECK FASCIA	
		STATION	ELEVATION	STATION	ELEVATION	STATION	ELEVATION
SPAN NO.1	0.00 L	459+89.79	1068.37	459+89.79	1068.72	459+89.79	1068.37
	0.20 L	459+97.54	1068.52	459+97.54	1068.87	459+97.54	1068.52
	0.40 L	460+05.29	1068.66	460+05.29	1069.01	460+05.29	1068.66
	0.60 L	460+13.04	1068.81	460+13.04	1069.16	460+13.04	1068.81
	0.80 L	460+20.79	1068.96	460+20.79	1069.31	460+20.79	1068.96
SPAN NO.2	0.00 L	460+28.54	1069.10	460+28.54	1069.46	460+28.54	1069.10
	0.20 L	460+36.44	1069.25	460+36.44	1069.61	460+36.44	1069.25
	0.40 L	460+44.34	1069.40	460+44.34	1069.76	460+44.34	1069.40
	0.60 L	460+52.24	1069.55	460+52.24	1069.91	460+52.24	1069.55
	0.80 L	460+60.14	1069.70	460+60.14	1070.06	460+60.14	1069.70
SPAN NO.3	0.00 L	460+68.04	1069.85	460+68.04	1070.21	460+68.04	1069.85
	0.20 L	460+75.79	1070.00	460+75.79	1070.35	460+75.79	1070.00
	0.40 L	460+83.54	1070.15	460+83.54	1070.50	460+83.54	1070.15
	0.60 L	460+91.29	1070.30	460+91.29	1070.65	460+91.29	1070.30
	0.80 L	460+99.04	1070.44	460+99.04	1070.80	460+99.04	1070.44
	1.00 L	461+06.79	1070.59	461+06.79	1070.94	461+06.79	1070.59

# GENERAL NOTES AND DETAILS FOR POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM

**ITEM SPECIAL - POLYMER-MODIFIED ASPHALT EXPANSION JOINT SYSTEM**

THIS ITEM WILL BE USED TO SEAL THE EXPANSION/CONTRACTION JOINTS AS PER THESE DETAILS AND THE MANUFACTURER'S REQUIREMENTS USING A POLYMER-MODIFIED ASPHALT SYSTEM. THE PRIME CONTRACTOR WILL OBTAIN THE SERVICES OF ONE OF THE FOLLOWING APPROVED APPLICATORS WHO WILL FURNISH AND INSTALL THE NEW BRIDGE EXPANSION JOINT SYSTEM AFTER ALL PAVING ON THE AFFECTED BRIDGE(S) HAS BEEN COMPLETED.

D.S. BROWN COMPANY P.O. BOX 158 300 E. CHERRY ST. N. BALTIMORE, OH 45872-0158 TEL: 1-800-258-0162	LINEAR DYNAMICS, INC. RD #2 BOX 311 MUNCY, PA 17756 TEL: (717) 546-6041	INFRASTRUCTURE SYSTEMS, INC. 830 E. Higgins Road Chicago, IL 60173-4792 SUITE 111 M TEL: (708) 706-9230
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HARRIS SPECIALTY CHEMICAL, INC.  
10245 CENTURION PARKWAY, N.  
JACKSONVILLE, FL 32256  
TEL: (904) 996-6000

**MATERIALS:**

**BRIDGING PLATE:**

MILD STEEL 1/8" OR 1/4" THICK PLATE, 8" WIDE OR 18 GAUGE ALUMINUM, 8" WIDE.

**BINDER:**

TYPE:	POLYMER MODIFIED ASPHALT
SOFTENING POINT:	180 DEGREES F. MIN.
FLOW:	1/8" MAX. AT 140 DEGREES F.
PENETRATION:	1/4" MAX. AT 77 DEGREES F. 1/32" MAX AT 0 DEGREES F. ASTM D 3407
DUCTILITY:	1413 C.F. MIN. ASTM D 113
RESILIENCE:	60% MIN. AT 77 DEGREES F.
TENSILE ADHESION:	700% MIN.
SPECIFIC GRAVITY:	1.10 ± 0.05
POURING TEMP:	350 - 390 DEGREES F.

**AGGREGATE:**

TYPE: CRUSHED, DOUBLE WASHED, AND DRIED GRANITE OR BASALT

GRADATION: THE GRADATION OF THE AGGREGATE VARIES BY MANUFACTURER AND WILL BE AS PER THE MANUFACTURER'S RECOMMENDATIONS FOR THE SYSTEM BEING USED ON THIS PROJECT.

**BACKER ROD:**

THE BACKER ROD SHALL BE A CLOSED CELL FOAM EXPANSION JOINT FILLER CAPABLE OF WITHSTANDING THE PLACEMENT TEMPERATURE OF THE POLYMER MODIFIED ASPHALT.

**INSTALLATION PROCEDURES:**

**SAWING AND SURFACE PREPARATION:**

AFTER ALL PAVING OPERATIONS ARE COMPLETE, THE OVERLAY IS TO BE TRANSVERSELY SAW CUT FULL DEPTH NO LESS THAN 2 INCHES DEEP (20 INCHES CENTERED OVER JOINT OPENING, UNLESS OTHERWISE NOTED). REMOVE ALL MATERIAL, INCLUDING WATER-PROOFING MATERIAL, BETWEEN SAW CUTS. THOROUGHLY CLEAN AND DRY EXPOSED CONCRETE, STEEL, AND CUT SURFACES USING COMPRESSED AIR AND A HOT COMPRESSED AIR (HCA) LANCE. THE LANCE MUST PRODUCE A FLAME RETARDED AIR STREAM TEMPERATURE OF 1649 DEGREES C. AT A VELOCITY OF 3000 FEET PER SECOND WITH 103.4 kPa GAGE CHAMBER PRESSURE. IF THERE IS AN INTERRUPTION DUE TO WEATHER OR OTHER CAUSES, THE OPERATION WILL BE REPEATED WITH THE HCA LANCE IMMEDIATELY BEFORE THE BINDER COAT OPERATION. ALSO, 6 INCHES OF THE ROAD SURFACE ON EITHER SIDE OF THE JOINT WILL BE DRIED SO THAT A SUITABLE SURFACE FOR BITUMEN ADHESION IS OBTAINED.

**SEALING OF EXPANSION JOINT: (PRE-STRESSED BOX OR CONCRETE SLAB)**

THE EXPANSION JOINT GAP IS TO BE SEALED AND A BRIDGING PLATE CENTERED ALONG IT. A VERY NARROW GAP WILL BE SEALED BY POURING HOT BINDER INTO THE GAP. GAPS OF 1/8" OR MORE WILL FIRST BE FILLED WITH AN APPROPRIATELY SIZED BACKER ROD. THE BACKER ROD WILL BE INSTALLED SO THAT IT IS BETWEEN 1/8" AND 1" BELOW THE TOP OF THE EXISTING GAP. THE GAP WILL THEN BE FILLED WITH BINDER.

**BOND BREAKER:**

SPREAD BINDER OVER SURFACE AREA WHERE THE METAL BRIDGING PLATE WILL BE PLACED. CENTER THE BRIDGING PLATE OVER THE EXISTING JOINT AND BED INTO THE HOT BINDER. BUTT JOINT THE BRIDGING PLATES TO ACCOMMODATE THE ENTIRE JOINT LENGTH. SPIKE HOLES WILL BE DRILLED AT 1 FOOT INTERVALS ALONG THE LONGITUDINAL CENTERLINE OF THE PLATES. SECURE BRIDGING PLATE WITH NAILS OR SPIKES. SEAL BUTT JOINTS WITH HOT BINDER AND ALLOW BINDER TO SETUP BEFORE NEXT OPERATION. WHEN ALUMINUM BRIDGING PLATES ARE USED, ONLY THE BINDER IS REQUIRED TO SECURE THE INDIVIDUAL PLATES.

**BINDER COAT:**

SEAL ALL PREPARED, EXPOSED SURFACES OF THE JOINT WITH BINDER. POUR THE HOT BINDER OVER THE FLOOR AREA OF THE JOINT AND SPREAD TO COAT ALL EXPOSED SURFACES. THE BINDER WILL BE A MINIMUM OF 1/32" THICK ON THE BOTTOM OF THE JOINT CAVITY, WITH POOLS OF GREATER THICKNESS WHERE SURFACE IRREGULARITIES EXIST. THE BINDER APPLICATION TEMPERATURE WILL BE BETWEEN 177 AND 199 DEGREES C. THE BINDER WILL NOT BE ALLOWED TO BE HEATED ABOVE 210 DEGREES C. NOR ALLOWED TO EXCEED 199 DEGREES C. FOR MORE THAN 1 HOUR. A DOUBLE JACKETED OIL MELTER WILL BE USED TO HEAT THE BINDER. THE MELTER WILL BE EQUIPPED WITH A CONTINUOUS AGITATION SYSTEM, TEMPERATURE CONTROLS, AND A CALIBRATED THERMOMETER. ALSO A SYSTEM FOR ACCURATELY MEASURING THE WEIGHTS OF THE BINDER AND THE AGGREGATE WILL BE REQUIRED.

**BUILD-UP OF JOINT LAYERS:**

**AGGREGATE PREPARATION:**

HEAT THE AGGREGATE TO A TEMPERATURE OF 135 TO 163 DEGREES C., WITH A SUITABLE ROTATING DRUM WITH ATTACHED HEAT SOURCE OR A HOT COMPRESSED AIR LANCE, TO REMOVE DUST AND MOISTURE.

**AGGREGATE PROPORTION AND LAYER THICKNESS:**

MIX THE AGGREGATE WITH THE BINDER SUCH THAT THE MINIMUM AGGREGATE CONTENT BY WEIGHT WILL BE 68%. THE HEATED AGGREGATE AND BINDER WILL BE COMBINED IN LAYERS NOT LESS THAN 1/2" NOR EXCEEDING 2.5". THE THICKNESS OF EACH LAYER CAN BE VARRIED, WITHIN THESE LIMITS, TO ACHIEVE THE REQUIRED JOINT THICKNESS ( MINIMUM 2"). THE OBJECTIVE IS TO COAT EACH STONE AND FILL THE VOIDS WHILE AVOIDING AN EXCESS OF BINDER. THIS WILL ACHIEVE THE MAXIMUM CONTENT OF STONE CONSISTENT WITH ALL STONES BEING COATED WITH BINDER. RAKE THE MIXTURE TO MIX AND LEVEL.

THE TOP LAYER THICKNESS WILL VARY BETWEEN 1/2" AND ONE 1". IN PREPARING THE TOP LAYER, THE RATIO OF AGGREGATE TO BINDER WILL BE APPROXIMATELY 6:1 BY WEIGHT. OVERFILL THE TOP LAYER AND COMPACT TO THE LEVEL OF THE ADJACENT SURFACES USING A ROLLER OR VIBRATORY PLATE COMPACTOR. IMMEDIATELY AFTER COMPLETION OF THE COMPACTION, POUR SUFFICIENT BINDER OVER THE JOINT TO FILL THE SURFACE VOIDS AND COAT THE SURFACE STONE. DUST THE FINISHED JOINT WITH A FINE, DRY AGGREGATE TO PREVENT TACKINESS.

**MAINTENANCE OF TRAFFIC:**

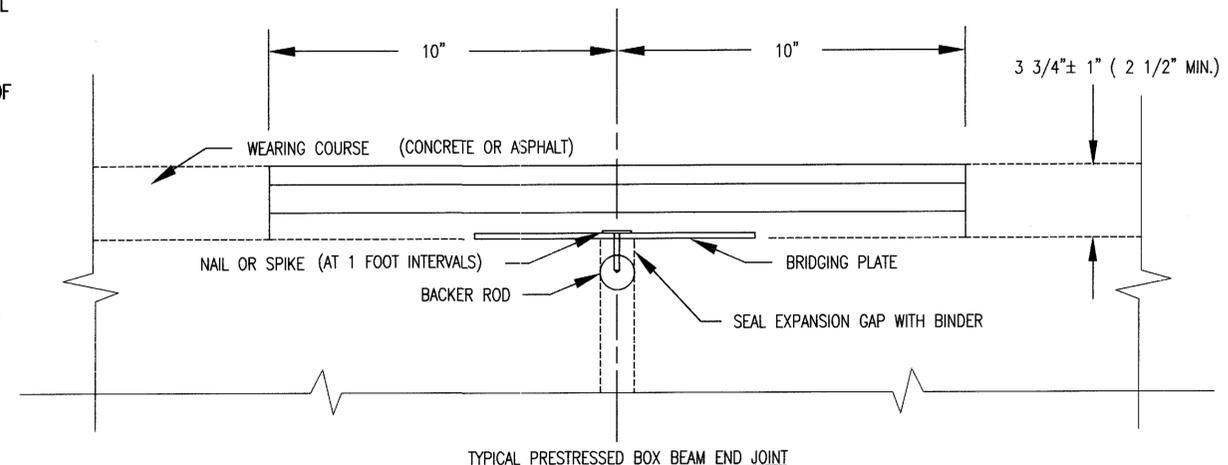
IF NECESSARY TO FACILITATE TRAFFIC MAINTENANCE, THE JOINT WILL BE INSTALLED IN TWO (2) HALF-WIDTH PHASES. DURING PHASE 1 APPROXIMATELY HALF OF THE TOTAL JOINT WILL BE INSTALLED. DURING PHASE 2, A MINIMUM OF 2" OF THE PHASE 1 JOINT WILL BE REMOVED, AT OR NEAR THE CENTERLINE, WITH THE REMAINDER OF THE JOINT INSTALLED. IN ALL CASES, OPERATIONS WILL BE SCHEDULED SO THAT ALL LANES CAN BE OPEN TO TRAFFIC DURING ALL NON-WORKING HOURS.

**TESTING:**

CERTIFICATION WILL BE SUPPLIED FOR EACH PROJECT SHOWING BINDER COMPLIANCE WITH REQUIRED PROPERTIES. A ONE LITER SAMPLE OF BINDER WILL BE RETRIEVED FROM EACH BRIDGE FOR FURTHER TESTING BY THE O.D.O.T. TESTING LABORATORY.

**PAYMENT:**

PAYMENT FOR ALL THE ABOVE WILL BE AT THE UNIT PRICE BID PER LINEAR METER OF SEALED JOINT IN PLACE FOR ITEM SPECIAL 516 31300, POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM ( 3 3/4" INCHES THICK). THIS WILL INCLUDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS NECESSARY TO COMPLETE THE ABOVE WORK.



DESIGN AGENCY  
COLUMBUS ENGINEERING CONSULTANTS, INC.  
840 MICHIGAN AVE., COLUMBUS, OH 43215  
FAX: (614) 228-3519 TEL: (614) 228-3500

DATE	11/99
REVIEWED	JJ
DRAWN	CEC
DESIGNED	YSJ
STRUCTURE FILE NUMBER	1501445
CHECKED	RT

EXPANSION JOINT DETAILS  
BRIDGE NO. COL-14-0871  
OVER MILL CREEK

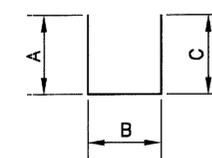
COL - 14 - 870  
15 / 16  
28  
33

# REINFORCING STEEL LIST

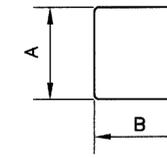
MARK	NO.	LENGTH	WEIGHT	TYPE	A	B	C	D	INCR.
<b>ABUTMENTS</b>									
A501*	16	19'-8"	328	STR					
A502	16	23'-8"	395	STR					
A503	58	5'-11"	358	2	1'-6"	3'-2"	1'-6"		
A504	58	3'-8"	222	STR					
A505	16	9'-6"	158	2	4'-2"	1'-5"	4'-2"		
A507	8	4'-5"	37	STR					
A508	16	4'-5"	74	STR					
A509	16	7'-6"	125	STR					
A801	58	4'-10"	748	8	1'-5"	2'-6"			
			2445	LBS**					
<b>PIERS</b>									
P301	14	45'-0"	807	12	1'-0"	1'-0"			
P401	28	9'-5"	176	3	2'-6"	2'-0"			
P501*	8	19'-9"	165	STR					
P502	64	8'-5"	562	2	3'-0"	2'-8"	3'-0"		
P503	64	8'-5"	562	2	3'-0"	2'-8"	3'-0"		
P504	16	8'-5"	140	2	3'-0"	2'-8"	3'-0"		
P601	112	45'-0"	7570	STR					
P801*	16	19'-9"	844	STR					
P802	16	23'-9"	1015	STR					
			11841	LBS**					
<b>SUPERSTRUCTURE</b>									
S401*	8	19'-2"	102	STR					
S402	8	23'-2"	124	STR					
S501	88	3'-11"	359	5	2'-9"				
S601*	2	19'-8"	59	STR					
S602	2	23'-8"	71	STR					
			715	LBS**					

## NOTES

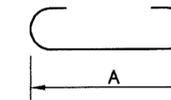
1. THE BAR SIZE NUMBER IS SPECIFIED ON THE PLANS IN THE BAR MARK COLUMN. THE FIRST TWO DIGITS INDICATE THE BAR SIZE NUMBER. FOR EXAMPLE, A501 IS A NO.5 BAR. BAR DIMENSIONS SHOWN ARE OUT TO OUT UNLESS OTHERWISE INDICATED. I.R. INDICATES INSIDE RADIUS, UNLESS OTHERWISE NOTED.
2. ALL REINFORCING BARS SHALL BE EPOXY COATED. PAYMENT FOR THESE BARS SHALL BE INCLUDED WITH APPROPRIATE CONCRETE ITEMS.
3. "STR" IN THE TYPE COLUMN INDICATES STRAIGHT BARS.
4. REFER TO C.M.S. SECTION 509.05 FOR STANDARD BEND DIMENSIONS.
5. MECHANICAL CONNECTORS: AN APPROVED TYPE OF MECHANICAL CONNECTOR FOR REINFORCING BARS SHALL BE PROVIDED. INSTALLATION OF CONNECTORS SHALL CONFORM WITH MANUFACTURER'S RECOMMENDED PROCEDURES. IF A DOWEL BAR SPLICE TYPE OF CONNECTOR IS FURNISHED, THE MINIMUM DOWEL BAR LENGTH TO BE INCLUDED WITH THE CONNECTOR SHALL BE AS GIVEN BY THE DIMENSION "L" BELOW. CONNECTORS AND DOWEL BARS SHALL BE EPOXY COATED. COATINGS FOR BOTH CONNECTORS AND BARS SHALL CONFORM TO THE SAME SPECIFICATIONS. COATINGS WHICH HAVE BEEN DAMAGED OR WHICH OTHERWISE DO NOT MEET SPECIFICATIONS WITH RESPECT TO COLOR, CONTINUITY AND UNIFORMITY MAY BE REPAIRED AS DIRECTED BY THE ENGINEER OR THEY SHALL BE REPLACED WITH MATERIAL WHICH MEETS THE SPECIFICATIONS. CONNECTORS AND DOWEL BAR EXTENSION SHALL CONFORM WITH ITEM 509.
6. ALL REINFORCING STEEL CLEARANCES ARE 2 INCHES UNLESS NOTED OTHERWISE.



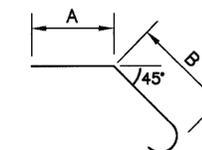
TYPE 2



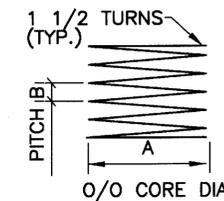
TYPE 3



TYPE 5

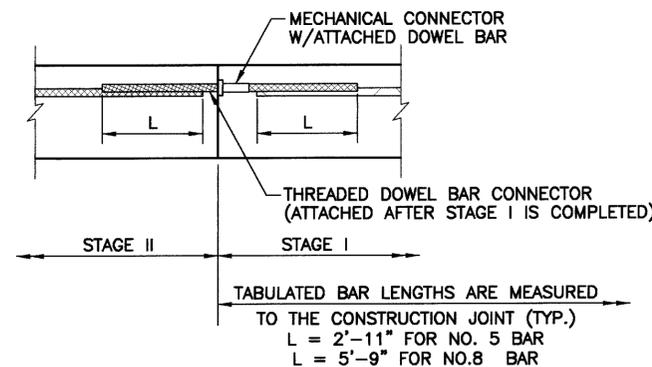


TYPE 8



TYPE 12

## BENDING DIAGRAM



## MECHANICAL CONNECTOR DETAIL

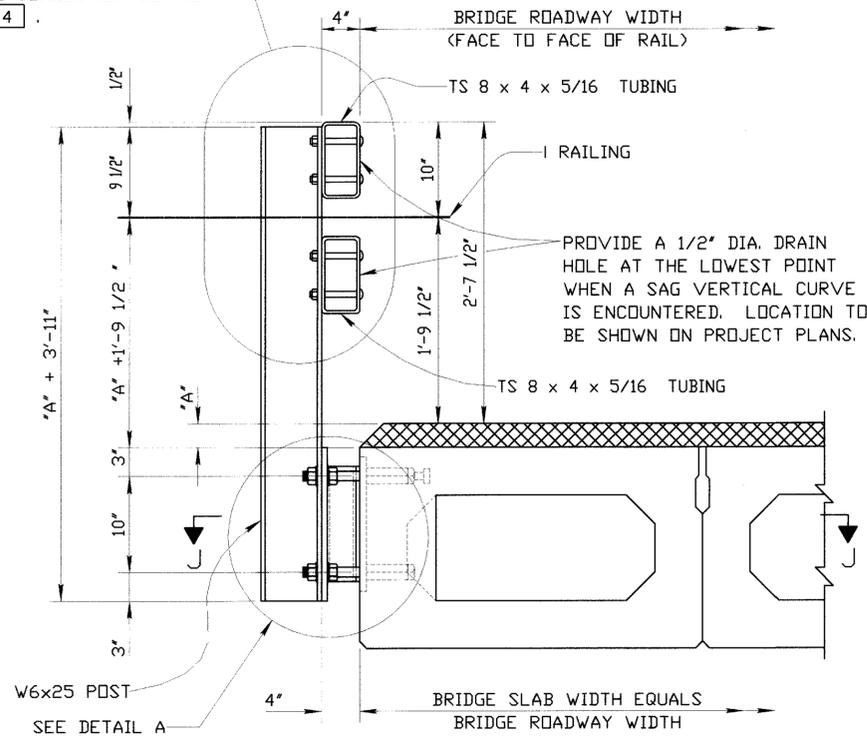
ALL BARS SHALL BE EPOXY COATED

\* INDICATES BARS REQUIRING MECHANICAL CONNECTORS. THE LENGTHS SHOWN IN THE TABLE ARE THE NOMINAL LENGTHS MEASURED TO THE CONSTRUCTION JOINT. ADJUSTMENT IN THE LENGTHS OF THE BARS DUE TO MECHANICAL SPLICING SHALL BE MADE PRIOR TO THE FABRICATION.

\*\* FOR INFORMATIONAL PURPOSE ONLY



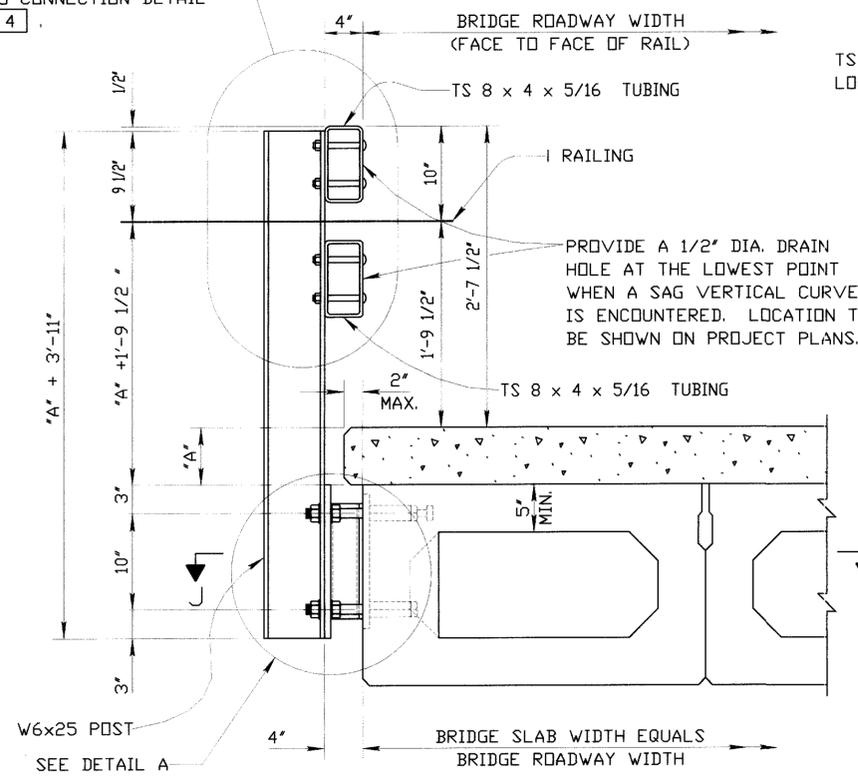
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

(FOR 17" AND DEEPER NONCOMPOSITE PRESTRESSED BOX BEAM BRIDGES)

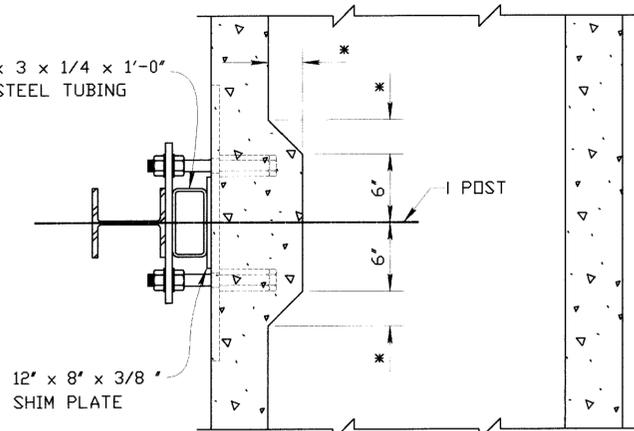
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

(FOR 17" AND DEEPER COMPOSITE PRESTRESSED BOX BEAM BRIDGES)

TS 6 x 3 x 1/4 x 1'-0" LONG STEEL TUBING

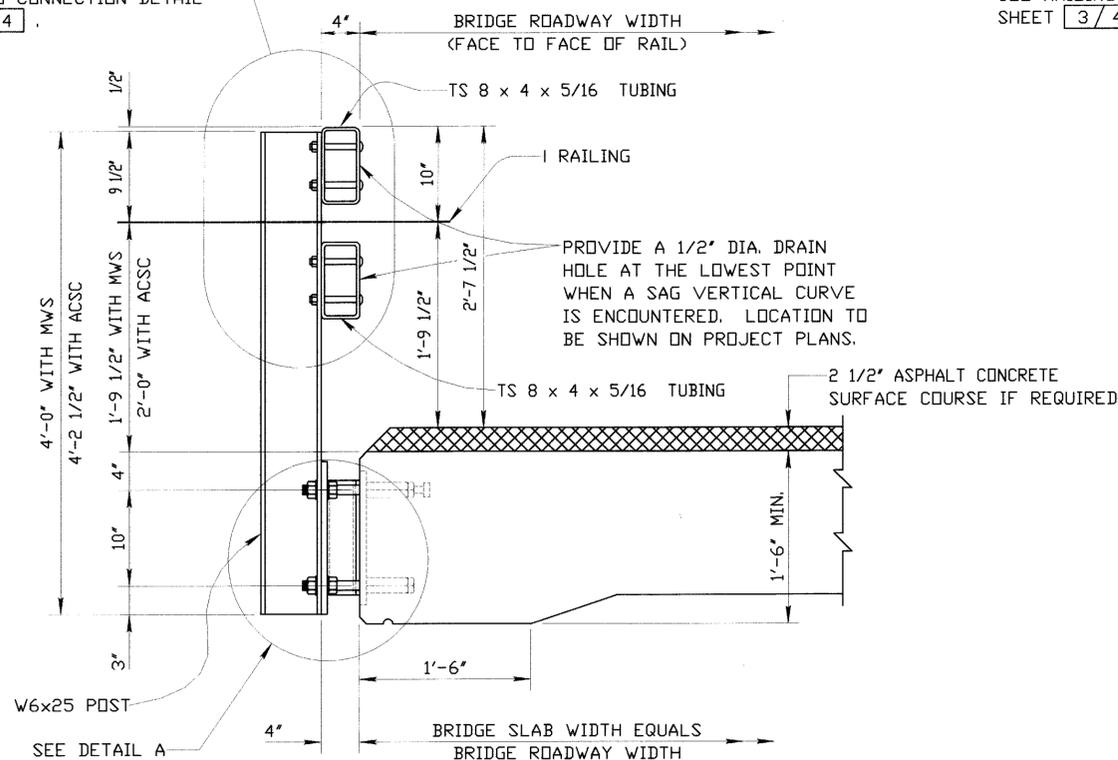


**SECTION J-J**

**LEGEND**

- MWS - MONOLITHIC WEARING SURFACE
- ACSC - ASPHALT CONCRETE SURFACE COURSE
- 'A' - OVERLAY THICKNESS, THIS DIMENSION VARIES ACROSS THE LENGTH OF THE BRIDGE.
- \* - THIS DIMENSION IS THE SAME AS THE WIDTH OF FILLET IN THE BOX BEAM'S VOID.

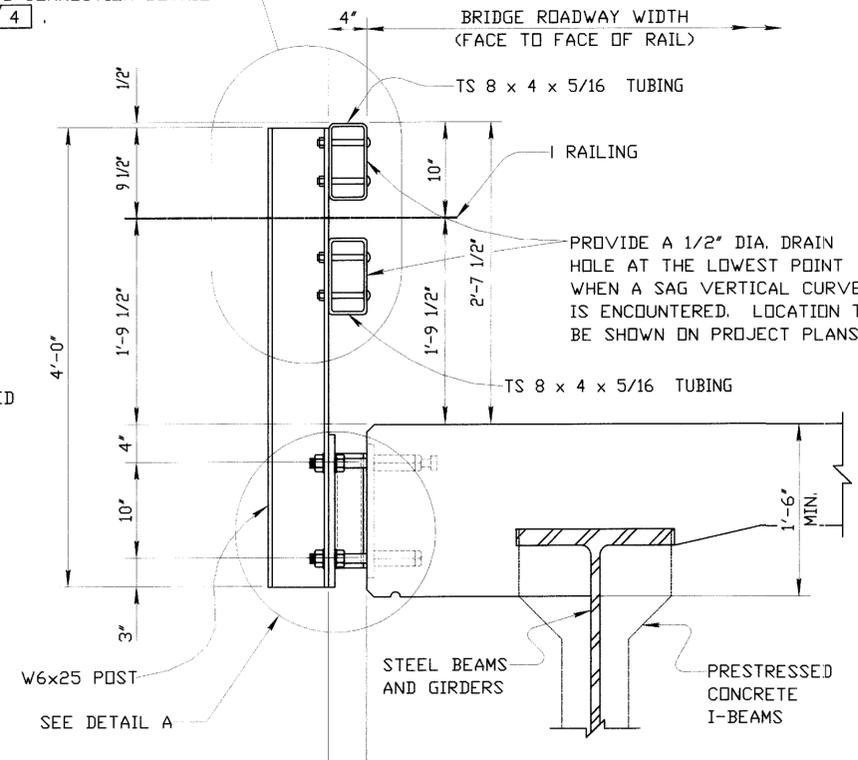
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

(FOR SLAB BRIDGES)

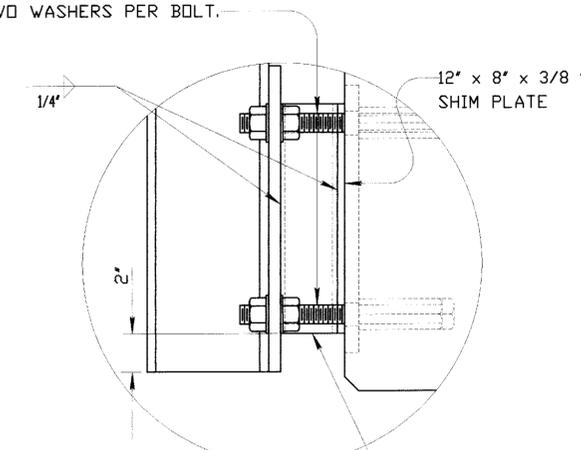
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

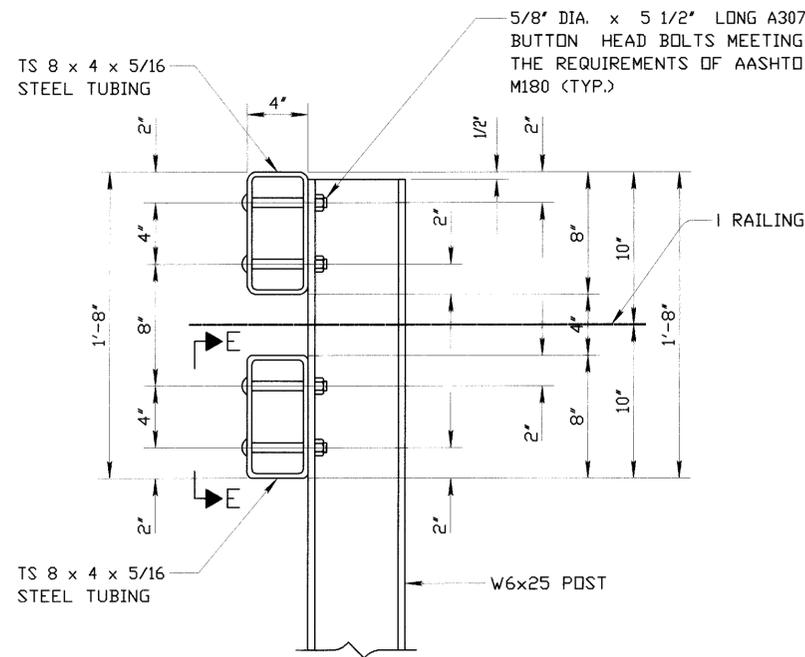
(FOR CONCRETE OR STEEL I-BEAM BRIDGES)

2 - 1" DIA. x 12" LONG ANCHOR BOLTS WITH MACHINE THREADS FULL LENGTH AND TWO HEX NUTS AND TWO WASHERS PER BOLT.

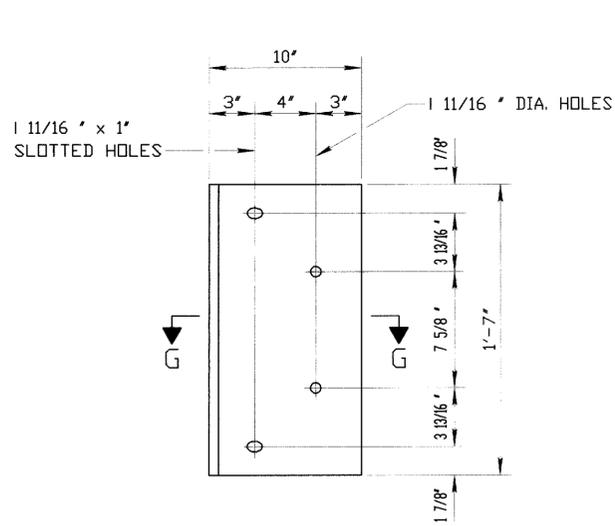


**DETAIL A**

TS 6 x 3 x 1/4 x 1'-0" LONG STEEL TUBING, WELD TO ANCHOR PLATE AND SHIM PLATE PRIOR TO GALVANIZING.



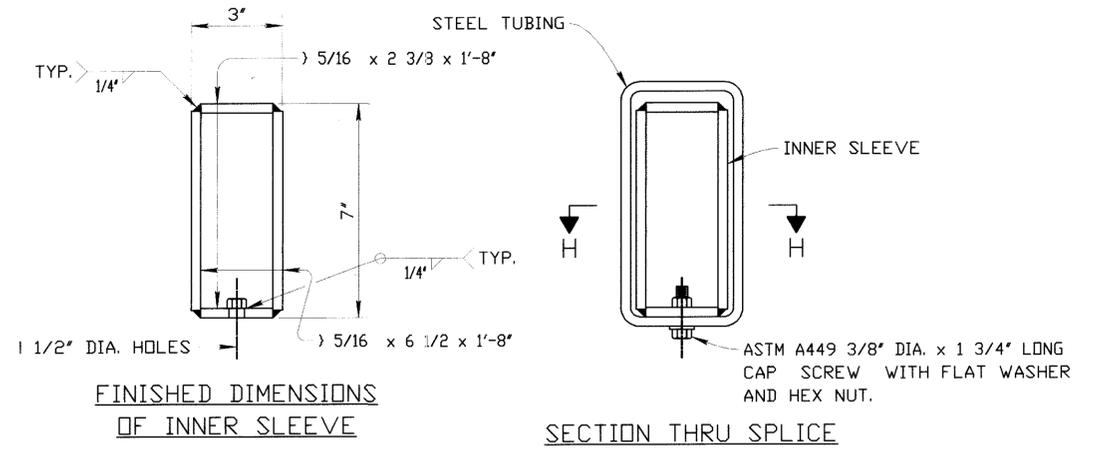
RAILING CONNECTION DETAIL



ELEVATION

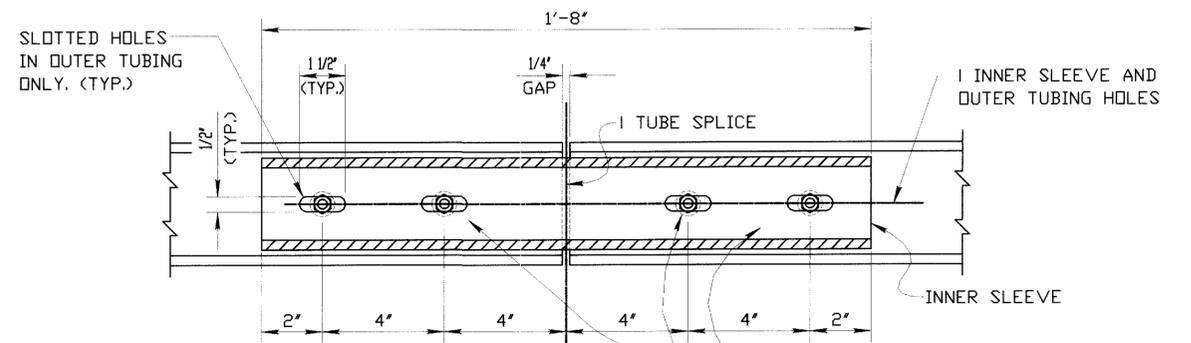
SECTION G-G

BRIDGE TERMINAL CONNECTOR ASSEMBLY



FINISHED DIMENSIONS OF INNER SLEEVE

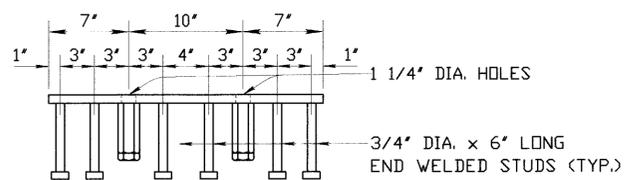
SECTION THRU SPLICE



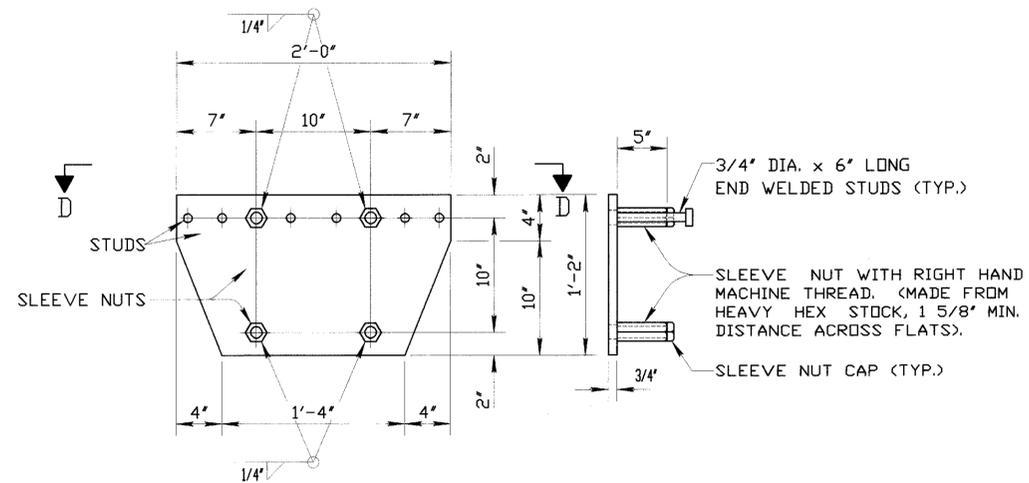
SECTION H-H

STEEL TUBE SPLICE DETAILS

BOLTS IN SLOTTED HOLES SHALL NOT BE DRAWN UP SO TIGHT AS TO PREVENT SLIDING BETWEEN THE OUTER TUBE AND THE INNER SPLICE.



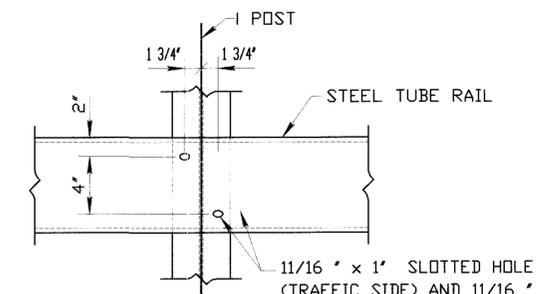
VIEW D-D



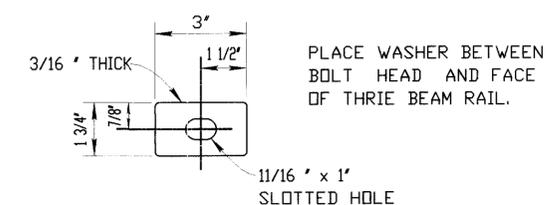
ELEVATION

END VIEW

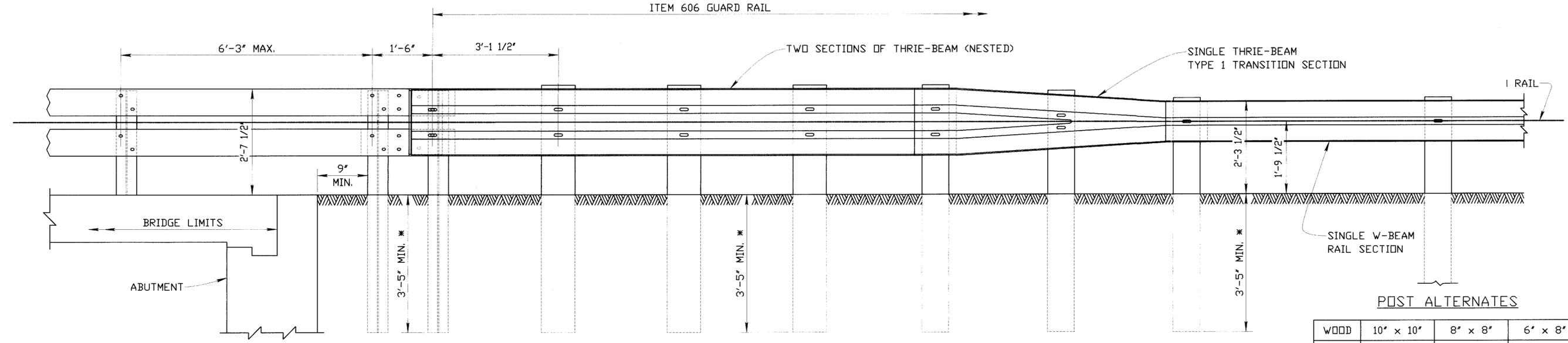
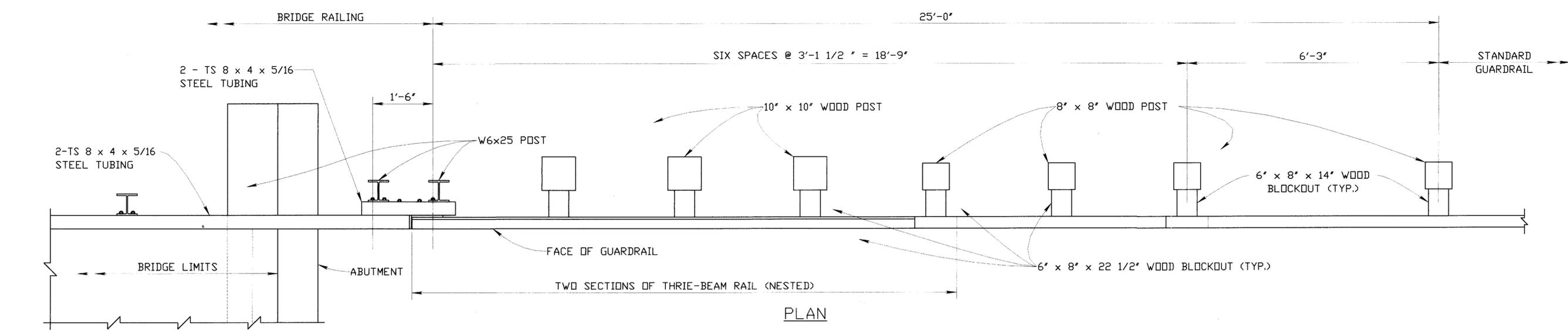
POST ANCHOR DEVICE



VIEW E-E



SPECIAL WASHER



	WOOD	10' x 10'	8' x 8'	6' x 8'
STEEL	W8x24	W6x25	W6x9	

\* SEE STD. CONSTR. DWG. GR-1.2 FOR ADDITIONAL POST EMBEDMENT DETAILS.

TYPE 3 BRIDGE TERMINAL ASSEMBLY (MODIFIED)

TST-1-98 GENERAL NOTES:

GENERAL: THIS DRAWING PROVIDES DESIGN AND CONSTRUCTION DETAILS. THE PROJECT PLANS FOR EACH STRUCTURE SHALL PROVIDE NECESSARY ADDITIONAL RAILING DIMENSIONS INCLUDING RAILING LENGTHS, POST SPACINGS, POST LENGTHS AND ANY OTHER PERTINENT INFORMATION INCLUDING SPECIAL NOTES AND DETAILS. FOR ADDITIONAL GUARDRAIL DETAILS, SEE STD. CONSTR. DWGS. GR-1.1, GR-1.2 AND OTHER DRAWINGS PERTAINING TO DESIGN OF SPECIFIC GRADRAIL TYPES.

APPLICATION: THE TWIN STEEL TUBE RAILING SHALL BE USED ON STRUCTURES DESIGNED TO DRAIN SURFACE WATER OVER THE SIDES OF THE STRUCTURE. THIS RAILING IS NOT APPLICABLE TO COMPOSITE BOX BEAM BRIDGES WITH DESIGN OVERHANGS GREATER THAN 2' OR TOP FLANGE THICKNESSES LESS THAN 5".

THE TYPE 3 BRIDGE TERMINAL ASSEMBLY (MODIFIED) SHALL BE USED TO CONNECT GUARDRAIL RUNS TO BOTH THE APPROACH AND TRAILING ENDS OF TWIN STEEL TUBE BRIDGE RAILINGS.

DESIGN SPECIFICATIONS: THIS DESIGN CONFORMS TO THE "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996, INCLUDING THE 1997 INTERIM SPECIFICATIONS, AND THE ODOT BRIDGE DESIGN MANUAL.

DESIGN DATA:  
SHAPED STRUCTURAL TUBING: ASTM A 500 GRADE B Fy=46 KSI  
STRUCTURAL STEEL SHAPES AND PLATES: ASTM A 572 Fy=50 KSI

MATERIALS: SHAPED STRUCTURAL TUBING SHALL BE AS PER ODOT CONSTRUCTION AND MATERIALS SPECIFICATIONS (CMS) ITEM 707.10. IN LIEU OF THE "DROP WEIGHT TEAR TEST" AS PER ASTM E 436, THE MANUFACTURER MAY CHOOSE TO SUPPLY TUBING THAT MEETS IMPACT TOUGHNESS ACCORDING TO AASHTO T 266, "NOTCHED BAR IMPACT TESTING OF METALLIC MATERIALS (CVN)". THE CVN IMPACT REQUIREMENTS SHALL BE 15 FT-LBS AT 0°F. FOR EACH HEAT SUPPLIED, THE MANUFACTURER SHALL FURNISH ONE 2" x 18" SPECIMEN, MARKED WITH ITS HEAT NUMBER, FOR IMPACT TESTING.

STRUCTURAL STEEL SHAPES AND PLATES SHALL BE AS PER CMS ITEM 711.01

GALVANIZING: ALL SHAPED STRUCTURAL TUBES, POSTS, PLATES HARDWARE AND ACCESSORIES SHALL BE GALVANIZED IN ACCORDANCE WITH CMS 711.02. PRIOR TO GALVANIZING, ALL EXPOSED STRUCTURAL TUBING ENDS SHALL BE ROUNDED, AND BURRS SHALL BE REMOVED FROM ALL STEEL TUBING, SHAPES AND PLATES.

TUBE SPLICES ARE TO BE LOCATED SO THAT EACH TUBE SEGMENT SHALL BE CONNECTED TO NOT LESS THAN TWO POSTS. SPLICES IN THE TOP AND BOTTOM TUBES SHALL BE STAGGERED AND SHOULD NOT OCCUR IN THE SAME PANEL.

HORIZONTAL CURVATURE: THIS STANDARD IS APPLICABLE TO STRUCTURES HAVING A RAILING CURVATURE RADIUS OF 20 FEET OR MORE. FOR A RADIUS OF LESS THAN 20 FEET, THE DESIGN SHALL BE SPECIAL. FOR ALL CURVED STRUCTURES, THE HORIZONTAL RAIL ELEMENTS, SHALL BE HEAT CURVED AS SPECIFIED BY AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.

FASTENERS SHALL CONFORM TO THE FOLLOWING:

THE ANCHOR BOLTS, SLEEVE NUTS, NUTS, AND WASHERS SHALL CONFORM TO CMS 711.09 (ASTM A 325).

END WELDED STUDS SHALL CONFORM TO ASTM A 108.

THE HORIZONTAL RAIL TO POST CONNECTION BOLTS AND HEX NUTS SHALL CONFORM TO CMS 711.10 AND TO AASHTO M180. THE RECTANGULAR BEAM WASHERS IN AASHTO M180 ARE NOT TO BE USED IN THE TUBULAR STEEL CONNECTIONS. TUBULAR STEEL CONNECTION WASHERS SHALL CONFORM TO ASTM F 436, TYPE 1.

THE HEX CAP SCREWS (BOLTS), HEX NUTS AND WASHERS SHALL CONFORM TO ASTM A 449.

BOX BEAMS: THE DISTANCE BETWEEN THE END OF A BOX BEAM AND THE CENTERLINE OF THE FIRST GUARDRAIL POST SHALL NOT BE LESS THAN 2'-10". THE LOCATION OF THE HORIZONTAL TIE RODS MAY NEED TO BE MOVED IN ORDER TO ACCOMMODATE EACH POST ANCHOR DEVICE.

POSTS MAY BE SET IN DRILLED HOLES OR DRIVEN TO GRADE.

WOOD POSTS SHALL BE SQUARE - SAWED PRESSURE TREATED WOOD AS PER CMS 710.14 AND FABRICATED WITH SQUARE ENDS. BOLT HOLES SHALL BE BORED AND TOPS OF POSTS TRIMMED, IF REQUIRED, AFTER POSTS ARE SET.

ALTERNATE STEEL POSTS AND STEEL BLOCKOUTS MAY BE FURNISHED ACCORDING TO THE CHART GIVEN ABOVE. PLASTIC BLOCKOUTS SHALL NOT BE PERMITTED.

PAYMENT FOR ITEM 517 - RAILING (TWIN STEEL TUBE) SHALL INCLUDE ALL STEEL TUBING, STEEL POSTS, POST ANCHOR DEVICES, ANCHOR PLATES, TUBE SPLICE PLATES, STEEL SHIM PLATES, ANCHOR BOLTS, BOLTS, SLEEVE NUTS, NUTS, CAP SCREWS, WASHERS AND OTHER HARDWARE.

PAYMENT FOR ITEM 606 - BRIDGE TERMINAL ASSEMBLY TYPE 3 (MODIFIED) SHALL INCLUDE THE EXTRA COST, IN EXCESS OF NORMAL GUARDRAIL COST, FOR ADDITIONAL AND DIFFERENT TYPE POSTS AND BLOCKOUTS, NESTED THRIE BEAM SECTIONS, BRIDGE TERMINAL CONNECTOR ASSEMBLY, THRIE BEAM TRANSITION SECTION, BOLTS, HEX NUTS, WASHERS, AND OTHER HARDWARE.

# SPECIAL PROVISIONS

## WATERWAY PERMITS FOR

CRS: COL-14-8.70 PID 18196

U.S. ARMY CORPS OF ENGINEERS  
PERMIT NUMBER: NWP #3

OHIO EPA  
PERMIT NUMBER: NA

DATE: 11/5/99

### NATIONWIDE PERMIT

**3. Maintenance.** The repair, rehabilitation, or replacement of any previously authorized, currently serviceable, structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area including those due to changes in materials, construction techniques, or current construction codes or safety standards which are necessary to make repair, rehabilitation, or replacement, are permitted provided the environmental effects resulting from such repair, rehabilitation, or replacement are minimal. Currently serviceable means useable as is or with some maintenance but not so degraded as to essentially require reconstruction. This NWP authorizes the repair, rehabilitation, or replacement of those structures destroyed by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced or under contract to commence within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the District Engineer, provided the permittee can demonstrate funding, contract, or other similar delays. Maintenance dredging and beach restoration are not authorized by this NWP. (Sections 10 and 404)

For activities involving a discharge, the Ohio State Certification General Conditions apply to this nationwide permit.

## OHIO STATE CERTIFICATION GENERAL CONDITIONS FOR NATIONWIDE PERMITS.

The following general conditions apply to Nationwide Permits 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 18, 19, 20, 22, 23, 25, 26, 27, 29, 30, 31, 32, 33, 34, 36, 37, 38, and 40.

Steps shall be taken, upon completion of the projects, to ensure bank stability. This may include, but is not limited to, the placement of riprap or bank seeding.

Any damages to the immediate environment of the project by equipment needed for construction or hauling will be repaired immediately.

Care must be employed throughout the course of this project to avoid the creation of unnecessary turbidity which may degrade water quality or adversely affect aquatic life outside the project areas.

For Nationwide Permits 14, 21, 26 (1-3 acres), 29, 33, 37, and 38, that require Agency coordination, in accordance with the Nationwide Permit General Condition entitled "Notification", Number 13(e)(i), the Corps shall submit a pre-construction notification to Ohio EPA for review and comment.

## NATIONWIDE PERMIT CONDITIONS

### GENERAL CONDITIONS:

The following general conditions must be followed in order for any authorization by a NWP to be valid:

- 1. Navigation.** No activity may cause more than a minimal adverse effect on navigation.
- 2. Proper maintenance.** Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.
- 3. Erosion and siltation controls.** Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.
- 4. Aquatic life movements.** No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.
- 5. Equipment.** Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.
- 6. Regional and case-by-case conditions.** The activity must comply with any regional conditions which may have been added by the Division Engineer (see 33 CFR 330.4(e) and with any case specific conditions added by the Corps or by the State or tribe in its section 401 water quality certification.
- 7. Wild and Scenic Rivers.** No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status, unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely effect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)
- 8. Tribal rights.** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.
- 9. Water quality certification.** In certain states, an individual Section 401 water quality certification must be obtained or waived (see 33 CFR 330.4(c)).

**10. Coastal zone management.** In certain states, an individual State coastal zone management consistency concurrence must be obtained or waived (see Section 330.4(d))

**11. Endangered Species.**

(a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the District Engineer if any listed species or critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized.

(b) Authorization of an activity by a nationwide permit does not authorize the "take" of a threatened or endangered species as defined under the Federal Endangered Species Act. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, both lethal and non-lethal "takes" of protected species are in violation of the Endangered Species Act. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. Fish and Wildlife Service and National Marine Fisheries Service or their world wide web pages at <http://www.fws.gov/~r9endspp/endspp.html> and [http://kingfish.spp.mnfs.gov/tmcintyr/prot\\_res.html#ES](http://kingfish.spp.mnfs.gov/tmcintyr/prot_res.html#ES) and Recovery, respectively.

**12. Historic properties.** No activity which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the DE has complied with the provisions of 33 CFR Part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)).

**13. Notification.**

(a) **Timing:** Where required by the terms of the NWP, the prospective permittee must notify the District Engineer with a Pre-Construction Notification (PCN) as early as possible and shall not begin the activity: (1) Until notified by the District Engineer that the activity may proceed under the NWP with any special conditions imposed by the District or Division

Engineer; or (2) If notified by the District or Division Engineer that an individual permit is required; or (3) Unless 30 days (or 45 days for NWP 26 only) have passed from the District Engineer's receipt of the notification and the prospective permittee has not received notice from the District or Division Engineer Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) **Contents of Notification:** The notification must be in writing and include the following information:

- (1) Name, address and telephone numbers of the prospective permittee;
- (2) Location of the proposed project;
- (3) Brief description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity; and
- (4) For NWPs S 18, 21, 26, 29, 34, and 38, the PCN must also include a delineation of affected special aquatic sites, including wetlands (see paragraph 13(f));
- (5) For NWP 21 - Surface Coal Mining Activities, the PCN must include an OSM or State approved mitigation plan.
- (6) For NWP 29-Single-Family Housing, the PCN must also include:
  - (i) Any past use of this NWP by the individual permittee and/or the permittee's spouse;
  - (ii) A statement that the single-family housing activity is for a personal residence of the permittee;
  - (iii) A description of the entire parcel, including its size, and a delineation of wetlands. For the purpose of this NWP, parcels of land measuring 0.5 acre or less will not require a formal on-site delineation. However, the applicant shall provide an indication of where the wetlands are and the amount of wetlands that exists on the property. For parcels greater than 0.5 acre in size, a formal wetland delineation must be prepared in accordance with the current method required by the Corps. (See paragraph 13(f));
  - (iv) A written description of all land (including, if available, legal descriptions) owned by the prospective permittee and/or the prospective permittee's spouse, within a one mile radius of the parcel, in any form of ownership (including any land owned as a partner, corporation, joint tenant, co-tenant, or as a tenant-by-the-entirety) and any land on which a purchase and sale agreement or other contract for sale or purchase has been executed;

(7) For NWP 31 Maintenance of Existing Flood Control Projects, the prospective permittee must either notify the District Engineer with a Pre-Construction Notification (PCN) prior to each maintenance activity or submit a five year (or less) maintenance plan. In addition, the PCN must include all of the following:

(I) Sufficient baseline information so as to identify the approved channel depths and configurations and existing facilities. Minor deviations are authorized, provided that the approved flood control protection or drainage is not increased;

(ii) A delineation of any affected special aquatic sites, including wetlands; and,

(iii) Location of the dredged material disposal site.

(8) For NWP 33-Temporary Construction, Access, and Deterring, the PCN must also include a restoration plan of reasonable measures to avoid and minimize adverse effects to aquatic sources.

**(c) Form of Notification:** The standard individual permit application form (Form ENG 4345) may be used as the notification but must clearly indicate that it is a PCN and must include all of the information required in (b) (1)-(7) of General Condition 13. A letter may also be used.

**(d) District Engineer's Decision:** In reviewing the pre-construction notification for the proposed activity, the District Engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative-adverse environmental effects or may be contrary to the public interest. The prospective permittee may, optionally, submit a proposed mitigation plan with the pre-construction notification to expedite the process and the District Engineer will consider any optional mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed work are minimal. If the District Engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects are minimal, the District Engineer will notify the permittee and include any conditions the DE deems necessary.

Any mitigation proposal must be approved by the District Engineer prior to commencing work. If the prospective permittee elects to submit a mitigation plan, the District Engineer will expeditiously review the proposed mitigation plan, but will not commence a second 30-day (or 45-day for NWP 26) notification procedure. If the net adverse effects of the project (with the mitigation proposal) are determined by the District Engineer to be minimal, the District Engineer will provide a timely written response to the applicant stating that the project can proceed under the terms and conditions of the nationwide permit

If the District Engineer determines that the adverse effects of the proposed work are more than minimal, then he will notify the applicant either: (1) that the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (2) that the project is authorized under the NWP subject to the applicant's submitting a mitigation proposal that would reduce the adverse effects to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions.

**(e) Agency Coordination:** The District Engineer will consider any comments from Federal and State agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(i) For NWP 14, 21, 26 (between 1 and 3 acres of impact), 29, 33, 37, and 38. The District Engineer will, upon receipt of a notification, provide immediately, e.g., facsimile transmission, overnight mail or other expeditious manner, a copy to the appropriate offices of the Fish and Wildlife Service, State natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO), and, if appropriate, the National Marine Fisheries Service. With the exception of NWP 37, these agencies will then have 5 calendar days from the date the material is transmitted to telephone or fax the District Engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the District Engineer will wait an additional 10 calendar days (16 calendar days for NWP 26 PCNs) before making a decision on the notification. The District Engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency. The District Engineer will indicate in the administrative record associated with each notification that the resource agencies' concerns were considered. Applicants are encouraged to provide the Corps multiple copies of notifications to expedite agency notification.

(ii) Optional Agency Coordination For NWPs 5, 7, 12, 13, 17, 18, 27, 31, and 34, where a Regional Administrator of EPA, a Regional Director of USFWS, or Regional Director of NMFS has formally requested general notification from the District Engineer for the activities covered by any of these NWPs, the Corps will provide the requesting agency with notification on the particular NWPs. However, where the agencies have a record of not generally submitting substantive comments on activities covered by any of these NWPs, the Corps district may discontinue providing notification to those regional agency offices. The District Engineer will coordinate with the resources agencies to identify which activities involving a PCN that the agencies will provide substantive comments to the Corps. The District Engineer may also request comments from the agencies on a case by case basis when the District Engineer determines that such comments would assist the Corps in reaching a decision whether effects are more than minimal either individually or cumulatively.

(iii) Optional Agency Coordination, 401 Denial. For NWP 26 only, where the State has denied its 401 water quality certification for activities with less than 1 acre of wetland impact, the EPA regional administrator may request agency coordination of PCNs between 1/3 and 1 acre. The request may only include acreage limitations within the 1/3 to 1 acre range for which the state has denied water quality certification. In cases where the EPA has requested coordination of projects as described here, the Corps will forward the PCN to EPA only. The PCN will then be forwarded to the Fish and Wildlife Service and the National Marine Fisheries Service by EPA under agreements among those agencies. Any agency receiving the PCN will be bound by the time frames for providing comments to the Corps.

**(f) Wetlands Delineations:** Wetland delineations must be prepared in accordance with the current method required by the Corps. For NWP 29 see paragraph (b)(6)(iii) for parcels less than 0.5 acres in size. The permittee may ask the Corps to delineate the special aquatic site. There may be some delay if the Corps does the delineation. Furthermore, the 30-day period (45 days for NWP 26) will not start until the wetland delineation has been completed and submitted to the Corps, where appropriate.

**(g) Mitigation:** Factors that the District Engineer will consider when determining the acceptability of appropriate and practicable mitigation include, but are not limited to:

(I) To be practicable, the mitigation must be available and capable of being done considering costs, existing technology, and logistics in light of the overall project purposes;

(ii) To the extent appropriate, permittees should consider mitigation banking and other forms of mitigation including contributions to wetland trust funds, "in lieu fees" to organizations such as The Nature Conservancy, state or county natural resource management agencies, where such fees contribute to the restoration, creation, replacement, enhancement, or preservation of wetlands. Furthermore, examples of mitigation that may be appropriate and practicable include but are not limited to: reducing the size of the project; establishing wetland or upland buffer zones to protect aquatic resource values; and replacing the loss of aquatic resource values by creating, restoring, and enhancing similar functions and values. In addition, mitigation must address wetland impacts, such as functions and values, and cannot be simply used to offset the acreage of wetland losses that would occur in order to meet the acreage limits of some of the NWPs (e.g., for NWP 26, 5 acres of wetlands cannot be created to change a 6-acre loss of wetlands to a 1 acre loss; however, 2 created acres can be used to reduce the impacts of a 3-acre loss.).

**14. Compliance certification.** Every permittee who has received a Nationwide permit verification from the Corps will submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the Corps with the authorization letter and will include:

- a. A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions;
- b. A statement that any required mitigation was completed in accordance with the permit conditions;
- c. The signature of the permittee certifying the completion of the work and mitigation.

**15. Multiple use of Nationwide permits.** In any case where any NWP number 12 through 40 is combined with any other NWP number 12 through 40, as part of a single and complete project, the permittee must notify the District Engineer in accordance with paragraphs a, b, and c on the "Notification General Condition number 13. Any NWP number 1 through 11 may be combined with any other NWP without notification to the Corps, unless notification is otherwise required by the terms of the NWPs. As provided at 33 CFR 330.6(c) two or more different NWPs can be combined to authorize a single and complete project. However, the same NWP cannot be used more than once for a single and complete project.

## SECTION 404 ONLY CONDITIONS:

In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material into waters of the U.S., and must be followed in order for authorization by the NWPs to be valid:

**1. Water supply intakes.** No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

**2. Shellfish production.** No discharge of dredged or fill material may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by NWP 4.

**3. Suitable material.** No discharge of dredged or fill material may consist of unsuitable material (e.g. trash, debris, car bodies, asphalt, etc.) and material discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

**4. Mitigation.** Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e. on-site), unless the District Engineer approves a compensation plan that the District Engineer determines is more beneficial to the environment than on-site minimization or avoidance measures.

**5. Spawning areas.** Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

**6. Obstruction of high flows.** To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

**7. Adverse effects from impoundments.** If the discharge creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized to the maximum extent practicable.

**8. Waterfowl breeding areas.** Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

**9. Removal of temporary Fills.** Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

**GEOLOGY OF THE SITE**

THE SITE LIES ON THE GENTLY ROLLING ALLEGHENY PLATEAU. THE WISCONSIN GLACIER PASSED OVER THE SITE. THE GLACIAL DEPOSITS SURROUNDING THE SITE ARE GENERALLY ON THE ORDER OF 25 TO 30 FEET IN THICKNESS. HOWEVER, AT THE STRUCTURE LOCATION, THE DEPOSITS ARE IN EXCESS OF 70 FEET IN DEPTH. THESE GLACIAL DEPOSITS ARE DESCRIBED AS SILTS OR SAND AND GRAVEL.

**EXPLORATION**

TWO (2) STRUCTURE TEST BORINGS, DESIGNATED AS B-1 AND B-2, WERE DRILLED IN THE VICINITY OF THE PROPOSED STRUCTURE TO DEPTHS OF 90.0 AND 95.0 FEET, RESPECTIVELY. ADDITIONALLY, TWO (2) ROADWAY TEST BORINGS WERE DRILLED NEAR THE PROPOSED APPROACH SLABS TO DEPTHS OF 10.0 FEET EACH. THE TEST BORINGS WERE ADVANCED UTILIZING HOLLOW STEM AUGERS (HSA) ON SEPTEMBER 20 AND 21, 1999.

**INVESTIGATIONAL FINDINGS AND OBSERVATIONS**

BORINGS B-1 AND B-2 WERE DRILLED THROUGH THE EXISTING BRIDGE DECK. THE GROUND SURFACE IN THE CREEK BED WAS ENCOUNTERED AT A DEPTH OF 18.5 FEET IN B-1 AND 16.5 FEET IN B-2. THE BORINGS ENCOUNTERED LAYERS OF SANDY SILT OR SILTY SAND CREEK BED DEPOSITS TO DEPTHS RANGING FROM 22.5 TO 26.0 FEET BELOW THE TOP OF THE BRIDGE DECK.

BELOW THE CREEK BED DEPOSITS, THE BORINGS ENCOUNTERED SAND AND GRAVEL DEPOSITS WITH CLAYEY SILT LAYERS AND COBBLES EXTENDING DOWNWARDS TO DEPTHS RANGING FROM 62.0 TO 66.0 FEET. GRAY CLAYEY SILT OR SILT WAS ENCOUNTERED BELOW THE SAND AND GRAVEL, EXTENDING DOWNWARDS TO THE DRILLED DEPTHS.

BORINGS B-3 AND B-4 WERE DRILLED THROUGH THE EXISTING ROADWAY AND EXHIBITED A PAVEMENT COMPOSITION CONSISTING OF 5.5 INCHES OF ASPHALT CONCRETE AND 8.5 TO 9.0 INCHES OF PORTLAND CEMENT CONCRETE OVER 6 TO 7 INCHES OF GRANULAR BASE COURSE.

BENEATH THE PAVEMENT COMPOSITION, BORINGS B-3 AND B-4 ENCOUNTERED BROWN OR BROWN AND GRAY SANDY SILT SOILS TO THE DRILLED DEPTH. THESE SOILS WERE DESCRIBED AS FILL THAT WAS PLACED DURING THE CONSTRUCTION OF THE ORIGINAL BRIDGE.

GROUNDWATER WAS ENCOUNTERED IN BORING B-1 AT DEPTH OF 26.0 FEET BELOW THE TOP OF THE BRIDGE DECK AND IN BORING B-2 AT A DEPTH OF 22.0 FEET BELOW THE TOP OF THE BRIDGE DECK. NO GROUNDWATER WAS ENCOUNTERED IN BORINGS B-3 AND B-4.

D50 VALUES WHICH HAVE BEEN CALCULATED FOR THE SCOUR ANALYSIS ARE PROVIDED ON PAGE 3.

**SYMBOLS OF ROCK TYPES**

	Coal		Weathered Siltstone
	Fire Clay or Underclay		Siltstone
	Weathered Mudstone		Weathered Sandstone
	Mudstone		Sandstone
	Weathered Shale		Leached Dolomite
	Shale		Dolomite
	Weathered Clay-Shale		Leached Limestone
	Clay-Shale		Limestone
	Boulders or Cobbles		

**LEGEND**

	AUGER BORING LOCATION
	PRESS SAMPLE, DRIVE SAMPLE, AND/OR CORE BORING LOCATION
TR	TOP OF ROCK
W—	INDICATES FREE WATER ELEVATION
▼—	INDICATES STATIC WATER ELEVATION
H	HORIZONTAL BAR ON BORING INDICATES THE DEPTH THE SAMPLE WAS TAKEN - PROFILE VIEW
X/Y/Z	FIGURES BESIDE THE BORING IN PROFILE INDICATE THE NUMBER OF BLOWS FOR STANDARD PENETRATION TEST X = NUMBER OF BLOWS FOR FIRST 0.15 m Y = NUMBER OF BLOWS FOR SECOND 0.15 m Z = NUMBER OF BLOWS FOR THIRD 0.15 m

**SOIL LEGEND**

		CLASSIFICATION
	GRAVEL AND/OR STONE FRAGMENTS	A-1-a
	GRAVEL AND/OR STONE FRAGMENTS WITH SAND	A-1-b
	FINE SAND	A-3
	COARSE AND FINE SAND	A-3a
	GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT	A-2-4 A-2-5
	GRAVEL AND/OR STONE FRAGMENTS WITH SAND, SILT AND CLAY	A-2-6 A-2-7
	SANDY SILT	A-4a
	SILT	A-4b
	ELASTIC SILT AND CLAY	A-5
	SILT AND CLAY	A-6a
	SILTY CLAY	A-6b
	ELASTIC CLAY	A-7-5
	CLAY	A-7-6
	FILL	VISUAL
	VARIOUS OTHER MATERIALS	

**GENERAL INFORMATION**

**DRIVE SAMPLES**

DRIVE SAMPLE BORINGS ARE MADE BY MEANS OF A MECHANICALLY-POWERED ROTARY-TYPE DRILL RIG, EMPLOYING A 50.80 mm O.D., 34.93 mm I.D. SPLIT SPOON SAMPLING DEVICE, AT 0.76 m AND/OR 1.52 m DEPTH INTERVALS, DRIVEN BY MEANS OF A 63.5 kg HAMMER WITH A FREE FALL OF 0.76 m. THE NUMBER OF BLOWS REQUIRED TO DRIVE THE SAMPLING DEVICE THREE 0.15 m INCREMENTS IS CONSIDERED THE STANDARD PENETRATION TEST.

**PRESS SAMPLES**

PRESS SAMPLES ARE TAKEN BY MEANS OF MECHANICALLY-POWERED ROTARY-TYPE DRILLING MACHINE, EMPLOYING A 76 mm O.D. THIN WALL PRESS SAMPLING TUBE. THE PRESS SAMPLING TUBE IS ADVANCED BY CONTINUOUS UNIFORM PRESSURE APPLIED BY THE DRILLING MACHINE.

**CORE BORINGS**

CORE BORINGS ARE MADE BY MEANS OF A MECHANICALLY-POWERED ROTARY-TYPE DRILLING MACHINE, EMPLOYING AN NQ CORE BARREL WITH INDUSTRIAL DIAMOND CUTTING HEAD.

**SAMPLING AND TESTING**

THE BORING LOG SHEETS DISPLAY A GRAPHIC PLOT OF THE INFORMATION OBTAINED, INCLUDING DEPTH AND ELEVATION OF THE SAMPLE, TYPE OF SAMPLE, THE STANDARD PENETRATION TEST READINGS IN THREE 0.15m INCREMENTS, DEPTH AND ELEVATION OF PRESS SAMPLES, FIELD NUMBER ASSIGNED TO SAMPLE, SAMPLE DESCRIPTION-BASED ON LABORATORY TESTS UTILIZING GRADATION, PLASTICITY AND MOISTURE CONTENT DETERMINATIONS. RESULTS OF STRENGTH AND CONSOLIDATION TESTING, IF PERFORMED ON UNDISTURBED SAMPLES, WILL APPEAR GRAPHICALLY ON SEPARATE ENCLOSURES. ROCK SAMPLES ARE DISPLAYED ON THE LOG SHEETS INCLUDING DEPTH AND ELEVATION OF THE SAMPLE, AMOUNT OF RECOVERY AND A VISUAL CLASSIFICATION BASED ON TYPE, COLOR, DEGREE OF HARDNESS, GRAIN SIZE, DETERIORATION, BEDDING ACID REACTION AND OTHER QUALIFYING FACTORS.

AT DEPTH WHERE MATERIALS ARE BOULDERY OR GRAVELLY TO THE EXTENT THAT THE SAMPLER CAN NOT BE UTILIZED, A WASH SAMPLE IS PROCURED AND VISUALLY CLASSIFIED, IN ORDER TO DETERMINE THE GENERAL CHARACTERISTICS OF THE MATERIAL. THESE SAMPLES ARE NOT CONSIDERED SUFFICIENTLY REPRESENTATIVE TO WARRANT LABORATORY TESTING.

	300 mm	75 mm	2.0 mm	0.42 mm	0.074 mm	0.005 mm
Boulders	Cobbles	Gravel	Coarse Sand	Fine Sand	Silt	Clay
		No. 10 SIEVE	No. 40 SIEVE	No. 200 SIEVE		

**NOTES**

ALL AVAILABLE SOIL AND BEDROCK INFORMATION WHICH CAN BE CONVENIENTLY SHOWN ON THE STRUCTURE FOUNDATION INVESTIGATIONS SHEETS HAS BEEN SO REPORTED. ADDITIONAL SUBSURFACE INVESTIGATIONS MAY HAVE BEEN MADE TO STUDY SOME SPECIAL ASPECT OF THE PROJECT. COPIES OF THIS DATA, IF ANY, MAY BE INSPECTED IN THE DISTRICT DEPUTY DIRECTORS OFFICE, THE OFFICE OF MATERIALS MANAGEMENT AT 1600 WEST BROAD STREET, THE OFFICE OF ROADWAY ENGINEERING OR THE OFFICE OF STRUCTURAL ENGINEERING AT 25 SOUTH FRONT STREET, COLUMBUS, OHIO 43215.

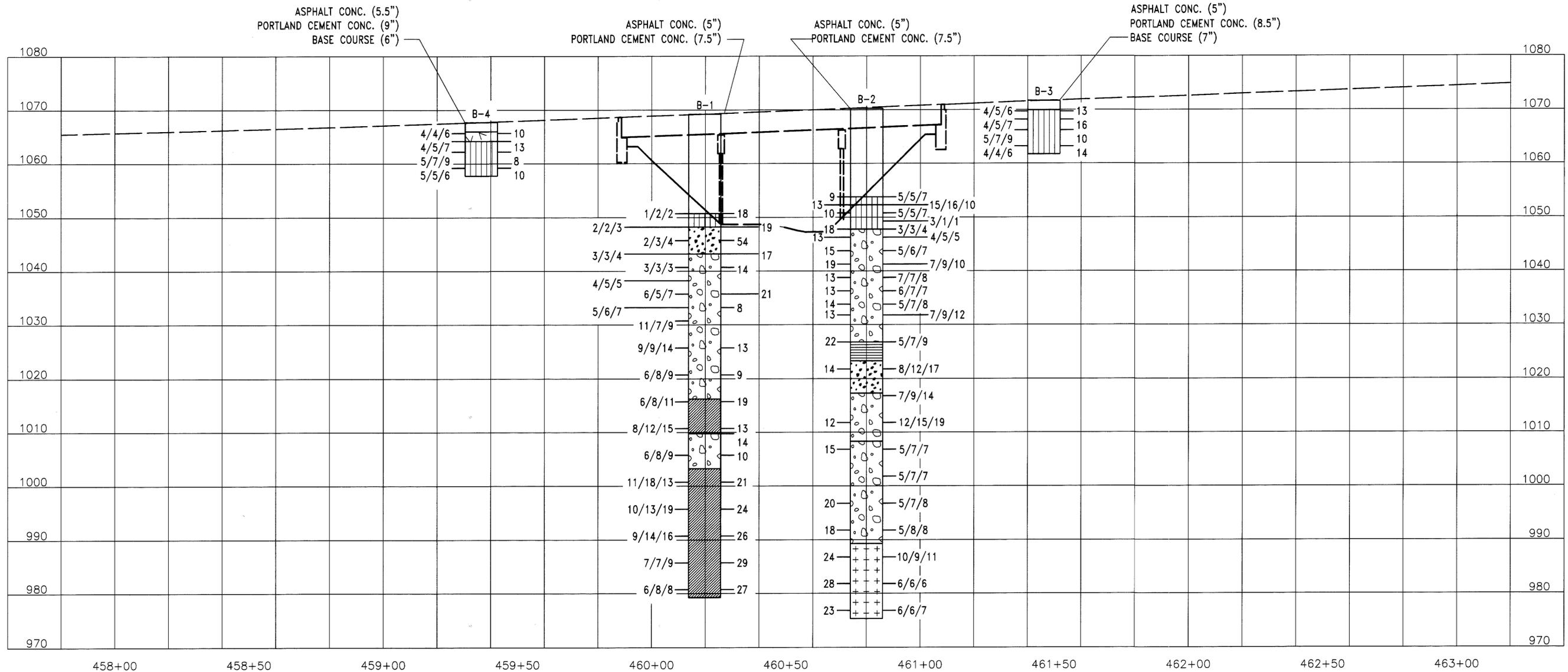
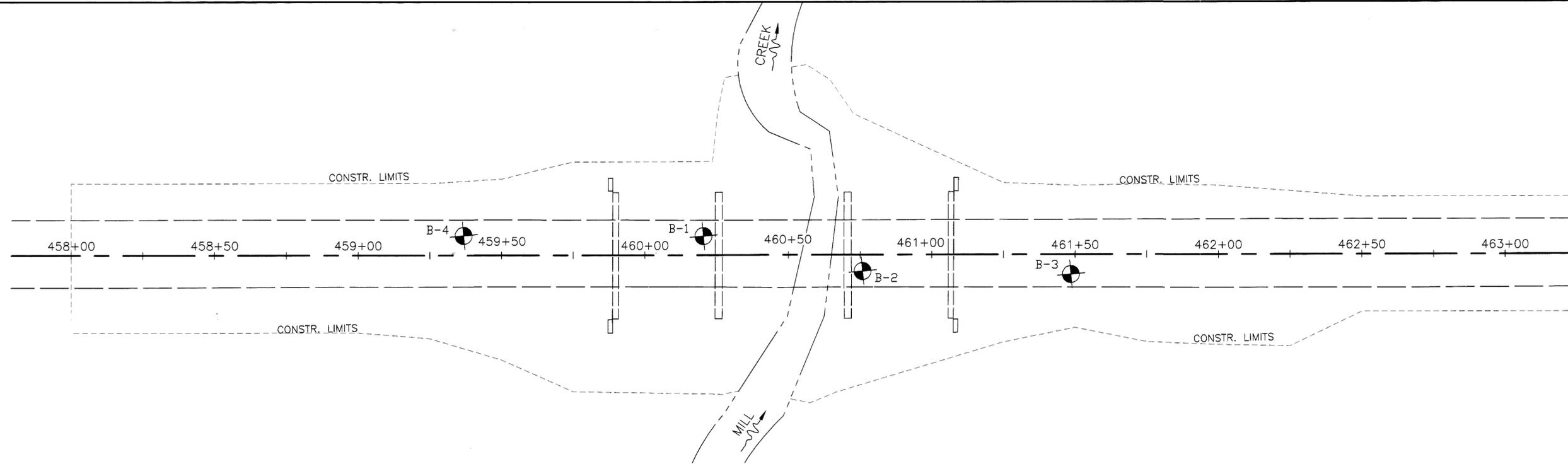
CTL ENGINEERING, INC.  
 2860 FISHER ROAD  
 COLUMBUS, OHIO 43204  
 PHONE: 614/276-8123 FAX: 614/276-6377

CALCULATED  
 CHECKED  
 DATE  
 8 OCT 99  
 REVIEWED  
 DRAWN  
 SSC

**STRUCTURE FOUNDATION INVESTIGATION**  
 COL-14-08.71 OVER MILL CREEK

COL-14-08.71

1/5



**STRUCTURE FOUNDATION INVESTIGATION**  
COL-14-08.71 OVER MILL CREEK

COL-14-08.71

2 / 5

DRAWN  
SSC

CALCULATED  
JLC

DATE  
6 OCT 99

CHECKED

0 20 40

HORIZONTAL  
SCALE IN FEET





Date Started 9/21/99 Sampler: Type SS Dia. 1.375" Water Elev. \_\_\_\_\_  
 Date Completed 9/21/99  
 Boring No. B-3 Station & Offset 461+48.59 6.88 Ft. Rt. Surface Elev. 1067.7ft

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)	Description	Sample No.	Physical Characteristics							ODOT Class				
							% Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.		W.C.			
1067.7	0																	
1067.7					ASPHALT CONCRETE (5 1/2") OVER PORTLAND CEMENT CONCRETE (8 1/2") OVER SAND AND GRAVEL BASE COURSE (7")													VIS.
1065.7	2	4/5/6				1	36	8	13	27	16	32	17	13				A-6a
1064.2	4	4/5/7			BROWN & GRAY SANDY SILT	2											16	VIS.
1062.2	6	5/7/9			BROWN & GRAY SILTY GRAVEL WITH SAND, LITTLE CLAY	3											10	VIS.
1059.2	8																	
1057.7	10	4/4/6			BROWN & GRAY SILTY GRAVEL WITH SAND, LITTLE CLAY	4											14	VIS.

BOTTOM OF BORING

Date Started 9/21/99 Sampler: Type SS Dia. 1.375" Water Elev. \_\_\_\_\_  
 Date Completed 9/21/99  
 Boring No. B-4 Station & Offset 459+36.80 6.78 Ft. Lt. Surface Elev. 1071.7ft

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)	Description	Sample No.	Physical Characteristics							ODOT Class				
							% Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.		W.C.			
1071.7	0																	
1071.7					ASPHALT CONCRETE (5 1/2") OVER PORTLAND CEMENT CONCRETE (9") OVER SAND AND GRAVEL BASE COURSE (6")													
1069.7	2	4/4/6				1	26	20	26	18	10	NP	NP	10				A-2-4
1068.2	4	4/5/7			BROWN SANDY SILT (FILL)	2											13	VIS.
1066.2	6	5/7/9			BROWN & GRAY SILTY SAND WITH GRAVEL, TRACES OF CLAY	3											8	VIS.
1063.2	8																	
1061.7	10	5/5/6			BROWN & GRAY SILTY SAND WITH GRAVEL, TRACES OF CLAY	4											10	VIS.

BOTTOM OF BORING

CTL ENGINEERING, INC.  
 2860 FISHER ROAD  
 COLUMBUS, OHIO 43204  
 PHONE: 614/276-8123 FAX: 614/276-6377

CHECKED	DATE	CALCULATED
	10-14-99	
REVIEWED		
DRAWN		

**STRUCTURE FOUNDATION INVESTIGATION**  
 COL-14-08.71 OVER MILL CREEK

COL-14-08.71  
 5/5

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 806**

**FIELD OFFICE  
September 9, 1997**

**806.01 Description**

**806.02 General**

**806.03 Computer Equipment for Field Office**

**806.04 Basis of Payment**

**806.01 Description.** This item shall consist of providing, maintaining and subsequently removing a field office for the exclusive use of the Department for the duration of the contract at a location approved by the Engineer. The field office will be designated as Type A, B or C.

**806.02 General.** The field office shall be available and completely functional at a time directed by the Engineer. The office shall have a minimum ceiling height of 2.1 m (7 feet) and have provisions for maintaining room temperature between 20 and 27 C (68 and 80 F). The Type C field office shall have a separate enclosed room for the Engineer. The Contractor shall provide and maintain telephone and electric service. One phone shall be connected to a recorded answering device. One speaker phone shall be required for Type B or Type C facilities. All field office types shall have one copying machine ;the copier shall be provided with all necessary maintenance and paper supplies, and be capable of producing multiple copies of documents up to 216 by 356 mm (8 1/2 by 14-inch) in size. The Type B and Type C field offices shall have a facsimile machine.

The office shall be provided with potable hot and cold water. The office shall also have neat, sanitary, enclosed toilet accommodations; associated lavatory and sanitary supplies shall be furnished. Portable facilities may be provided with the approval of the Engineer.

On all projects requiring moisture and density control of construction materials, the field office shall contain a storage box for a nuclear density gauge in accordance with drawings on file with the Director.

Additional requirements for field office and office equipment are as specified in the following table:

**FIELD OFFICE**

<b>Item</b>	<b>Type A</b>	<b>Type B</b>	<b>Type C</b>
Floor Space, m <sup>2</sup> (sq. ft.).....	14 (150)	46 (500)	93 (1000)
Telephone .....	2	4	4
Base Radio & 4-Hand Held Units <sup>1</sup> .....	--	--	1
10 Column Electronic Calculator with Tape .....	1	2	3
Desk and Chair Set .....	1	3	5
Work Tables, 750 by 1800 mm (30 by 72-inch) .....	1	2	3
4 Drawer, Legal Size, Lockable Metal File Cabinet .....	--	1	2
2 Drawer, Metal File Cabinet ...	1	2	2
Portable Fire Extinguishers - Type 2A10BC-5# .....	1	1	2
All Weather Parking Spaces ...	4	8	10
Plan Rack <sup>2</sup> .....	1	1	2

1. Units shall be capable of transmitting and receiving voice communication between office and any area on the project site.

2. Capable of handling the breakdown of 559x864 mm (22x34 inch) sized plans in to 10 sections.

The preceding requirements for the field office may be modified only upon written approval of the Engineer.

**806.03 Computer Equipment for Field Office.** Where required, the Contractor shall furnish, install, and maintain the following computer hardware and software in the field office required by this item for the life of the contract. All computer hardware and software furnished shall be for the exclusive use of the Engineer and staff and shall be operable at the same time as the field office.

This system shall not experience down time exceeding 48 hours from notification by the Engineer. The Contractor shall replace stolen, vandalized, or units otherwise inoperable within 48 hours after notification by the Engineer. Upon completion of the contract, the hardware and software furnished by the Contractor shall remain the property of the Contractor.

**Computer Hardware**

- (1) One IBM PC compatible computer with an Intel Pentium processor (or equal) operating at a minimum 200 MHz. The computer shall be provided with the following **minimum** requirements:
  - a. 2.1 Gigabyte hard disk
  - b. 32 Megabytes RAM

- c. one 3.5 inch., 1.44 MB floppy drive
- d. one 8x CD-ROM drive
- e. 101 key keyboard
- f. 15 inch Hi-Res Super VGA Color Monitor 1024 X 768 resolution with .28 dot pitch and Hi-Res Super VGA Card with 2 Megabytes of Video RAM.
- g. 2 Button Microsoft compatible mouse with appropriate software, compatible with required software.
- h. At least 1 parallel port and 1 serial interface port and 1 mouse port.
- i. one 56K firmware upgradeable 3Com compatible modem

(2) Hewlett Packard LaserJet compatible (PCL3 emulation) 6 page per minute printer or approved equal and parallel printer cable.

(3) Surge Protector. 15 amp six outlet with circuit breaker control, phone line circuit surge protection and a surge indicator light.

**Computer Software**

The Contractor shall furnish, load, and maintain the following software on the computers provided in the field offices: Microsoft Windows 95 (with games removed) and the Corel Professional Edition Office Suite Version 8.

All computer hardware and software shall be maintained by the Contractor during the life of the contract. Information for proposed "equal" equipment shall be submitted to the Engineer and be approved prior to use.

Along with the furniture under 806.02, the Contractor shall also provide the necessary stands, tables, etc. to accommodate the computer system.

**806.04 Basis of Payment.** The field office will be paid for at the contract price bid, which price shall be full compensation for furnishing, maintaining and subsequently removing the field office and all incidentals necessary to complete this item. The field office and any required computer equipment shall be paid on a monthly basis. The contract bid price shall be full compensation for furnishing, setting up, maintaining, and subsequently removing the specified computer hardware and software from the field office.

Item	Unit	Description
806	Month	Field office, Type _____
806	Month	Computer equipment for field office

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 814**

**EMBANKMENT CONSTRUCTION USING PETROLEUM CONTAMINATED SOIL**

**June 2, 1998**

**814.01 Description**

**814.02 Restrictions on Usage**

**814.03 Materials**

**814.04 Construction Requirements**

**814.05 Method of Measurement**

**814.06 Basis of Payment**

**814.01 Description:** This work shall consist of using Petroleum Contaminated Soil (PCS) material, and/or constructing a mixture of PCS material and embankment material in accordance with these specifications and in reasonably close conformity with the lines shown on the plans or established by the Engineer; mixed, spread, compacted, shaped and finished.

The Contractor may elect to use PCS material as embankment material or may excavate PCS material detailed in the contract or found in the work. It is not a requirement of this specification to use the PCS material in the embankment. The use of PCS material may be allowed as per this specification.

Item 203, Roadway Excavation and Embankment shall apply: deviations from these are as follows.

**814.02 Restrictions of Usage.** The Contractor shall certify to the Engineer that the PCS material does not exceed the petroleum constituent concentrations stated in OAC 1301: 7-9-16(I)(1)(c)(ii)(b). These values are provided below:

Benzene	35 parts per million
Toluene	109 parts per million
Ethylbenzene	32 parts per million
Total Xylenes	165 parts per million

This certification shall include test results from an independent environmental consultant approved by the Department. The consultant shall perform BTEX testing by using United States Environmental Protection Agency (USEPA) test method SW 846 method 8020 or equivalent method. These tests shall be performed on every 90 metric tons (100 tons) of PCS used on the project.

The Contractor shall submit this certification and information in a suitable format to the Engineer 10 working days prior to the intended usage.

PCS shall not be allowed within the top 1.0 m (3 feet) of the final subgrade elevation or within 1.5

m (5 feet) from any exposed surface.

The final PCS material shall produce a stable embankment. The source, materials, construction and compaction techniques shall be approved by the Engineer.

**814.03 Materials.** The PCS material shall meet the requirements of Item 203 and the following additional requirements:

The PCS material shall be classified by an independent soils consultant approved by the Department as per Section 4.3 of the Department's "Specifications for Subsurface Investigation Manual". The soils consultant shall determine the suitability of the material under Item 203 Embankment Materials.

The soils consultant shall make a moisture density curve in accordance with AASHTO T 99 for every 225 metric tons (250 tons) of PCS material.

The soils consultant shall submit the above information in a suitable format to the Engineer at least 7 working days prior to the proposed work. This report shall be written and sealed by a Registered Professional Engineer.

**814.04 Construction Requirements.** The outer soil cover shall be raised uniformly with the PCS material. At no time shall the PCS material be dumped or spread on soft areas, in jurisdictional wetland, or in standing water.

The layers of PCS material shall be alternated with other Department approved soil layers (other than PCS material).

PCS material shall be spread on the embankment or subgrade in 200 mm (8 inch) loose lifts.

Compaction shall be performed with a sheeps foot roller, self propelled roller or other approved equipment. The compaction operation shall be coordinated with the spreading operation to minimize the amount of PCS material spread out on the embankment. In no case shall the PCS material be left spread out and uncompacted overnight.

The PCS material shall be compacted at a moisture content to obtain the required density and embankment stability. The PCS mixture shall be compacted to a density required under 203.12 or to a density determined by 203.09(b). Any water needed to bring the material to the specified moisture shall be uniformly mixed throughout the lift.

**814.05 Method of Measurement.** The PCS material shall be paid as per the 203 Items in the contract documents.

**814.06 Basis of Payment.** The contract unit price per cubic meter(cubic yard) for the 203 Items in the contract documents shall include full compensation for furnishing all testing and certification documentation, labor, materials and incidentals for doing all work involved with the PCS material.

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 842

CONCRETE FOR STRUCTURES

January 6, 1999

- 842.01 Description
- 842.02 Materials
- 842.03 Proportions
- 842.04 Concrete Test Specimens
- 842.05 High-Early-Strength Concrete
- 842.06 Mixing of Concrete
- 842.07 Slump
- 842.08 Placing Concrete
- 842.081 Slipform Construction of Bridge Railing.
- 842.09 Construction Joints
- 842.10 Emergency
- 842.11 Depositing Concrete Under Water
- 842.12 Depositing, Protecting and Curing Concrete During Cold Weather
- 842.13 Removal of Forms
- 842.14 Curing and Loading
- 842.15 Surface Finish
- 842.16 Roadway Finish
- 842.161 Bridge Deck Grooving
- 842.17 Sidewalk Finish
- 842.18 Method of Measurement
- 842.19 Basis of Payment

**842.01 Description.** This item shall consist of furnishing and placing portland cement concrete including reinforcing steel in accordance with these specifications and in reasonably close conformity with the lines, grades and dimensions shown on the plans. This item shall also include all costs associated with saw cutting grooves into the surface of superstructure concrete after the concrete has cured. Falsework and forms shall be in accordance with 508.

For prestressed concrete, see Supplemental Specification 865.

Concrete for structures shall meet the requirements of Supplemental Specification 899 (Concrete - General), except as modified herein.

**842.02 Materials.** Materials shall conform to 899.02 except as follows:

Aggregate; all concrete above the ground line in a given substructure unit or all concrete for any given superstructure shall be made of aggregates of the same kind and colors, except upon permission of the Engineer.

Reinforcing materials; 509.02.

Curing materials; 705.05, 705.06 (white opaque), 705.07 Type 1 or 1D.  
Joint filler; 1/4 inch (6 mm) gray sponge 711.28, or preformed filler 705.03.  
Seals; preformed elastomeric compression joint seals, 705.11.

**842.03 Proportions.** Concrete for structures shall be proportioned according to 899.03, using Class C or Class S as specified.

**842.04 Concrete Test Specimens.** On structures over 20 foot ( 6.1 m) span, two test cylinders will be made from each 200 cubic yards (150 m<sup>3</sup>), or fraction thereof, of concrete that is incorporated each day in the work. On structures of 20 foot ( 6.1 m) span or less, not less than two cylinders will be made for each 50 cubic yards (35 m<sup>3</sup> ) of concrete.

When necessary to permit early removal of falsework or to permit backfilling, concrete test beams shall be made and tested according to standard methods on file in the office of the Director.

**842.05 High-Early-Strength Concrete.** The use of high-early-strength concrete shall be in accordance with 899.03. Curing and loading shall be in accordance with 842.14.

**842.06 Mixing of Concrete.** Mixing shall be according to 899.09.

When mixed, all concrete shall have a temperature of not more than 90 °F (32 °C ), and the concrete shall be maintained under this temperature until deposited in the work.

When an air temperature of 60 °F (16 °C) or higher prevails at the time of placing concrete in a bridge superstructure over 20 foot (6.1 m) span, the Contractor shall add an approved chemical admixture (705.12, Type B or D) to the concrete.

**842.07 Slump.** Concrete shall have a slump such that it will be workable in the required position. It shall be of such a consistency that it will flow around reinforcing steel, but individual particles of coarse aggregate, when isolated, shall show a coating of mortar containing its proportionate amount of sand.

The slump of concrete placed by the vibration method shall be in accordance with 899.03, the slump being determined according to ASTM C 143.

**842.08 Placing Concrete.** The Contractor shall submit according to 501.06, a description of the procedures he proposes to use and notify the Engineer at least 24 hours in advance of placing concrete.

Superstructure concrete shall be placed only when the surface evaporation rate determined by using Figure 1 in ACI 308 is equal to or less than 0.2 lb./sq. ft./hour(1.0 kg/m<sup>2</sup>/hour ). The Contractor shall determine and document the ambient air temperature, concrete temperature, deck surface temperature, relative humidity, and wind velocity, subject to verification by the Engineer. No superstructure concrete shall be placed if the ambient air temperature is 85 °F(30 °C) or higher or predicted to go above 85 °F(30 °C)

during the concrete placement regardless of the surface evaporation rate.

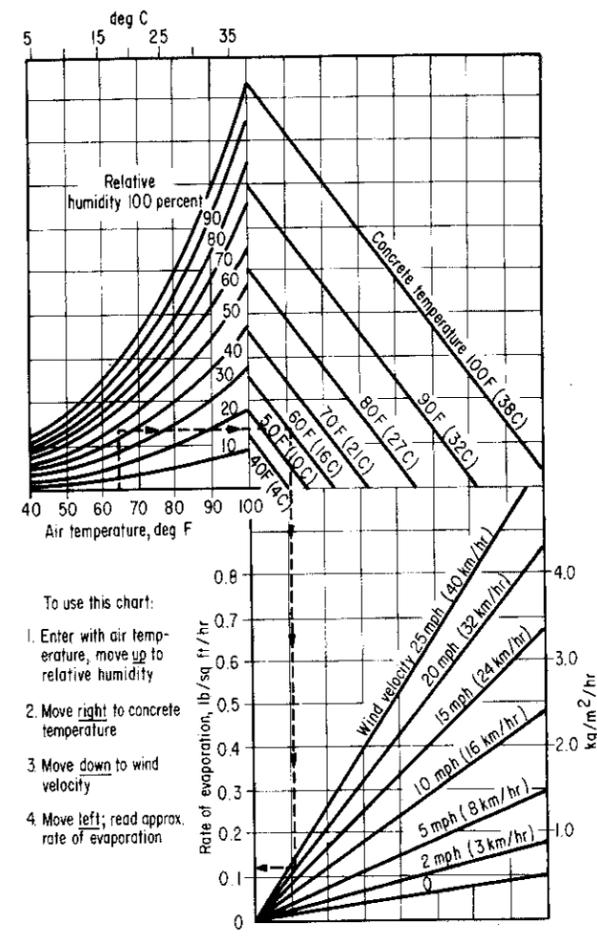
When a concrete deck is to be placed on continuous steel beams or girders, the placing of the concrete deck in any span shall not be started until all of the main beam or girder splices have been completed at least two piers beyond the pier or piers supporting the span in question.

Concrete for backwalls with steel expansion joints shall not be placed until the abutments have been backfilled to within 1 foot (0.3 m) of the bridge seat elevation and all structural steel or prestressed concrete beams have been erected, unless a different procedure is approved by the Director. The steel expansion joint shall serve as a template for the top of the backwall. If temporary bolts are used to support the backwall portion of an expansion device during the placing of the backwall concrete, these bolts shall be removed after the concrete has taken its initial set and before a change in temperature causes superstructure movement sufficient to damage the backwall.

In order that the concrete will be finished during daylight hours, the time of starting the concreting operations shall be subject to the approval of the Engineer.

The Contractor shall furnish assurance to the Engineer of an adequate and uniform source of supply of concrete to permit proper placing and finishing, and of the availability of coverings for protection in case of rain, before work will be permitted to start.

Figure 1 ACI 308-81



Before placing the concrete, all forms and structural steel which will be in contact with the concrete shall be thoroughly cleaned and the space to be occupied by the concrete shall be free from all laitance, silt, dirt, shavings, sawdust, loose and built-up rust and other debris. The methods of depositing shall be such as to insure that all reinforcing steel is completely enveloped in concrete mortar and such that this condition can be verified by inspection. The method or device used for conveying the concrete from the mixer to its place in the work shall be such as to insure against separation of the coarse aggregate from the mortar. When concrete is being deposited in shallow members, such as slabs, it shall be placed with as short a vertical drop as practicable. The concrete shall be deposited so as to maintain a surface practically horizontal over the section being placed.

When a chute is used, its slope shall be such as to allow concrete of the proper consistency to flow readily without segregation. Concrete shall be deposited as near as possible to its final position.

Concrete shall not be dropped into the forms a distance of more than 5 feet (1.5 m). Drop chutes shall be used to limit free fall to 5 feet (1.5 m) and the delivery ends shall be as nearly vertical as practicable.

The use of mortar topping for concrete railing caps and other similar surfaces shall not be permitted.

The use of the vibration method of placing all concrete, in structures is required. The Contractor shall furnish and have in use sufficient vibration equipment of an approved type and size to properly compact each batch immediately after it is placed in the forms.

The vibrators shall generally be of a type that is applied directly to the concrete and have a frequency of at least 4500 impulses per minute, but where inaccessibility precludes this method of vibration, the vibrators shall be applied externally to the forms.

The concrete shall be deposited as near its final position as possible and shall not be caused to flow long distances by vibrators. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. Vibrators shall be inserted into and withdrawn from the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but not continued so as to cause segregation. Care must be used not to disturb partially hardened concrete.

Such spading as is necessary to insure smooth surfaces and dense concrete shall be done along form surfaces and in corners and locations impossible to reach with the vibrators, The Engineer shall with the collaboration of the Contractor closely observe the results obtained on the first concrete placed and such alterations shall be made in the mix, as permitted by these specifications, as are necessary to secure the best results.

The surface of the finished concrete shall be covered immediately with wet burlap.

**842.081 Slipform Construction of Bridge Railing.** Unless the plans eliminate the use of slipforming for this project, the Contractor is permitted the option of slipforming the bridge parapets and medians. If the Contractor elects to slipform, the finished concrete shall meet the following tolerances from plan dimensions:

Reinforcing steel cover	-½ inch (-13mm) + ½ inch (+ 13 inch)
Top width dimension	-0 + 1/4 inch (+ 6 mm)
Bottom width dimension	-0 + ½ inch (+ 13mm)
Surface flatness	1/4 inch in 10 feet (6 mm in 3 meters)
Vertical alignment	½ inch in 20 feet
(Deviation from a line parallel to the grade line)	(13 mm in 6 meters)

All reinforcing steel joints and/or splices in the bridge railing steel shall be tied. A dry run to check for reinforcing clearance and rigidity of the reinforcing cages shall be required before any concrete is placed. The Contractor shall verify reinforcing clearances and make any adjustments to the cage to establish the required clearances during the dry run. Reinforcing steel cages are to be rigid (defined as no movement during the slipforming dry run). If the Engineer determines the cages are not rigid, the Contractor must stabilize the cages before any slipforming is performed. The Contractor may add any additional diagonal reinforcing steel between the front and rear vertical reinforcing faces to establish the required rigidity. Any additional reinforcing steel required to adequately stabilize the cages shall be the Contractor's expense.

Honeycombing, cracking, tearing and other defects shall be repaired or patched immediately upon exit from the slipform equipment. Defects shall be completely filled with concrete. The use of water to smooth or close the surface is not acceptable.

Control Joints shall be constructed by sawing 1 1/4 inches (32 mm) deep into the perimeter of the parapet, after the concrete has taken its initial set but before any shrinkage cracks develop. Generally initial set is within 6 hours of batching of the concrete. All joints shall be sawed within 24 hours of placement. Joints shall be sawed by using an edge guide, fence or jig to insure that the joint is straight, true and aligned on all faces of the parapet. The joint width shall be the width of the saw blade, a nominal 1/4 inch (6 mm). The control joints shall be caulked with a polyurethane or polymeric material meeting Federal Specification TT-S-00227E.

Slip formed concrete will require different slumps than those listed in 899 or other plan specified concrete. The consistency of the concrete should be such that the concrete exiting the slipform does not pull but is stiff enough to prevent waviness and sags in the finished surfaces. Method A, Water Curing, 842.14 is required. As slipformed concrete has a low water/cement ratio, timely application of the water cure is critical in helping control shrinkage cracks.

No water shall be added or applied to the concrete after it has left the truck.

The Contractor shall furnish all necessary platforms to protect against falling debris during the slipforming operation, to allow access for completing the finishing operation and to allow the inspector access.

The Engineer will inspect the slipformed surface for horizontal cracking no earlier than 21 days after completion of the slipforming operation. All horizontal cracks shall be repaired by epoxy injection. If a concrete sealer has been applied, any damage to the sealer shall be repaired after the epoxy injection has been completed. The aforementioned repairs shall be made at no additional cost to the State.

**842.09 Construction Joints.** When construction joints are shown on the plans, all concrete between consecutive joints shall be placed in a continuous operation. Concrete shall not be placed against the side of any joint for at least 12 hours, or as required by 842.14.

Approval of the Director must be obtained for placing any construction joint not shown on the plans or permitted by 842.08 and 842.16.

The plans on which a day's work is to terminate shall be predetermined before depositing of concrete begins. They shall in general be perpendicular to the lines of principal stress and in regions of small shear. Horizontal joints will not be permitted in concrete girders and beams. Slabs acting with concrete beams or girders shall be deposited continuously with them unless composite construction is specified.

All construction joints shall be made with bulkheads provided with keys which clear all exposed surfaces approximately one-third the thickness of the joint.

Horizontal joints in piers, abutments and retaining walls generally shall be avoided and, when they are used, shall not be located within 2 feet (0.6 m) of the normal water level.

Construction joints not shown on the plans and above ordinary low water, in abutments, and in retaining walls that retain earth fills shall be waterproofed on the back with a 36 inch (1 m) strip of Type B waterproofing according to 512 at the Contractor's expense.

Joints in cantilevered members shall be avoided.

Horizontal construction joints shall have the surface of the concrete below the joint dampened immediately prior to placing adjoining concrete.

Horizontal construction joints between bridge slabs and superimposed curbs, parapets, sidewalks and median strips, shall be placed and protected the same as the remainder of the slab. They shall be cured in accordance with 842.14.

Care shall be exercised to avoid disturbing the bond of curb reinforcing steel protruding from the concrete. If the curb areas are used by workers when placing the deck concrete, the reinforcing steel shall be tied and/or braced to prevent its movement.

Where walls or columns support slabs or beams, the concrete in the vertical member shall be deposited up to the bottom of the supported member and a period of at least 2 hours shall elapse for settlement before placing concrete in the horizontal member.

**842.10 Emergency.** When the work is unexpectedly interrupted by break-downs, storms or other causes and the concrete as placed would produce an improper construction joint, the Contractor shall rearrange the freshly deposited concrete to provide a suitable construction joint. When such a joint occurs at a section on which there is shearing stress, he shall provide an adequate mechanical bond across the joint by forming a key, inserting reinforcing steel or by some other means satisfactory to the Engineer, which will prevent a plane of weakness.

**842.11 Depositing Concrete Under Water.** No concrete except for cofferdam seals shall be deposited under water, unless by special permission of the Director. If such permission is granted, care shall be exercised to prevent the formation of laitance.

Concrete shall not be deposited until any laitance, which may have formed on concrete previously placed, has been removed. Pumping shall be discontinued while depositing foundation concrete if it results in a flow of water inside of forms. If concrete other than cofferdam seals is deposited under water, the proportion of cement used shall be increased at least 10 percent at no extra expense to the State, to compensate for losses due to water. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie, a closed bottom dump bucket or other approved method and shall not be disturbed after being deposited.

**842.12 Depositing and Curing Concrete During Cold Weather.** When an atmospheric temperature of 32 °F (0 °C) or less exists at the time concrete is placed, or is predicted by weather forecasts to occur during the curing period, the following procedures shall apply:

The water or aggregate or both shall be heated as necessary to make the temperature of the concrete not less than 50 °F (10 °C) nor more than 70 °F (21 °C) when placed.

Concrete shall not be placed in contact with materials having a temperature of less than 32 °F (0 °C). If necessary, the forms, reinforcing steel and foundation materials shall be heated before the concrete is placed.

The concrete shall be protected from freezing and specified temperatures for curing shall be maintained by a heated enclosure, insulated forms or by either of these used in combination with flooding, except that insulation alone may not be used to protect and cure deck slabs less than 10 inches (250 mm) thick.

The heated enclosure shall surround the top, sides and bottom of the concrete to be placed during cold weather except that concrete surfaces which have been flooded need not be enclosed.

The concrete shall be cured by maintaining the surface temperature between 50 °F and 100 °F (10 °C and 38 °C) for a period of not less than five days except as modified below for concrete flooded with water. At the end of this curing period, the temperature shall be reduced at a rate not to exceed 20 °F (11 °C) in 24 hours until it is within 20 °F (11 °C) of atmospheric temperature.

Sufficient high-low thermometers shall be furnished and installed by the Contractor in such a manner that the surface temperature of the concrete may be readily determined. For deck slabs, the surface temperature shall include deck bottoms, deck facia and deck top surfaces.

Removal of falsework and opening to traffic shall be not earlier than specified by 842.14.

(a) When a heated enclosure is used. The enclosure and heating devices shall be as nearly complete before any concrete is placed as the placing will permit. Throughout the entire concreting operation, the completion of enclosures and the application of heat shall follow the placing of concrete as closely as possible.

Heat may be supplied by any method which will maintain the required temperature continuously with a reasonable degree of uniformity in all parts of the enclosure without discoloring the concrete.

Combustion-type heating units shall be vented from the enclosure.

If dry heat, other than free steam, is used with method (a) curing, all exposed concrete shall be covered with two thicknesses of burlap as soon after placing the concrete as it can be done without marring the surface. The burlap shall be wetted and kept continuously wet and shall not be removed during the heating period, except as required for rubbing. Wood forms without liners, left in place more than two days after the placing of concrete, shall be thoroughly wet at least once each day for the remainder of the heating period. If forms are removed during the heating period, the concrete shall be thoroughly drenched with water and covered with burlap as noted above for the remainder of the heating period.

Enclosures shall be strong and wind proof, and provide adequate space to allow free circulation of air around the forms and deposited concrete.

(b) When insulation is used. Sufficient thermometers shall be furnished and installed by the Contractor in such a manner that the surface temperature of the concrete may be readily determined. Whenever the surface temperature, as indicated by the thermometer readings, approaches 100 °F (38 °C), the forms or insulation shall be loosened or otherwise vented to keep the surface temperature within the specified limits. If the thermometer readings indicate that the minimum required temperature is not maintained, the structure shall be promptly enclosed and heated as provided above or flooded as specified below.

The insulating material shall be wind and water resistant. Precautions shall be taken at edges and corners to insure that such points of extreme exposure are adequately protected. The top surface of the concrete shall be protected by a tarpaulin, or other approved waterproof cover, placed over the insulation.

(c) When the concrete is to be flooded with water. The concrete may be flooded as soon as it can be done without damaging it. Flooding water shall be heated to a temperature of not less than 50 °F (10 °C) nor more than 100 °F (38 °C). The heated flood water may be discontinued after 48 hours if the concrete remains flooded to a depth of 1 foot (0.3 m) above its highest elevation for at least the subsequent 120-hour period.

**842.13 Removal of Forms.** In order to facilitate finishing, forms on vertical surfaces which are to receive a rubbed surface finish shall be removed as soon as the concrete has hardened sufficiently that it will not be damaged.

**842.14 Curing and Loading.** Concrete for structures shall have the falsework removed and be opened to traffic in not less time than is specified by the following table:

	Span (a)	Age of Concrete in Days	
		No Beam Test	Beam Test (b)
Removing	Over 10' (3.0 m)	14	5
Falsework	10' (3.0 m) or less and all pier caps	7	3
Traffic	Any	14	7

(a) Span in this circumstance is defined as the horizontal distance between faces of the supporting elements when measured parallel to the primary reinforcement.

(b) Applicable only when the average modulus of rupture for two tests is not less than 650 psi (4.5 MPa).

When the temperature of the air surrounding the concrete is above and maintained above 32 °F (0 °C) and below 50 °F (10 °C) and the provisions of 842.12 are not in force, the duration of the cure shall be based on a beam test, except that the curing time shall not be less than tabulated above.

When a beam test is not performed, the time specified above for removing falsework and opening to traffic shall be extended one day for each day the temperature of the air surrounding the concrete is below 50 °F (10 °C).

All superstructure concrete, all concrete which is to have a sealer applied, and all construction joints shall be cured in accordance with Method (a) Water Curing. All other concrete shall be cured either by Method (a) Water Curing or Method (b) Membrane Curing. However, if Method (b) is used on areas to be waterproofed, the membrane shall be removed.

Compression rings are not to be installed on pier columns or similar items of construction for the purpose of supporting falsework or subsequent construction until after a 72-hour curing period.

No load shall be applied or other work conducted that will damage new concrete or interfere with its curing. Where work is necessary on new concrete to complete a structure, such as building forms on a footing, workers and materials shall be kept off such concrete until such time as it will not be damaged by the work in progress, but in no case shall the elapsed time between placing the concrete and working on same be less than 36 hours. No work that will interfere with the curing shall be done on concrete placed during cold weather unless insulating material to retain the heat in the mix is placed during periods in the day when the presence of workers will not interfere with the normal curing procedure. When this is done, the normal protection shall be resumed immediately after work is suspended. Proper curing shall have preference and, if necessary, workers shall be kept off so that the concrete may be thoroughly wetted and kept wet until the curing is completed.

Method (a) Water Curing. All surfaces not covered by forms shall be protected immediately after brooming or final finishing with two thicknesses of wet burlap and kept wet by the continuous application of water for a period of not less than 7 days. Formed surfaces shall, after the removal of forms, be cured in like manner for the remainder of the curing period with the entire surface of the concrete being thoroughly drenched with water and covered immediately after forms are removed.

In lieu of continuous sprinkling, wet burlap covered with white polyethylene sheeting or plastic coated burlap blankets 705.06 may be used. They shall be placed wet with the burlap side against the concrete. Adjoining plastic coated blankets or polyethylene sheets used to cover wet burlap shall be lapped sufficiently and held securely in place at laps and edges so that positive moisture seal is provided. White polyethylene sheeting or plastic coated blankets containing holes or tears shall be covered with an additional covering of sheeting or blankets as directed.

Method (b) Membrane Curing. Immediately after the free water has disappeared on

surfaces not protected by forms and immediately after the removal of forms, if such are removed before the end of the 7-day curing period, the concrete shall be sealed by spraying as a fine mist a uniform application of the curing material 705.07, Type 1 or 1D, in such manner as to provide continuous, uniform, water impermeable film without marring the surface of the concrete.

The membrane curing shall be applied in one or more separate coats at the rate of at least 1 gallon per 200 square feet (1 L/5m<sup>2</sup>) of surface. To assure that the proper amount of the curing material is applied, the number of gallons (liters) of curing material in the spray container shall be noted, and the correct area for that volume laid off so that the area of concrete surface to be covered will be such that the approved application rate will be secured. Curing material shall be thoroughly agitated immediately previous to use. If the film is broken or damaged at any time during the specified curing period, the area or areas affected shall be given a complete duplicate treatment of the curing material applied at the same rate as the first treatment.

Unless adequate precautions are taken to protect the surface of the membrane, workers, materials and equipment shall be kept off the membrane for the duration of the curing period.

**842.15 Surface Finish.** Immediately after the removal of forms, all cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges and other defects shall be cleaned, dampened and completely filled, pointed or trued with a mortar of the same proportions as used in the concrete being finished. Exposed surfaces which are not satisfactory to the Engineer because of excessive patching and/or other corrective work, shall be grout cleaned or rubbed as required by the Engineer. Other contiguous exposed surfaces on the structure shall be finished in a similar manner to the extent required to produce a uniform appearance.

On all exposed surfaces, all fins and irregular projections shall be removed with a stone or power grinder, care being taken to avoid contrasting surface textures. Sufficient white cement shall be substituted for the regular cement in the filling of holes and other corrective work to produce finished patches of the same color as the surrounding concrete.

Grout Cleaning. Where grout cleaning is called for on the plans or is necessary for corrective work, the surface, after wetting, shall be uniformly covered with a grout consisting of one part cement to 1 1/2 parts fine sand, 703.03 and sufficient water to produce a consistency of thick paint. White portland cement shall be used for all or part of the cement in the grout, as directed by the Engineer, to give the color required to match the concrete. The grout shall be uniformly applied with brushes or a spray gun, and all air bubbles and holes shall be completely filled. Immediately after the application of the grout, the surface shall be vigorously scoured with a cork or other suitable float. While the grout is still plastic the surface shall be finished with a sponge rubber or other suitable float removing all excess grout. The finishing shall be done at the time when grout will not be pulled from the holes or depressions. After being allowed to thoroughly dry, the surface shall be vigorously rubbed with a dry burlap to completely remove any dried grout. There shall be no visible film of grout remaining on the surface after this rubbing and the entire cleaning operations of any area must be completed on the day it is started. If any dark spots or streaks remain after this operation, they shall be removed with a fine grained

silicon carbide stone, but the rubbing shall not be sufficient to change the texture of the surface. Unless otherwise directed by the Engineer, grout cleaning shall be delayed until the final clean up of the project.

**Rubbed Finish.** Forms shall be removed, if possible, within two days after concrete is placed. Corrections shall be made as outlined above. Rubbing of concrete shall be started as soon as the conditions will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for a minimum period of two hours. Sufficient time shall have elapsed before wetting down to allow the mortar used in pointing insert holes and defects to be thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse silicon carbide stone until all form marks, projections and irregularities have been removed, all voids filled and a uniform surface has been attained. The paste produced by rubbing shall be left in place at this time. No additional material other than water shall be applied to the surface. After all concrete above the surface being finished has been placed, the final finish shall be obtained by rubbing with a fine silicon carbide stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform in color. Any surfaces which have been given a rubbed finish, shall be protected from subsequent construction operations. Any surfaces which are not protected shall be cleaned and again rubbed, if necessary, to secure a uniform and satisfactory surface.

No extra payment will be made for any type of surface finish, the cost being considered as included in the price bid for concrete.

**842.16 Roadway Finish.** Concrete deck slabs shall be finished in accordance with the requirements of 451.12 except that construction joints shall not be edged, and a strip of surface 9 to 12 inches (220 to 300 mm) wide adjacent to curbs and barriers shall not be grooved. The use of a broom drag on concrete deck slabs may be in the longitudinal or transverse direction. The requirement for use of a finishing machine may be waived by the Engineer for small bridges where their use is impractical.

The finishing machine shall be approved by the Engineer. It shall be self-propelled and equipped with forward and reverse drive mechanisms that enable precision velocity control of the machine while moving in either direction. It shall be equipped with one or more rotating rollers, leveling augers and either a vibrating pan or vibrating rollers. Vibrating frequency for pans or rollers shall be variable from 1500 to 5000 pulses per minute. The Contractor shall furnish the necessary verification of these frequencies. The finishing machine shall be capable of finishing transversely while traveling in either direction across the deck. Screeds shall have provisions for raising them above the concrete surface. The finishing machine shall be of sufficient size to finish the full width of the decks between curbs or parapet walls. The wheels of the finishing machine shall run on temporary riding rails adequately supported on structural steel or falsework. The rail and rail supports shall be made of steel and shall be arranged so that the weight of the finishing machine and the operator cause zero vertical deflection while traveling across the deck. Rail shall be straight with no sections exceeding a tolerance of 1/8 inch in 10 feet (3 mm in 3.0 m) in any direction. All support rails shall be elevated a sufficient distance above the slab to permit the simultaneous finishing by hand of any portions not finished by the machine. Any rail supports shall be fabricated and installed in such manner

as to permit their removal to at least 2 inches (50 mm) below the top of the slab. Holes formed by the removal of such supports shall be filled during the final finishing of the slab. The concrete shall be delivered and distributed at a uniform and adequate rate ahead of the finishing machine by suitable mechanical equipment. Concrete shall be placed no more than 10 feet (3m) directly in front of the finishing machine.

Bridge decks that are to be waterproofed with a membrane shall be given a burlap drag finish.

**842.161 Bridge Deck Grooving.** After the concrete has cured, transverse grooves shall be sawed into the deck. The grooving shall conform to the following requirements:

Grooving shall be done utilizing diamond blades, mounted on a multi blade arbor on a self-propelled machine which has been built for grooving of concrete surfaces. The groove machine shall have a depth control device which will detect variations in the pavement surface and adjust the cutting head height to maintain the depth of the groove specified. The grooving machine will be provided with devices to control alignment. Flailing or impact type grooving equipment will not be permitted.

Grooves shall begin and end approximately one foot from any curb, parapet toe or deck edge and shall be perpendicular to the bridge center line.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimension, and grooving of the surface.

Grooves shall run in a continuous pattern across the surface. The grooving shall be terminated a minimum of 1 foot (300mm) from any device in place in a bridge deck, such as scuppers or expansion joints. The grooves shall be a random pattern spaced at 3/8 to 1 3/4 inch (10 to 45 mm), with 50 percent of spacings being less than 1 inch (25 mm). The grooves shall be approximately 0.15 inches (4 mm) deep and 0.10 inches (3 mm) wide.

At the beginning of each work shift, all grooving machines shall be equipped with a full complement of grooving blades that are capable of cutting grooves of the specified width, depth and spacing.

If during the course of work, a single grooving blade on any individual grooving machine becomes incapable of cutting a groove, work will be permitted to continue for the remainder of the work shift and the Contractor will not be required to otherwise cut the groove omitted because of the failed blade. Should two or more grooving blades on any individual grooving machine become incapable of cutting grooves, the Contractor shall cease operating such equipment until it is repaired.

The removal of all slurry and any remaining residue resulting from the grooving operation shall be continuous. The bridge deck surface shall be left in clean condition, free of all slurry and residue. Residue from grooving operations shall not be permitted to flow across shoulders or lanes occupied by public traffic or flow into gutters or other drainage facilities. Solid residue, resulting from grooving operations, shall be removed from the surface before such residue is blown by the action of traffic or wind.

The Contractor shall be responsible for providing water as necessary to perform the specified grooving in accordance with the specifications.

**842.17 Sidewalk Finish.** The concrete shall be struck off after placing with a template and finished with a float to produce a sandy texture.

**842.18 Method of Measurement.** The volume shall be the number of cubic yards (cubic meters) determined by calculations from plan dimensions, in place, completed and accepted.

Reinforcing steel, supports, mechanical connectors, and tie wires shall be incidental in the price bid for structural concrete.

No deduction will be made for the volume of the reinforcing steel, conduits or structural steel other than beam flanges embedded in deck slabs. No deduction will be made for the volume of any embedded timber or concrete piles.

Superstructure concrete includes the concrete in defluctive parapets not having a metallic railing.

Deck concrete may be measured by either volume or area. The area of concrete shall be based on plan dimensions.

**842.19 Basis of Payment.** Payment will be made at contract prices for:

<b>Item</b>	<b>Unit</b>	<b>Description</b>
842	Cubic yard (cubic meter)	Class ___ concrete, _____
842	Cubic yard (Cubic meter), Square yard (square meter)	Class ___ concrete, bridge deck

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 865**

**PRESTRESSED CONCRETE BRIDGE MEMBERS**

May 11, 1999

ASTM      American Society of Testing and Materials  
 OMM      Office of Materials Management.  
 OSE      Office of Structural Engineering.  
 PCI      Precast/Prestressed Concrete Institute.  
 PFQCS    Prestressed fabrication quality control specialist.  
 QA      Quality assurance.  
 QC      Quality control.

**865.02 Fabricator Approval.** Fabricators shall be pre-qualified by the Office of Materials Management (OMM). Requests for pre-qualification shall be made by the Fabricator in writing to the Office of Materials Management, Cement and Concrete Engineer. The pre-qualification process and its requirements are listed in this specification. The Contractor shall select a fabricator from the pre-qualified prestressed fabricator list in effect at the date of contract letting. The list will be on file in the Office of Materials Management. The Contractor shall inform the District Construction Engineer and the Office of Materials Management of the selected Fabricator.

**865.03 Fabricator Pre-qualification.** OMM shall perform a facilities inspection for pre-qualification evaluation of a fabricator. Fabricators that meet all requirements will be assigned a fabrication level and will be included on the pre-qualified prestressed fabricator list. The pre-qualified prestressed fabricator list will be updated as necessary by OMM.

A pre-qualified Fabricator does not guarantee the work performed will meet quality and conformance requirements of the contract. Final conformance is the responsibility of the Contractor.

**865.04 Levels of Fabrication Qualification.** There are three levels of Fabricator qualification. Each Fabricator shall be listed at the highest level of fabrication they are qualified to perform.

Level	Description of Capabilities
One	Straight strand prestressed box beam members
Two	Straight strand prestressed I-beam members
Three	Draped strand prestressed I-beam members

**865.05 Fabricator Evaluation and Required Qualifications.** Fabricators requesting pre-qualification shall have a fabrication facilities inspection performed by OMM. A facilities inspection check list is part of this specification (see Appendix I). During the inspection the

- 865.01 Description and Definitions
- 865.02 Fabricator Approval
- 865.03 Fabricator Pre-qualification
- 865.04 Levels of Fabrication Qualification
- 865.05 Fabricator Evaluation and Required Qualifications
- 865.051 Quality Control Personnel Qualifications
- 865.06 Fabricator Rating System
- 865.061 Fabricator Rating Review Process
- 865.07 General
- 863.071 Fabricator Documentation Responsibility
- 865.08 Fabrication Shop Drawings
- 865.081 Pre-Fabrication Meeting
- 865.09 Materials
- 865.091 Fabricator Materials Control
- 865.101 Casting Beds
- 865.102 Cold Weather Operations
- 865.103 Equipment
- 865.104 Inspection Facilities
- 865.11 Construction Methods
- 865.12 Concrete
- 865.13 Release of Prestressing Strands
- 865.14 Transportation, Storage and Erection
- 865.15 Method of Measurement
- 865.16 Basis of Payment
  - Appendix I Facilities Inspection Check List
  - Appendix II Quality Assurance rating forms
  - Appendix III Materials Control Documentation forms

**865.01 Description and Definitions.** This item shall consist of the manufacture, transportation, storage and erection, fabricator performed quality control (QC) and documentation of prestressed concrete bridge members produced in accordance with the plans, proposal and this specification.

Fabricator will furnish OMM's representative with documentation to validate the Fabricator meets the criteria listed below:

Precast/Prestressed Concrete Institute (PCI) Certification

Level 1 - PCI Group B3

Level 2 - PCI Group B3

Level 3 - PCI Group B4

Fabricator inspection personnel shall meet the requirements of 865.051.

Welders shall meet the requirements of 865.11.

**865.051 Quality Control Personnel Qualifications.** The Fabricator shall designate one individual as their Prestressed Fabrication Quality Control Specialist (PFQCS). The PFQCS shall be a PCI Certified Level II Technician. The Fabricator shall furnish the PFQCS with all tools and equipment necessary to provide quality control (QC) on all facets of the prestressed fabrication. The PFQCS shall have a thorough understanding of the plans, supplements, proposal and specifications pertaining to the project. The PFQCS shall be responsible for inspecting all equipment at the specified intervals and the fabricated work at all quality control points. The PFQCS shall have the direct authority to stop work and report non-conforming work to the Contractor and OMM. The person assigned as a PFQCS shall be designated the duties full time with no other assigned duties.

The qualifications of the PFQCS shall be approved prior to the Fabricator being qualified. The Fabricator shall provide a resume listing qualifications, work experience and date of PCI certification. The PFQCS shall not be changed without the approval of OMM.

The PFQCS shall be responsible for documenting all inspection hold points (Appendix II) for each fabricated component to show conformance with the specification and contract documents. The Fabricator is responsible for providing supervisory and/or any additional QC inspection personnel to control the work properly and to assure satisfactory materials and workmanship. The use of production staff or additional QC staff for specific quality control functions does not eliminate the PFQCS's responsibility for documentation, QC and final acceptance of fabricated components at all required hold points.

QA inspection forms in Appendix II are for OMM quality assurance (QA) inspectors. While they define areas of rating by QA inspectors, these forms are not intended as forms for the Fabricator's PFQCS to use. QC inspection forms are the responsibility of the Fabricator to develop to assure that all facets of fabrication are documented for each member and to assure their QA rating by OMM inspectors.

**865.06 Fabricator Rating System.** OMM shall evaluate the Fabricator's level of quality throughout the fabrication process. This evaluation will include quality assurance reviews of shop drawings, material test reports and control, QC documentation, and shop Quality Assurance (QA) inspection.

OMM shall perform random and/or specific hold point QA inspections (see Appendix II). OMM may choose to waive any or all parts of the QA inspection. The Office of Structural Engineering, under OMM oversight, will perform QA reviews of Contractor approved shop drawings. The QA rating forms associated with each process are in the Appendix II of this specification.

The Fabricator shall perform QC and provide documentation for each main material member at specified QA hold points (Appendix II). QA hold point inspections are points in the fabrication process that require both QC inspection by the Fabricator and QA inspection by OMM before the recommencement of the fabrication process.

The results of OMM and field construction QA evaluations shall be the Fabricator's rating. This rating shall be reported to the fabricator and shall affect the future qualification of the fabricator as follows:

**A-Rated Fabricators:** Fabricators that perform fabrication resulting in ratings of 90 percent and above, based upon the average of five consecutive bridge, structural file, numbers, within the last 36 months and with no individual rating less than 80 percent will be defined as an A-rated Fabricator. These Fabricators shall have the A-rating QA hold points and random QA inspection performed. The A-rating QA hold point is: Final before shipment (hold point 10, Appendix II). A single rating below 80 percent, or the average of five consecutive ratings dropping below 90 percent, will result in the Fabricator's qualification being lowered to a B-rating.

**B-Rated Fabricators:** Fabricators that perform fabrication with ratings 89 to 80 percent, based upon the average of five consecutive bridge, structural file, numbers, within the last 36 months and with no individual rating less than 70 percent will be defined as a B-rated Fabricator. These Fabricators shall have all B-rating QA hold points and random QA inspection performed. The B-rating QA hold points are: Testing and De-tensioning (hold point 8, Appendix II), and Final before shipment (hold point 10, Appendix II). A single rating below 70 percent, or the average of five consecutive ratings dropping below 80 percent, will result in the Fabricator's pre-qualification being lowered to a C-rating.

**C-Rated Fabricators:** The C-rating is an interim level for Fabricators, newly approved, to validate their QC performance and upgrade to the Department's B and/or A-rating level. These Fabricators shall have all C-rating QA hold points and random QA inspection performed. The C-rating QA hold points are: Strand tensioning and pre-pour inspection (hold point 5, Appendix II); Testing and De-tensioning (hold point 8, Appendix II); Post inspection (hold point 9, Appendix II); and, Final before shipment (hold point 10, Appendix II).

The C-rating is not a permanent qualification level for Fabricators. Fabricators who fail to achieve an average rating above 80 percent but average between 70 to 79 percent based on five consecutive bridge, structural file, numbers within the last 36 months, with no

individual rating less than 60 percent, will be reduced one level on the pre-qualification list. The reduced level Fabricator shall then have three additional consecutive bridge, structural file, numbers to be averaged with the previous five to achieve a B-rating. Fabricators that still do not achieve a B-rating will result in removal from the pre-qualified Fabricator list. Any time the average of three consecutive ratings drops below 70 percent, the Fabricator shall be removed from the pre-qualified Fabricator list. The Fabricator can request re-qualification, 863.03, 36 months after removal.

Any rated Fabricator that receives a single rating below 60 percent shall be removed from the pre-qualified Fabricator list. The Fabricator can request pre-qualification, 863.03, 36 months after removal.

**865.061 Fabricator Rating Review Process** A Fabricator may request, in writing, a reconsideration of the performance rating by a board created by the Department. The board shall be comprised of the Deputy Director, Division of Engineering Policy, or his representative, the Administrator of the Office of Materials Management, or his representative, and the Administrator of the Office of Structural Engineering, or his representative. The board shall hear appeals concerning the Fabricator's performance rating on a specific bridge, structural file, number. The board has no authority to hear appeals for revocation or suspension of a Fabricator from the pre-qualification list.

Within ten days from receipt of the Department's performance rating, the Fabricator may write to the Office of Materials Management requesting the board evaluate a rating. The Fabricator shall also submit additional documentation or evidence bearing on the performance of the work.

The Office of Materials Management shall schedule an informal hearing where the Fabricator shall have an opportunity to present its case. The Department may have representatives at the hearing offering evidence in rebuttal. The board shall consider the evidence and issue its decision within fifteen days of the hearing.

**865.07 General.** All members shall be produced in accordance with 511, except as herein provided in this specification.

Shop inspection or acceptance of shop drawings by the Department shall not relieve the Contractor of responsibility for erroneous or inconsistent dimensions, notations, omissions or other errors. All parts forming a structure shall be built in accordance with the contract. The Contractor will not be responsible for any contract plan errors.

**865.071 Fabricator Documentation Responsibility.** The Fabricator shall keep and maintain documentation records for each project bridge, structural file, number concerning:

1. Fabricator approval
2. Shop drawing approval

3. Material test reports
4. Welding qualifications
5. Quality control inspection

This documentation shall be made available for auditing, inspection and copying upon the Department's request. The documentation shall be archived for at least a five-year period from the date of final shipment from the fabrication shop.

Documentation systems are the Fabricator's responsibility to establish. Quality control documentation shall include all material quality checks, dimensional checks, weld quality inspection, strand tensioning procedures, release procedures, concrete release and final strengths etc. to document both to the Fabricator and to the Department that all fabrication has been thoroughly inspected and meets the specification requirements. Evaluation of the Fabricator's performance by Departmental personnel, using forms defined in Appendix II, will include validation of the Fabricator's actual records of inspection. This validation is intended to assure that rating of an individual component will reflect the overall quality of all components.

**865.08 Fabrication Shop Drawings.** Prestressed fabricated items sold under this specification or other similar items requiring fabrication shall be detailed on shop drawings by the Contractor or Fabricator in accordance with AASHTO "Standard Specifications for Highway Bridges", the Bridge Design Manual.

The Contractor shall submit to OMM, Cement & Concrete Engineer, 7 days before the pre-fabrication meeting (see 865.081), written acceptance and four copies of the shop drawings, unless additional copies are requested. Written acceptance is a letter from the Contractor stating that the drawings have been reviewed and approved by a professional engineer and the Contractor accepts the shop drawings as acceptable for fabrication. Each shop drawing sheet shall be stamped with the date and approval by a registered professional engineer representing the Contractor. All drawings shall show detailer's initials. In addition to the sets of drawings submitted to OMM, the Contractor shall furnish the fabricator's PFQCS with one record set of the checked and Contractor accepted shop drawings. This set will be furnished the PFQCS on or before the pre-fabrication meeting.

By submission of shop drawings, the Contractor represents to the Department that all materials, field measurements, construction requirements, contract requirements, performance criteria and similar data have been verified. By submission, the Contractor further certifies the shop drawings have been coordinated and verified with the details of the work to be performed by other Fabricators, Contractors and entities on the project. No allowance for additional cost or delays will be made to the Contractor for incorrect fabrication as a result of failure to coordinate or perform these verifications.

The prints shall be made from tracings, neatly and accurately drawn on sheets 22 x 34 inches (559 mm x 864 mm).

Shop drawings shall show details, dimensions, size of materials, match mark diagrams for field connection and erection, and any other information necessary for the complete fabrication and erection of the prestressed members.

When changes on submitted drawings are requested by the Department, or the Contractor makes changes in addition to those expressly requested, the shop drawings shall be submitted to identify the changes with revision marks and include written acceptance by the Contractor, and be stamped and dated by the Contractor's Professional Engineer.

Deviation from the contract plans or accepted shop drawings will not be permitted without the order of the OMM. Requests for such deviation or change shall be submitted in writing to OMM. After acceptance by the Engineer, such plans shall be taken as supplemental to, but in no sense a substitute for, the contract. The Contractor shall be responsible for supplying documentation and any revised drawings or changes listed above.

After all fabrication is completed, the Contractor shall have the Fabricator furnish a 35-millimeter microfilm copy of each shop drawing mounted on an aperture card in accordance with Supplement 1002, on file in the Department. These microfilm copies shall be submitted to the OSE, Attention Structural Steel Engineer. If the details shown on a drawing apply to more than one bridge, an aperture card for that drawing shall be furnished for each bridge to which it applies, each card bearing the applicable bridge number. For structures carrying railroad traffic, an additional set of aperture card-mounted films or, at the option of the railroad, a set of full-size drawings on mylar shall be furnished for each railway company involved.

**865.081 Pre-Fabrication Meeting.** A pre-fabrication meeting shall be held at the Fabricator's facilities, or another location agreeable to all parties, for review of any fabrication issues, including information on shop drawings, inspection, hold points, unique fabrication items, special processes, etc. for the project. Attendance at the meeting shall include the Fabricator, the PFQCS, the Contractor, or designated representative, and OMM's QA inspector. The meeting will be conducted by the PFQCS. If all parties feel documentation is required, minutes can be taken and distributed. The issue of minutes shall be the first item during the meeting..

The time of the meeting shall be agreeable to all parties, but no earlier than 7 days after submittal of Contractor approved shop drawings, 865.08. OMM may waive the pre-fabrication meeting if accepted by the Fabricator and the Contractor. If Contractor submitted shop drawings do not comply with the requirements of 865.08, no pre-fabrication meeting can be scheduled or waived.

**865.09 Materials.** Materials shall conform to the following:

Concrete .....	865.12
Aggregate* .....	703.02
Portland cement .....	701.01 thru 701.06

Air-entraining admixture .....	705.10
Chemical admixtures for concrete .....	705.12
Prestressing steel .....	711.27
Reinforcing steel .....	509
Transverse tie rods .....	711.01

\*Fine aggregate shall be natural sand for members that will not have a separate wearing course. Coarse aggregate shall be modified as follows:

Deleterious materials, max. ....	0.4%
Gradation shall be No. 57, 6, 67, 68, 7, 78 or 8 standard size coarse aggregate.	

**Materials Approval.** All materials either incorporated into the prestressed fabricated item or supplied under 865 as component parts of the fabricated items shall be the responsibility of the Fabricator to control, have tested, validate materials requirements and provide supporting documentation at the time of final inspection by the QA inspector. The Fabricator's PFQCS is responsible for the documentation, test results, or certification required by ODOT needed to validate that the materials meet the specification.

Department specified materials have either specific ASTM requirements, ODOT specification requirements or specific project requirements. The Department reserves the right to perform random check sampling of materials. Approval sampling of materials at the Fabricator's plant will not be performed.

**865.091 Fabricator Materials Control.** The Fabricator's PFQCS shall be responsible for materials approval. The PFQCS shall be responsible for delivered materials meeting specification requirements. This includes inspection of material; checking test reports for conformance to applicable specifications; requiring test reports, certifications and other required documentation at time of delivery; rejecting un-acceptable and/or un-documented materials; completing documentation forms for each bridge number and assembling complete and correct documentation packages for each project.

The forms in Appendix III are to be completely filled out for each project before presentation to the QA inspector. The QA inspector will verify from documented results the materials incorporated into the fabricated products to be shipped meet requirements. As verification will be done after the product is completed, any incomplete documentation will cause all products to be rejected. The QA inspector either at time of shipment, or at a time designated by the QA inspector, may require review of the complete materials package to support the completed forms or for required fabrication information.

If a coating is required, such as epoxy or galvanizing, coating records shall also be required showing date, type, and quality control records from the coater and actual thickness measurements of the coating. The PFQCS is responsible for making actual coating measurements on the delivered materials to assure the product meets specification and recording those measurements.

**865.101 Casting Beds.** Casting beds shall be constructed of steel or concrete. The beds shall be above grade to assure that they will not be submerged due to accumulation of water as a result of curing operations. Beds and abutments shall be so designed that they are capable of safely resisting all forces applied to them without appreciable movement or deflection. These forces consist of compression and eccentric forces due to end-jacking operations, forces at hold down points when draped strands are used, and downward forces due to the dead weight of the members.

**865.102 Cold Weather Operations.** The following procedures will be employed when the ambient air temperature is below 50 F (10 C). Mixing water, aggregates or both shall be heated as necessary to result in concrete temperatures not less than 50 F (10 C) nor more than 70 F (21 C) when placed. Water heated above 150 F (66 C) shall not be permitted to come in direct contact with the cement. Concrete shall not be placed in contact with forms, reinforcing steel, prestressing strand or other hardware materials having a temperature less than 32 F (0 C). When casting bed temperatures are less than 30 F (-1 C), prestressing strand shall be tensioned to provide the design tension at 50 F (10 C).

**865.103 Equipment.** Hydraulic jacks of sufficient capacity and stroke shall be used for tensioning strands. Either single or multiple strand tensioning may be used. Tensioning jacks shall be equipped with automatic cutoff valves and gages with a minimum diameter of 6 inches (150 mm) and 500 pound (2 kN) increments. Gages shall be calibrated for the jacks with which they are to be used and a graph or table showing the calibration shall be available to the QA inspector. Two calibrated gages shall be provided for jacks, one of which shall be used during routine stressing, while the other is locked out and used only by the QA inspector to verify the accuracy of the working gage. Calibration of jacks shall be done by a method acceptable to the Office of Materials Management, at least once every six months or as ordered by the Director. Calibration documentation shall be part of project's QC documentation.

The jacking system shall be of such design as to assure uniform stress in all strands. When multiple strands are tensioned simultaneously, plants shall be equipped with approved types of dynamometers for equalizing the initial stress on all strands prior to application of the full tensioning load with the master jack. The capacity of the dynamometers shall be such that the desired readings are in the middle to upper range.

**865.104 Inspection Facilities.** The plant shall provide minimum floor area of 120 square feet (11 m<sup>2</sup>) for the use of QA Inspectors. This area shall be adequately heated and ventilated and equipped with necessary desks, chairs, tables, and electrical outlets.

**865.11 Construction Methods.** Forms shall be adequate to produce members within the tolerances set forth on the plans. Only metal forms shall be used, with the exception of bulkheads and voids. The surface of the forms in contact with the concrete shall be smooth, and the joints between panels shall be tight. The soffit form shall have a plane

surface at right angles to the vertical axis of the members and the two bottom edges shall be beveled 3/4 inch (19 mm) with a triangular strip built into the forms. The length of the members shall be increased for elastic shortening and normal concrete shrinkage, and the forms shall be so designed that they will not resist this movement.

Forms for voids in box beams shall be water-resistant and shall be constructed of a material that will resist breakage and deformation during the placing of the concrete, and they shall not excessively increase the dead load of the beams.

When forms are coated with an approved release agent, care shall be taken to prevent the oil from coming in contact with the prestressing strands or reinforcing steel.

Reinforcing steel shall be installed and assembled as per approved shop drawings. If authorized, welding of reinforcing cages shall be performed by welders qualified to AWS D1.4. Epoxy coated or galvanized reinforcing steel shall not be welded, except as approved by OMM. All coating areas damaged by welding shall be repaired as per coating manufacturer's instructions. Loss of cross-section of reinforcing due to welding shall be automatic cause for rejection of the reinforcing steel. Strands shall be accurately placed in the positions shown on the plans. Strands with kinks, bends, nicks, broken wires, or other defects, including scale or loose rust will not be permitted. Slight rusting, provided it is not sufficient to cause visible pits, shall not be cause for rejection. Before placing of the concrete, the strands shall be carefully cleaned of all dirt, grease, oil or other foreign matters. Splicing of the strands within a member will not be permitted.

Each strand shall be tensioned to the stress indicated on the plans. When two or more strands are stressed by one jack, each strand shall be individually stressed to about 1000 pounds (4.5 kN), or other approved initial pre-load, by means of a dynamometer before being attached to the jacking system. The required stress in the strands shall be measured by the jacking equipment and checked by the elongation of the strands. The PFQCS shall keep a record of all jacking forces and elongations.

The strands shall be secured by suitable anchorage devices capable of developing at least 85 percent of the ultimate strength of the strands. The anchorage shall be such that no slippage of the strand will occur after the tensioning operation.

When draped strands are used, the loss of stress due to friction shall not exceed 5 percent. The PFQCS shall be responsible for validating loss due to friction by a procedure approved by the Office of Materials Management. In order not to exceed 5 percent, the strands shall be tensioned at both ends. Hold-down points shall be placed within 3 inches (90 mm) of the locations shown on shop drawings and within 12 inches (0.3m) of the locations on the plans.

**865.12 Concrete.** The concrete shall be machine mixed according to Supplemental Specification 899, except that 899.03 does not apply. The concrete shall contain  $6 \pm 2$  percent entrained air, and slump shall be maintained with the range of 1 to 4 inches (25 to 100 mm). The slump may be increased to 7 inches (180 mm) provided the increase is

achieved by the addition of a chemical admixture meeting the requirements of 705.12, Type F or G. An approved corrosion inhibiting admixture shall be used in all prestressed concrete. The admixture and dosage rate shall be approved by the Laboratory.

The concrete shall be proportioned of materials specified in 865.09 to provide a minimum cylinder strength of 5500 psi (38.0 MPa), or plan specified strength, in 28 days, as determined from the testing by the Laboratory of at least 2 cylinders. Each pair of cylinders shall have an average strength of not less than 5500 psi (38.0 MPa), or plan specified strength, and no cylinder shall have less than 95 percent of the specified strength. A minimum of 2 cylinders shall be made from the first and last loads in each casting bed used per day, and an additional 2 cylinders made for each 200 feet (61 m) of beam produced per bed.

Fabricator concrete mix designs shall be submitted to OMM with test data validating the mix's capability to achieve the required 28 day strength under the curing method used.

Calcium chloride or admixtures containing calcium chloride are prohibited.

Concrete may be placed in the bottom flange of a box beam before the interior forms and reinforcement for the upper portion of the member is placed, providing continuous placement is not interrupted for more than 45 minutes.

The top surfaces of non-composite members shall be screeded and finished with a burlap drag, or other means to provide a uniform surface with a gritty texture suitable for waterproofing. The top surface of composite members shall be screeded and given a wire broom finish, in a transverse direction, penetrating the finished surface approximately 1/4 inch (6 mm).

The concrete shall be given an accelerated cure by low pressure steam or radiant heat within a suitable enclosure to contain the live steam or heat. The initial application of the steam or heat shall be from two to four hours after the final placement of concrete to allow the initial set to take place. If retarders are used, the waiting period shall be increased to four to six hours. The time of initial set may be determined by ASTM C 403, and the time limits described above may then be waived.

During the waiting period the temperature within the curing enclosure shall be not less than 50 F (10 C).

During the initial application of live steam or radiant heat, the ambient temperature within the curing enclosure shall increase at an average rate not exceeding 80 F (44 C) per hour until the curing temperature is reached. The maximum curing temperature shall not exceed 190 F (87 C). The maximum temperature shall be held until the concrete has reached the desired strength. Detensioning shall be accomplished immediately after the steam or radiant heat curing has been discontinued. Additional curing is not required after detensioning.

(1) Curing with low pressure steam. Application of live steam shall not be directed on the concrete forms so as to cause localized high temperature.

(2) Curing with radiant heat. Radiant heat may be applied by means of pipes circulating steam, not oil or hot water, or by electric heating elements. Moisture loss shall be minimized by covering all exposed concrete surfaces with plastic sheeting or by applying an approved liquid membrane curing compound to all exposed concrete surfaces. Shear faces of composite members and other surfaces to which field-cast concrete or other materials will be bonded in the finished structure shall have the curing compound removed.

Cavities in the exposed surface of beams shall be neatly filled with grout. Grout used shall be non-shrink, conforming to ASTM C 1107. Cleaning, application and curing of the grout shall be as per manufacturer's published recommendations. Honeycomb that is considered to impair the member's performance shall be cause for rejection.

**865.13 Release of Prestressing Strands.** Prestressed strands shall not be released until the concrete has reached a strength of at least 4000 psi (28.0 MPa), or plan defined release strength, as determined by the testing of pairs of concrete cylinders made according to AASHTO T 23, cured by the exact method used to cure the beam, and tested according to AASHTO T 22. These cylinders shall be tested in the Fabricator's laboratory. Both tested cylinders shall meet or exceed the required strength of 4000 psi (28.0 MPa), or plan defined release strength. The QA Inspector shall be notified in advance and shall have the right to observe the testing of the cylinders. A-rated Fabricators are not required to provide notification.

The strands shall be released immediately after accelerated curing by steam has been discontinued. Prior to release of prestressed strands, forms and hold-downs which restrict either horizontal or vertical movement of prestressed members shall be loosened or removed. Each strand shall be burned or heat released simultaneously at selected exposed points between anchorages and the sequence should follow a predetermined pattern, approved by the Director, to equalize the forces being transferred to the various areas of the cross section of the member. For heat release, a low-oxygen flame shall be used and at least a 4 inch (100 mm) length of strand be uniformly heated.

**865.14 Transportation, Storage and Erection.** Prestressed members shall not be shipped until the 28-day design strength of the concrete is reached and approval by the QA inspector has been received.

The members shall be stored, transported and erected in an upright position, and points of support and direction of reactions shall be approximately the same during storage and transportation as when the members are in their final position. Whenever members are to be stored, care shall be taken to provide unyielding horizontal supports capable of maintaining the members in a vertical position. If it is found necessary to transport the members in any position other than vertical, it shall be done only with the written approval

of the Director. The members shall be lifted and erected through the use of lifting devices capable of withstanding any required loads. Members damaged by improper handling, storing, transportation or erection shall be repaired or replaced, at the discretion of the Director, at no expense to the Department. In no instance shall any vehicular load be allowed on an individual prestressed concrete box beam in a prestressed concrete box beam deck after the tie rods have been tightened and prior to grouting of the keyway and the grout obtaining the specified design strength.

Prestressed box beams shall be accurately placed during erection to assure uniform load on all bearings. Box beams shall be placed to assure correct fit of the keyways and to assure that the keyways can be properly grouted. Keyway grouts approved by the Laboratory shall be mixed, installed and cured as per grout manufacturer's published recommendations to obtain a design compressive strength of 5000 psi (34.5 MPa). Any proposed deviations to the manufacturer's published recommendations shall not be acceptable without approval of the Office of Materials Management.

Where erection of prestressed members will require placement of cranes or launching devices on previously erected spans, erection procedures shall be submitted for approval as per 501.06.

**865.15 Method of Measurement.** The quantity shall be the number of members, or the length of the members in linear feet (meters).

This item includes all inserts, sleeves, fittings, reinforcing steel fully or partially encased in the members, and all transverse tie rods necessary to complete this item.

Concrete diaphragms, 511, and bearing plates or pads or other expansion materials, 516, will be paid for as separate items.

**865.16 Basis of Payment.** Payment will be made at contract price for:

Item	Unit	Description
865	Each, linear foot (meter)	Prestressed concrete non-composite box beam bridge members, Level 1
865	Each, linear foot (meter)	Prestressed concrete composite box beam bridge members, Level 1
865	Each, linear foot (meter)	Straight strand prestressed concrete bridge I-beam members, Level 2
865	Each, linear foot (meter)	Draped strand prestressed concrete bridge I-beam members, Level 3

APPENDIX I



OHIO DEPARTMENT OF TRANSPORTATION

1600 W Broad Street  
Columbus, OH 43223  
614-275-1325 / fax 614-275-1543 / bstruble@dot.state.oh.us

Facilities inspection has been performed by \_\_\_\_\_ From the Office of Materials Management (OMM) \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ Based upon this report your facility will be evaluated for acceptance into the Prequalified Prestressed Fabricator List as specified by Supplemental Specification 865.

**Facilities Evaluation Check List**

1. Company Name: \_\_\_\_\_
2. Address: \_\_\_\_\_
3. Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E Mail \_\_\_\_\_
4. PCI Certification, enclose copy of certification: \_\_\_\_\_
  - a. Level 1 fabricator: \_\_\_\_\_
  - b. Level 2 fabricator: \_\_\_\_\_
  - c. Level 3 fabricator: \_\_\_\_\_
5. Company Representative
  - a. President: \_\_\_\_\_
  - b. Chief Engineer: \_\_\_\_\_
  - c. Prestressed fabrication superintendent \_\_\_\_\_
  - d. PFQCS, enclose certifications: \_\_\_\_\_
6. Prestressed Beds
  - Length (ft) \_\_\_\_\_
  - Length (ft) \_\_\_\_\_
7. Building facilities:
  - Reinforcing steel fabrication Area (dimensions) \_\_\_\_\_
  - Adequate bending equipment \_\_\_\_\_
  - Projection method for epoxy coating reinforcement \_\_\_\_\_
  - Method of cage construction \_\_\_\_\_
  - Reinforcing steel welders AWS qualified \_\_\_\_\_

Prestressed Concrete Cylinder Testing facilities:

- Capacity of cylinder testing equipment
- Calibration documentation
- Capping method equipment

APPENDIX I

- ODOT QA inspection office (dimensions)
- Adequate heating \_\_\_\_\_
  - Adequate lighting \_\_\_\_\_
  - Phone line \_\_\_\_\_
8. Lifting methods for beams
    - Crane capacity \_\_\_\_\_
  9. Concrete Quality
    - Source of concrete \_\_\_\_\_
    - Mix design \_\_\_\_\_
    - QC procedure established for concrete \_\_\_\_\_
    - Moisture control methods for aggregate \_\_\_\_\_
    - Admixture batching method and QC \_\_\_\_\_
  10. Fabrication Quality
    - Written prestressed strand tension method
      - straight \_\_\_\_\_
      - draped \_\_\_\_\_
    - Written prestressed strand release method
      - Method of debonding \_\_\_\_\_
  11. Materials controls
    - Control and method of tracking
      - cement \_\_\_\_\_
      - aggregate \_\_\_\_\_
      - admixtures \_\_\_\_\_
      - reinforcing \_\_\_\_\_
      - prestressed strand \_\_\_\_\_
      - inserts and fabricated items \_\_\_\_\_



**APPENDIX II**

Y = yes, N = no, NA = not applicable  
 No partial points are used for Y, N or NA selection

Sum of  $\{Y/(Y+N)\} \times$  Selection Factor = Fabricator Rating

Contractor Coordination	_____ (Y)/ _____	(Y+N) x 10 = _____
Title Block	_____ (Y)/ _____	(Y+N) x 1 = _____
General Notes	_____ (Y)/ _____	(Y+N) x 15 = _____
Framing Plan	_____ (Y)/ _____	(Y+N) x 10 = _____
Beam Details	_____ (Y)/ _____	(Y+N)* x 34 = _____
Cross Section	_____ (Y)/ _____	(Y+N)* x 30 = _____

Summation fabricator rating for performance of shop drawings (%) = \_\_\_\_\_

\* Y / (Y+N) x 1.0 for Beam Details or Cross Section sections. If an individual rating is lower than the summation fabricator rating, the fabricator rating shall be based upon the lowest individual section rating.

**APPENDIX II**

**FABRICATOR \_\_\_\_\_ RATING FOR SHOP FABRICATION**

**County:** \_\_\_\_\_ **Project:** \_\_\_\_\_ **SFN:** \_\_\_\_\_ **Shop ID:** \_\_\_\_\_

Office of Materials Management QA Inspector: _____				
<b>Hold Point Descriptions for Prestressed Fabricators - Levels 1 thru 3</b>	<b>Points</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>
<b>Strand and Reinforcing validation</b>	<b>QA Hold point 1</b>			
Certified test data's Heat number matches tagging identification on rebar and strand	5			
Yield Strength of reinforcing meets plan requirements, Fy (psi)	3			
Tensile Strength of reinforcing steel meets plan specifications, Fu (psi)	1			
Tensile Strength of prestressing strand meets plans and specifications, Fu (psi)	5			
Strand and reinforcing inspected for acceptable surface conditions rust, etc.	1			
<b>Hold Point 1 Sub Total</b>	<b>15</b>			
<b>Concrete Mix Inspection</b>	<b>QA Hold Point 2</b>			
Mix design documented to OMM	5			
Batching weights controlled- equipment calibrated	3			
Corrosion inhibitor Admixture batched correctly	3			
Aggregates checked for segregation, contaminants, and proper handling	2			
<b>Hold Point 2 Sub Total</b>	<b>13</b>			
<b>Reinforcing inspection - pre-form:</b>	<b>QA Hold Point 3</b>			
Pre-fabrication cages meet dimensional requirements	5			
Individual bars checked dimensionally, size and grade before installation	1			
Tack welded assemblies, welds acceptable	3			
Welders qualified D1.5	2			
Welder following qualified procedure for reinforcing	2			
Lap lengths built into longitudinal bar assemblies meet requirements when stirrups properly spaced	2			
<b>Hold Point 3 Sub Total</b>	<b>15</b>			
<b>Hold Point Descriptions for Prestressed Fabricators - Levels 1 thru 3</b>	<b>Points</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>
<b>Form Inspection</b>	<b>QA Hold Point 4</b>			
Cross-section dimensionally correct	3			
Skew ends meet dimensions and angle	2			
Hold down points located as per shop drawings (+/- 3 inches)	3			

**APPENDIX II**

Holes plugged and flush, welds ground flush	1			
Form joints sealed	1			
Forms string lined for straightness	2			
Length of members conforms with specifications with bulkheads correctly installed	4			
<b>Hold Point 4 Sub Total</b>	<b>16</b>			
<b>Strand tensioning and pre-pour inspection:</b>	<b>QA Hold Point 5</b>			
Strand diameter correct	5			
Strands inspected in bed for nicks, gouges	2			
Correct strands debonded and for correct length	3			
Check Elongation established using Strand reel Modulus of Elasticity (E), measured area of strand and corrections for temperature, bed shortening, additional strand length due to draping, slippage at ends and seating losses	5			
Jacking equipment calibrated as per specification	2			
Written strand stressing procedure at jacking location	1			
Pre-load applied	2			
Strands loaded symmetrically, Final load applied, elongation checked	6			
Draped strand force at bed ends shall be validated to be within 5%	4			
<b>Hold Point 5 Sub Total</b>	<b>30</b>			

Hold Point Descriptions for Prestressed Fabricators - Levels 1 thru 3	Points	Y	N	N/A
<b>reinforcing placement pre-pour:</b>	<b>QA Hold Point 6</b>			
Reinforcing steel sizes correct	5			
Clearance of reinforcing and strand from forms meets concrete cover	3			
Lapslice reinforcing installed and meet specifications	3			
Reinforcing adequately tied against movement	2			
Guardrail and inserts installed correctly	3			
Reinforcing located as per shop drawings	2			
Tierod holes and anchor holes dimensionally correct	2			
Release agent applied on forms	1			

**APPENDIX II**

Lifting devices installed	3			
<b>Hold Point 6 Sub Total</b>	<b>24</b>			
<b>Member Fabrication Concrete QC</b>	<b>QA Hold Point 7</b>			
Unit weight, slump and air tested and meet requirements	3			
Verification cylinders made	5			
Vibration performed as per specifications and plant approved procedure	2			
slump and air tested per load	2			
<b>Dimensional</b>				
Concrete cover checked during placement	3			
Concrete depth checks performed for top and bottom flange	4			
Composite reinforcing checked for extension out of member	2			
Voids inspected for location after concrete placed (box beam)	2			
Top of member surface finish meets specifications	1			
Lifting devices final location meets specifications	4			
<b>Hold Point Descriptions for Prestressed Fabricators - Levels 1 thru 3</b>	<b>Points</b>	<b>Y</b>	<b>N</b>	<b>N/A</b>
<b>Cure application</b>				
Protection of concrete before initial set performed	2			
Set time of mix exceeded before accelerated cure applied	3			
Temperature measurement during accelerated cure	5			
Cylinders cured as per member	3			
<b>Hold Point 7 Sub Total</b>	<b>43</b>			
<b>Testing and De-tensioning:</b>	<b>QA Hold Point 8</b>			
Cylinders tested for release strength	5			
Cylinder testing equipment calibrated	1			
Cure removed	2			
De-tensioning procedure performed and meets specifications	4			
Initial camber checked and recorded	2			
<b>Hold Point 8 Sub Total</b>	<b>14</b>			
<b>Post inspection</b>	<b>QA Hold Point 9</b>			
Beam length dimensionally correct	3			
Cavities in concrete surfaces repaired	1			
Honeycombing inspected and documented QA inspector notified	2			

APPENDIX II

Validate dimensional locations of tierods, guardrails and other inserts	3			
Sweep meets required tolerances	2			
Composite reinforcing meets required clearance	1			
reinforcing steel coating inspected and repaired as per requirements	1			
<b>Hold Point 9 Sub Total</b>	<b>14</b>			
<b>Final before shipment</b>	<b>QA Hold Point 10</b>			
Cylinders tested for 28 day strength to meet specifications	5			
Final camber measured and evaluated against adjacent members and tolerances	2			
Final sealing applied Documentation of cleaning and rate of application	3			
Inspection for cracks, lifting damage, etc.	3			
<b>Hold Point 10 Sub Total</b>	<b>13</b>			

Y = Yes, N = No, NA = Not Applicable, No partial points are available for a Y, N or NA answer

APPENDIX II

Hold Point	Yes/(Yes + No)	Weight Factor	Rating Total
1		12	
2		10	
3		5	
4		5	
5		16	
6		7	
7		12	
8		13	
9		8	
10		12	
		Total Rating	

Summation Fabricator rating for performance of QA Inspection = \_\_\_\_\_

\*  $Y / (Y + N) \times 100$  for Hold Points 1, 5 and 8. If any of these individual ratings are lower than the summation fabricator rating, then the Fabricator rating shall be based upon the lowest individual section rating.

Required Hold points

A Rating hold points = 10

B Rating hold points = 8 and 10

C Rating hold points = 5, 8, 9 and 10

Final Total Fabricator Rating .20 x Shop Drawing Rating \_\_\_\_\_  
 .80 x Fabrication Rating \_\_\_\_\_

If no shop QA rating is performed, the Fabrication QA rating will be the fabricator's QA rating for the project.

**APPENDIX III**

**ODOT MATERIALS CERTIFICATION FORM  
PRESTRESSED/PRECAST CONCRETE**

Precast Producer \_\_\_\_\_  
 ODOT Project Number \_\_\_\_\_ Bridge Number \_\_\_\_\_

**Cement**

Manufacturer	Plant	Type	Insp. App.

**Cementitious Materials (fly Ash, GGBF, Micro-silica)**

Manufacturer	Source	Type	Insp. App.

**Aggregate FINE**

Producer	Type	Soundness %	Insp. App.

**Aggregate COARSE**

Producer	Type & Size	Deleterious Materials	Soundness %	Abrasion %	Insp. App.

**ADMIXTURES (corrosion inhibitor, retarders, air entrainers, superplasticizers)**

Manufacturer	Brand name	Admixture Type	Dosage rate	Insp. App.

**APPENDIX III**

**REINFORCING STEEL**

Rebar Size (Epoxy/Black)						
Manufacturer						
Heat Number						
Yield Strength						
Tensile Strength						
Elongation %						
Coating Thickness						
Bar Mark						
Use of Rebar						
TE-24						
Insp. App.						

**WIRE MESH REINFORCING**

Mesh Size						
Heat Number						
Manufacturer						
Tensile Strength (LW)						
Dia. (LW)						
Area (LW)						
Tensile Strength (CW)						
Dia. (CW)						
Area (CW)						
Weld Shear						
Coating Thickness						
TE-24						
Insp. App.						

**PRESTRESSING STRAND**

Heat Number					
Coil No.					
Nominal Diameter					
Area					
Ultimate Strength					
Yield Strength					
Elongation					

**APPENDIX III**

Modulus of Elasticity					
Coating Thickness					
Insp. App.					

**TRANSVERSE TIE RODS**

Heat Number					
Nominal Diameter					
Area					
Yield Strength					
Ultimate Strength					
Elongation					
Coating Thickness					
TE-24					
Insp. App.					

**INSERTS INCLUDING EMBEDDED INSERTS, BOLTS, NUTS, WASHERS, COUPLING NUTS**

Insert Description				
Certification or TE-24				
Mill Certs				
Coating Thickness				
Insp. App.				

**FABRICATED PLATE (BEARING INSERT PLATES, WELDING CONNECTION PLATES, ETC.)**

Description			
Diameter			
Length			
Width			
Thickness			
Depth			
Coating Thickness			

**APPENDIX III**

Insp. App.			

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 877  
TEMPORARY SEDIMENT AND EROSION CONTROL**

April 13, 1999

**877.01 Description**  
**877.02 Materials**  
**877.03 Construction Requirements**  
**877.04 Maintenance**  
**877.05 Performance**  
**877.06 Method of Measurement**  
**877.07 Basis of Payment**

**877.01 Description.** This work shall consist of temporary control measures as detailed in the plans and/or general notes during the life of the contract to control sediment and erosion through the use of straw or hay bales, dikes, slope protection, sediment pits, basins and dams, slope drains, coarse aggregate, mulches, grasses, filter fabrics, ditch lining, inlet protection and other erosion control devices or methods.

The permanent control provisions contained in the contract shall be coordinated with the temporary erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

Temporary controls are required for construction work outside the right-of-way in areas such as borrow pit operations, haul roads, equipment and material storage sites, waste areas, and temporary plant sites. This work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract prices bid for the items to which they apply.

**877.02 Materials.** Commercial fertilizer shall be (10-20-10) and shall conform to Item 659.

Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*). Seed and mulching materials shall be applied in accordance with Item 659.

Temporary filter fabric ditch checks shall consist of 30 inch [0.8m] wide filter fabric with sound wood supports with maximum spacing of 10 feet [3.0m] on centers. Temporary inlet filter barriers shall consist of 18 inch [0.5m] wide filter fabric fence with a securely nailed 2 x 4 wood frame.

Temporary bale filter dikes and perimeter filter fabric fence shall consist of straw or hay bales, or 30 inch [0.8m] wide filter fabric fence with sound wood supports with a maximum

spacing of 10 feet [3.0m] on centers. All the above filter fabric fence shall meet the requirements of 712.09, Type C.

Temporary dikes shall consist of suitable 203 material.

Temporary slope drains shall consist of pipe, pipe caps, coarse aggregate, riprap, rock channel protection, or other materials. Sediment pits are not paid for separately but are included as part of slope drain construction.

Pipe caps shall be included in the unit bid price for the pipe. Pipe caps shall have a minimum diameter of 1/4 inch (6.4mm) holes and be specifically designed to connect to the pipe. There will be a minimum of one hole per square inch (645 mm<sup>2</sup>) of the cross sectional end area of the pipe cap.

Temporary sediment basins and dams shall be constructed by methods described in Item 203 Excavation and Embankment and Item 601 Rock Channel Protection, Type C or D with filter.

Temporary rock check dams shall be constructed of Item 601 Rock Channel Protection, Type C or D without filter.

Temporary ditch and slope protection shall meet the requirements of Item 670.

**877.03 Construction Requirements.** The Storm Water Pollution Prevention Plan (SWPPP) details the placement, location and description of the temporary and permanent erosion control items. The following descriptions shall be used to supplement the plan. The Contractor shall rearrange and modify the plan quantities to meet the field conditions and the National Pollutant Discharge Elimination System (NPDES) Permit.

When the plan does not have a SWPPP, the Contractor shall submit a plan detailing control feature locations and quantities at the pre-construction meeting.

In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

(A) Clearing and Grubbing. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, and borrow and fill operations as determined by the project conditions. The Contractor shall preserve existing vegetation where attainable and temporarily seed and mulch disturbed idle areas as stated.

Inactive cleared and grubbed areas that are scheduled to remain idle for more than 45 days shall be stabilized with vegetation (i.e. temporary seed and mulch) within 7 days following the clearing and grubbing operations. If an area is within 50 feet [15 m] of any water body (i.e. stream, river, pond, etc.), then it shall be vegetated within 2 days following

the clearing and grubbing operations.

(B) Installation of Control Features. Temporary erosion and sediment control items shall be installed as detailed and are to remain functional until the upper slope drainage areas are fully stabilized.

Temporary perimeter, ditch check or inlet filter fabric fence shall be constructed in accordance with Standard Drawing DM-4.4.

1. Temporary Perimeter Controls: Temporary perimeter filter fabric fence shall protect the following from sheet flow runoff: off right of way locations; off construction limit locations; around water bodies, wet lands or around other significant items designated on the plan.

Dikes shall be used to prevent flow from coming on to the project and to barren areas on the project.

The Contractor shall install perimeter filter fabric fence and dikes concurrent with the clearing and grubbing operations.

2. Inlet Protection: The Contractor shall use an 18 inch [0.5m] wide filter fabric fence supported around a storm drain inlet or manhole with securely nailed 2 x 4 inch (50 X 100 mm) lumber. The Contractor shall excavate a six inch (150 mm) trench around the inlet, and drive the posts six inches (150 mm) below the excavated trench bottom. The fabric shall be stretched around the frame, placing six inches of fabric in the trench and secure tightly. The fabric shall overlap on one side of the inlet so that the fabric ends are not attached to the same post. Backfill the excavated soil onto the fabric and compact tightly.

The Contractor shall construct the inlet protection as soon as the inlet is completed.

3. Temporary and Permanent Seeding: Use seed and mulch liberally during and after construction and before or during winter shut down. Temporary seeding areas shall be fertilized at one-half the specified rate of application in Item 659. Temporary seeding shall be annual ryegrass sown at 2 pounds per 1000 square feet [1 kg/100 m<sup>2</sup>] and mulched in accordance with Item 659. When project conditions prevent the incorporation of fertilizer into the soil and preparation of the seed bed cannot be performed in accordance with Item 659, these requirements may be waived. Temporary seed shall not be placed on frozen ground.

The Contractor shall place the permanent seed on all barren areas within 7 days of obtaining final grade. The Contractor shall place the temporary seed and mulch as stated under clearing and grubbing.

4. Slopes: Dikes, slope drains and ditches shall be installed to divert water from bare soil and to protect cut and fill slopes. The Contractor shall place dikes at the top of fill slopes to protect the sides slopes from erosion.

The Contractor shall install dikes and slope drains when no filling activity occurs for three or more weeks and when slope height is greater than 8 feet [2.5m].

The Contractor shall construct a ditch at the top of cut slopes prior to the cutting of the slope to reduce runoff potential.

5. Ditch Checks: Filter fabric fence or rock checks are placed to protect ditches from erosion and to filter sediment from flowing water. The checks are placed across the width of the ditch.

Filter fabric fences are installed for 2 acres (8,000 m<sup>2</sup>) or less of drainage area. Rock ditch checks are installed for 2 to 5 acres (8,000 to 20,000 m<sup>2</sup>) of drainage area. When no rock quantities are denoted for rock checks, use the calculated rock quantities from basins for the rock checks.

Ditch checks shall be installed in conjunction with sediment basins and dams when the above drainage areas are not exceeded.

The Contractor shall place the ditch checks as soon as the ditch is cut.

6. Bale Filter Dikes: Bale filter dikes shall be installed a few feet (meters) from the toe of a slope to filter and/or divert sediment to an appropriate control before it enters a water body on or off the project limits.

It is used to collect sediment for a maximum of:

- a) less than 1/4 acre [1,000 m<sup>2</sup>] without an outlet
- b) slope length of less than 100 feet [30 m] at a maximum slope of 2:1.
- c) use outlet or pit every 100 feet [30 m] for a 2:1 slope. Use a greater spacing for flatter slopes.

Bale filter dikes shall be constructed in accordance with Standard Drawing DM- 4.3. When filter fabric is used for the bale filter dike, the location is accordance with Standard Drawing DM-4.3 and the construction details shown in Standard Drawing DM-4.4 are used.

The Contractor shall construct the bale filter dikes concurrent with the grubbing operations.

7. Sediment Dams or Basins: Basins and dams are placed and used at concentrated and critical flow locations to settle sediment out before leaving the project. Use basins at the bottom of a ravine, at a culvert inlet or outlet, along or at the end of the ditch and at any concentrated sediment exit point of the project. Use a basin quantity of 67 cubic yards for every acre of drainage area (125 m<sup>3</sup> per 10,000 m<sup>2</sup>).

The Contractor shall construct sediment dams and basins at the first step of grading and within 7 days of commencing grubbing operations.

8. River, Stream and Water Body Protection: Protect all streams or water bodies passing through or on the project. Use filter fabric or bale filter dikes to line the water edges. Divert project sediment flow by using dike and slope protection. A combination of the above or other control features can be used.

The Contractor shall construct the above features concurrent with the grubbing operations.

a) Stream Relocation: Fully stabilize the new stream channel prior to diverting flow into the new channel.

b) Stream and River Crossing: Provide a means for construction equipment to cross water courses without causing erosion of streambanks or deposits in the channel. Plan and locate crossings well in advance of needing them. Disturbance to water bodies shall be kept to a minimum. Crossings shall be kept to a minimum and as narrow as practical. Crossings shall be made in shallow areas rather than deep pools where possible. Clearing, grubbing and excavation of streambanks, bed and approach sections shall be kept to a minimum.

The provisions for conveyance shall anticipate high flows and shall not impede the movement of aquatic life.

If culverts are used, the following minimums shall apply: Place culverts on the existing stream bed to avoid a drop in waterfall at the downstream end of the pipe. Culvert diameter shall be at least three times the depth of normal stream flow at the point of the crossing. The minimum size culvert to be used shall be 18 inches [0.5m]. There shall be sufficient number of culverts to completely cross the channel from stream bank to stream bank with no more than 12 inches [0.3m] between each culvert.

All fill and surface material placed in the channel, around the culverts or on the surface of the crossing shall be clean non toxic dump rock fill Type B, C, or D. Extend placed rock up slope from original stream bank to catch and remove erodible material from equipment.

Aggregate used does not need to be removed. Care should be taken to avoid any impoundment or restriction to fish passage. All pipes must be removed upon project completion.

The stream crossing work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract bid prices for the items to which they apply.

When the normal water elevation is shown on the plan, the Contractor shall construct crossings to accommodate a water elevation at least one foot (0.3m) above the stated normal water elevation. Fording in accordance with 107.21 is not allowed.

**877.04 Maintenance.** Temporary erosion control features shall be properly maintained.

The Contractor shall maintain these items with the concurrence of the Engineer. When the Contractor properly places the erosion control items in the contract in accordance with the contract documents, then the Department will pay for the additional cost to maintain or replace these items of work by the unit bid prices, agreed unit prices or by 109.04. Silt removed from erosion control features shall be disposed of in accordance with 203.05.

The Engineer or appointed inspector will check the temporary and permanent erosion control features every 7 days or within 24 hours of any rainfall of more than ½-inch (10 mm).

(A) Temporary Perimeter, Ditch Checks, Inlet Protection Filter Fabric Fence, Dikes and Bale Filter Dikes. Trapped sediment shall be removed and cleaned when it reaches half the height of the lowest section. The Contractor shall make the appropriate corrections when the above fail or become non functional. The Contractor shall maintain the items until the up slope permanent grass coverage is 70 percent or better. The Contractor shall remove the items when the up slope permanent grass coverage is 70 percent or better.

(B) Temporary and Permanent Seed: The seed bed shall be thoroughly watered in accordance with the requirements of Item 659. The quantity of water will be measured and paid for as Item 659 water. Seeded areas shall be maintained until 70 percent or better cover is established. Temporary seeded areas shall be mowed and paid for in accordance with Item 659.

(C) Sediment Dams and Basins: Deposited sediment shall be removed when the initial volume has been reduced one-half. The Contractor shall make the appropriate corrections when these items fail or non functional. The Contractor shall remove the dams and basins when the permanent seed and mulch is placed on the entire project.

**877.05 Performance.** The Contractor shall install additional erosion control features, make adjustments to meet the field conditions, anticipated future work or corrections based on the weekly storm water inspections with the concurrence of the Engineer. The type and quantity will be paid by the unit bid prices, agreed unit prices or by 109.04.

In the event that the Contractor or its agents refuse or fail to adhere to the requirements of the 404 Permit, the 401 Water Quality Certification and/or the NPDES Storm Water Permit and as a result an assessment or fine is made or levied against the Ohio Department of Transportation, the Contractor shall reimburse the Department within ten (10) calendar days of the assessment or fine or the Department may withhold the amount of the fine from the Contractor's next pay estimate and deliver that sum to the permitting agencies issuing the assessment or fine.

These fines are not to be construed as a penalty but are liquidated damages to recover costs assessed against the Department due to the Contractor's refusal or failure to comply with the permit requirements.

If proper sediment and erosion controls are not being provided by the Contractor, progress estimates shall be withheld until proper controls are placed.

All temporary erosion control items shall be removed before the project is accepted. Removed materials shall become the property of the Contractor and shall be disposed of in accordance with Item 203.

**877.06 Method of Measurement.** Temporary erosion and sediment control work, completed and accepted, will be measured as follows:

- (A) All fertilized areas will be measured and paid for as Item 659 Commercial Fertilizer.
- (B) Temporary seeding and mulching will be measured by the square yard (square meter) of seeded and mulched area completed in accordance with these specifications.
- (C) Temporary slope drains will be measured by the linear foot (meter) complete in place.
- (D) Temporary Perimeter, Inlet Protection, Ditch Check, Filter Fabric Fence will be measured per linear foot (meter) in place. Bale filter dike will be paid under temporary perimeter fabric fence.
- (E) Rock required will be paid for under Item 601 Rock Channel Protection, Type C or D with or without filter.
- (F) Temporary sediment dams, and basins will be measured by the cubic yard (cubic meter) of excavation and embankment complete in place.
- (G) Temporary dikes will be measured by the cubic yard(cubic meter), of excavation and embankment complete in place.
- (H) Temporary slope or ditch protection will be measured by the square yard (square meter), complete in place.
- (I) Sediment Removal will be measured in cubic yards(cubic meters) completed in place. The sediment removed from dams, basins, inlet protection, ditch checks, perimeter filter fabric, bale filter dikes and all other types of filter fabrics, straw or hay bales or any other temporary sediment control items will be paid under this item.

In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, such temporary work shall be performed by the Contractor at his expense.

**877.07 Basis of Payment:** Accepted quantities of temporary sediment and erosion control

work placed and measured as provided above, will be paid for under:

Item	Unit	Description
877	Square yard (square meter)	Temporary seeding and mulching
877	Linear foot (meter)	Temporary slope drains
877	Cubic yard (cubic meter)	Temporary sediment basins and dams
877	Linear foot (meter)	Temporary perimeter, ditch check or inlet protection filter fabric fence
877	Linear foot (meter)	Temporary perimeter filter fabric fence
877	Linear foot (meter)	Temporary ditch check filter fabric fence
877	Linear foot (meter)	Temporary inlet protection filter fabric fence
877	Cubic yard (cubic meter)	Temporary dikes
877	Square yard (square meter)	Temporary ditch protection
877	Square yard (square meter)	Temporary slope protection
877	Cubic yard (cubic meter)	Sediment removal

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 899

CONCRETE - GENERAL

October 21, 1998

899.01	<b>Description</b>
899.02	<b>Materials</b>
899.03	<b>Proportioning</b>
899.04	<b>Proportioning Options</b>
899.05	<b>Additional Classes of Concrete for Rigid Replacement</b>
899.06	<b>Equipment</b>
899.07	<b>Handling, Measuring, and Batching Materials</b>
899.08	<b>Batch Plant Tickets</b>
899.09	<b>Mixing Concrete</b>

**899.01 Description.** This work shall consist of proportioning and mixing portland cement concrete.

**899.02 Materials.** Materials shall be:

Fine aggregate*	703.02
Fly ash	705.13
Coarse aggregate	703.02, 703.13***
Portland cement	701.01, 701.02, 701.03
	701.04, 701.05****
Ground granulated blast furnace slag	ASTM C 989, grade 100 or 120
Air entraining admixture.	705.10
Chemical admixture for concrete.	705.12**

\*703.02 natural sand is required in 255, 451, 452, 453, 611, and 511 deck slabs.

\*\*Admixtures shall contain no more than 50 parts per million chloride ions by weight of cement.

\*\*\* Applies only to 451, 452 and 453.

\*\*\*\* Use of Slag-Modified Portland Cement meeting ASTM C 595M, Type I(SM) is permitted; acceptance shall be in accordance with 701 and Supplement 1028. Type I(SM) may be used only between April 1 to October 1, and when 705.10 Air-Entraining Admixture is added at the mixer. Type I(SM) may not be used with Options 1 and 3.

Water used in concrete shall be free from sewage, oil, acid, strong alkalis or vegetable matter, and also shall be free from clay and loam. Water which is potable is satisfactory for use in concrete.

**899.03 Proportioning.** Proportioning shall be based on pre-determined cement content. Except as otherwise provided herein, each cubic yard (cubic meter) of concrete shall contain the specified weight of cement as determined by the yield calculation. The yield shall be within  $\pm 1$  percent of the theoretical yield of 27.00 cubic feet (1 m<sup>3</sup>). The water-cement ratio shall not exceed the maximum specified. Below this limit, the quantity of water shall be adjusted to meet the slump requirements.

Concrete shall contain  $6 \pm 2$  percent of total air, except as noted herein.

Slump shall be maintained within the range shown as nominal slump in the following table. No concrete shall be used in the work that has a slump greater than that shown as maximum in the table. When the slump is found to exceed the limit of nominal slump but is within the maximum limit, occasional loads of concrete may be used, provided an immediate adjustment is made in the mixture to reduce the slump of succeeding loads to within the nominal range shown.

Type of Work	Nom. Slump inch (mm)*	Max. Slump inch (mm)**
Concrete pavement (305, 451, 452, 453, 611, 615)	1-3 (25-75)	4 (100)
Structural Concrete (511, 610, 622)	1-4 (25-100)	5 (125)
Superstructure concrete (511)	2-4 (50-100)	4 (100)
Non-reinforced concrete (601, 602, 603, 604, 608, 609, 612, 622)	1-4 (25-100)	5 (125)

\*This slump may be increased to 6 inches (150 mm) provided the increase is achieved by the addition of a chemical admixture meeting the requirements of 705.12, Type F or G.

\*\*This slump may be increased to 7 inches (180 mm) provided the increase is achieved by the addition of a chemical admixture meeting the requirements of 705.12, Type F or G.

Tests on the plastic concrete for pavement shall be made at the paving site or at a location designated by the Engineer. Tests for structure concrete shall be made at the site of the work at the point of placement.

The weights of fine and coarse aggregate shall be determined by the Engineer from the weights given in the Concrete Table. If high early strength concrete is specified, the Contractor may use high-early strength cement, additional cement, approved chemical admixtures, or a combination of these materials to achieve a modulus of rupture of 600 psi (4.2 MPa) in three days or less. If high-early-strength concrete is not specified, but is desirable to expedite the work, the Contractor may use these same materials at no additional cost to the state.

The weights specified in the Concrete Table were calculated for aggregates of the following bulk specific gravities: natural sand and gravel 2.62, limestone sand 2.68, limestone 2.65, and slag 2.30. The assumed specific gravities of fly ash and ground granulated blast furnace slag are 2.30 and 2.90, respectively. For aggregates of specific gravities differing more than plus or minus 0.02 from these, the weights in the table shall be corrected as indicated in paragraph (c).

**CONCRETE TABLE**  
Quantities Per Cubic Yard (Meter)

Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	Water-Cement Ratio Maximum
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)		
CLASS C (Using No. 57 or No. 67 Size)					
Gravel	1160 (688)	1735 (1029)	2895 (1717)	600 (356)	0.5
Limestone	1285 (762)	1630 (967)	2915 (1729)	600 (356)	0.5
Slag	1350 (801)	1360 (807)	2710 (1608)	600 (356)	0.5
CLASS F (Using No. 57 or No. 67 Size)					
Gravel	1270 (753)	1810 (1074)	3080 (1827)	470 (288)	0.55
Limestone	1345 (798)	1730 (1026)	3075 (1824)	470 (288)	0.55
Slag	1380 (819)	1470 (872)	2850 (1691)	470 (288)	0.55
CLASS S (Using No. 57 or No. 67 Size)					
Gravel	1125 (667)	1735 (1029)	2860 (1697)	715 (424)	0.44
Limestone	1260 (747)	1530 (908)	2790 (1655)	715 (424)	0.44
Slag	1280 (759)	1370 (813)	2650 (1572)	715 (424)	0.44

On projects specifying 451, 452, or 453, the following requirements shall apply. If No. 57 or 67 Size is approved, the quantities per cubic yard (cubic meter) will be in accordance with the above concrete table. If sizes No. 7, 78, or 8 are approved, the concrete shall contain 8 plus or minus 2 percent air, and the quantities will be in accordance with the following table:

Quantities Per Cubic Yard (Meter)						
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	Water-Cement Ratio Maximum	
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)			
CLASS C (Using No. 7, 78, or No. 8 Size)						
Gravel	1320(783)	1460(866)	2780(1649)	600(356)	0.5	
Limestone	1380(819)	1410(837)	2790(1656)	600(356)	0.5	

At any time during the construction period, the relative weights of fine and coarse aggregate as determined from the above table may be varied by the Engineer in order to insure a workable mix within the slump range and to control the yield. However, the total weight of aggregate per cubic yard (cubic meter) shall not be changed except as provided in the preceding paragraph as for the following conditions or both.

(a) For batch weights, the weights determined as described above shall be corrected to compensate for moisture contained in the aggregates at the time of use.

(b) If it is found impossible to prepare concrete of the proper consistency without exceeding the maximum water/cement ratio specified, a water reducing admixture conforming to requirements of 705.12 shall be used or the cement content shall be increased. However, the Contractor shall not be compensated for the admixture or additional cement which may be required by reason of such adjustment.

(c) If, during the progress of the work, the specific gravity of one or both of the aggregates changes, the batch weight shall be adjusted to conform to the new specific gravity.

(d) Unit weight determinations shall be made and the yield shall be calculated and maintained in accordance with ASTM C 138. Based on these determinations, the batch weights will be adjusted when necessary. However, the specified cement content shall be maintained within a tolerance of ± 1 percent and the maximum water-cement ratio shall not be exceeded.

(e) The amount of mixing water shall be adjusted for the moisture contained in the aggregate and for the moisture which they will absorb, in order to determine the amount of water to be added at the mixer.

(f) An approved set retarding admixture meeting the requirements of 705.12, Type B or Type D shall be required for concrete when the concrete temperature exceeds a nominal temperature of 75° F (24° C).

**899.04 Proportioning Options.** The Contractor may substitute one of the following options for all concrete items: The dry weights specified in these tables were calculated using the same specific gravities used in 899.03. The specific gravity used for ground granulated blast furnace (GGBF) slag is 2.90. Adjustments shall be made to the mix design due to specific gravities differing by more than 0.02. Other adjustments may be made as allowed in 899.03 and approved by the Engineer.

The requirements for Proportioning Option 1 are as follows. The cement content may be reduced as much as 15 per cent by weight with the substitution of an equivalent weight of fly ash meeting the requirements of 705.13. The water/cement ratio shall be based on the combined weight of cement and fly ash. Proportioning Option 1 shall meet the following Mix Design Concrete Table:

Quantities Per Cubic Yard (Cubic Meter)						
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	Fly Ash lb (kg)	Water-CM Ratio Maximum
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)			
CLASS C Option 1 (Using No. 57 or No. 67 Size)						
Gravel	1140(676)	1700(1009)	2840(1685)	510(303)	90(53)	0.50
Limestone	1260(748)	1595(946)	2855(1694)	510(303)	90(53)	0.50
Slag	1320(783)	1330(789)	2650(1572)	510(303)	90(53)	0.50
CLASS F Option 1 (Using No. 57 or No. 67 Size)						
Gravel	1260(748)	1800(1068)	3060(1815)	400(237)	70(42)	0.55
Limestone	1350(801)	1730(1026)	3080(1827)	400(237)	70(42)	0.55
Slag	1380(819)	1475(875)	2855(1694)	400(237)	70(42)	0.55
CLASS S Option 1 (Using No. 57 or No. 67 Size)						
Gravel	1060(629)	1640(973)	2700(1602)	608(361)	107(63)	0.44
Limestone	1230(730)	1490(884)	2720(1614)	608(361)	107(63)	0.44
Slag	1220(724)	1300(771)	2520(1495)	608(361)	107(63)	0.44

CLASS C Option 1 (Using No. 7, 78 or 8 Size)						
Gravel	1310(777)	1440(854)	2750(1631)	510(303)	90(53)	0.50
Limestone	1350(801)	1410(837)	2760(1638)	510(303)	90(53)	0.50

The requirements for Proportioning Option 2 are as follows. The cement content may be reduced as much as 50 pounds per cubic yard (30 kg/m<sup>3</sup>), with the substitution of an equivalent volume of aggregate, provided the Contractor uses an approved water reducing admixture meeting the requirements of 705.12; Type A or Type D. Proportioning Option 2 shall meet the following Mix Design Concrete Table:

Quantities Per Cubic Yard (Cubic Meter)						
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	Water-Cement Ratio Maximum	
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)			
CLASS C Option 2 (Using No. 57 or No. 67 Size)						
Gravel	1190(706)	1785(1059)	2975(1765)	550(326)	0.50	
Limestone	1320(783)	1675(994)	2995(1777)	550(326)	0.50	
Slag	1385(822)	1395(828)	2780(1649)	550(326)	0.50	
CLASS F Option 2 (Using No. 57 or No. 67 Size)						
Gravel	1315(780)	1880(1115)	3195(1896)	420(249)	0.55	
Limestone	1410(837)	1810(1074)	3220(1910)	420(249)	0.55	
Slag	1445(857)	1540(914)	2985(1771)	420(249)	0.55	
CLASS S Option 2 (Using No. 57 or No. 67 Size)						
Gravel	1120(664)	1710(1015)	2830(1679)	665(395)	0.44	
Limestone	1290(765)	1560(926)	2850(1691)	665(395)	0.44	
Slag	1270(753)	1370(813)	2640(1566)	665(395)	0.44	

CLASS C Option 2 (Using No. 7, 78 or No. 8 Size)						
Gravel	1370(813)	1510(896)	2880(1709)	550(326)	0.50	
Limestone	1420(842)	1480(878)	2900(1720)	550(326)	0.50	

The requirements for Proportioning Option 3 are as follows. The Portland cement content may be reduced as much as 50 pounds per cubic yard (30 kg/m<sup>3</sup>) with the substitution of an equivalent volume of aggregate, provided the Contractor uses an approved water-reducing admixture meeting the requirements of 705.12, Type A or D. The cementitious materials content shall consist of a combination, by weight, of a minimum of 70 percent Type I or Type IA Portland cement (701.04 or 701.01), and a maximum of 30 percent ground granulated blast furnace slag, ASTM C 989, grade 100 or 120. Proportioning Option 3 shall meet the following Mix Design Concrete Table:

Quantities Per Cubic Yard (Cubic Meter)						
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	GGBF Slag lb (kg)	Water-CM Ratio Maximum
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)			
CLASS C Option 3 (Using No. 57 or No. 67 Size)						
Gravel	1185(703)	1775(1053)	2960(1756)	385(228)	165(98)	0.50
Limestone	1310(777)	1670(991)	2980(1768)	385(228)	165(98)	0.50
Slag	1385(822)	1385(822)	2770(1644)	385(228)	165(98)	0.50
CLASS F Option 3 (Using No. 57 or No. 67 Size)						
Gravel	1320(783)	1870(1109)	3190(1892)	294(174)	126(75)	0.55
Limestone	1400(831)	1810(1074)	3210(1905)	294(174)	126(75)	0.55
Slag	1440(854)	1535(911)	2975(1765)	294(174)	126(75)	0.55

CLASS S Option 3 (Using No. 57 or No. 67 Size)

Gravel	1105(656)	1715(1017)	2820(1673)	465(276)	200(119)	0.44
Limestone	1280(759)	1555(923)	2835(1682)	465(276)	200(119)	0.44
Slag	1270(753)	1360(807)	2630(1560)	465(276)	200(119)	0.44

CLASS C Option 3 (Using No. 7, 78 or No. 8 Size)

Gravel	1370(813)	1500(890)	2870(1703)	385(228)	165(98)	0.50
Limestone	1410(837)	1480(878)	2890(1715)	385(228)	165(98)	0.50

GGBF = ground granulated blast furnace slag; CM = cementitious material.

The use of coarse aggregate in Portland cement concrete pavements is restricted by 703.13, as modified by the proposal.

Approval of Optional Mix Designs. A request to use any option design must be submitted to the Engineer for approval.

All admixtures used in the concrete mixture must be compatible and shall be dispensed in accordance with the manufacturer's recommendations.

If Portland cement with fly ash as an additive is used as described under Option 1 or ground granulated blast furnace slag is used under Option 3, the mix design shall be used only between April 1 and October 15, unless otherwise authorized by the Director. If Option 1 is used, an approved set retarding admixture meeting the requirements of 705.12, Type B or Type D shall be used if the concrete temperature exceeds a nominal temperature of 75° F (24° C). If Option 2 or 3 is used, an approved water reducing set retarding admixture meeting the requirements of 705.12, Type D shall be used if the concrete temperature exceeds a nominal temperature of 75° F (24° C).

The proportioning adjustments under Options 1, 2 or 3 shall be the responsibility of the Contractor, and shall be in accordance with the ACI Standard "Recommended Practice for Selecting Proportions for Normal Weight Concrete" (ACI 211.1). The proportioning shall be based on developing an average compressive strength at 28 days of 4000 psi (28.0 MPa) for Class C, 3000 psi (21.0 MPa) for Class F or 4500 psi (31.0 MPa) for Class S.

Optional mixes are not permitted with concrete bridge deck overlays using microsilica. For mixes used in latex modified and superplasticized dense concrete bridge deck overlays (Supplemental Specifications 847 and 848), and using Option 1 and 2, certified test data shall be provided for all requirements in accordance with Supplement 1045. Option 3 may not be used with concrete bridge deck overlays (Supplemental Specifications 847 and 848). The testing for Absorption, Scaling Resistance, and Volume Change will not be required for mixes used in dense concrete bridge deck overlays.

Only one source of fly ash shall be used in any one structure unless otherwise authorized by the Director. Bulk fly ash shall be stored in waterproof bins.

No option mixes shall be permitted in concrete mixes designed or intended to obtain high early strength.

**899.05 Additional Classes of Concrete for Rigid Replacement.**

*Class FS.* This mixture is a fast-setting Portland cement concrete for accelerated setting and strength development. The minimum cement content shall be 900 pounds per cubic yard (534 kg/m<sup>3</sup>) and the maximum water-cement ratio shall be 0.40. The rigid replacement may be opened to traffic after four hours provided test beams have attained a modulus of rupture of 400 psi (2.8 MPa).

The concrete shall be kept plastic by means of a Type B or D admixture until the surface has been textured. The Type B or D admixture shall be used in accordance with the manufacturer's recommendations.

Calcium chloride shall be added and mixed with each batch of concrete just prior to placement. If calcium chloride with 94-97 percent purity is used, the addition rate shall be 1.6 percent by weight of the cement. If calcium chloride with 70-80 percent purity is used, the addition rate shall be 2.0 percent by weight of the cement. When calcium chloride in a water solution is used, the water used shall be considered as part of the concrete mixing water and appropriate adjustments shall be made for its inclusion in the total concrete mixture.

Any other approved accelerating admixture may be used at the rate recommended by the manufacturer, provided it will produce the required strength in the allotted time.

Immediately after the curing compound has been applied, the replacements shall be

covered with polyethylene sheeting and further covered with building board as specified in ASTM C 208. The building board shall be wrapped in a black polyethylene sheeting and placed tight against the surrounding concrete and weighted down to protect the fresh concrete from the weather.

*Class MS.* This mixture is a moderate-setting portland cement concrete for accelerated strength development. The rigid replacement may be opened to traffic after 24 hours provided test beams have attained a modulus of rupture of 400 psi (2.8 MPa). The minimum cement content shall be 800 pounds per cubic yard (475 kg/m<sup>3</sup>) and the maximum water-cement ratio shall be 0.43.

The proportioning of the concrete materials to meet the requirements of each class of rigid replacement concrete specified shall be the responsibility of the Contractor. The coarse aggregate may be any one of the following sizes: No. 57, No. 6, No. 67, or No. 8. When No. 8 size is used, the entrained air content shall be 8 ±2 percent. Otherwise, the entrained air content shall be 6 ±2 percent.

The Engineer's approval of the concrete mix design will be based on the Contractor's submitted proportions and the foregoing information.

**899.06 Equipment.** Equipment shall be as follows:

(a) *Batching Plants.* Each plant shall be constructed and operated so that no intermingling of materials occurs prior to batching. The plant shall have weighing mechanisms which provide either a visible means of checking weights or a printed record. Dispensing mechanisms for water and admixtures shall have a visible means of checking quantities or shall produce a printed record.

Weighing mechanisms used for cement and aggregates shall weigh to an accuracy such that the weight indicated on the scale or printed ticket is within ± 0.5 percent of the correct weight. Devices for weighing or metering water shall measure to an accuracy of ± 1.0 percent throughout the range used.

All weighing and metering devices shall have been checked and their accuracy attested to within the 12-month period immediately prior to their use. This service may be performed by the Sealer of Weights and Measures or a scale servicing company. In lieu of the preceding requirements, the concrete batch facilities may be approved if a Certificate of Performance has been issued by the National Ready Mixed Concrete Association.

To reach a capacity of 500 pounds (227 kg), ten standard test weights or the services of a scale servicing company shall be readily available for testing the weighing devices at the batch plant. All weights used in testing the weighing devices shall be sealed every 3 years by the Ohio Department of Agriculture.

Weighing and dispensing devices shall be tested as often as the Engineer may deem necessary to assure their continued accuracy.

(b) *Mixers.* Mixers and agitators shall conform to paragraphs 10, 11.2, 11.5 and 11.6 of AASHTO M 157, except that mechanical counters are permitted.

When a truck mixer is used for complete mixing, each batch of concrete shall be mixed for not less than 70 revolutions of the drum or blades at the rate of rotation designated on the metal plate on the mixer as mixing speed.

Bodies of nonagitating hauling equipment for concrete shall be smooth, mortartight, metal containers and shall be capable of discharging the concrete at a satisfactory controlled rate without segregation. Covers shall be provided when required by the Engineer. Trucks having dump bodies with rounded corners and no internal ribs or projections will be permitted for nonagitating hauling.

**899.07 Handling, Measuring and Batching Materials.** Aggregates from different sources and of different gradings shall not be stockpiled together. Aggregates that have become segregated, or mixed with earth or foreign material, shall be reworked or cleaned as directed by the Engineer, or rejected. Coarse aggregate shall be maintained with a uniform moisture content.

The fine aggregate and coarse aggregate shall be separately weighed in the respective amounts set by the Engineer as outlined in 899.03. Separate weighing devices shall be used for weighing the cement.

Batching shall be so conducted as to result in the weights of each material required within a tolerance of ± 1.0 percent for cement and ± 2.0 percent for aggregates. Water shall be measured by weight or volume to within a tolerance of ± 1.0 percent. Admixtures shall be dispensed to within ± 3.0 percent of the desired amount.

Methods and equipment for adding air-entraining agent or other admixture into the batch, when required, shall be approved by the Engineer.

**899.08 Concrete Batch Plant Tickets.** The Contractor shall furnish the Engineer a concrete batch

plant ticket for each load of concrete delivered for use on the project. Batch tickets may be computer-generated, handwritten, or a combination. The ticket shall include, at a minimum, the information listed in Table I:

TABLE I - EVERY BATCH TICKET	
Name of ready-mix batch plant	
Batch Plant No	
Batch Plant Location	
Serial number of ticket	
Date	
Truck Number	
Class of Concrete	
JMF#	
Time the load was batched	
Size of Batch [cu yd (cu m)]	
Actual weights of cementitious material:	
Cement [lbs(kg)]	
Fly ash [lbs(kg)]	
Ground granulated blast furnace slag [lbs(kg)]	
Micro-silica [lbs(kg)]	
Other	
Actual weights of aggregates:	
Coarse [lbs(kg)]	
Fine [lbs(kg)]	
Other	
Actual weight of water [lbs(kg)]	
Actual volume of admixtures:	
Air entrainer [fl. oz. (mL)]	
Superplasticizer [fl. oz. (mL)]	
Water reducer [fl. oz. (mL)]	
Retarder [fl. oz. (mL)]	
Other	
Aggregate moisture contents (%):	
Coarse Aggregate	
Fine Aggregate	
Water Cement Ratio, leaving the plant	

Batch tickets for each day's first load of concrete, for each JMF, shall also include the information in Table II below. The Table II information may be either included on the batch ticket or furnished on a separate form. The separate form may be computer-generated or handwritten, but the form must be physically attached to the batch ticket.

If during the concrete manufacturing process any of the information listed in Table II changes, the information in Table II shall be resubmitted with the first concrete batch ticket supplied with the changed concrete.

TABLE II - FIRST TICKET EACH DAY, EACH JMF	
Cementitious Sources and Grade or Type:	
Cement	
Micro - Silica	
Ground granulated Blast Furnace slag	
Fly Ash	
Other	
Admixtures - Brand and Type:	
Air entrainer	
Retarder	
Water reducer	
Superplasticizer	
Other	

Concrete batch ticket information conforms to ASTM C 94, section 13.

Supporting data may be required by the Engineer to validate the basis for the furnished aggregate moisture contents.

Cost for generating and supplying the information and the concrete batch tickets shall be included in the individual concrete items.

**899.09 Mixing Concrete.** The concrete may be mixed in a central mix plant or in truck mixers. The mixer shall be of an approved type.

When mixed in central mixers, the mixing time shall not be less than 60 seconds. Mixing time begins when all materials are in the drum and ends when the discharge begins. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

Ready-mixed concrete shall be mixed and delivered in accordance with 899.04(b). Mixed concrete from the central mixers shall be transported in truck mixers, truck agitators, or trucks having nonagitating bodies. The concrete shall be delivered to the site of the work and discharge shall be completed within one hour after the combining of the water and the cement. If an approved set-retarding (705.12, Type B) or a water-reducing and set-retarding (705.12, Type D or G) admixture is used at the Contractor's expense, discharge shall be completed within 90 minutes after the combining of the water and the cement.

When concrete is delivered in transit mixers or agitators, additional water within the limits specified may be added and sufficient mixing performed to adjust the slump and to regenerate the specified air content throughout the batch, provided all these operations are performed prior to discharging any of the batch and within the above time limitations. When making these adjustments, the concrete shall be mixed a minimum of 30 revolutions at mixing speed.

Retempering after the start of discharge is permitted by the use of approved admixtures (705.12, Type F or G) when approved by the Engineer.

Admixtures containing more than 50 parts per million chloride by weight of cement will be permitted only when provided for in the contract, or upon written permission of the Director.

The procedure for making and testing of concrete beams shall be in accordance with the requirements of Supplement 1023 on file in the Office of the Director.

When mixed, all concrete shall have a temperature of not more than 90° F (32° C), and the concrete shall be maintained under this temperature until deposited in the work.

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 904  
STANDARDIZATION OF 499.031  
CONCRETE PROPORTIONING OPTIONS**

May 5, 1998

**904.01 Description**

**904.02 Option 1 Mix Design Concrete Table**

**904.03 Option 2 Mix Design Concrete Table**

**904.04 Option 3 Mix Design Concrete Table**

**904.05 Approval**

**904.01 Description.** This specification supercedes the *Construction & Material Specification* 499.031 requirement of submitting option mix designs and certified test data for approval. Tables have been developed to standardize the 499.031 option mix designs and therefore submittal of the certified test data is no longer required when using these tables. All other requirements of 499.031 apply.

The dry weights specified in these tables were calculated using the same specific gravities used in 499.03. The specific gravity used for ground granulated blast furnace (GGBF) slag is 2.90. Adjustments shall be made to the mix design due to specific gravities differing by more than 0.02. Other adjustments may be made as allowed in 499.03 and approved by the Engineer.

**904.02 Option 1 Mix Design Concrete Table: Quantities Per Cubic Meter (Cubic Yard).**

	Fine Agg. kg (lb)	Coarse Agg. kg (lb)	Total kg (lb)	Cement kg (lb)	Fly Ash kg (lb)	W/C Ratio
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Class C Option 1(Using No. 57 or No. 67 size):

GR	676 (1140)	1009 (1700)	1685 (2840)	303 (510)	53 (90)	0.50
LS	748 (1260)	946 (1595)	1694 (2855)	303 (510)	53 (90)	0.50
SLG	783 (1320)	789 (1330)	1572 (2650)	303 (510)	53 (90)	0.50

Class F Option 1(Using No. 57 or No. 67 size):

GR	748 (1260)	1068 (1800)	1815 (3060)	237 (400)	42 (70)	0.55
LS	801 (1350)	1026 (1730)	1827 (3080)	237 (400)	42 (70)	0.55
SLG	819 (1380)	875 (1475)	1694 (2855)	237 (400)	42 (70)	0.55

Class S Option 1 (Using No. 57 or No. 67 size):

GR	629 (1060)	973 (1640)	1602 (2700)	361 (608)	63 (107)	0.44
LS	730 (1230)	884 (1490)	1614 (2720)	361 (608)	63 (107)	0.44
SLG	724 (1220)	771 (1300)	1495 (2520)	361 (608)	63 (107)	0.44

**904.03 Option 2 Mix Design Concrete Table: Quantities Per Cubic Meter (Cubic Yard).**

	Fine Agg. kg (lb)	Coarse Agg. kg (lb)	Total kg (lb)	Cement kg (lb)	W/CM Ratio
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Class C Option 2 (Using No. 57 or No. 67 size):

GR	706 (1190)	1059 (1785)	1765 (2975)	326 (550)	0.50
LS	783 (1320)	994 (1675)	1777 (2995)	326 (550)	0.50
SLG	822 (1385)	828 (1395)	1649 (2780)	326 (550)	0.50

Class F Option 2 (Using No. 57 or No. 67 size):

GR	780 (1315)	1115 (1880)	1896 (3195)	249 (420)	0.55
LS	837 (1410)	1074 (1810)	1910 (3220)	249 (420)	0.55
SLG	857 (1445)	914 (1540)	1771 (2985)	249 (420)	0.55

Class S Option 2 (Using No. 57 or No. 67 size):

GR	664 (1120)	1015 (1710)	1679 (2830)	395 (665)	0.44
LS	765 (1290)	926 (1560)	1691 (2850)	395 (665)	0.44
SLG	753 (1270)	813 (1370)	1566 (2640)	395 (665)	0.44

**904.04 Option 3 Mix Design Concrete Table: Quantities Per Cubic Meter (Cubic Yard).**

	Fine Agg. kg (lb)	Coarse Agg. kg (lb)	Total kg (lb)	Cement kg (lb)	GGBF Slag kg (lb)	W/CM Ratio
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Class C Option 3 (Using No. 57 or No. 67 size):

GR	703 (1185)	1053 (1775)	1756 (2960)	228 (385)	98 (165)	0.50
LS	777 (1310)	991 (1670)	1768 (2980)	228 (385)	98 (165)	0.50
SLG	822 (1385)	822 (1385)	1644 (2770)	228 (385)	98 (165)	0.50

Class F Option 3 (Using No. 57 or No. 67 size):

GR	783 (1320)	1109 (1870)	1892 (3190)	174 (294)	75 (126)	0.55
LS	831 (1400)	1074 (1810)	1905 (3210)	174 (294)	75 (126)	0.55
SLG	854 (1440)	911 (1535)	1765 (2975)	174 (294)	75 (126)	0.55

Class S Option 3 (Using No. 57 or No. 67 size):

GR	656 (1105)	1017 (1715)	1673 (2820)	276 (465)	119 (200)	0.44
LS	759 (1280)	923 (1555)	1682 (2835)	276 (465)	119 (200)	0.44
SLG	753 (1270)	807 (1360)	1560 (2630)	276 (465)	119 (200)	0.44

GR = Gravel; LS = Limestone; SLG = Slag; W/C = Maximum water-cement ratio; GGBF = Ground granulated blast furnace slag; CM = Cementitious material..

**904.05 Approval.** All usage and date limitations in 499.031 shall apply. A request to use any option design must be submitted to the Engineer for approval.

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 905  
OPEN HEARTH AND BASIC OXYGEN FURNACE STEEL SLAG AGGREGATE  
USED FOR ITEMS 203, 304, 306, 307, 410, 411, 617, 503 OR 603**

**April 1, 1998**

Open Hearth (OH) or Basic Oxygen Furnace (BOF) slag shall not be used for Aggregate or Soil for Item 603 Bedding or Backfill, for Items 306 Cement Treated Free Draining Base or 307 Non-Stabilized Drainage Base, Item 503.10 Backfill; or under, around or within 15 meters (50 feet) of any structure.

OH and BOF slag may be used in Item 203 Embankment, as defined in 203.02, if the OH or BOF slag is blended in a 3:1 mixture (3 parts natural soil and 1 part OH or BOF slag). The 3:1 mixture shall be placed at least 0.3m (1.0 ft) below the flow line of the underdrains or other drainage items susceptible to runoff as per 203.08. Aging and stock piling requirements of this specification are required.

OH and BOF slag may be used for surface course applications in Items 617, 410 and 411, if the OH and BOF slag meets the above specifications, and meets the aging and stock piling, deleterious substances, and crushing requirements of this specification.

BOF slag shall not be allowed for non-surface course applications in Items 304, 410, 411 or 617.

Recycled OH or BOF slag from Department or non-Department projects may be used in Item 203, or surface course applications in Items 617, 410 or 411, if the material meets the requirements of this specification.

OH slag may be used for Item 304 and for a non-surface course application in Items 617, 410 and 411, if the OH slag meets the above specifications and all the additions and deletions listed below;

Recycled OH or BOF slag from Department or non-Department projects shall not be allowed.

Deleterious substances (soft pieces) shall include soft lime, lime oxide or magnesia agglomerations or any foreign materials prone to rapid disintegration under construction processing and weathering conditions.

Deleterious substances (soft pieces) in accordance with Supplement 1029 (hand crushing of soft pieces) shall be less than 3 percent by weight.

Material passing the 75  $\mu$ m(200 sieve) shall be less than 10 percent by weight.

No crushing of OH or BOF slag shall be allowed.

Identification of OH Slag. Clear, definitive and undisputable identification of the OH slag is required for OH slag used for Item 304 or for a non-surface course application in Items 617, 410 or 411.

The producer shall show the Department evidence that the material supplied is open hearth slag. This information shall consist of but not be limited to the following:

Steel producer, production dates, production rates, stockpiling dates, type of steel produced, and all known Department and non-Department projects where the material was previously used.

This identification of OH slag may be supplemented by other information approved by the Department or by using 10 years of good performance data. The producer shall submit to the Department projects where the OH slag has been used without expansion or tufa problems. The Department will review the above projects as part of the identification approval process.

All OH slag not identified as open hearth slag shall be considered basic oxygen furnace slag unless identified otherwise.

Tufa Performance Verified. Tufa is a precipitate form of calcium carbonate that can clog up the underdrain systems. Some OH slag sources clog up underdrain systems and some do not. Tufa performance verification will be based on field performance and Department's inspection of the underdrain systems.

Tufa performance verification is required for OH slag used for Item 304, or when OH slag is used for a non-surface course applications in Items 617, 410 or 411.

The producer shall submit to the Department past projects that are at least 10 years old that used the proposed OH slag source. The producer shall supply the Department with construction plans with the underdrains and underdrain outlets marked on the plans, or other suitable method, approved by the Department, showing the underdrain system. The producer shall mark the underdrain outlets in the field for inspection. The Department will inspect the underdrain systems for tufa deposits. If tufa deposits are found in the outlets or in the underdrain system, the OH slag source shall be rejected.

The following sources have previously been evaluated for tufa performance: Standard-Lafarge's Cuyahoga Heights and McDonald plants. Tufa performance verification is not required for these sources.

Aging and Stockpiling Requirements. All OH and BOF slag shall be stockpiled and aged as follows:

The material shall be graded and stockpiled into maximum size piles of 23,000 Metric ton (25,000 ton). Prior to and during the stock piling operation, these materials shall have water added to provide a uniform moisture content not less than their absorbed moisture. The stockpile shall be maintained in a moist condition during the required stock piling period.

The producer shall mix the stockpile when the outside surface of the pile has crusted over. The Department will inspect the stock pile every 2 months to ensure no crusting occurs. Frozen stockpile material shall not be mixed. The aging period shall be suspended when the stockpile is frozen for more than one month.

This aging period shall be at least 6 months in duration and shall start over if any new material is added to the pile during the aging period.

Expansion Testing. After the aging and stock piling requirements have been met, expansion testing is required for OH slag used for Item 304 or when OH slag is used for a non surface course applications in Item 617, Item 410 or Item 411.

Expansion Testing shall be performed in accordance with Pennsylvania Department of Transportation PTM No. 130, the ODOT equivalent to this test or expansion testing acceptable to ODOT.

The producer shall hire an independent AASHTO accredited and ODOT approved laboratory to perform at least half of the expansion testing. At the producer's option, up to half of the required expansion testing may be performed by the producer's lab. The Office of Materials Management shall observe the expansion testing and approve each independent and producer laboratory.

The expansion testing shall be performed for every 2300 metric tons (2500 tons) or fraction thereof of the material supplied.

The maximum allowable total expansion for each test shall be less than 0.50 percent. If any one test fails in the stockpile, the entire stockpile shall be rejected.

When sampling for expansion, the producer shall notify the Department at least 48 hours prior to the sampling. The Department will verify that the sample came from the correct stock pile and take independent spit samples , if required.

The expansion test data and a suitably presented summary of the expansion test data shall be submitted to the Department for approval. The Department reserves the right to perform independent testing to verify the laboratory results at any time.

The Department expansion test data shall take precedence over the producer or independent laboratory expansion testing results in the event of a conflict. The Department shall make the final determination on all conflicting data.

If the material fails the expansion testing, the material shall be stock piled for a minimum of 2 additional months from the date of last sampling and retested for expansion. No materials shall be approved for use until the material passes the expansion test.

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 906**

**ANTISTRIP ADDITIVE FOR ASPHALT CONCRETE**

**May 5, 1998**

On this project, if any gravel coarse aggregate or more than 25 percent natural sand or more than 20 percent reclaimed materials containing gravel coarse aggregate is used in any bituminous aggregate base designed in accordance with Supplement 1044 or any asphalt concrete designed in accordance with 441, then the Contractor shall perform the following additional tests:

1. Moisture damage potential test in accordance with Supplement 1051.
2. Washed gradation in accordance with AASHTO T 11 as modified by Supplement 1004.
3. Adherent fines test for each component in accordance with ASTM D 5711.

If the results of the moisture damage potential test show the Tensile Strength Ratio (TSR) of the bituminous aggregate base mix or asphalt concrete mix to be less than 0.70, then the mix shall be modified by one of the following antistrip additives:

**Liquid Antistrip Material** - The mix shall include liquid antistrip material at a rate of 0.50 to 1.00 percent by weight of the asphalt cement. The TSR of the bituminous aggregate base mix or asphalt concrete mix shall be greater than or equal to 0.80 after the addition of the liquid antistrip material.

**Hydrated Lime** - The mix shall include hydrated lime in the dry form at a rate of 1.0 percent by the dry weight of aggregate for asphalt concrete and 0.75 percent by the dry weight of aggregate for bituminous aggregate base. The hydrated lime shall meet the requirements of AASHTO M 303, Type 1. A list of approved sources of hydrated lime will be maintained by the Laboratory. To become an approved source, a source shall submit certified test data to the Laboratory showing their hydrated lime meets the requirements of AASHTO M 303, Type 1. Annual submittal of certified test data by January 1 each year will be necessary to maintain approval. The following information shall be provided to the Engineer for each shipment of hydrated lime: (1.) letter of certification; (2.) production date; (3.) shipment date; (4.) shipment destination; (5.) batch or lot number (6.) net weight.

The antistrip additive shall be included in the Contractors' mix design established in accordance with 441 or Supplement 1044. The following shall be submitted to the Laboratory with the proposed JMF:

1. All TSR data (before and after the addition of the antistrip additive).
2. Rate of addition of the liquid antistrip material, if used.
3. Product information, recent supplier State project information using the liquid antistrip material, and letter of certification (only for liquid antistrip material, if used).
4. Results of the washed gradation test of the individual components of the mix used in determining the combined gradation.
5. Results of the adherent fines testing for each component.

The Laboratory may perform additional tests in accordance with Supplements 1051, 1052, and 1004. These tests may be performed on material conforming to a proposed JMF or on material obtained during production of an approved JMF. If a change in the aggregate production is suspected, the District/Laboratory may require the Contractor to perform washed gradations on components and calculate adherent fines to determine the need for additional TSR review. The Laboratory may obtain samples of the hydrated lime at any time to verify quality. If the quality of the hydrated lime is in question, the Laboratory may require independent laboratory testing for the hydrated lime supplier.

Antistrip additives shall be stored and introduced into the mix in accordance with Supplement 1053. Prior to the start of production, the Laboratory shall approve the antistrip additive storage and feed systems. During production, if the antistrip additive is not being properly dispersed into the mix, the Laboratory may require modifications in the method of introducing the antistrip additive into the mix.

At the end of the project and at the end of each construction year on a multiple year project, the Contractor shall provide delivery tickets to the Engineer verifying the number of pounds of antistrip additive used is within 10 percent of the calculated amount of antistrip additive required for the total pounds of bitumen, based on the JMF, used in the bituminous aggregate base or asphalt concrete.

The cost of this additional testing and the addition of any antistrip additive shall be included in the contract price for the bituminous aggregate base or asphalt concrete.

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 907

Sulphur Leachate Test for Air Cooled Blast Furnace Slag for Acceptance  
of Items 203, 304, 306, 307, 503, 603 and S.S.855 (Asphalt Treated Free Draining Base)

October 21, 1998

**907.01 Description**

**907.02 Sampling Procedure**

**907.03 Sulphur Leachate Test Procedure and Criteria**

**907.01 Description.** Air cooled blast furnace slag used in Items 203, 304, 306, 307, 503, 603, and S.S.855 (Asphalt Treated Free Draining Base) must meet the requirements of this specification. This specification contains the required sampling procedure; sulphur leachate test procedure; and, the criteria that must be met for the material to be incorporated into the work.

**907.02 Sampling Procedure.** The following sampling method for obtaining samples of air cooled blast furnace slag for leachate tests shall be used:

1. Sampling: The material to be used should be sampled as the stockpile is being built.
2. When obtaining the sample after the stockpile is built: The sample may be taken by shovel or hand. The sample shall be selected randomly from both the exterior and interior of the stockpile. The producer shall use a heavy equipment for the excavation of the interior material.
3. Sampling Frequency: Each sample is to be taken in random increments over each 5200 tons (4720 metric tons) stockpiled.
4. Sample size and sample reduction: The field sample should be 80 to 100 pounds (35 to 45 kg). From this field sample, a test sample of 20 to 25 pounds (9 to 11 kg) shall be quartered out.
5. Documentation : Stockpile location and test results shall be maintained at the plant and shall be available upon request.

6. The Producer shall certify that this test has been performed prior to acceptance.

**907.03 Sulphur Leachate Test Procedure and Criteria.** The test procedure involves soaking the slag material in water for a specified period of time and then observing the color of the water. A greenish-yellow coloration indicates a problem. The smell of hydrogen sulfide (rotten eggs) usually accompanies the observation of colored water.

1. Equipment Needed:

- A. A five-gallon (19-liter) bucket for soaking the sample.
- B. Filter paper for filtering the water.
- C. A funnel through which to filter the water.
- D. A glass container for observing the water.
- E. A rock color chart. This chart is used for color comparisons and is distributed by the Geological Society of America
- F. Water shall be distilled or tap water let set in a bucket for a minimum of 12 hours.

2. Test Procedures.

A. Prepare a test sample of approximately 20 to 25 pounds (9 to 11 kg) from a field sample of approximately 100 pounds (45 kg).

B. For Item 306, Type 3 granular material in Item 603, and S.S.855 (Asphalt Treated Free Draining Base), the test sample should then be rinsed over a No. 4 (4.75mm) sieve to remove any fines that may be clinging to the larger particles.

C. Place the test sample in bucket and fill with water until the sample is covered by at least ½ inch (13 mm) of water. Allow the sample to soak for 24 hours.

D. After soaking for 24 hours, thoroughly mix the water and collect a water sample of approximately 3.4 fl. oz. (100 mL).

E. Filter the water sample to remove the suspended solids which may interfere with the color observation.

F. If the color of the filtered water is equal to or darker than the moderate greenish-yellow color from the rock chart (hue 10Y), the material fails. If the water appears clear or lighter than the moderate greenish-yellow color from the rock chart (hue 10Y), then allow the sample to soak for another 24 hours and repeat steps "D" through "F".

G. If, after 48 hours, the water appears clear or less than the moderate greenish-yellow color from the rock chart (hue 10Y), then the material is acceptable.

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 908**

**PERFORMANCE GRADE (PG) BINDER REQUIREMENTS**

January 6, 1999

- 908.01 Performance Grade Binder Specifications**
- 908.02 Viscosity Grade Cross Reference**
- 908.03 Contractor Storage Requirements**
- 908.04 Contractor Sampling Requirements**

**908.01 Performance Grade Binder Specifications.** The requirements of 702.01 shall be replaced with AASHTO Provisional Standard MP1-93, 1997 AASHTO Provisional Standard version for Performance Graded (PG) binders as modified below:

PG 64-22 shall meet: Penetration, 77 F (25 C), 3.53 oz (100g), 5s - 55 - 75  
 PG 58-28 shall meet: Viscosity, poise, 140 F (60 C)- 800 min

The Materials and Manufacture section 5 shall be modified for all performance grades (PG) as follows:

- 5.1 The performance grade binder shall be an asphalt cement from the refining of crude petroleum, or combination of asphalt cements from the refining of crude petroleum, or asphalt cements and suitable liquid from the refining of crude petroleum, and possible organic modifiers for performance enhancement. Material from the crude refining stream will be considered neat. Use of any hydrocarbon material not taken directly from the crude refining stream shall be considered a modifier as in 5.2. Modifier or liquid direct from the refining stream may be used for adjustments but shall not be used for the purpose of substitution of crude refined asphalt cement in a performance grade asphalt binder.
- 5.2 Modifiers may be any organic material of suitable manufacture that is proven compatible with asphalt cement (does not separate appreciably in routine storage), and that is dissolved, dispersed or reacted in asphalt cement to improve its performance. The use of modifiers shall be limited to 6.0 percent by performance grade binder weight. Performance enhancement is defined as a decrease in the temperature susceptibility of the asphalt cement while maintaining desirable properties in a neat asphalt cement such as coatability, adhesiveness and cohesiveness. The use of any previously used whole material (liquid or solid) as a modifier is expressly forbidden. Reprocessed previously used materials may be applicable but materials and sources must be approved by the Department. Since no standard test procedures exist for reprocessed materials (and original tests were not developed with the use of such materials in mind), any test methods may be chosen by the Department for review. Department approval does not relieve the performance grade binder supplier from full responsibility for content and use of any previously used material nor guarantee suitable performance enhancement as defined above. The detected presence in a performance grade binder sample of any unapproved previously used material will mean immediate removal from certification. All constituent (modifier, etc.) MSDS sheets must be with the performance grade binder MSDS sheet supplied to a hot mix facility and accompany the supplier quality control plan on file in the Office of Materials Management.
- 5.3 The performance grade asphalt binder shall be homogeneous, free from water and deleterious materials, and shall not foam when heated to 350 F (175 C). The asphalt binder (before

modification or after modification if liquid modifier used) shall be proven fully compatible with a negative result by means of the Spot Test per AASHTO T 102 using standard naphtha solvent. If standard naphtha shows a positive result, a retest using 35 percent Xylene/ 65 percent Heptane (volume) may be used.

- 5.4 The performance grade asphalt binder shall be at least 99.0 percent soluble as determined by ASTM D 5546 or D 2042. Any insoluble component shall be substantially free of fibers and have discrete particles less than 75 m.

**908.02 Viscosity Grade Cross Reference.** All asphalt concrete and bituminous aggregate base specifying either AC-20 or AC-10 asphalt cement shall switch to a performance graded (PG) binder in accordance with the following chart:

Mix	Specified Binder	Use PG Binder (2)
441 designed for heavy traffic (1)	AC-20 AC-10	PG 64-22 PG 64-28 (3)
441 designed for medium or light traffic (1)	AC-20 AC-10	PG 64-22 PG 58-28
Any other specification (1)	AC-20 AC-10	PG 64-22 PG 58-28

- (1) Mixes containing reclaimed pavement, where a grade change is necessary in accordance with 441.03, shall use a performance grade binder specified by Department policy covering testing and selection of binders for recycled mixes.
- (2) The performance grade binder shall meet the requirements of the rest of this specification.
- (3) Neat asphalt, unmodified

**908.03 Contractor Storage Requirements.** Storage of a performance grade binder shall be in accordance with 750.01, with the following additions:

- 1. If a Contractor is providing a binder other than a performance grade binder to customers other than the Department (excepting winter carryover work), a separate storage tank shall be used.
- 2. When the Contractor switches between different performance grade binders because of alternating mix types, a separate storage tank shall be used.
- 3. When the Contractor switches from any asphalt cement or other performance grade binder to a different performance grade binder using the same storage tank, the storage tank shall be at least 90 percent empty by tank height.

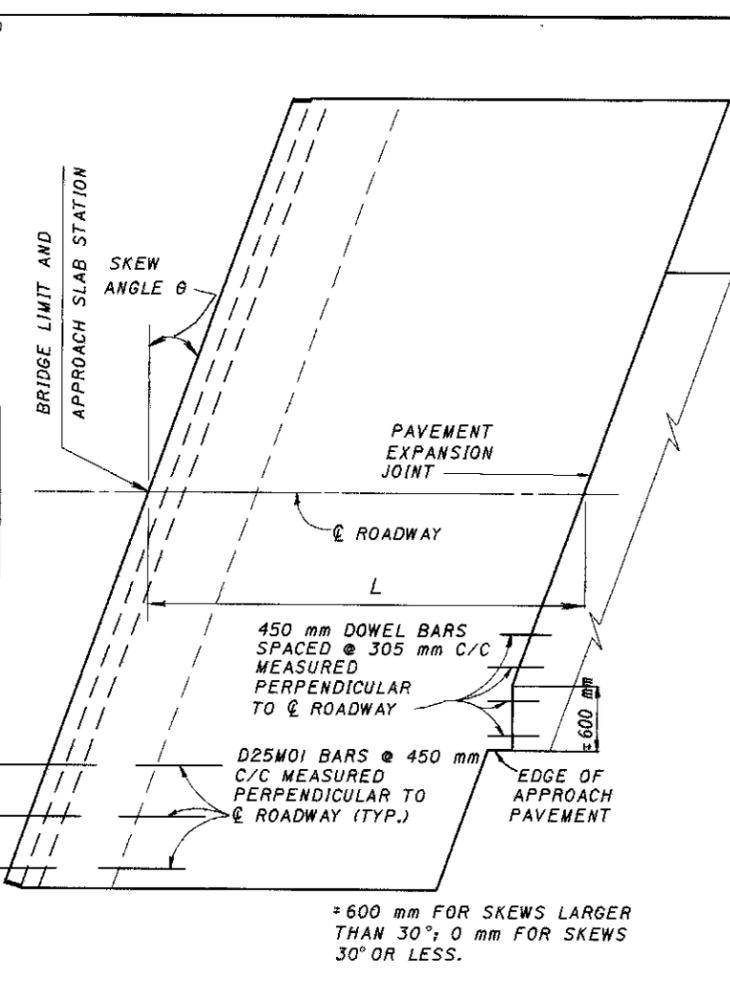
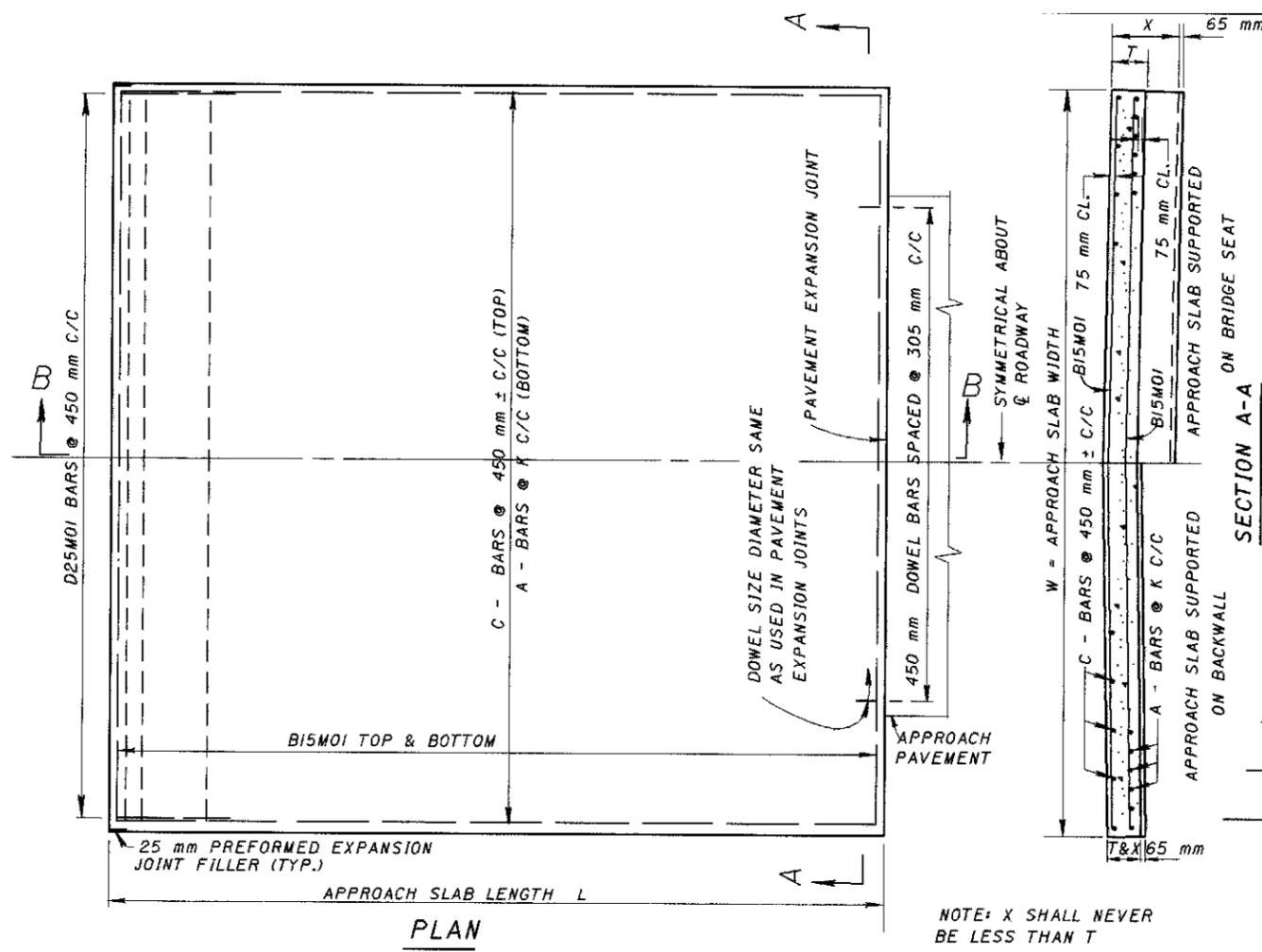
The Monitoring Team shall be notified before the delivery of the first load of each type of performance grade binder, with sufficient lead time to allow for verification of the condition of the storage tank. The Monitoring Team may sample the first storage tank load or give the Contractor permission to proceed with no tank verification, at their discretion.

**908.04 Contractor Sampling Requirements.** The Contractor shall take two 1 quart (1 liter) samples from the first transport truck load of performance grade binder before incorporation into the storage tank. The Contractor will label and date the samples and retain them in the plant laboratory for future reference by the Department, if necessary.

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 911  
PLASTIC SUPPORTS FOR REINFORCING STEEL  
July 10, 1997**

This specification covers the material requirements for plastic support chairs for reinforcing steel used with Item 509, Reinforcing Steel. All plastic chair designs shall be capable of supporting at least 150 kg(330 pounds) without any recorded deformation, breakage or damage at a temperature of at least 38 C (110 F). No plastic chair designs shall have sharp protrusions or edges that could damage or penetrate coatings on the reinforcing steel. All chair designs shall be capable of permitting a No. 57 coarse aggregate to flow either through or around the reinforcing steel support without binding or causing a void in the finished concrete. No plastic chair designs shall be supported on a footprint of greater than 1300 sq mm (2 sq inches). Plastic chair designs shall be manufactured from material chemically inert to concrete. Reinforcing steel support chairs that have passed the testing and acceptance procedures in Supplement 1081 shall be approved for use and included on an approved list of plastic chair supports for reinforcing steel..



**DESIGN SPECIFICATIONS:** THIS STANDARD DRAWING CONFORMS TO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1977, INCLUDING THE 1978, 1979, 1980 AND 1981 INTERIM SPECIFICATIONS AND THE OHIO "SUPPLEMENT" TO THESE SPECIFICATIONS.

**DESIGN DATA**  
 DESIGN LOADING: MS18 AND THE ALTERNATE MILITARY LOADING.  
 CONCRETE CLASS C : COMPRESSIVE STRENGTH 28 MPa

**REINFORCING STEEL:** ASTM A615M, A616M OR A617M-GRADE 400; MINIMUM YIELD STRENGTH OF 400 MPa AND SHALL BE EPOXY COATED.

**REINFORCING STEEL:** FOR SKEWED BRIDGES THE A AND C BARS SHALL BE PLACED PARALLEL TO THE CENTER LINE OF ROADWAY AND THE B BARS SHALL BE PLACED PARALLEL TO THE ABUTMENTS.

**PREFORMED EXPANSION JOINT FILLER,** TYPE "A" WATER PROOFING, AND SEALER AT THE CORNERS AND SIDES OF THE APPROACH SLAB SHALL BE INCLUDED IN THE PRICE BID PER SQUARE METER FOR THE APPROACH SLAB.

**PREFORMED ELASTOMERIC JOINT SEALER** SHOWN AT THE BRIDGE LIMIT END OF THE APPROACH SLAB SHALL BE INCLUDED IN THE PRICE BID PER SQUARE METER FOR THE APPROACH SLAB.

**LONGITUDINAL CONSTRUCTION JOINTS** REQUIRED FOR STAGE CONSTRUCTION SHALL BE AS PER 511.09.

**CURBS, BRIDGES WITH SIDEWALKS :** FOR BRIDGES CONSTRUCTED WITH RAISED SIDEWALKS, DEFLECTOR PARAPETS OR OTHER TYPES OF CONSTRUCTION WHICH RETAIN ROADWAY SURFACE DRAINAGE, THE APPROACH SLABS SHALL EITHER INCLUDE INTEGRAL CURBS OR BE CONSTRUCTED IN CONJUNCTION WITH BRIDGE CURBS. CURB HEIGHT SHALL BE TRANSITIONED UNIFORMLY BETWEEN BRIDGE CURB HEIGHT AND APPROACH CURB HEIGHT IN A LENGTH AS FOLLOWS: WHERE WINGWALL EXTENDS BEYOND END OF APPROACH SLAB, USE A MINIMUM LENGTH OF 3000 mm BEYOND END OF WINGWALL. WHERE THE APPROACH SLAB EXTENDS BEYOND THE END OF WINGWALL, TRANSITION IN THIS LENGTH. HOWEVER, THE TRANSITION LENGTH SHALL NOT BE LESS THAN 3000 mm AND THE TRANSITION SHALL EXTEND BEYOND THE END OF APPROACH SLAB IF NECESSARY.

**APPROACH SLAB WIDTH (W):** APPROACH SLABS SHALL BE THE SAME WIDTH AS THE BRIDGE ROADWAY.

**THE LENGTH OF APPROACH SLABS** SHOULD BE BASED ON FACTORS SUCH AS THE SIZE AND AMOUNT OF EXCAVATION BEHIND THE ABUTMENTS, NEW OR EXISTING EMBANKMENTS AND SKEW OF THE BRIDGE.

**CROWN** SHALL CONFORM TO THAT OF THE APPROACH PAVEMENT AND BRIDGE DECK. IF THE RATE OF CROWN OF THE BRIDGE DECK DIFFERS FROM THAT OF THE APPROACH PAVEMENT, A SMOOTH TRANSITION SHALL BE PROVIDED WITHIN THE LIMITS OF THE APPROACH SLAB.

**WEARING SURFACE:** GENERALLY APPROACH SLABS SHALL HAVE AN ASPHALT CONCRETE WEARING SURFACE ONLY WHEN BOTH THE APPROACH PAVEMENT SURFACE AND THE BRIDGE WEARING SURFACE ARE ASPHALT CONCRETE.

**EXPANSION JOINT DETAILS** AT THE APPROACH PAVEMENT END OF THE APPROACH SLAB ARE USED ONLY IN CONJUNCTION WITH CONCRETE PAVEMENT OR CONCRETE BASE COURSE. PAYMENT FOR THE EXPANSION JOINT, INCLUDING DOWEL BARS, PREFORMED EXPANSION JOINT FILLER AND JOINT SEALER, IS INCLUDED IN THE PRICE BID PER SQ. METER FOR THE APPROACH SLAB.

**APPROACH SLAB FOR SKEWED STRUCTURE**

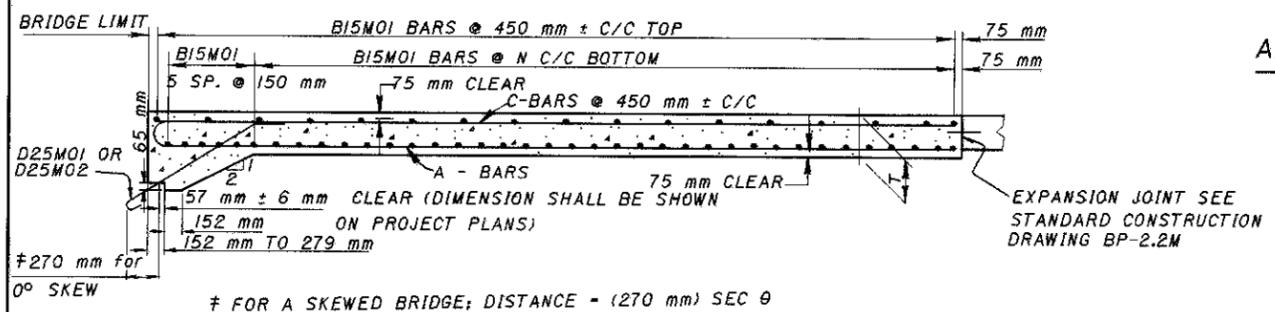
**GENERAL:** THIS DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS. THE PROJECT PLANS WILL SHOW LENGTH, SKEW, CURBS (IF ANY), ESTIMATED QUANTITY (SQUARE METER), AND SPECIAL NOTES AND DETAILS WHERE NECESSARY. FOR CONDITIONS OTHER THAN THOSE INDICATED HEREON, THE APPROACH SLAB SHALL BE ADAPTED TO FIT THE ENDS OF THE BRIDGE AND THE APPROACH PAVEMENT.

**ANCHOR BARS D25M01 OR D25M02** SHALL BE DETAILED FOR A SPECIFIC BRIDGE AND SHALL BE INCLUDED WITH ITEM 509 UNDER ABUTMENTS OR SUPERSTRUCTURE FOR PAYMENT. D25M01 BARS CANNOT BE USED AS SHOWN WHERE APPROACH SLABS ARE SUPPORTED ON BACKWALLS LESS THAN 350 mm THICK. D25M02 BARS SHALL BE USED ON PRESTRESSED CONCRETE BOX BEAM BRIDGES WHERE THE APPROACH SLAB IS SUPPORTED ON AN 280 mm THICK BACKWALL.

**BAR SIZE IS INDICATED** IN THE BAR MARK. THE FIRST LETTER IDENTIFIES THE BAR LOCATION, NEXT TWO DIGITS AND LETTER INDICATES THE METRIC BAR SIZE DESIGNATION, AND THE REMAINING DIGITS ITS SEQUENCE NUMBER.

- EXAMPLE : A35M01  
 1) A = LOCATION OF THE BAR IN THE STRUCTURE  
 2) 35M = METRIC BAR SIZE DESIGNATION  
 3) 01 = SEQUENCE NUMBER

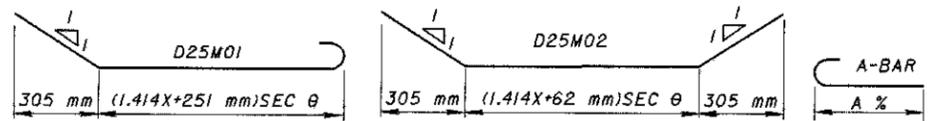
\* AT THE OPTION OF THE CONTRACTOR, B15M01 BARS MAY BE LAPPED 500 mm MINIMUM AT THE CENTERLINE OF ROADWAY, OR WHERE REQUIRED FOR LONGITUDINAL CONSTRUCTION JOINTS.

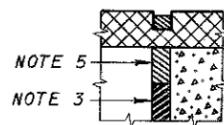


**SECTION B-B**

REINFORCING STEEL (FOR ONE APPROACH SLAB)													
LENGTH L mm	THICKNESS T mm	SP'C'G		A-BARS		B15M01 (BOTTOM)		B15M01 (TOP)		C-BARS		D25M01 OR D25M02	
		SP'C'G K	MARK	LENGTH mm	DIMENSION A mm	NO. REQ'D.	SP'C'G N	NO. REQ'D.	LENGTH mm	NO. REQ'D.	MARK	LENGTH mm	NO. REQ'D.
4600	305	255	A35M01	4880	4450	230	22	11	C15M01	4425			
6100	330	190	A35M02	6380	5950	200	31	14	C15M02	5950			
7600	380	180	A35M03	7880	7450	200	39	18	C15M03	7450			
9150	430	165	A35M04	9430	9000	215	44	21	C15M04	9000			

W - APPROACH SLAB WIDTH, OUT TO OUT, IN mm  
 theta - ANGLE OF SKEW  
 K - A-BAR SPACING IN mm  
 N - B-BAR SPACING IN mm  
 X - APPROACH SLAB THICKNESS AT ABUTMENT END IN mm  
 % - OUT TO OUT





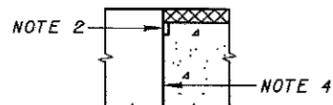
**DETAIL A**

CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB

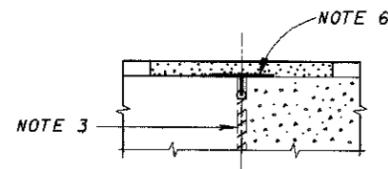


**DETAIL B**

CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB

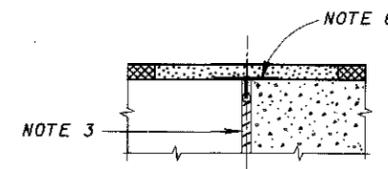


**DETAIL C**

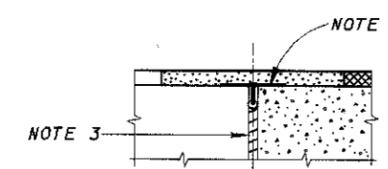


**DETAIL D**

CONCRETE WEARING SURFACE ON BRIDGE DECK ONLY



**DETAIL E**



**DETAIL F**

NOTE 1 : PREFORMED ELASTOMERIC JOINT SEALER 705.11 (32 mm FOR 13 mm JOINT) DEPRESSED 3 mm BELOW ROADWAY. PLACED IN 13 mm x 55 mm GROOVE.

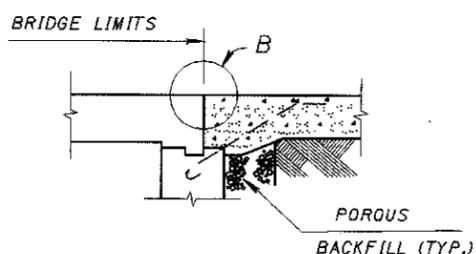
NOTE 2 : PREFORMED ELASTOMERIC JOINT SEALER 705.11 (32 mm FOR 13 mm JOINT) PLACED IN 13 mm x 55 mm GROOVE.

NOTE 3 : 25 mm PREFORMED EXPANSION JOINT FILLER 705.03

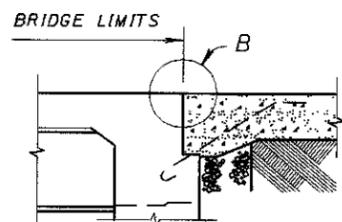
NOTE 4 : TYPE "A" WATERPROOFING.

NOTE 5 : SEE PLAN INSERT SHEET, ABUTMENT JOINTS IN BITUMINOUS CONCRETE BOX BEAM BRIDGES.

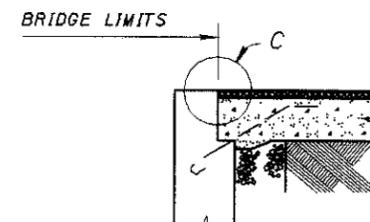
NOTE 6 : SEE PLAN INSERT SHEET, POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM.



**ON SLAB BRIDGES**

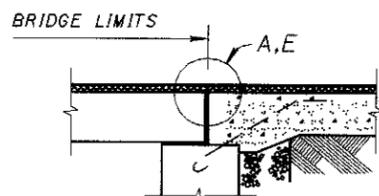


**ON BRIDGES WITH INTEGRAL CONSTRUCTION**

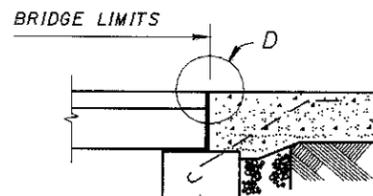


**APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL**

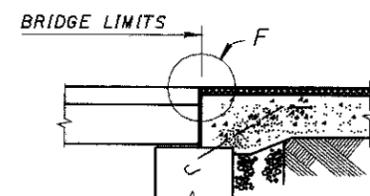
ASPHALT CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB



**ON PRESTRESSED CONCRETE BOX BEAM BRIDGES**



**ON PRESTRESSED CONCRETE BOX BEAM BRIDGES**

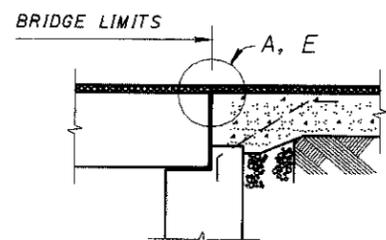


**ON PRESTRESSED CONCRETE BOX BEAM BRIDGES**

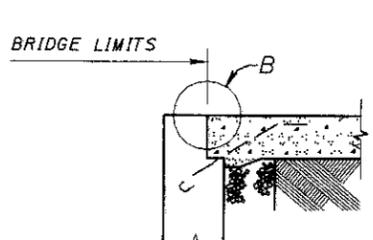
TYPE "A" WATERPROOFING SHALL NOT EXTEND ABOVE THE BOTTOM OF THE GROOVE INTO WHICH THE PREFORMED ELASTOMERIC JOINT SEALER IS TO BE PLACED. IT SHALL BE APPLIED TO THE ENTIRE AREA OF THE ABUTMENT OR SUPERSTRUCTURE WHICH COMES INTO CONTACT WITH THE APPROACH SLAB.

FOR PRESTRESSED CONCRETE BOX BEAM BRIDGES WITH ASPHALT CONCRETE ON BOTH BRIDGE DECK AND APPROACH SLAB, THE TOP OF APPROACH SLAB AT THE BRIDGE END SHALL BE CONSTRUCTED TO THE LEVEL OF THE TOP OF THE BEAMS TO FACILITATE WATERPROOFING OF THE JOINT. THE THICKNESS OF ASPHALT CONCRETE AT THE APPROACH END SHALL BE THE THICKNESS OF ASPHALT CONCRETE USED ON THE ROADWAY PAVEMENT. THE THICKNESS OF ASPHALT CONCRETE SHALL VARY UNIFORMLY, IF NECESSARY, IN THE LENGTH OF THE APPROACH SLAB. THE BASE SHALL BE GRADED TO PERMIT THE BOTTOM OF THE APPROACH SLAB TO BE PARALLEL TO THE TOP.

FOR STRUCTURES HAVING ASPHALT CONCRETE WEARING SURFACE ON BOTH BRIDGE DECK AND APPROACH SLABS AND WHERE NO DECK EXPANSION DEVICES ARE PROVIDED, THE DECK MEMBRANE WATERPROOFING SHALL EXTEND BEYOND THE BRIDGE LIMITS A DISTANCE OF 600 mm.

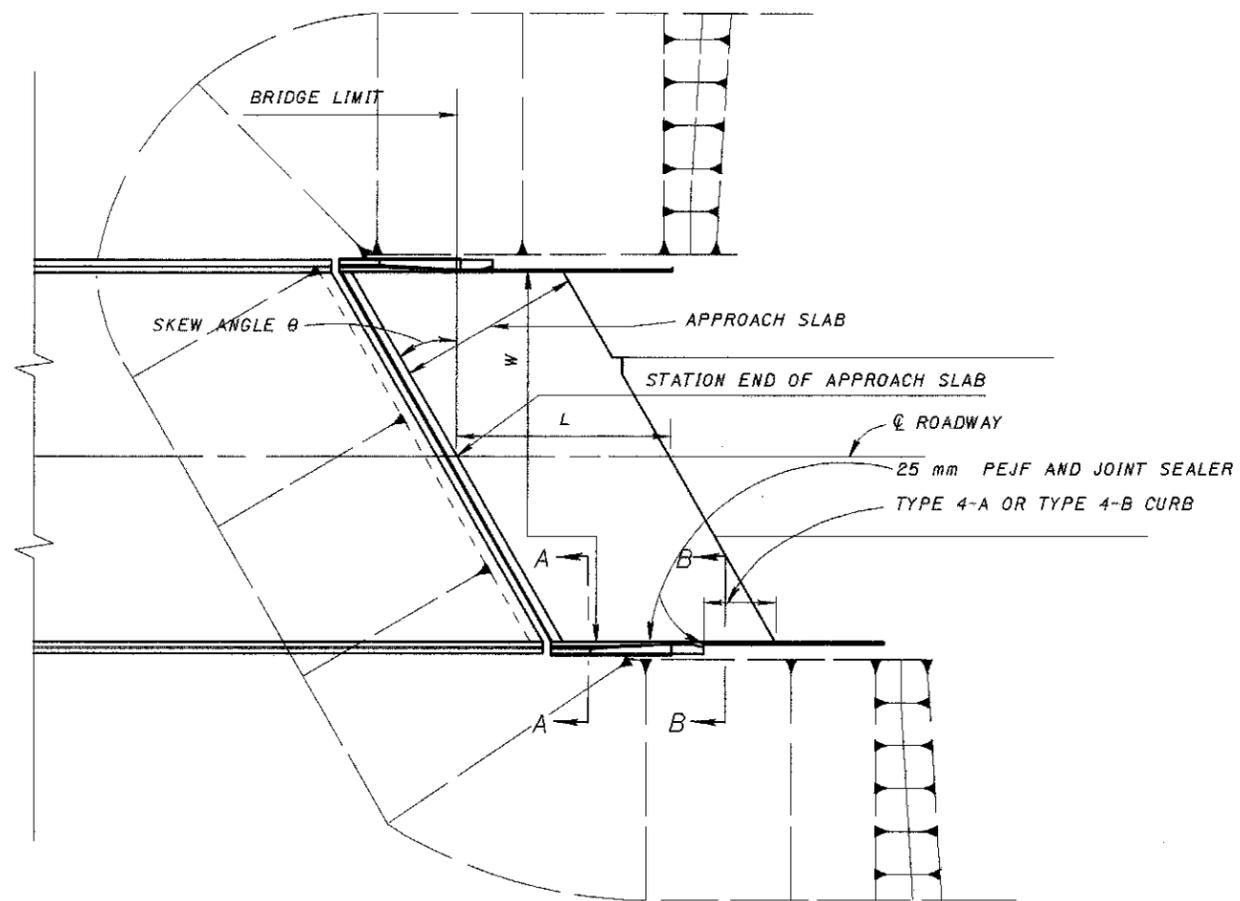


**APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL**

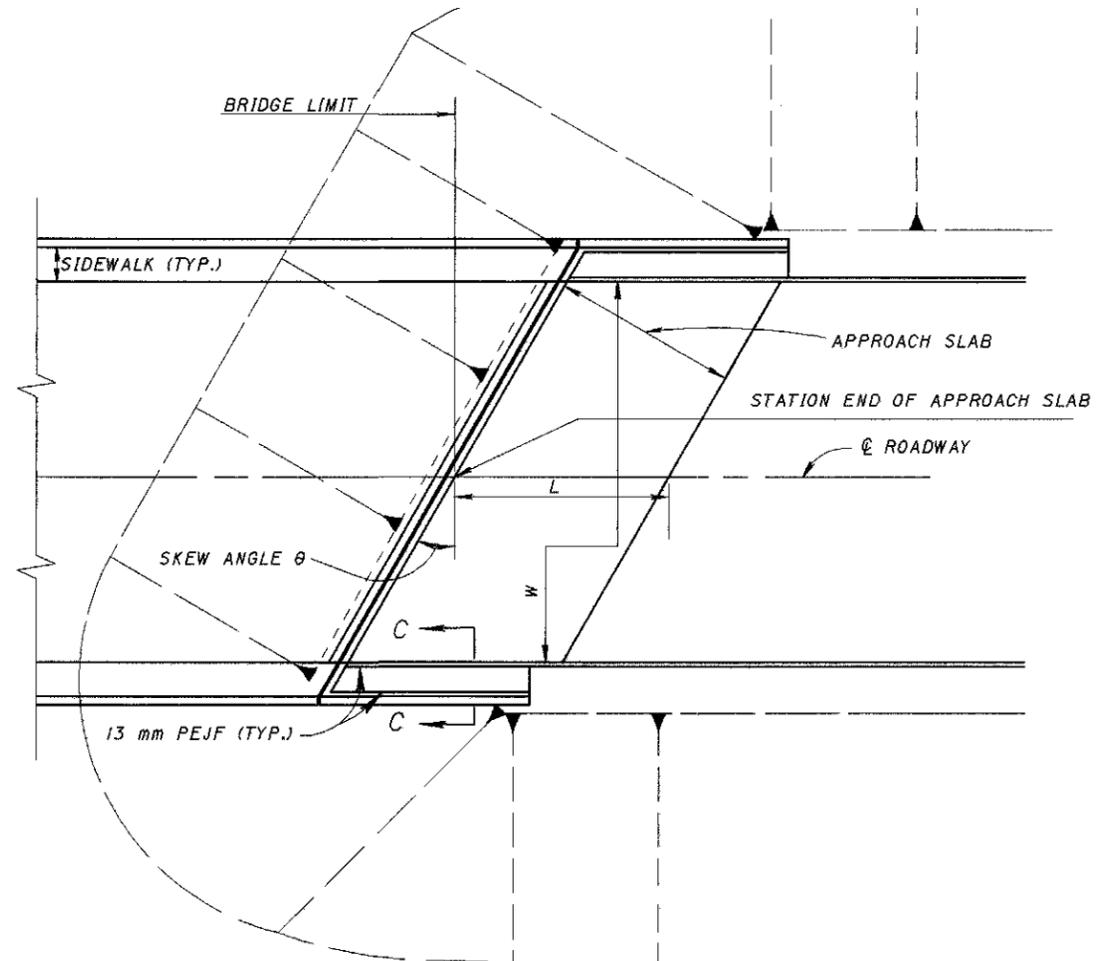


**APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL**

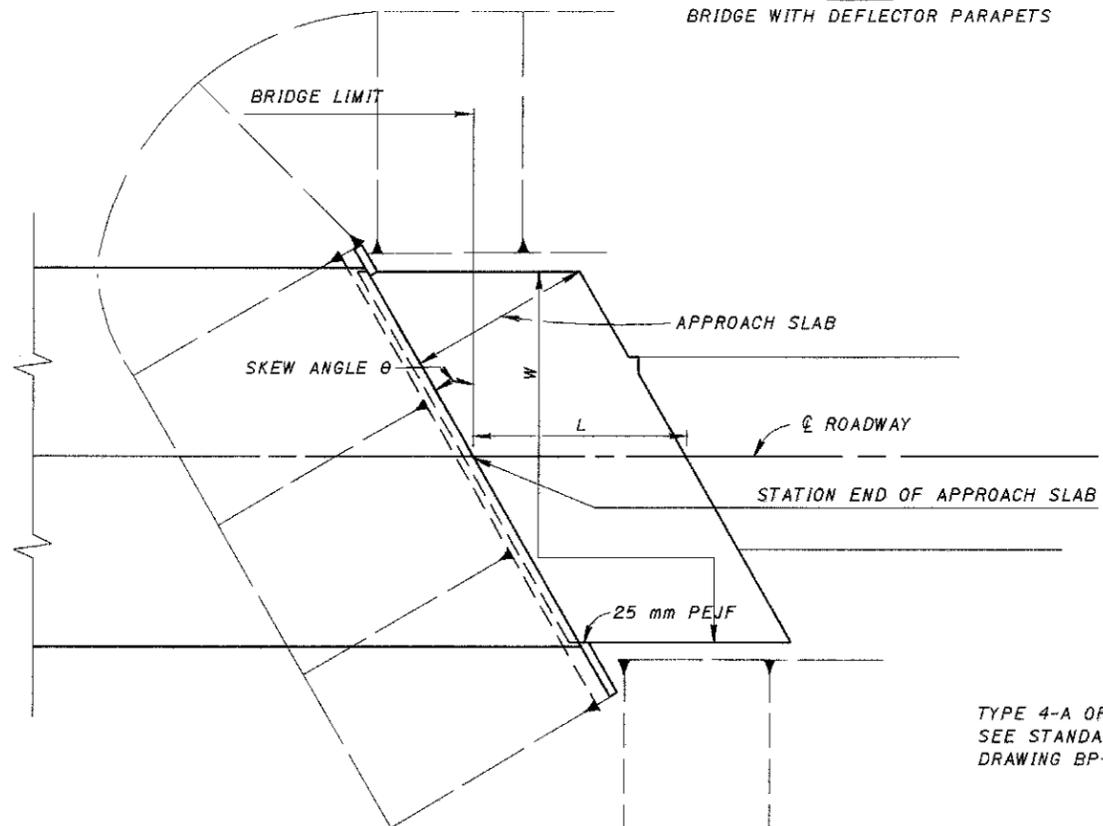
NOTE : APPROACH SLAB SEAT ON PRESTRESSED CONCRETE BOX BEAM BRIDGES IS SHOWN AT SAME ELEVATION AS BEAM SEAT. HOWEVER, IT MAY ACTUALLY BE HIGHER OR LOWER THAN THE BEAM SEAT DEPENDING ON BOX BEAM DEPTH.



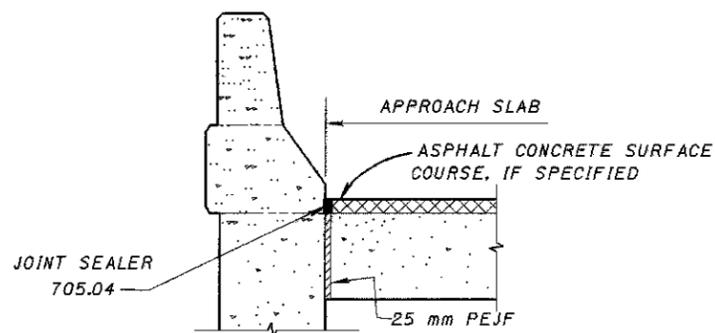
**PLAN**  
BRIDGE WITH DEFLECTOR PARAPETS



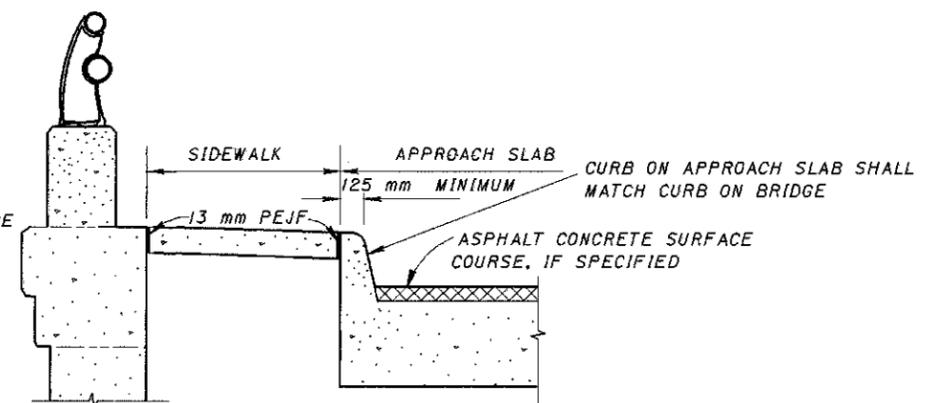
**PLAN**  
BRIDGE WITH SIDEWALKS



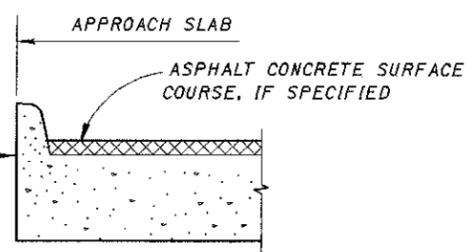
**PLAN**  
BRIDGE WITHOUT CURBS



**SECTION A-A**

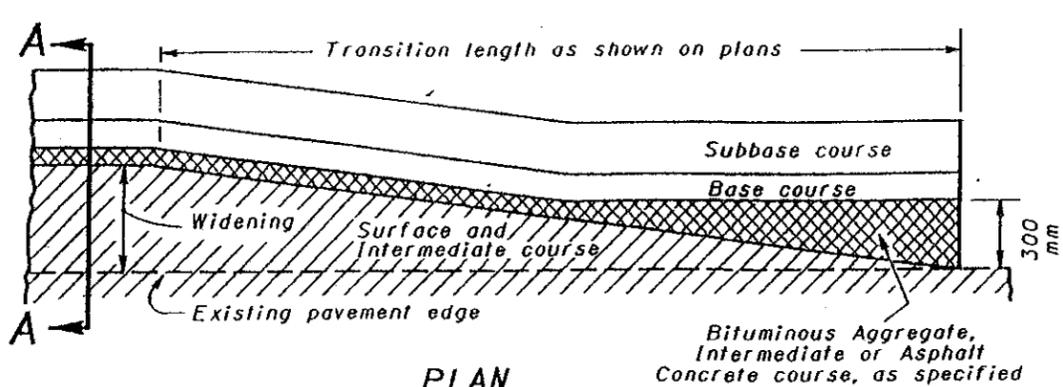


**SECTION C-C**



**SECTION B-B**

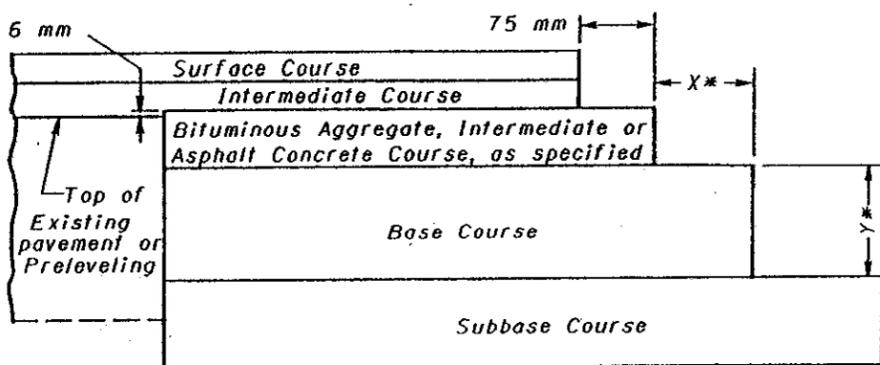
TYPE 4-A OR TYPE 4-B CURB  
SEE STANDARD CONSTRUCTION  
DRAWING BP-5.J M



PLAN

**MERGING EDGE OF PAVEMENT WIDENING WITH EDGE OF EXISTING PAVEMENT**

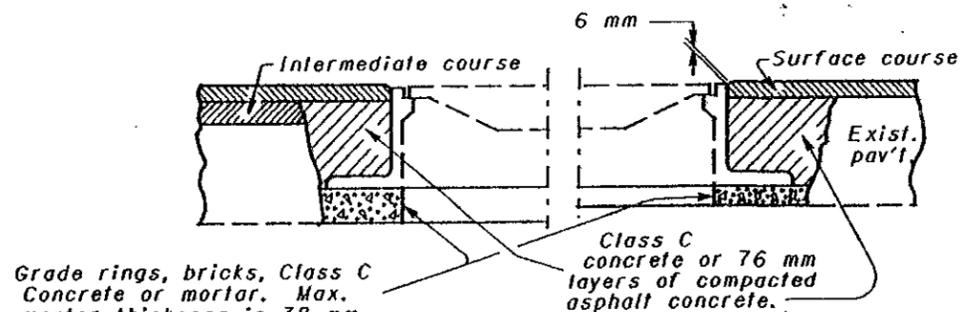
Bituminous Aggregate, Intermediate or Asphalt Concrete course, as specified



The Bituminous Aggregate in the upper part of the base widening shall finish approximately 6 mm above the edge of the existing pavement where no preleveling is used. Where a preleveling (using intermediate course material) is specified it shall be placed prior to excavation of the widening trench and the upper course of the base widening shall finish approximately 6 mm above the preleveling.

\*The extended width (X) of a base or subbase course shall be equal to the depth (Y) of that particular course, unless otherwise specified in the plans.

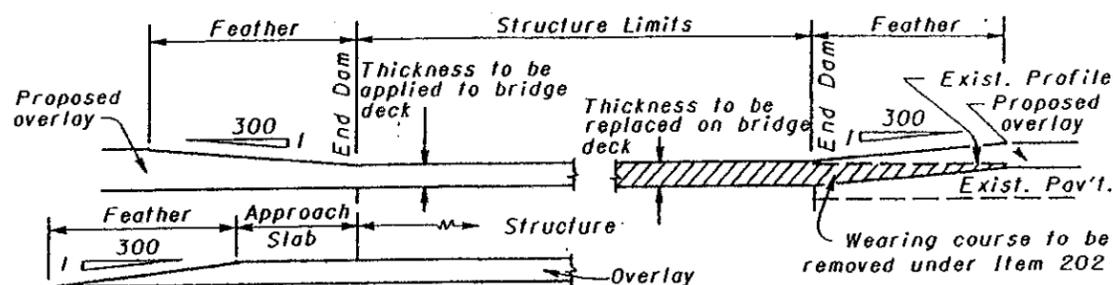
**SECTION A-A COURSE DETAIL FOR WIDENING**



**USING CONCRETE OR MORTAR**

Metal adjusting rings shall: (a) attach securely to the existing frame by welding or mechanical devices; (b) consist either of cast metal having an integral rim and seal, or be fabricated metal with a sturdy connection between the seat and rim; and (c) provide an even seat for the manhole cover. In addition, the adjusting ring type shall be a design acceptable to the local governmental agency responsible for street and sewer maintenance. Any installation unacceptable to the Engineer shall be replaced by the Contractor at his expense.

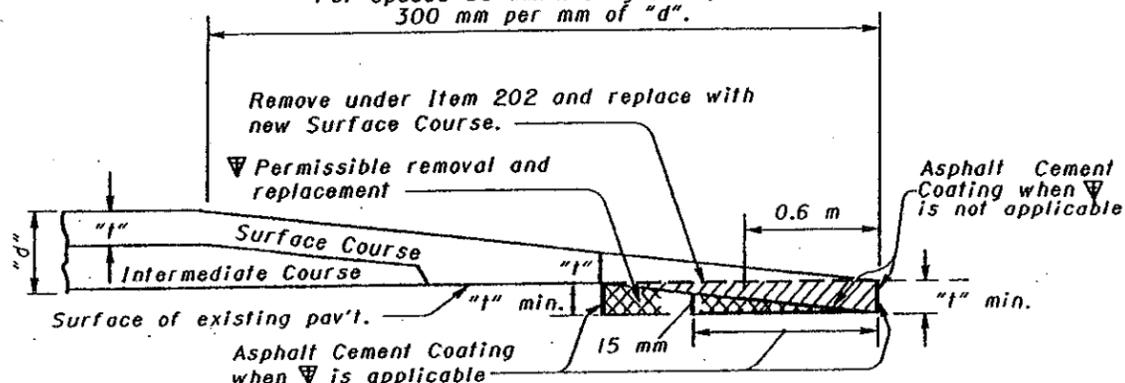
**MANHOLES ADJUSTED TO GRADE**



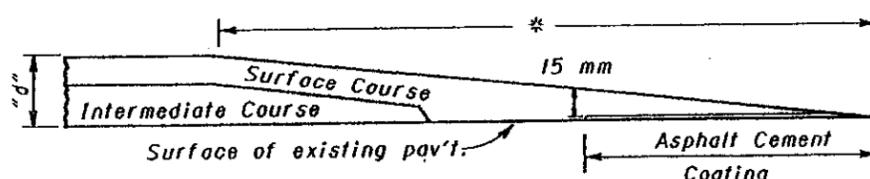
Details assume non-settled approach slabs. Smoothing of the profile for settlement is required per plan grades or as directed by the Engineer.

**FEATHERING AT STRUCTURES**

\* Min length - 120 mm per mm of "d".  
For speeds 80 km/h or greater, use 300 mm per mm of "d".



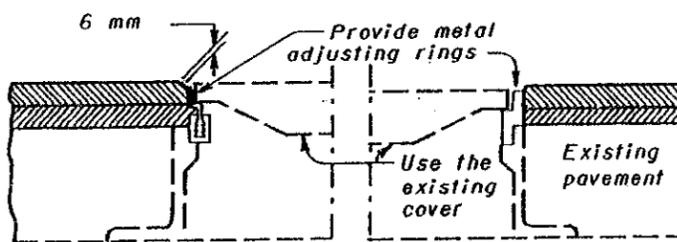
**BUTT JOINT TYPE**



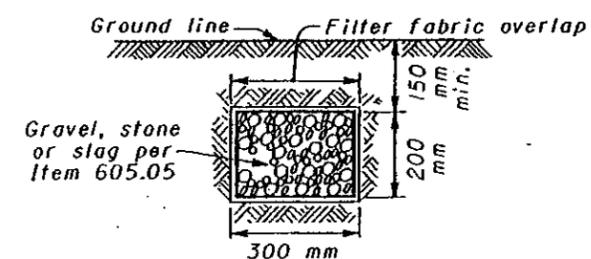
**TAPER EDGE TYPE**

NOTE: Either butt or taper type may be used unless type is specified by the plan.

**PLACING FEATHERED AREAS**

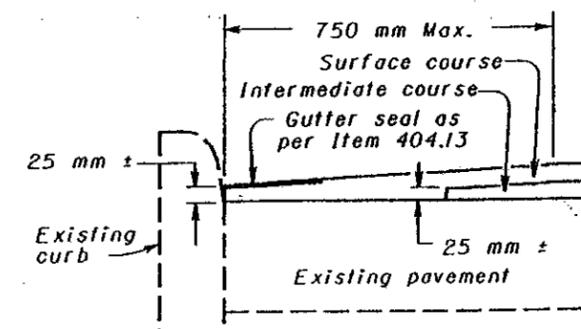


**USING METAL ADJUSTING RINGS**



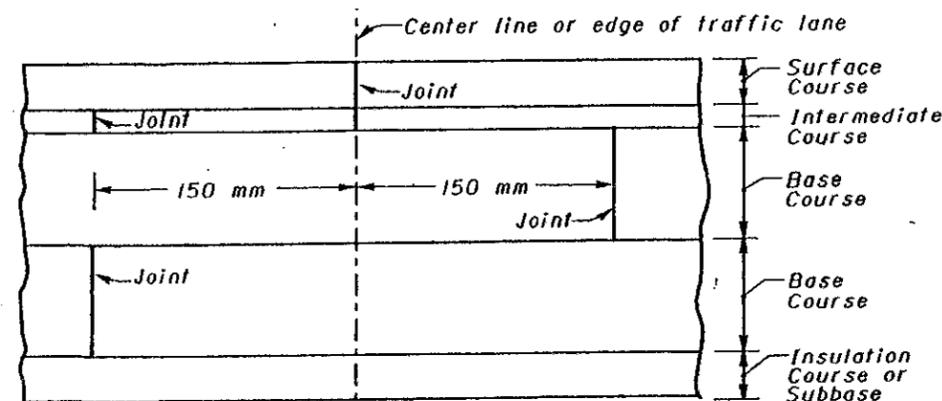
Aggregate drains to be placed where and as directed by Engineer. Provide filter fabric when specified as a separate pay item.

**AGGREGATE DRAIN**



Special care shall be taken during construction to obtain maximum compaction of bituminous concrete in gutters.

**GUTTER FINISH**



**LAPPING LONGITUDINAL JOINTS**

BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

DATE

10-28-94

**RESURFACING**

STANDARD CONSTRUCTION DRAWING  
**BP-3.1M**

APPROVED W.K. Hulman

ENGR., L & D



# STRAW OR HAY BALES

**BALE PLACEMENT:** Bales shall be tightly placed adjacently and entrenched 2" [50] to 3" [75] before staking; or a small amount of loose soil shall be lightly compacted along the upstream edge of the bales.

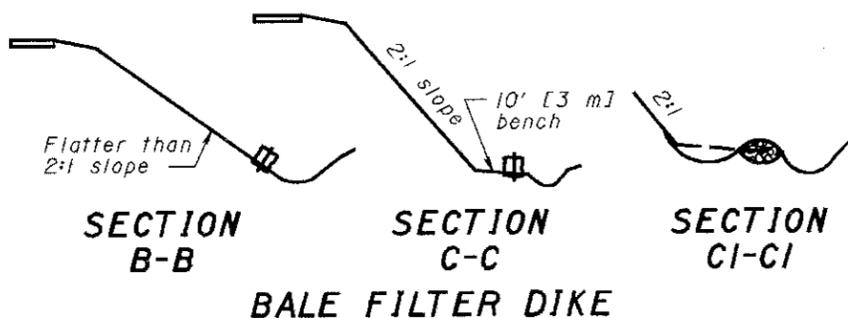
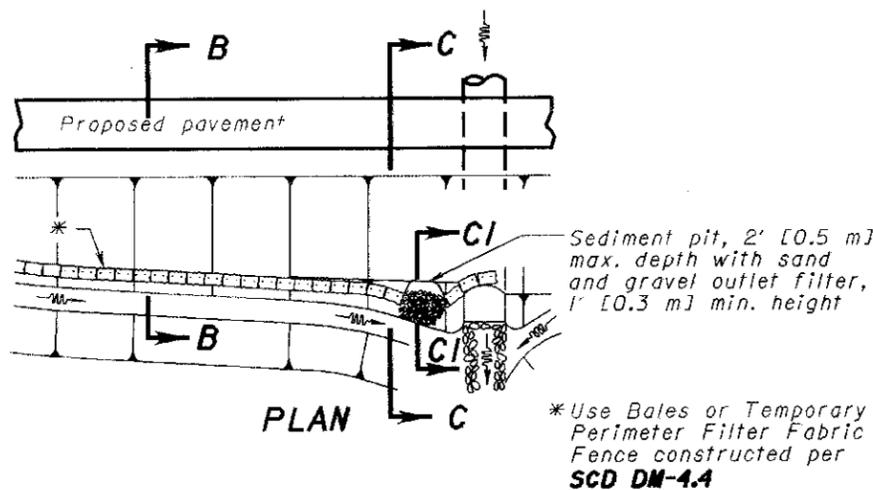
Each bale shall be firmly staked with a minimum of two stakes at least 3' [1 m] in length. Stakes shall be wooden 2"x2" [50x50], reinforcing bars or fence posts.

Loose straw or hay shall be wedged between and under staked bales.

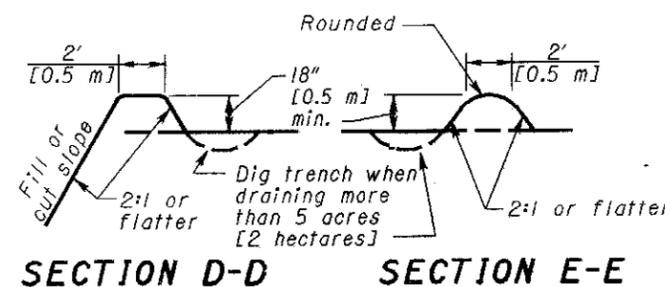
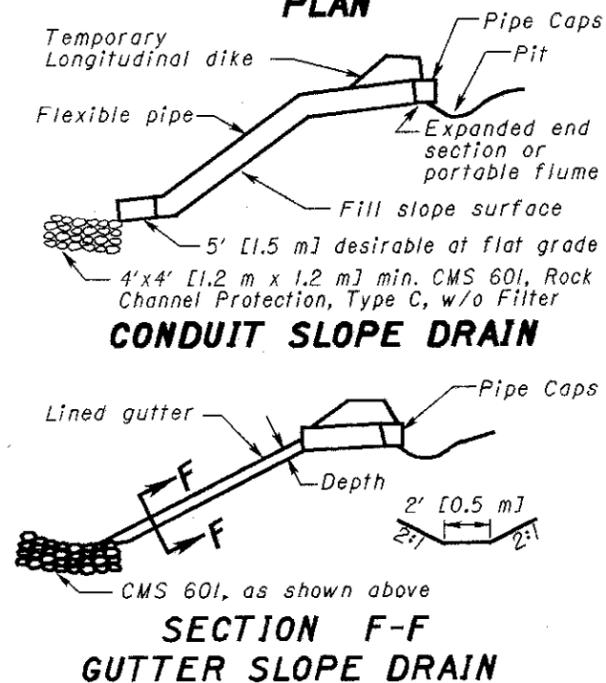
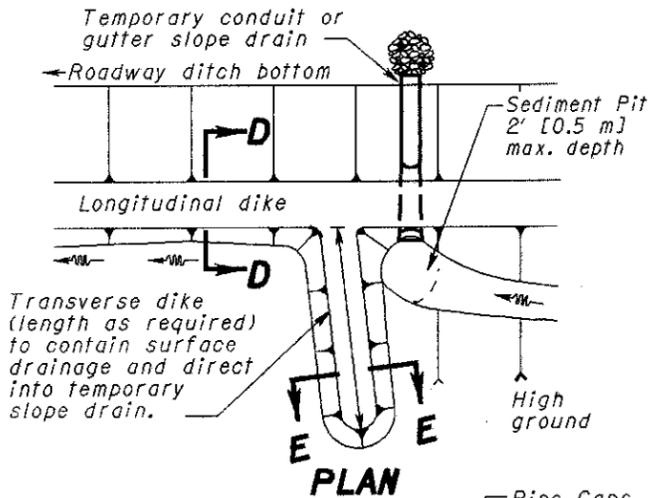
**PITS:** Sediment pits shall be provided and their cost included in the unit price bid for the adjacent SS 877 items.

**MAINTENANCE:** The maintenance or replacement will be paid for by the Department under unit bid prices, agreed unit price, or under 109.04.

**BASIS OF PAYMENT:** Straw or hay bale installation shall be paid for under Item 877 - Temporary Perimeter Filter Fabric Fence. Cost will include placing, staking and removing.



# DIKES AND SLOPE PROTECTION



Area in acres [hectares]	Pipe Sizes			Gutter depth
	Smooth	Corrugated	Half-round	
0-4 [0-1.6]	6" [150]	6" [150]	18" [450]	8" [200]
4-8 [1.6-3.2]	8" [200]	12" [300]	18" [450]	8" [200]
8-12 [3.2-4.9]	10" [250]	15" [375]	21" [525]	12" [300]

**GENERAL:** Dikes & drains shown shall be used when earthwork operations on slopes are higher than 8' [2.5 m] and fill operations are suspended for three weeks or more. Smaller dikes used at the end of a day's operation shall be considered as part of the earthwork. Temporary slope drains shall be suitably positioned and anchored to prevent movement or undermining.

**LONGITUDINAL DIKES:** Longitudinal dikes shall be constructed of suitable material as per CMS 203 and compacted to 85% of maximum density.

**CONDUITS:** Conduits for slope drains shall be corrugated steel pipe, corrugated or smooth plastic pipe, rubber conduit, or an approved equal.

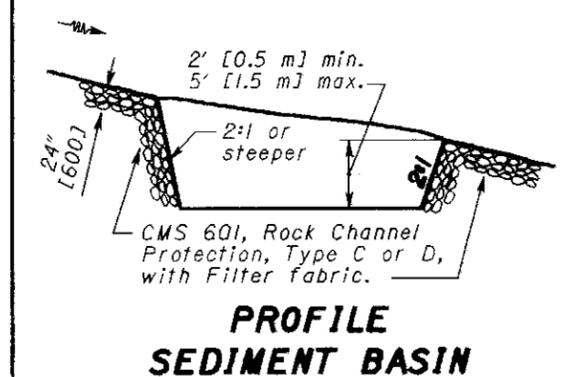
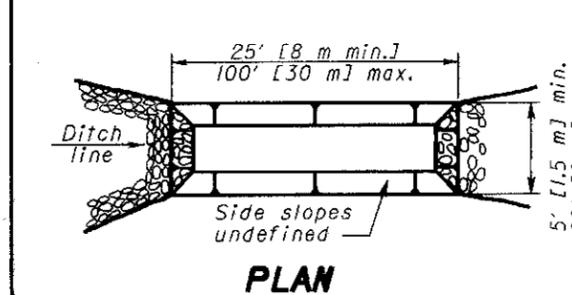
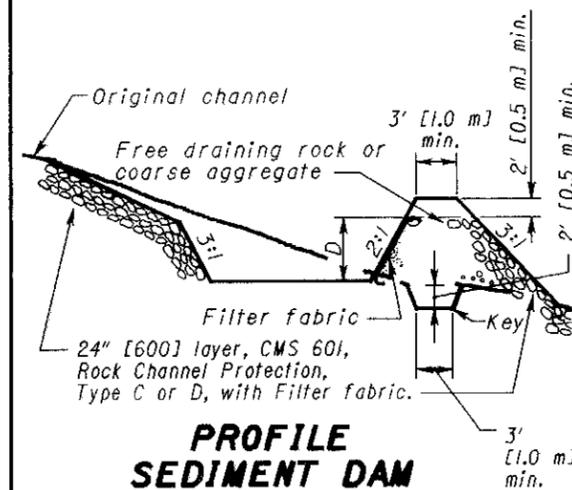
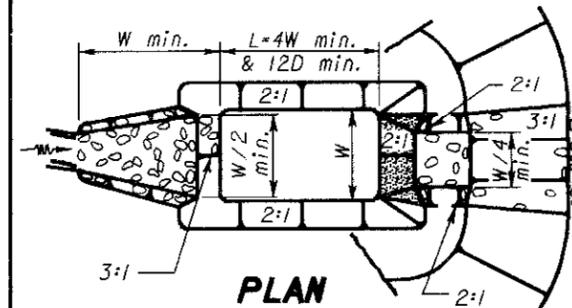
**GUTTERS:** Gutters for slope drains shall be lined with Type C rock channel protection, crushed aggregate slope protection, portland cement concrete, bituminous concrete, plastic sheeting (on slopes 4:1 max.), partial pipe sections or approved equal.

**PITS:** Sediment pits shall be provided and their cost included in the unit price bid for the adjacent items.

**MAINTENANCE:** Dikes and slope protection shall be acceptably maintained. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

**BASIS OF PAYMENT:** Temporary dikes shall be paid for under Item 877-Temporary Dikes. Temporary slope drains shall be paid for under Item 877-Temporary Slope Drains. Rock required shall be paid for under Item 601, Rock Channel Protection, Type C, w/o Filter.

# SEDIMENT BASINS & DAMS



**EMBANKMENT:** Sediment basin embankment construction shall be as per CMS 203.

**FILTERS:** Filter fabric shall be per CMS 601.02 and installed per CMS 601.08 or as detailed here. Such fabrics may be cleaned in lieu of replacement. The cost of all filter fabric required to construct the sediment basin or dam shall be included in the cost of the Item 601, Rock Channel Protection, with Filter Fabric.

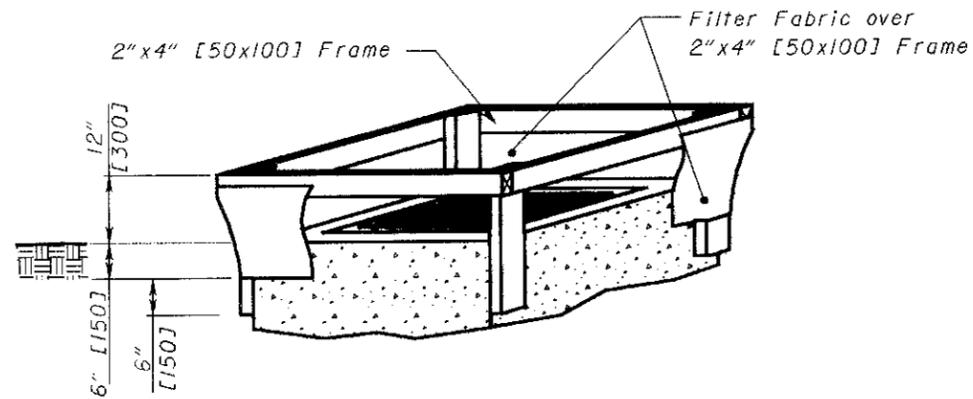
**SIZE:** The volume shown on the plans is the total storage volume required for the sediment basin or dam (67 cubic yards per acre [127 cubic meters per hectare]). A series of smaller basins or dams may be substituted for a larger basin or dam.

**MAINTENANCE:** Sediment pits, dams and basins shall be acceptably maintained. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

**BASIS OF PAYMENT:** Sediment Dams and Basins shall be paid for under Item 877-Sediment Basin and Dams. The pay quantity shall be the actual number of cubic yards [cubic meters] of excavation and embankment required to construct the basin or dam. Rock required shall be paid for under Item 601, Rock Channel Protection, Type C or D, with Filter.

THIS DRAWING REPLACES DM-4.3M DATED 6-30-95.

# TEMPORARY INLET PROTECTION FILTER FABRIC FENCE



**MATERIALS:** Filter Fabric shall meet the requirements of CMS 712.09, Type C. The framing wood shall be construction grade 2"x4" [50x100] lumber.

**CONSTRUCTION:** Excavate a 6" [150] deep trench around the inlet, then drive the 2"x4" [50x100] posts 6" [150] below the excavated trench. Construct the wooden frame using the overlap joint detail shown above. The filter fabric shall be stretched around the wooden frame and securely fastened. The filter fabric shall overlap across one side of the inlet such that the ends of the filter fabric are not attached to the same post. Backfill and compact the excavated soil. Other devices may be used with the approval of the Director.

**MAINTENANCE:** The filter fabric shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and/or replacement of the filter fabric. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or under CMS 109.04.

**PAYMENT:** The cost of all materials, construction and removal shall be paid for under **Item 877 - Temporary Inlet Protection Filter Fabric Fence, Linear Foot [Meter].**

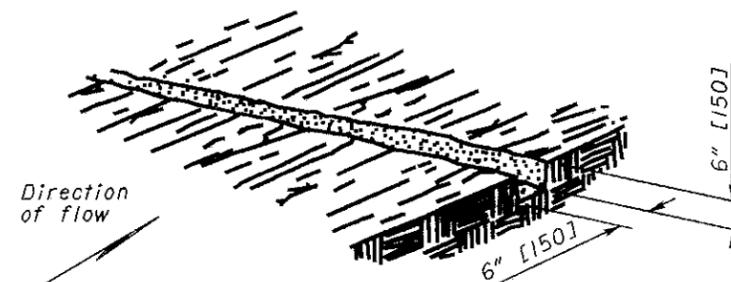
## NOTES

**MATERIALS:** Filter fabric shall meet the requirements of CMS 712.09, Type C. Support stakes shall be a minimum of 1.5"x1.5" [38x38], nominal, and shall be hardwood of sound quality. The stakes shall be driven a minimum of 6" [150] below the bottom of the filter fabric. The maximum spacing between support stakes shall be 10' [3 m].

**CONSTRUCTION:** The bottom of the fabric shall be buried 6" [150] below the ground. The ends of adjacent sections of fence shall be overlapped with the end stake of each section wrapped together prior to installation. The ground elevation of the fence shall be held constant except that the end elevations shall be raised upslope to prevent flow around the end of the fence.

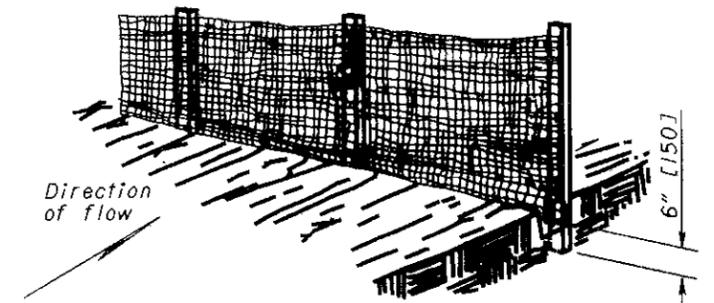
**MAINTENANCE:** The filter fabric fence shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and replacement of the filter fabric. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

**PAYMENT:** The cost of all materials, construction and removal shall be paid for under **Item 877 - Temporary Perimeter Filter Fabric Fence or Temporary Ditch Check Filter Fabric Fence, Linear Foot [Meter].**



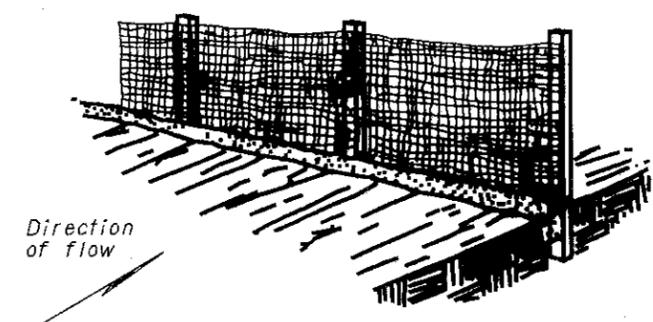
Excavate a 6"x6" [150x150] trench along the proposed fence line.

### STEP 1



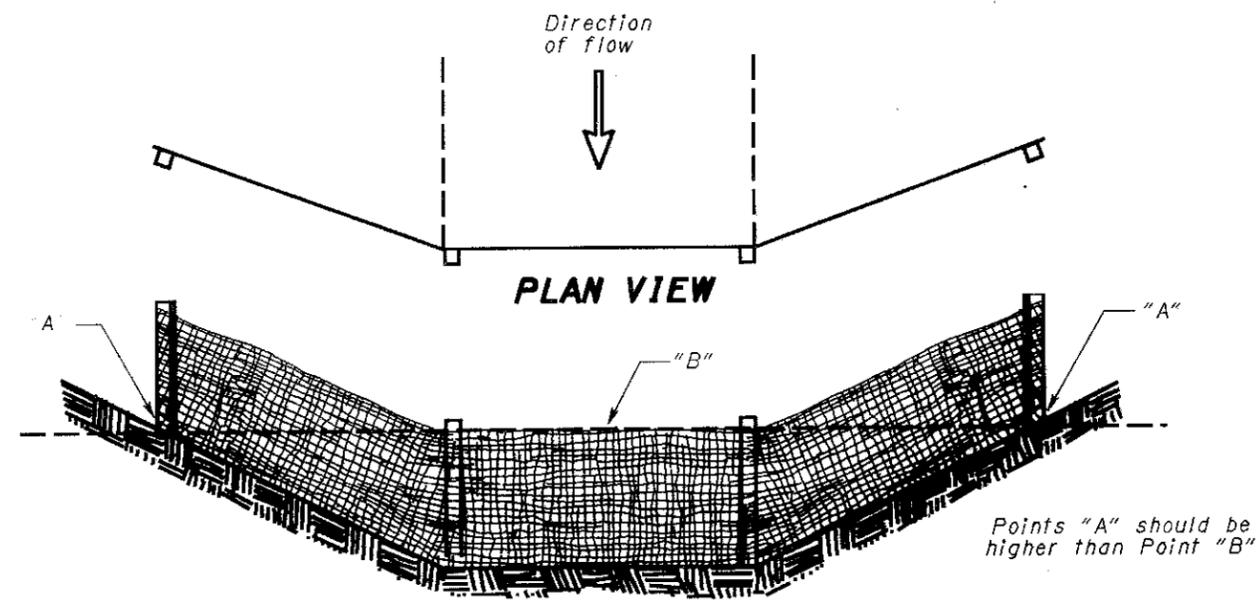
Place fabric and support stakes and extend fabric into the trench.

### STEP 2



Backfill and compact the excavated soil.

### STEP 3



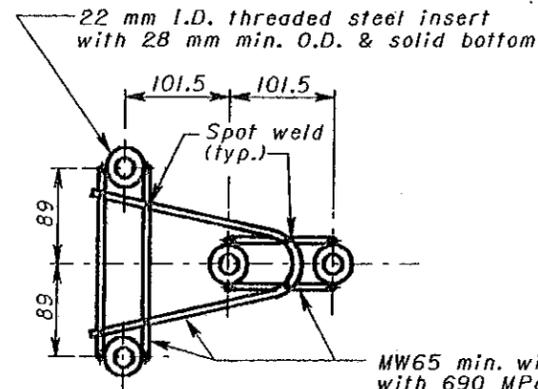
### ELEVATION VIEW

## PLACEMENT AND CONSTRUCTION OF DITCH CHECK FILTER FABRIC FENCE

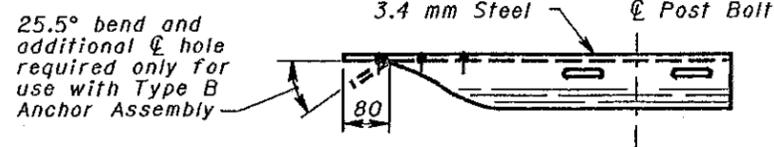
## PLACEMENT AND CONSTRUCTION OF PERIMETER FILTER FABRIC FENCE

THIS DRAWING REPLACES DM-4.4M DATED 6-30-95.

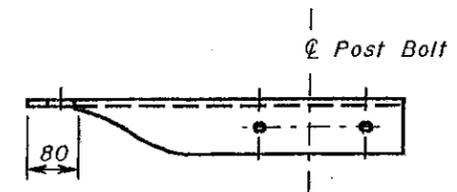
OHIO DEPARTMENT OF TRANSPORTATION	DATE
REVISIONS	4-29-99
STOS. ENGR.	ROADWAY DESIGN ENGINEER
M. EVANS	
D. FOCKE	
All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.	
DESIGN CHECK	OFFICE OF PLANNING
STANDARD ROADWAY CONSTRUCTION DRAWING	TEMPORARY EROSION CONTROL
NUMBER	DM-4.4



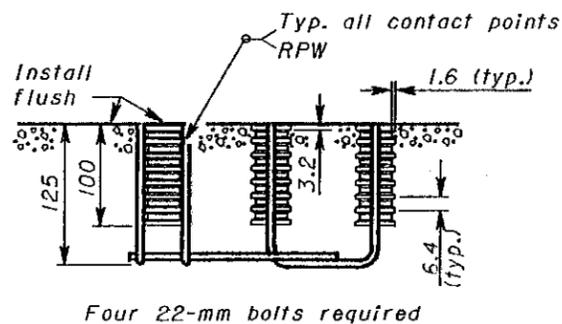
PLAN



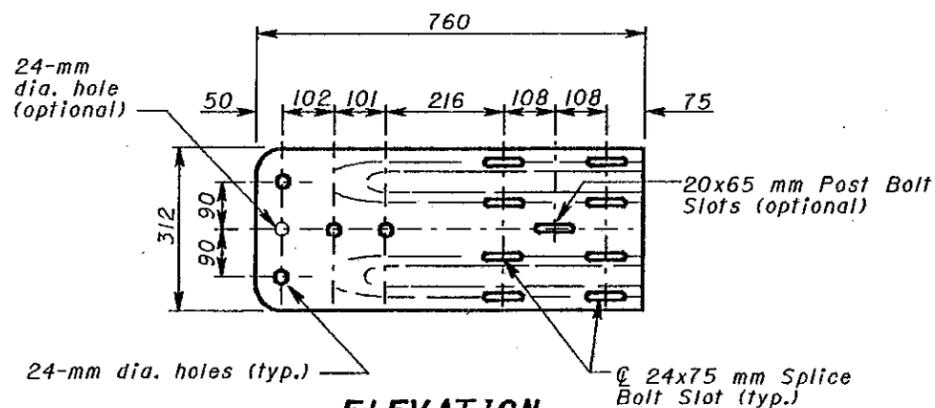
PLAN



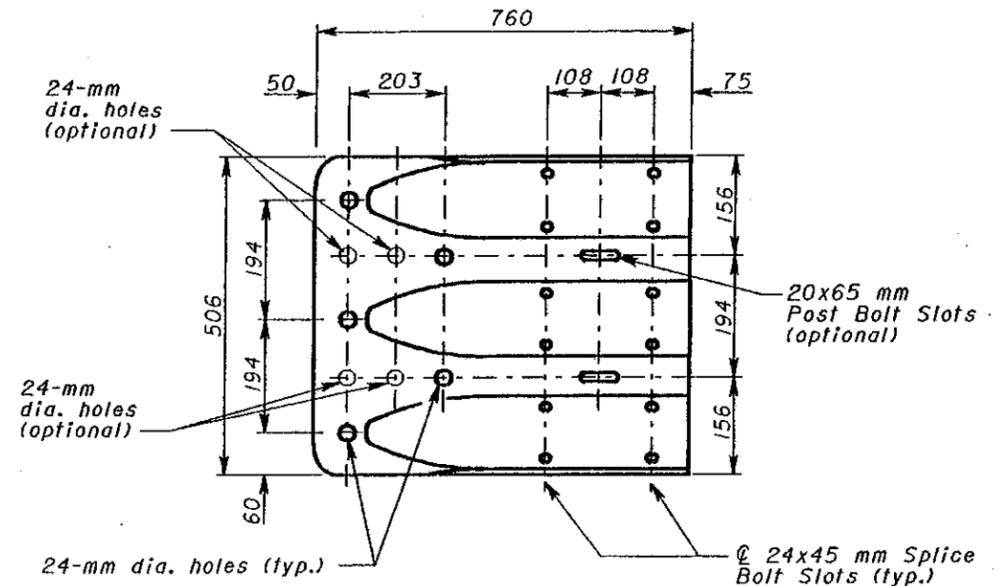
PLAN



ELEVATION



ELEVATION



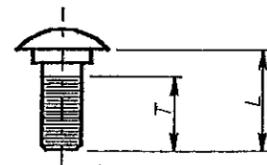
ELEVATION

**CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)**

**W-BEAM TERMINAL CONNECTOR**

**THRIE-BEAM TERMINAL CONNECTOR**

All dimensions are in millimeters unless otherwise noted.



L (mm)	T min. (mm)	Bolt Use
455 (Standard Rail)	85	Type 5: WP/WB, PB
660 (Barrier Rail)		
255	60	Type 4: WP Type 5: SP/WB, PB
50	35	Type 4: SP
32	Full	Splice Bolt

WP- wood post      WB- wood blackout  
 SP- steel post      PB- plastic blackout  
 Longer bolt may be needed for round WP larger than 200 mm dia.

**BUTTON HEAD BOLT**  
 (For post and splice bolts)

**NOTE**

Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts and nuts, and Type I W-Beam to Thrie-Beam Transition section.



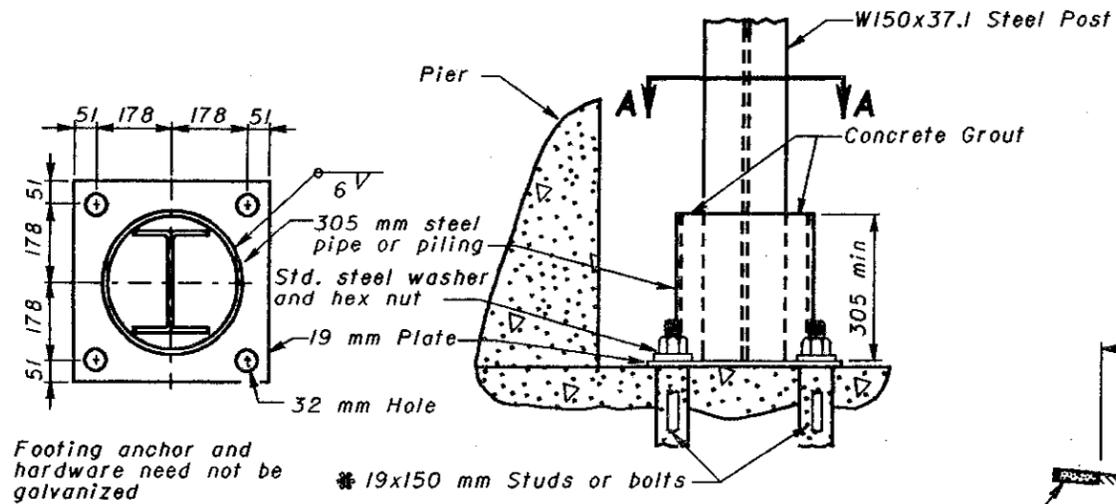
**OHIO DEPARTMENT OF TRANSPORTATION**

**GUARDRAIL DETAILS**

DATE  
 11-30-94  
 10-21-97

STANDARD CONSTRUCTION DRAWING **GR-1.1M**

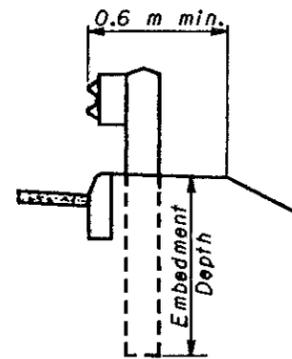
APPROVED *Randy T. Sutherland*



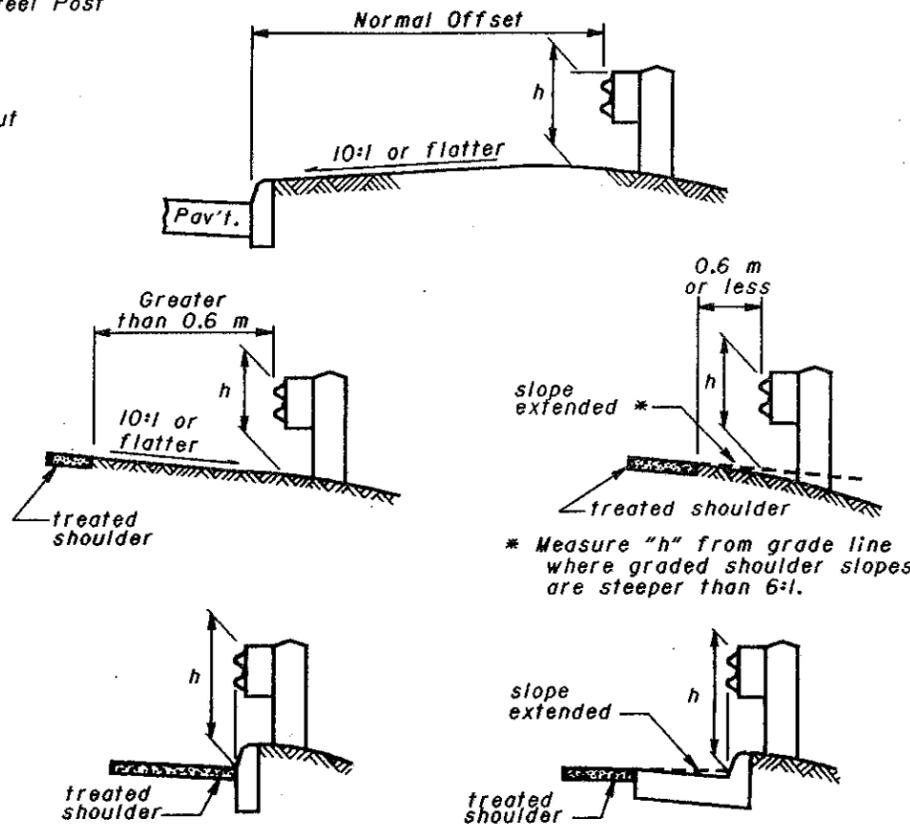
SECTION A-A

ELEVATION

**FOOTING ANCHOR**

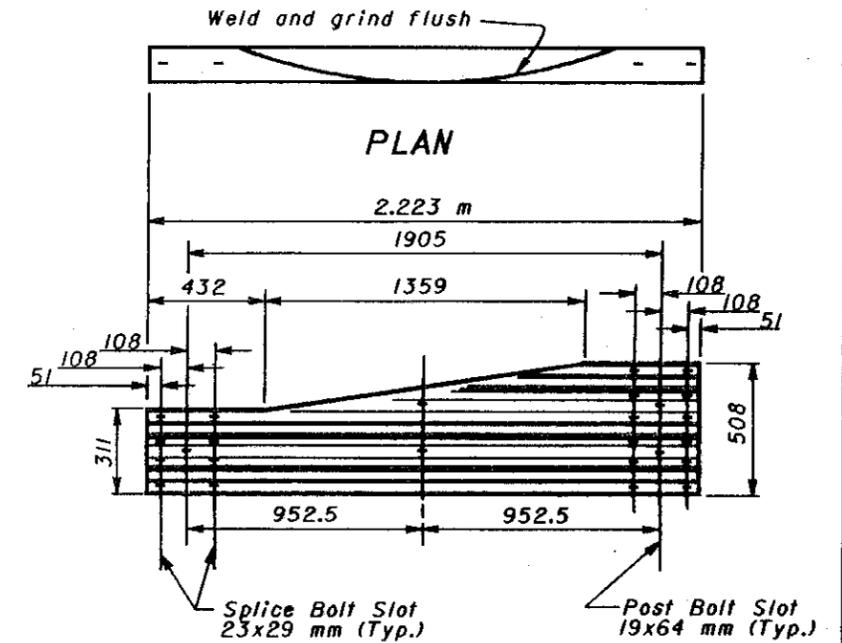


DETAIL A



$h$  = Standard height (Tolerance  $\pm 25$  mm)

**MEASURING GUARDRAIL HEIGHT**



ELEVATION

**TYPE 2  
TRANSITION SECTION \*  
(W-Beam to Thrie-Beam)**

\* For details of Type 1 Transition Section, refer to AASHTO M 180, Figure 4.

**NOTES**

**BEAM RAIL ELEMENTS:** Elements shall be 3.81 m effective length, unless otherwise specified, with 19x64 mm post bolt slots on 1.905 m centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to CMS 606.05.

**BEAM RAIL SPLICE** between two rail elements or between a rail and terminal connector shall be lapped in the direction of traffic. The buffer or flared end sections shall lap on the traffic face. A 305 mm length of beam rail (Back-up Plate), with a 19 mm diameter bolt hole or a 19x64 mm slot, shall be provided at steel posts not having a rail splice.

**EMBEDMENT DEPTH:** Where less than 0.6 m of graded shoulder width (10:1 or flatter) exists, measured from the face of the guardrail (see Detail "A"), longer posts shall be used so that a minimum of 1.65 m embedment depth is provided. Payment for the longer posts will be made at the unit price bid per Each, Item 606 - Guardrail Post, 2.75 m.

**PROTECTIVE COATING:** In lieu of the requirements of CMS 710.06, expansion shields, anchors and insert anchor assemblies installed (embedded) in concrete shall be coated in accordance with ASTM A 153 or be of stainless steel. Any bolts screwed into these embedded devices shall meet CMS 710.06.

**SPECIAL POST MOUNTINGS:**

Posts located over a drainage inlet or structure shall be encased or anchored per the details shown on Standard Construction Drawing GR-2.2M.

Posts located over a footing with a cover of less than 0.75 m shall be installed with a footing anchor as detailed hereon. (A plate, as detailed on Section B-B of Standard Construction Drawing GR-2.2M, may be used as an alternate attachment method.) Where the cover is between 0.75 m and 1.04 m, the footing anchor may be omitted and the post encased instead with 100 mm (min.) of concrete.

Posts located over a culvert with less than 1.3 m of cover shall not be driven, but shall be set in drilled or dug holes. Where the available post embedment depth is less than 1.04 m, the post shall be encased with 100 mm (min.) of concrete.

All costs associated with special post mountings shall be included in the unit price bid for 606 Guardrail of the type specified in the plans.

\* **ANCHORS:** Holes and grouting shall comply with CMS 510. Either cement or nonshrink, nonmetallic grout may be used.

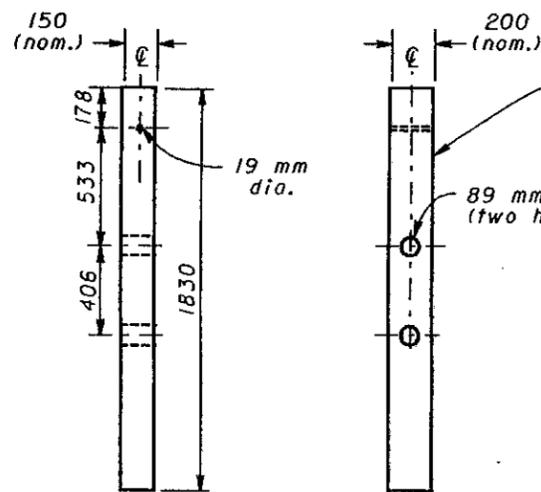
Expansion shield anchors conforming to CMS 712.01 may be substituted except where concrete deterioration has occurred, as determined by the Engineer. The same bolt diameter specified shall be required. Where self-drilling anchors are used, the holes shall be drilled with the expansion shield (not by a drill bit) and the shield installed flush with the concrete surface.

All dimensions are in millimeters unless otherwise noted.

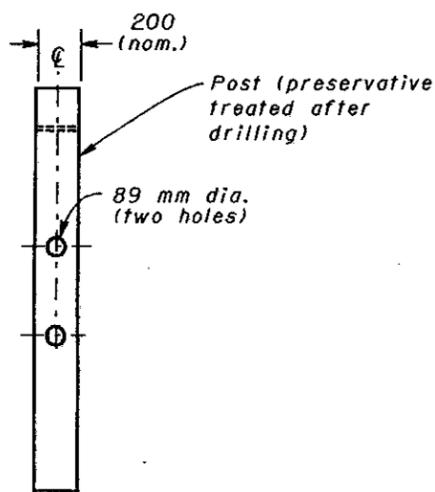


This Drawing Replaces GR-1.2.

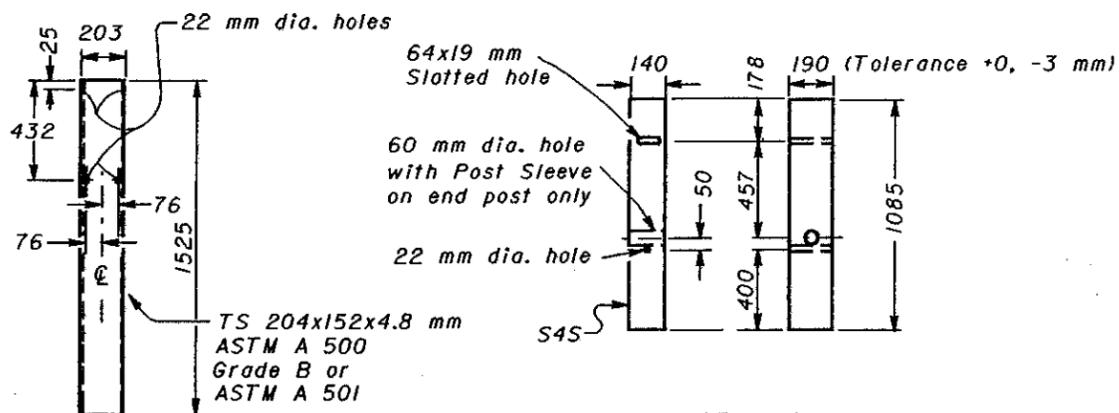
OFFICE OF ROADWAY ENGINEERING OHIO DEPARTMENT OF TRANSPORTATION	
<b>GUARDRAIL DETAILS</b>	DATE 1-3-96
STANDARD CONSTRUCTION <b>GR-1.2M</b> DRAWING	
APPROVED <u>D.K. Hulman, P.E.</u> ADMINISTRATOR	



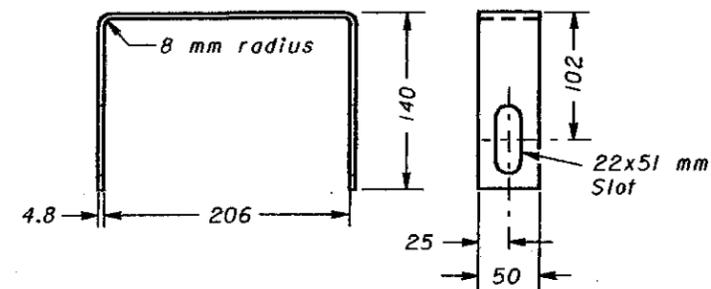
**TYPE 1 BREAKAWAY POST**



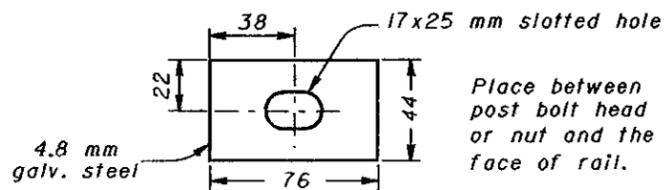
**STEEL TUBE**



**TYPE 2 BREAKAWAY POST**

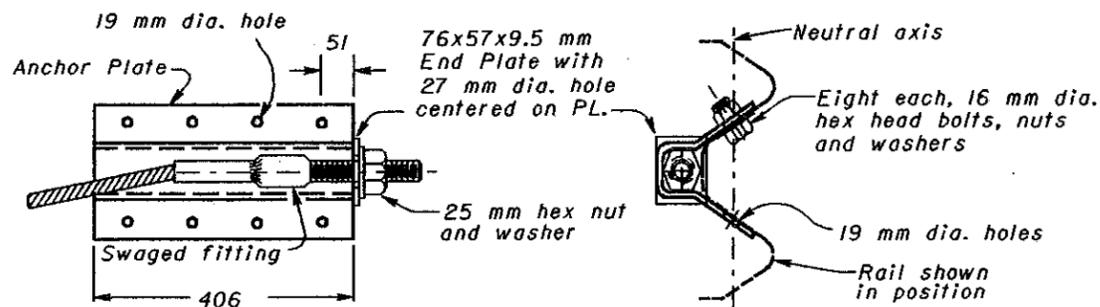


**YOKE DETAILS**

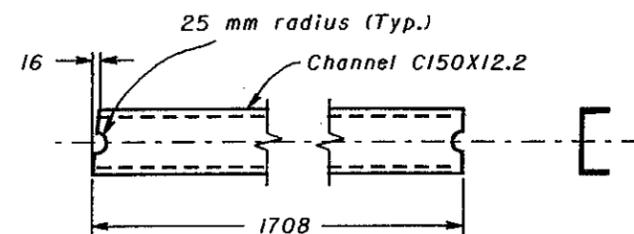


**RECTANGULAR WASHER**

(Not to be used in typical Type 4, 5 or 5A guardrail installations. Use only where specified.)

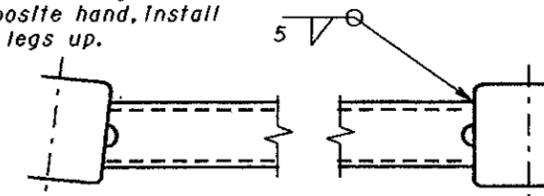


**ANCHOR PLATE ASSEMBLY DETAILS**



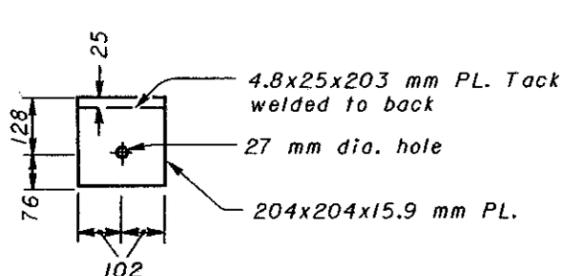
**STRUT DETAILS**

Shown, channel legs down. For opposite hand, install channel legs up.

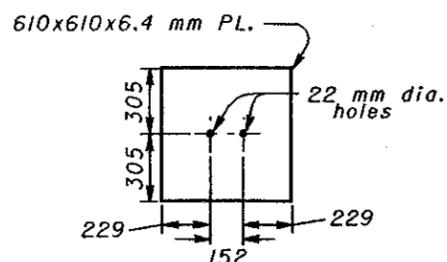


**STRUT AND YOKE ASSEMBLY**

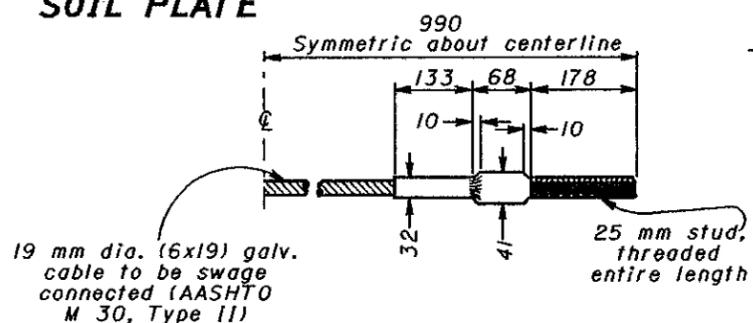
All dimensions are in millimeters unless otherwise noted.



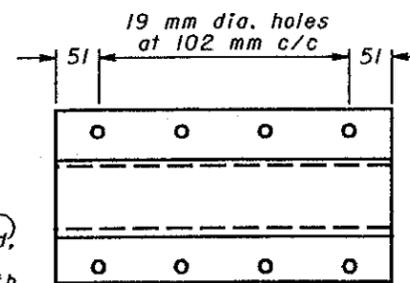
**BEARING PLATE**



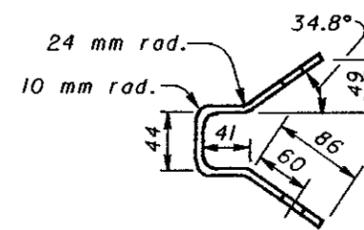
**SOIL PLATE**



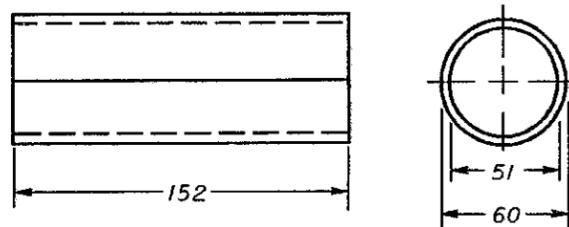
**STANDARD SWAGED FITTING AND STUD CABLE ASSEMBLY**



**ANCHOR PLATE**



**Bent Plate 4.8 mm thickness**



**POST SLEEVE**



BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>GUARDRAIL DETAILS</b>	DATE 11-30-94
STANDARD CONSTRUCTION DRAWING <b>GR-1.3M</b>	
APPROVED <i>R. K. Hulman</i> ENGR., L & D	

# NOTES

**POSTS:** Posts may be round (standard single rail only) or 150x200 mm square-sawn pressure-treated wood or W150x13.5 galvanized steel. The same type post shall be used throughout the length of the project unless otherwise required by the plans or permitted by the Engineer. Round posts shall be 200 mm ± 25 mm in diameter at the top and not more than 75 mm larger at the butt with a uniform taper. Post may be set in drilled holes or may be driven to grade.

Wood posts shall be fabricated with square ends. Posts and blockouts shall be pressure-treated per CMS 710.14. Bolt holes shall be bored and the tops of posts shall be trimmed as shown, if required, after posts are set.

**ALTERNATE BLOCKOUTS:** Approved plastic blockouts may be used in lieu of the wood blockouts shown. The approved list is maintained by the Office of Materials Management.

**WASHERS:** Standard galvanized steel washers of the appropriate size shall be installed on the nut side of bolts through wood posts.

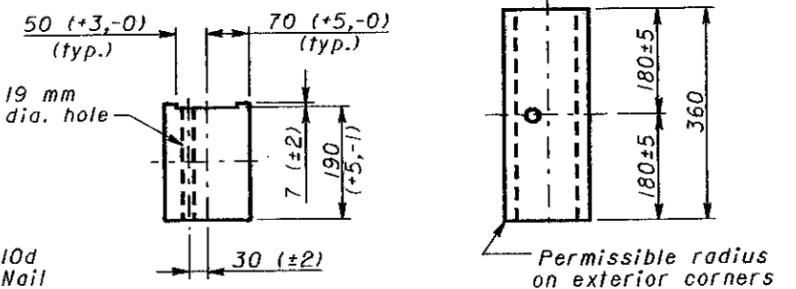
**WELDED BEAMS:** Welded beam guardrail posts may be used for Item 606, Guardrail, provided the web and flange sizes are as shown hereon. Welding of the web to the flanges shall conform to ASTM A 769M, Class 1 using Grade 36 steel (250 MPa yield point) with the following exceptions:

- Sec. 7.2 Test reports of tensile properties for each lot shall accompany each shipment.
- Sec. 12 Beams that have imperfections repaired by welding shall not be accepted for use in Item 606.
- Sec. 13 Random samples shall be tested by the Department from materials delivered to the project site or other locations designated by the Laboratory.

**\* POST EMBEDMENT DEPTH:** For specific depth requirements, see SCD GR-1.2M.

STEEL BEAM POSTS				
Size	Beam depth	Flange width	Flange thickness	Web thickness
Rolled W150x12.6	148 mm	100 mm	4.9 mm	4.3 mm
Rolled W150x13.5	150 mm	100 mm	5.5 mm	4.3 mm
Welded 150x12.6	152 mm	100 mm	4.9 mm	4.3 mm
Welded 150x13.5	152 mm	100 mm	5.5 mm	4.3 mm

**MISCELLANEOUS:** For details not shown see SCD's GR-1.1M and GR-1.2M.



PLAN ELEVATION  
NOTCHED BLOCKOUTS FOR STEEL POSTS

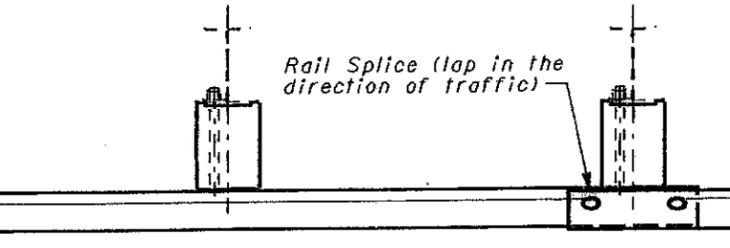
OHIO DEPARTMENT OF TRANSPORTATION

**GUARDRAIL  
TYPE 5 & 5A**

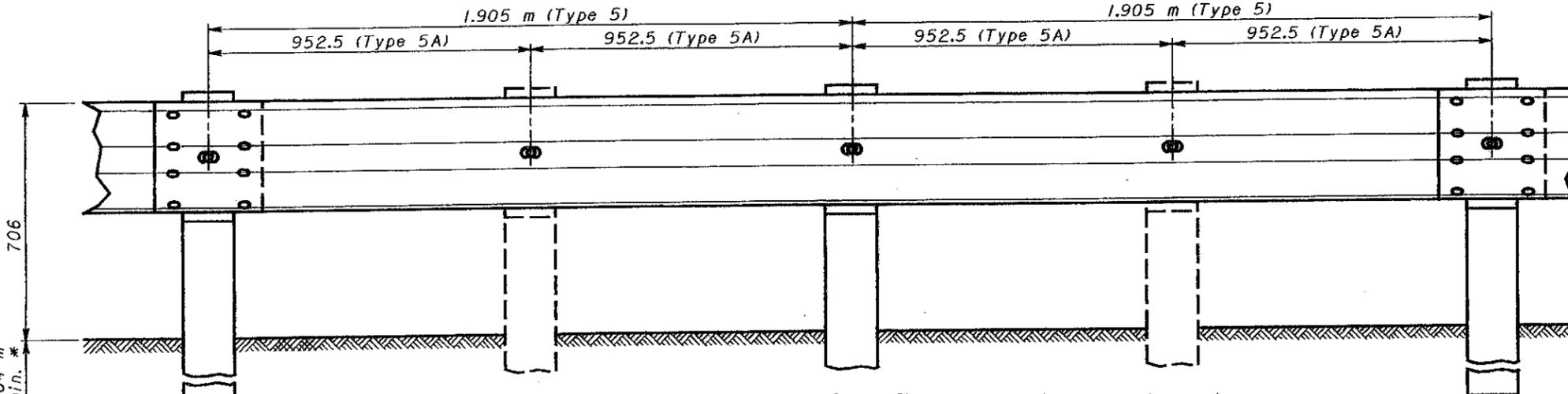
DATE  
11-30-94  
10-21-97  
4-14-98

STANDARD  
CONSTRUCTION  
DRAWING  
**GR-2.1M**

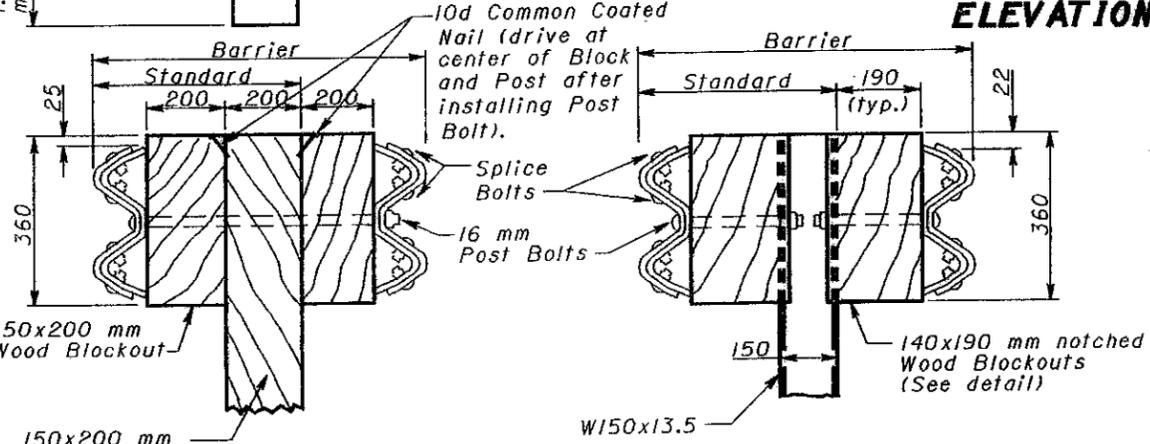
APPROVED *Larry T. ...*



PLAN VIEW (Steel Posts shown)

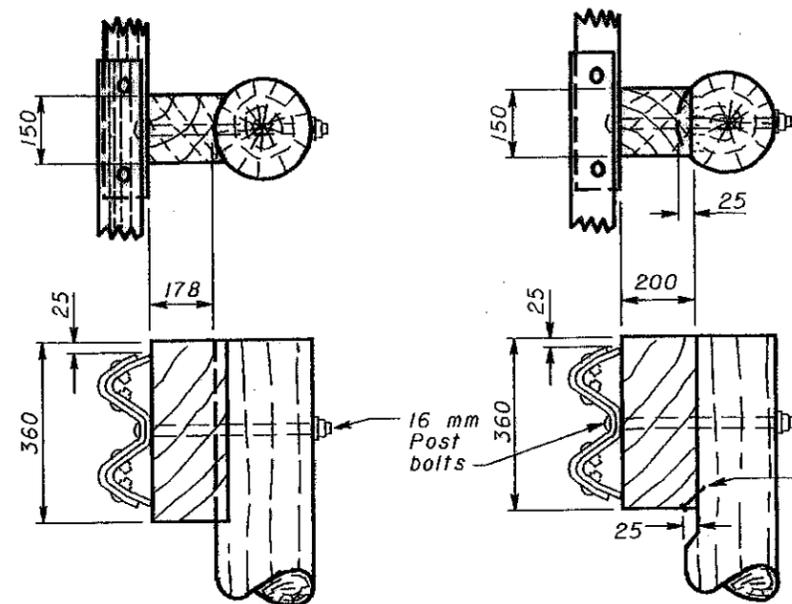


ELEVATION (Wood Posts shown)



SQUARE WOOD POST

STEEL POST



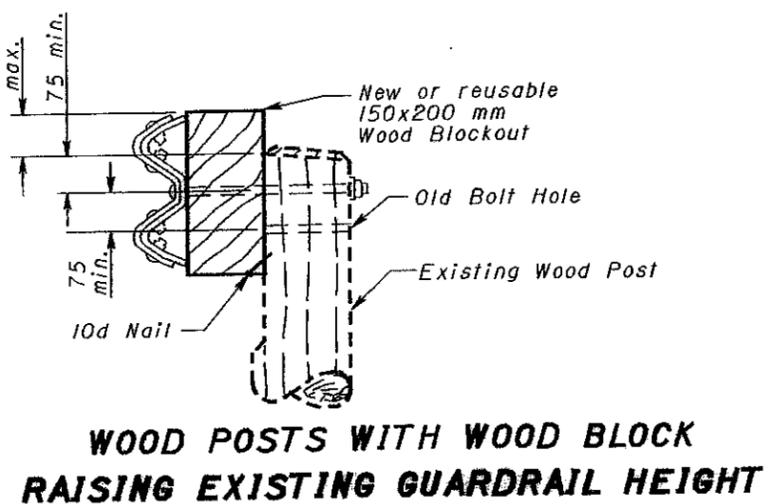
METHOD 1

METHOD 2

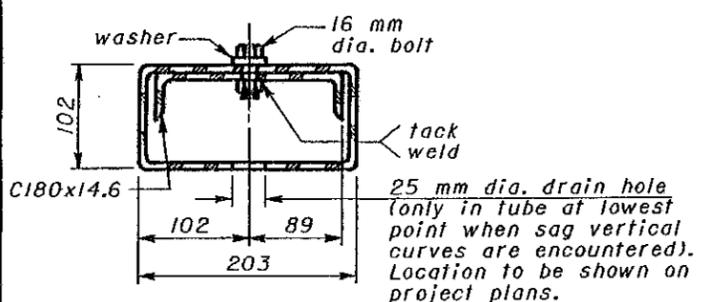
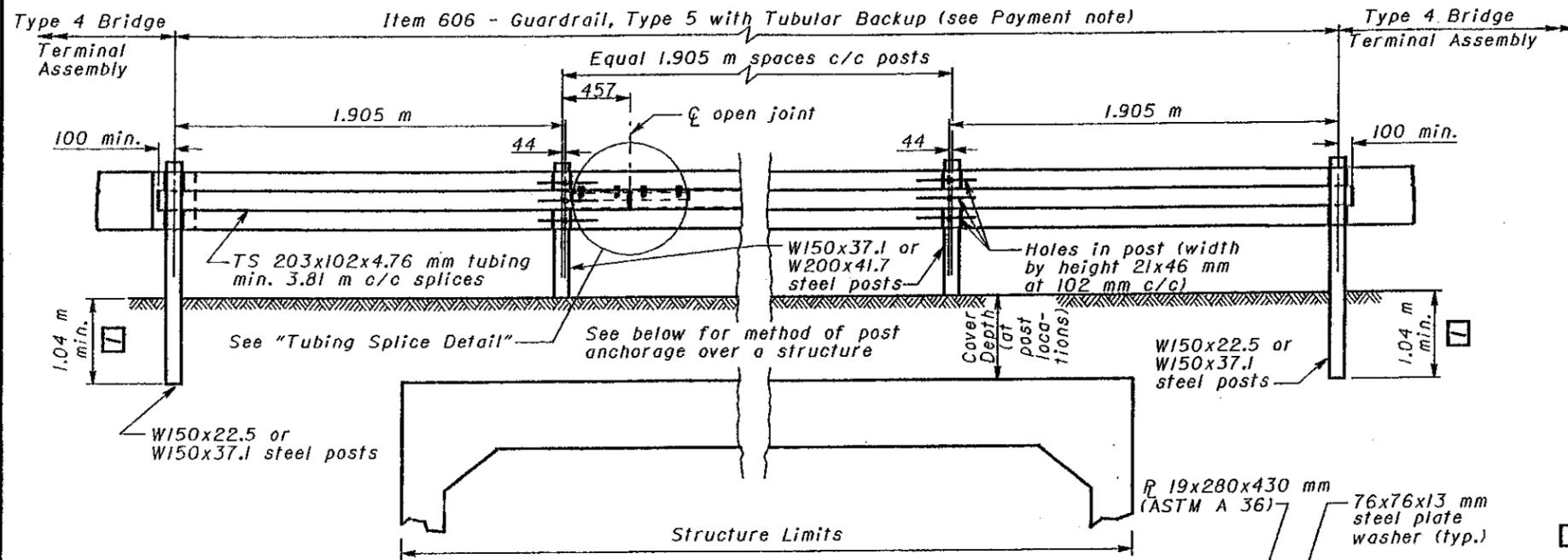
Alternate methods of placing the blockouts on round posts may be submitted for consideration and approved by the Engineer.

ROUND WOOD POSTS

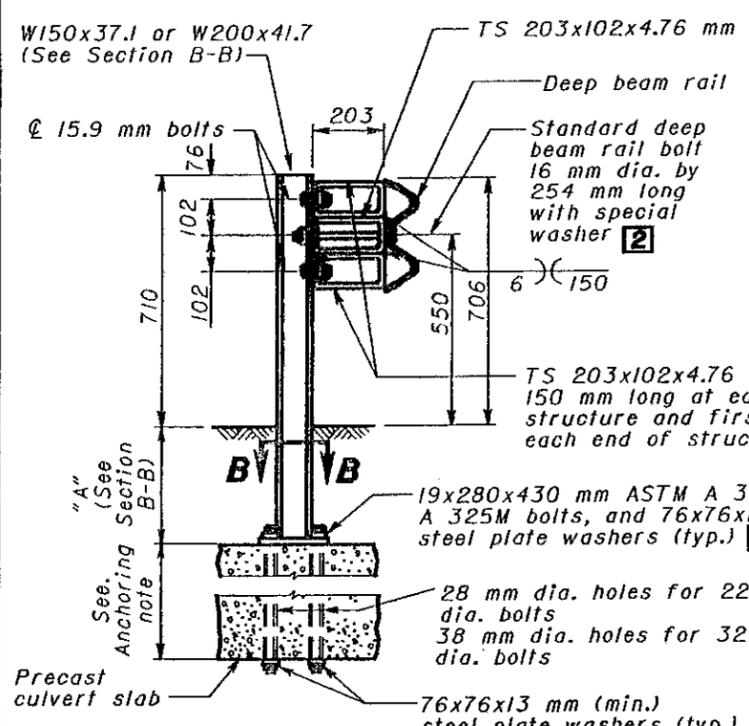
All dimensions are in millimeters unless otherwise noted.



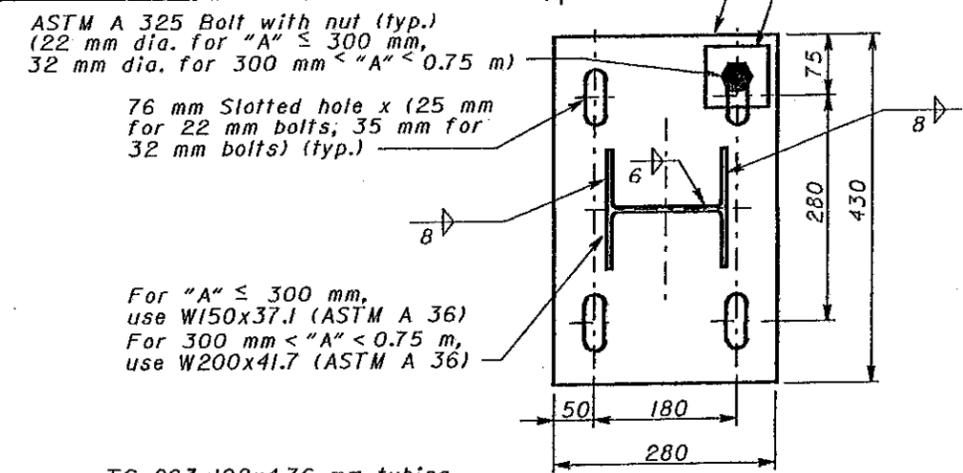
WOOD POSTS WITH WOOD BLOCK  
RAISING EXISTING GUARDRAIL HEIGHT



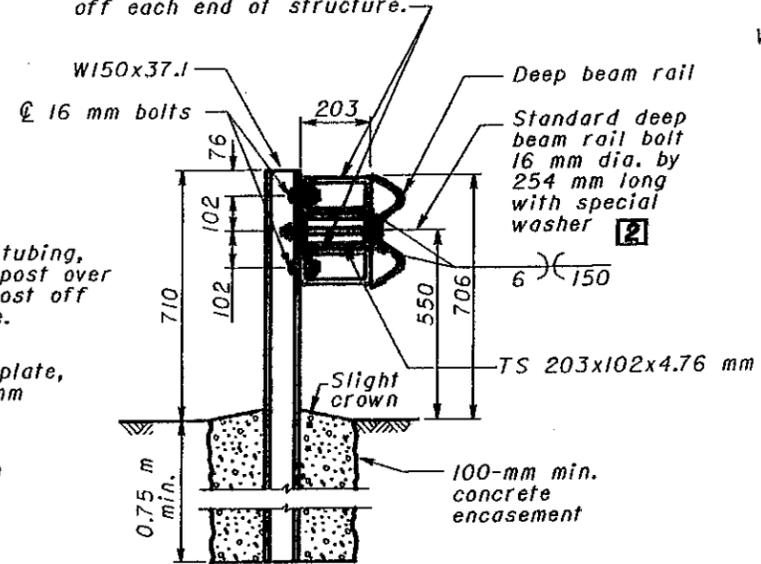
**SECTION A-A**



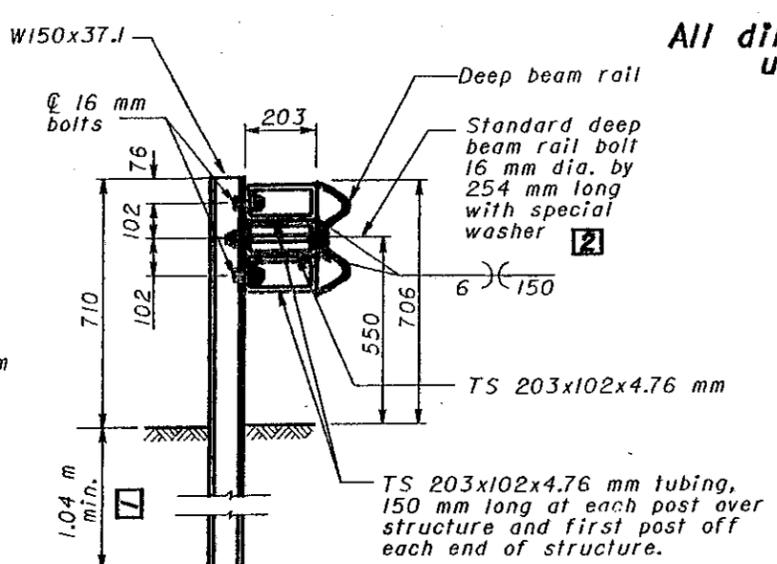
**COVER DEPTH < 0.75 m**



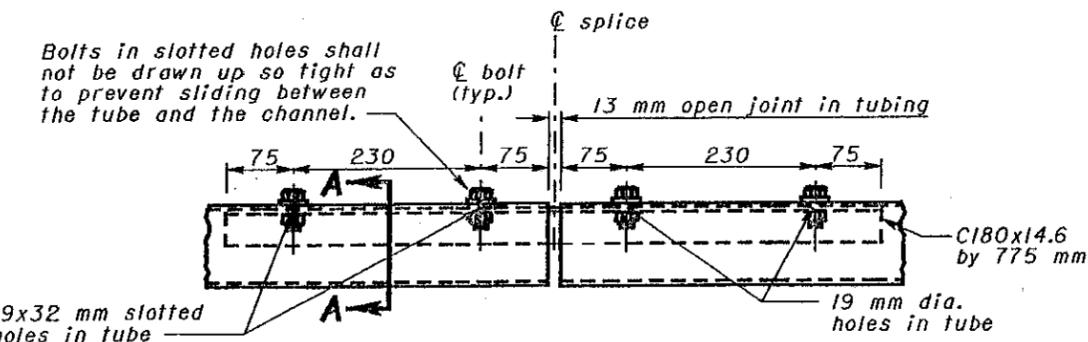
**SECTION B-B**



**0.75 m <= COVER DEPTH < 1.04 m**



**COVER DEPTH >= 1.04 m**



**TUBING SPLICE DETAIL**

**NOTES**

**PAYMENT:** Item 606, Guardrail, Type 5 with Tubular Backup shall be in Meters for the length specified in the plans and shall include tubular backup as per Item 707.10, rails, posts and all other hardware, materials and labor required to construct the guardrail as shown. The specified lengths should be for full panels, i.e. evenly divisible by 3.81 m.

**GALVANIZING:** Rails, posts, baseplates, bolts, nuts, washers and tubular backup shall be galvanized as per Item 711.02.

**ANCHORING:** Partial-depth anchoring is preferred to through-bolting.

Partial depth anchoring shall use nonshrink, non-metallic grout per 705.20. Minimum embedment depths shall be 230 mm for 22 mm bolts and 250 mm for 32 mm bolts.

Through-bolting: Drilling methods that cause spalling of the concrete where the bit passes through the underside of the slab shall not be permitted. In haunches 6:1 or flatter, beveled plate washers shall be used on the bottom surface to compensate for the slope. Through-bolting shall not be permitted in haunch areas with a slope greater than 6:1.

**SIDE-MOUNTED POST ANCHORAGES TO STRUCTURES:** Anchorages shall be installed according to the Office of Structural Engineering's Standard Drawing DBR-2-73M and shall be paid for under Item 517, Railing.

- 1 FOR DETAILS NOT SHOWN: See SCD's GR-1.1M and GR-1.2M. See GR-1.2M regarding post embedment depth.
- 2 For details of special washer, see AASHTO M 180.
- 3 Embed plate in sealant as per Federal Specification TT-S-00230C, Type II.

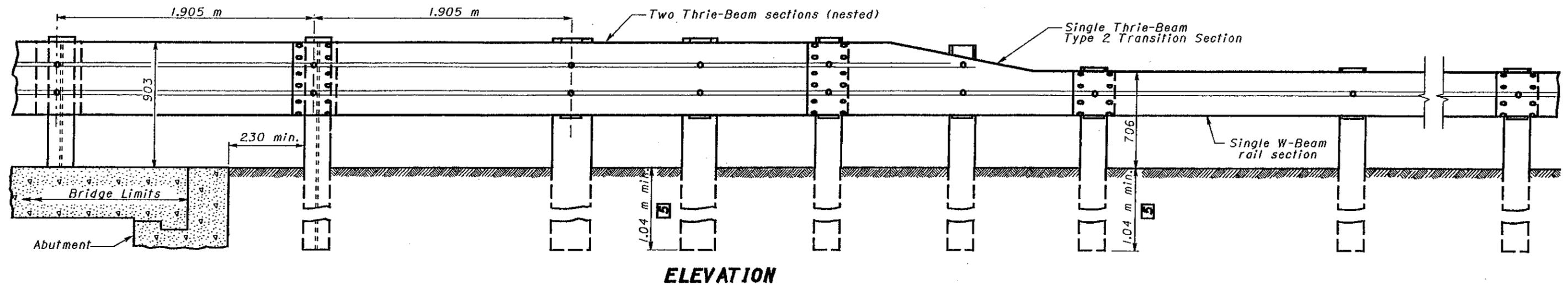
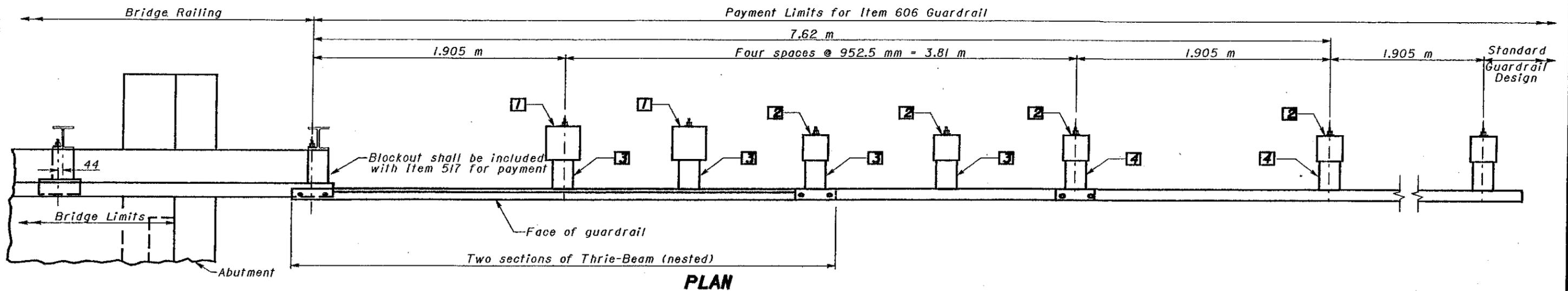
Bolts in slotted holes shall not be drawn up so tight as to prevent sliding between the tube and the channel.

All dimensions are in millimeters unless otherwise noted.



This Drawing Replaces GR-2.2.

<b>OHIO DEPARTMENT OF TRANSPORTATION</b>	
<b>GUARDRAIL TYPE 5 WITH TUBULAR BACKUP</b>	
<b>STANDARD CONSTRUCTION DRAWING</b>	<b>GR-2.2M</b>
APPROVED <i>[Signature]</i>	DATE 1-3-96 10-21-97



All dimensions are in millimeters unless otherwise noted.



**NOTES**

**LEGEND**

- 1 250 x 250 mm wood post
- 2 200 x 200 mm wood post
- 3 150 x 200 x 570 mm wood blockout (See ALTERNATE POSTS AND BLOCKOUTS note)
- 4 150 x 200 x 355 mm wood blockout (See ALTERNATE POSTS AND BLOCKOUTS note)
- 5 See SCD GR-1.2M for additional post embedment details.

**GENERAL:**

For additional details, see SCD's. GR-1.1M, GR-1.2M and other Drawings pertaining to specific guardrail types.

**APPLICATION:**

The Type 3 Bridge Terminal Assembly shall be used to connect guardrail runs to both the approach and trailing ends of Thrie-Beam bridge railings.

**POSTS:**

**GENERAL -** Posts may be set in drilled holes or driven to grade.

**WOOD POSTS -** shall be square-sawed pressure treated wood as per CMS 710.14 and fabricated with square ends. Bolt holes shall be bored and tops of posts trimmed, if required, after posts are set.

ALTERNATE POSTS AND BLOCKOUTS for Type 3 Bridge Terminal Assemblies may be furnished according to the following chart. Plastic blockouts shall not be permitted for Type 3 Bridge Terminal Assemblies.

<b>Wood Posts &amp; Blockouts</b>	250x250 mm	200x200 mm
<b>Steel Posts</b>	W200x35.9	W150x37.1
<b>Wood Blockouts</b>	150x200 mm	
<b>Steel Blockouts</b>	W150x13.5	

**PAYMENT:**

Payment for Item 606 - Each, Bridge Terminal Assembly, Type 3, shall include the extra cost, in excess of normal guardrail costs, for additional and different type posts and blockouts, nested Thrie-Beam sections, Thrie-Beam transition section, and other hardware.

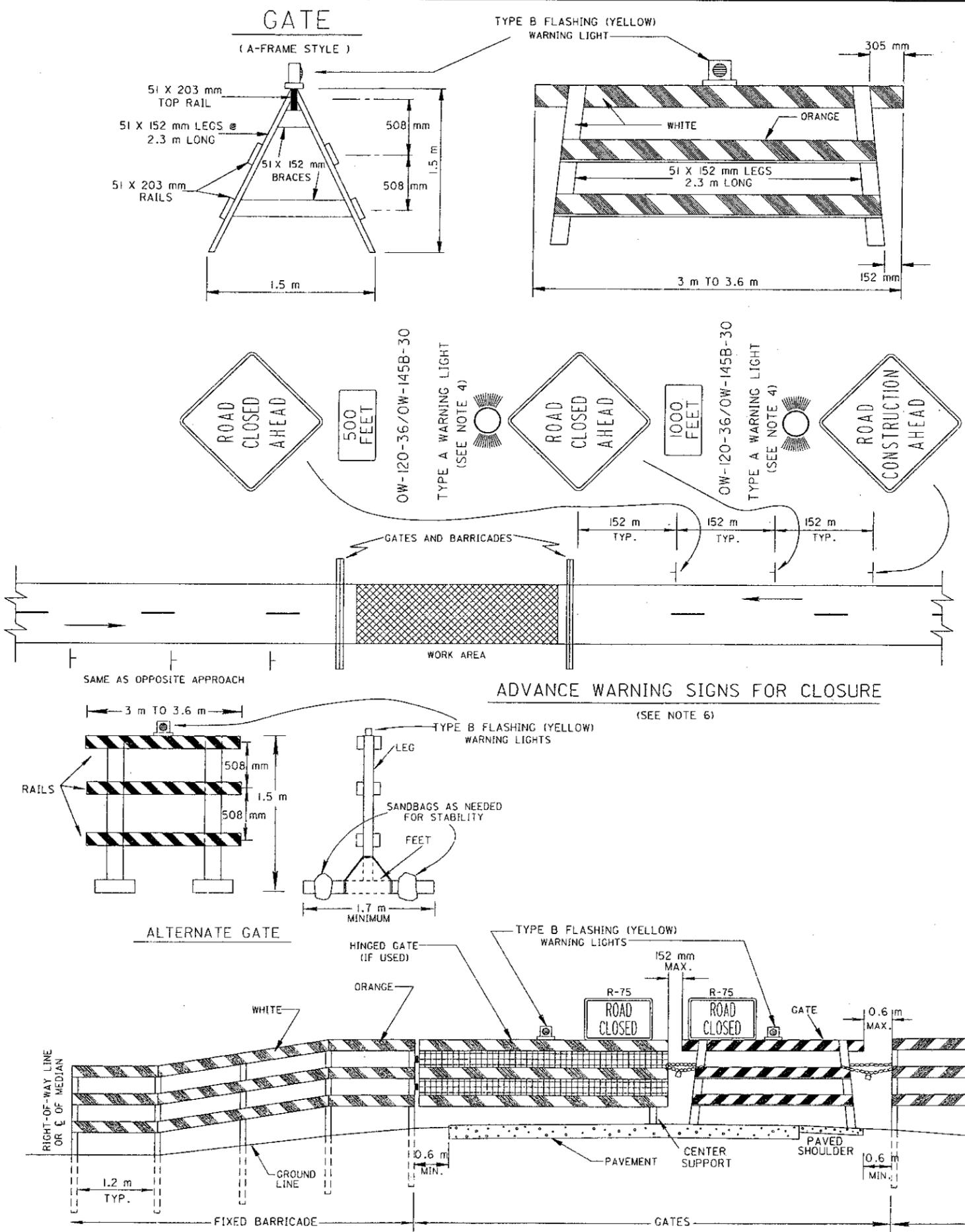
OHIO DEPARTMENT OF TRANSPORTATION

**BRIDGE TERMINAL ASSEMBLY, TYPE 3**

DATE  
11-30-94  
10-21-97

STANDARD CONSTRUCTION DRAWING **GR-3.3M**

APPROVED *Luigi T. Suberland*



**GENERAL NOTES**

- BARRICADES:** BARRICADES SHALL BE CONSTRUCTED ACCORDING TO DETAILS SHOWN. WHEN THE ROAD IS CLOSED TO TRAFFIC, BARRICADES AND GATES SHALL BE USED TO EFFECTIVELY CLOSE THE ENTIRE ROADWAY INCLUDING THE MEDIAN OF DIVIDED HIGHWAYS. IN URBAN AREAS AND AT LOCATIONS WHERE IT IS IMPRACTICAL TO EXTEND THE BARRICADE TO THE RIGHT-OF-WAY LINE BECAUSE OF A SIDEWALK WHICH IS TO REMAIN OPEN OR OTHER OBSTRUCTION, THE ENDS OF THE BARRICADE SHALL BE LOCATED AS DIRECTED BY THE ENGINEER TO EFFECT THE DESIRED CLOSING OF THE HIGHWAY.
- PAINTING AND REFLECTORIZATION:** IN CONSTRUCTION OR MAINTENANCE AREAS ALL RAILS OF THE BARRICADES AND GATES SHALL BE REFLECTORIZED WITH ORANGE AND WHITE REFLECTORIZED TYPE G SHEETING IN 152 mm WIDE ALTERNATE STRIPES WHICH SLOPE DOWNWARD TOWARD THE CENTER LINE OF THE ROAD AT AN ANGLE OF 45°. THE TOP RAIL OF THE A-FRAME AND ALL THREE RAILS OF THE HINGED GATE SHALL BE STRIPED ON BOTH SIDES. ALL POST, BRACES, GATE LEGS, AND ANY UNSTRIPED RAILS SHALL BE PAINTED WHITE. (GATES AND BARRICADES USED IN PERMANENT OR SEMIPERMANENT APPLICATION SHALL DIFFER ONLY IN THAT THEY SHALL USE RED AND WHITE STRIPES).
- GATES:** ONE GATE SHALL BE ERECTED FOR EACH TRAFFIC LANE. GATES SHALL BE CHAINED AND PADLOCKED TO ONE ANOTHER AND TO ADJACENT POST OF THE BARRICADES. CHAINS SHALL BE 6.4 mm STOCK OR LARGER WITH WELDED LINKS. A HINGED GATE MAY BE USED AND SHALL BE SUPPORTED AT THE CENTER IN AN APPROVED MANNER.
- TYPE A FLASHING WARNING LIGHTS:** TYPE A FLASHING WARNING LIGHTS ARE REQUIRED ON THE OW-128 AND THE FIRST OW-120 SIGNS.
- TYPE B FLASHING WARNING LIGHTS:** EACH GATE SHALL BE EQUIPPED WITH A TYPE B FLASHING WARNING LIGHT, CONSPICUOUSLY VISIBLE AT ALL DISTANCES UP TO 305 m UNDER NORMAL ATMOSPHERIC CONDITIONS. THE LIGHT SHALL BE IN OPERATION AT ALL TIMES DURING THE PERIOD THE HIGHWAY IS CLOSED.
- SIGNS:** WHERE THE ROAD IS CLOSED TO TRAFFIC BY THE ERECTION OF GATES AND BARRICADES, R-75 SIGNS SHALL BE MOUNTED ON THE GATES AS SHOWN. THE ADVANCE WARNING SIGNS SHOWN ON THIS DRAWING WILL NOT BE REQUIRED WHEN ALL TRAFFIC HAS BEEN DIRECTED FROM THE ROADWAY AT OR JUST IN ADVANCE OF THE GATES AND BARRICADES SUCH AS ON A LIMITED ACCESS HIGHWAY OR WHEN A TEMPORARY RUNAROUND SIMILAR TO FIGURE C-24 OF THE OHIO MANUAL IS USED. ADVANCE WARNING SIGNS SHALL BE REQUIRED IN ALL OTHER SITUATIONS AND WHEN REQUIRED IN THE PLANS. ADVANCE WARNING SIGNS ON AN APPROACH SHALL CONSIST OF TWO OW-120 SIGNS WITH DISTANCE PLAQUES PLACED ABOUT 152 m AND 305 m FROM THE CLOSURE AND A OW-128 PLACED ABOUT 457 m FROM CLOSURE, THE SIGNS SHALL BE PLACED ON BOTH SIDES OF THE ROAD (DUALLED) FOR 4-LANE DIVIDED HIGHWAYS OR WHEN REQUIRED BY THE PLANS.

**OPERATION:** ON A 2-LANE 2-WAY ROADWAY THE CONTRACTOR WILL NORMALLY OPEN ONLY THE LEFT HAND GATE AS NECESSARY TO ALLOW VEHICLES TO ENTER AND IMMEDIATELY CLOSE IT. BOTH GATES WILL NOT NORMALLY BE OPENED AT THE SAME TIME. THE CONTRACTOR SHALL ASSIGN AN EMPLOYEE TO ASSURE THAT GATES ARE CLOSED AND CHAINED SHUT AT THE END OF EACH WORKDAY.

**MATERIALS:** GATES OR BARRICADES SHALL BE FABRICATED OF THE FOLLOWING MATERIALS:  
**FIXED BARRICADE:**  
 POST: - 102 X 102 mm SQUARE OR 127 mm DIA. (MAXIMUM) WOOD (MAY BE TREATED)  
 - NO. 3, DRIVE POST (712.20)  
 - UP TO 51 mm SQUARE, 14 GAUGE PUNCHED STEEL TUBING  
 RAILS: - 25 X 203 mm OR 51 X 203 mm COMMON LUMBER  
 - 203 X (16 TO 25 mm) THICK EXTERIOR PLYWOOD  
 - EXTRUDED PLASTIC OR FORMED SHEET METAL WITH A 203 mm WIDE SURFACE AND OF SUFFICIENT STIFFNESS TO RESIST TYPICAL WIND LOADS OF UP TO 1436 pascals, BUT HAVING A WEIGHT OF NOT MORE THAN 7.5 kg/m.

**FASTENERS:** - SPIKES (OF SUFFICIENT LENGTH TO CLINCH)  
 - SCREWS/BOLTS (8 mm MIN. DIA.) METAL GUSSETT PLATES AND FORMED OR WELDED METAL JOINTS OF SUFFICIENT SIZE AND QUANTITY TO RESIST THE WIND LOAD SPECIFIED ABOVE. ALL SLIPFIT CONNECTIONS SHALL ALSO BE BOLTED TO PREVENT UNAUTHORIZED DISASSEMBLY

**GATES:**  
 LEGS: - 51 X 152 mm COMMON LUMBER ("A FRAME" ONLY)  
 - 102 X 102 mm WOOD  
 - UP TO 51 mm SQUARE, 14 GAUGE PUNCHED STEEL TUBING  
 - NO. 3 DRIVE POST (712.20)  
 RAILS: - 51 X 203 mm COMMON LUMBER  
 FASTENERS: (SAME AS BARRICADES ABOVE)  
 FEET: - 152 X 152 mm WOOD  
 - NO. 3 DRIVE POST (712.20)  
 - UP TO 57 mm SQUARE, 12 GAUGE PUNCHED STEEL TUBING  
 BRACES: - 51 X 152 mm (MAXIMUM) COMMON LUMBER  
 - 102 mm WIDE X 19 mm THICK PLYWOOD STRIPS  
 - NO. 2 DRIVE POST (712.20)

**HINGED GATE:**  
 GATE: - 3.6 m X 1.2 m STEEL FRAME, FARM GATE  
 RAILS: (SAME AS FIXED BARRICADES ABOVE)  
 HARDWARE: - HINGED SCREWHOOKS FOR HANGING GATE TO POST

**LUMBER:** LUMBER USED IN THE CONSTRUCTION OF GATES AND BARRICADES SHALL BE COMMON YELLOW PINE OR COMMON DOUGLAS FIR, SURFACED ON FOUR SIDES STANDARD, ALL SIZES ARE NOMINAL.

METRIC

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF OMUTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

BUREAU OF DESIGN SERVICES DIVISION OF HIGHWAYS OHIO DEPARTMENT OF TRANSPORTATION	
MAINTENANCE OF TRAFFIC	DATE 04/25/94
GATES AND BARRICADES IN POSITION	
STANDARD CONSTRUCTION DRAWING	MT-101.60M
APPROVED <i>[Signature]</i> ENGR. OF DESIGN SERVICES	

# 614 TEMPORARY RAISED PAVEMENT MARKERS

## GENERAL

THIS ITEM OF WORK SHALL CONSIST OF FURNISHING, INSTALLING, MAINTAINING AND SUBSEQUENTLY REMOVING TEMPORARY RAISED PAVEMENT MARKERS (TRPM'S). THE MARKERS SHALL BE YELLOW OR WHITE, AS DESCRIBED IN THE PLAN.

## MATERIAL

ALL MARKERS AND RETROREFLECTORS SHALL BE OF SUFFICIENT STRENGTH AND PROPERLY SHAPED SO AS NOT TO BE DISLODGED OR BROKEN, BY IMPACTS FROM VEHICLES TIRES, INCLUDING THOSE OF HIGH PRESSURE TRUCK TIRES LOADED TO 2043 KILOGRAMS.

RETROREFLECTORS SHALL BE PROVIDED IN ONE OR TWO DIRECTIONS ON EACH MARKER AS REQUIRED BY THE USAGE AND SHALL RETURN WHITE OR YELLOW LIGHT AS IS APPROPRIATE FOR THE APPLICATION.

THE REFLECTOR SHALL HAVE AN EFFECTIVE AREA OF 225 SQUARE MILLIMETERS FOR TYPE A OR 1935 SQUARE MILLIMETERS FOR TYPE B. ITS BRIGHTNESS OR SPECIFIC INTENSITY (WHEN TESTED AT 0.2 DEGREE ANGLE OF OBSERVATION AND THE FOLLOWING ANGLES OF INCIDENCE) SHALL MEET OR EXCEED THE FOLLOWING:

### SPECIFIC INTENSITY

INCIDENCE ANGLE (DEGREES)	TYPE A	
	WHITE	YELLOW
0	1.0	0.6
20	0.4	0.24
45	—	—

INCIDENCE ANGLE (DEGREES)	TYPE B	
	WHITE	YELLOW
0	3.0	1.8
20	1.2	0.72
45	0.3	0.2

**ANGLE OF INCIDENCE** FORMED BY A RAY FROM LIGHT SOURCE TO THE MARKER AND THE NORMAL TO THE LEADING EDGE OF THE MARKER FACE (ALSO HORIZONTAL ENTRANCE ANGLE).

**ANGLE OF OBSERVATION** FORMED BY A RAY FROM LIGHT SOURCE TO THE MARKER AND THE RETURNED RAY FROM THE MARKER TO THE MEASURING RECEPTOR.

**SPECIFIC INTENSITY** IS THE MEAN CANDLEPOWER OF THE REFLECTED LIGHT (AT GIVEN INCIDENCE AND DIVERGENCE ANGLES) FOR EVERY 10.7 LUX AT THE REFLECTOR (ON A PLANE PERPENDICULAR TO THE INCIDENT LIGHT).

**TYPE A** MARKERS ARE INTENDED TO PROVIDE HIGH VISIBILITY BOTH DAY AND NIGHT. THEIR DAYTIME VISIBILITY SHALL BE ASSURED BY SIZE, SHAPE AND COLOR AS FOLLOWS:

- 1) THE MARKERS SHALL BE A HIGH VISIBILITY YELLOW OR WHITE COLOR WHICH WILL NOT DEGRADE SUBSTANTIALLY DUE TO TRAFFIC WEAR AND WHICH WILL MATCH THE COLOR OF THE REFLECTOR.
- 2) WHEN VIEWED FROM ABOVE, THE MARKERS SHALL HAVE A VISIBLE AREA OF NOT LESS THAN 9030 SQUARE MILLIMETERS.
- 3) WHEN VIEWED FROM THE FRONT, PARALLEL TO THE PAVEMENT, AS FROM APPROACHING TRAFFIC, THE MARKER SHALL HAVE A WIDTH OF APPROXIMATELY 100 MILLIMETERS AND A VISIBLE AREA OF NOT LESS THAN 970 SQUARE MILLIMETERS.

**TYPE B** MARKERS ARE INTENDED TO PROVIDE HIGH VISIBILITY AT NIGHT BY RETROREFLECTING LIGHT FROM AUTOMOTIVE HEADLIGHTS BACK TO THE DRIVER.

## INSTALLATION

TEMPORARY RAISED PAVEMENT MARKERS SHALL BE ATTACHED TO CLEAN, DRY PAVEMENT BY A BUTYL ADHESIVE PAD, A BITUMINOUS ADHESIVE OR OTHER CONSTRUCTION GRADE ADHESIVES (SUCH AS FRANKLIN PANEL AND METAL ADHESIVE) SUITABLE TO ANCHOR THE MARKER UNDER THE ABOVE CONDITIONS. WHEN IT IS NECESSARY TO ATTACH MARKERS TO NEW CONCRETE PAVEMENT WITH CURING COMPOUND REMAINING, THE CURING COMPOUND MEMBRANE SHALL BE REMOVED BY SANDBLASTING OR OTHER MECHANICAL CLEANING METHOD. MARKERS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

THE CONTRACTOR SHALL IMMEDIATELY REPLACE, AT HIS EXPENSE, ANY MARKERS WHICH FAIL (BROKEN HOUSING, HOUSING WORN TO THE EXTENT THAT DAYTIME VISIBILITY IS SIGNIFICANTLY DIMINISHED OR OF AN UNACCEPTABLE COLOR, DETACHED OR BROKEN REFLECTOR, HOUSING DETACHED FROM ADHESIVE).

MARKERS ARE LIKELY TO BE REMOVED BY SNOW PLOWING OPERATIONS, THUS THEY ARE NOT CONSIDERED SUITABLE FOR USE DURING THE PERIOD FROM OCTOBER 15 UNTIL APRIL 30. THE CONTRACTOR IS ADVISED TO SCHEDULE HIS WORK AND/OR THE USE OF THESE DEVICES TO AVOID THIS PERIOD. SHOULD THE CONTRACTOR CHOOSE TO USE TRPM'S DURING THIS PERIOD AND THEY ARE SUBSEQUENTLY REMOVED OR DESTROYED BY SNOW AND ICE CONTROL ACTIVITIES, THE CONTRACTOR SHALL IMMEDIATELY, AT HIS EXPENSE, PROVIDE A SUBSTITUTE TRAFFIC GUIDANCE SYSTEM EFFECTIVE DURING DAY AND NIGHT AND WHICH IS ACCEPTABLE TO THE ENGINEER.

THE MARKERS SHALL BE PLACED ACCURATELY TO DEPICT STRAIGHT OR UNIFORMLY CURVING LINES. WHEN USED TO SUPPLEMENT TEMPORARY PAVEMENT MARKINGS, THEY SHALL BE PLACED ON OR IMMEDIATELY ADJACENT TO THE PAVEMENT MARKING. LOCATIONS SHALL BE ADJUSTED UP TO 300 MILLIMETERS LONGITUDINALLY OR 150 MILLIMETERS Laterally TO AVOID PLACEMENT ON JOINTS, OR ON CRACKED OR DETERIORATED PAVEMENT. MARKERS SHALL NOT BE PLACED DIRECTLY ON PAVEMENT MARKINGS IF THIS DETRACTS FROM THEIR ABILITY TO REMAIN ATTACHED TO THE PAVEMENT.

## APPLICATION

1) WHEN REQUIRED TO SUPPLEMENT PAVEMENT MARKING, TEMPORARY RAISED PAVEMENT MARKERS SHALL BE PLACED AS FOLLOWS:

LINE	TYPE	SPACING
EDGE LINE	A OR B	6 m C/C
LANE LINE	A OR B	12 m C/C*
CENTER LINE (SINGLE BROKEN)	A OR B	12 m C/C*
CENTER LINE (DOUBLE/SOLID)	A OR B	2 UNITS SIDE BY SIDE 100 mm APART 6 m C/C
CHANNELIZING LINE (INCLUDES EXIT GORE NOSE)	A OR B	3 m C/C

\* CENTERED IN GAP

2) WHEN USED TO SUBSTITUTE FOR (REPLACE) PAVEMENT MARKING, TEMPORARY RAISED PAVEMENT MARKERS SHALL BE PLACED AS FOLLOWS:

LINE	TYPE	SPACING
EDGE LINE	A	1.5 m C/C
LANE LINE	A	4 @ 0.75 m C/C 9 m GAP (12 m CYCLE)
CHANNELIZING LINE (INCLUDES EXIT GORE NOSE)	A	1.5 m C/C
EDGE LINE (TWO COLOR) (WHITE/YELLOW)	A	BACK TO BACK 1.5 m C/C

YELLOW MARKERS USED TO SEPARATE OPPOSITE FLOWS OF TRAFFIC (CENTER LINES) SHALL INCLUDE RETROREFLECTORS FOR BOTH DIRECTIONS. ALL OTHER YELLOW AND WHITE MARKERS SHALL PROVIDE RETROREFLECTIVITY FOR ONE DIRECTION ONLY.

## REMOVAL

REMOVAL SHALL BE ACCOMPLISHED IN A MANNER SUCH THAT LITTLE OR NONE OF THE ADHESIVE REMAINS ON THE PAVEMENT. PERMANENT PAVEMENT SURFACES SHALL NOT BE SCARRED, BROKEN OR ROUGHENED SIGNIFICANTLY.

## PAYMENT

BASIS OF PAYMENT SHALL BE AT THE CONTRACT UNIT PRICE PER EACH MARKER AND SHALL INCLUDE ALL LABOR, EQUIPMENT, HARDWARE AND INCIDENTALS REQUIRED TO PERFORM THE WORK. IT SHALL ALSO INCLUDE REPLACEMENT AT NO ADDITIONAL COST OF ALL TEMPORARY RAISED PAVEMENT MARKERS WHICH, IN THE JUDGEMENT OF THE ENGINEER, FAIL FOR ANY REASON, EXCEPT DUE TO FAILURE OF THE PAVEMENT TO WHICH THEY ARE ATTACHED.

ITEM	UNIT	DESCRIPTION
614	EACH	TEMPORARY RAISED PAVEMENT MARKER



metric units

OFFICE OF TRAFFIC ENGINEERING DIVISION OF ENGINEERING POLICY OHIO DEPARTMENT OF TRANSPORTATION	
MAINTENANCE OF TRAFFIC	DATE 03/01/96
TEMPORARY RAISED PAVEMENT MARKERS	
STANDARD CONSTRUCTION DRAWING	MT-101.20M
APPROVED <i>[Signature]</i>	ADMINISTRATOR

# TEMPORARY SIGN SUPPORT REQUIREMENTS

## A. PLACEMENT OF SIGNS WHICH WILL REMAIN MORE THAN ONE DAY:

- 1) LATERAL PLACEMENT TO NEAREST EDGE OF SIGNS SHALL BE AS FOLLOWS:
  - a) ON THE RIGHT SIDE OF THE ROAD FOR APPROACHING TRAFFIC (EXCEPT FOR DUAL MOUNTED SIGNS AND SIGNS DESIGNATED IN THE PLANS FOR LEFT SIDE MOUNTING).
  - b) CURBED ROADWAY - MINIMUM 0.6 m BEHIND FACE OF CURB.
  - c) UNCURBED ROADWAY - 3.7 m FROM EDGE OF TRAFFIC LANE OR 1.8 m FROM EDGE OF PAVED OR USEABLE SHOULDER, WHICHEVER IS GREATER.
  - d) BEHIND GUARDRAIL OR BARRIER - PREFERABLY 0.6 m BEHIND FACE OF GUARDRAIL (MINIMUM 0.3 m) FOR SIGNS ON CLASS A SUPPORTS; 1.2 m FOR CLASS B OR C SUPPORTS; 0.3 m BEHIND FACE OF CONCRETE BARRIER UNLESS BARRIER TOP MOUNTING IS REQUIRED BY THE PLAN.
- 2) VERTICAL CLEARANCE OF SIGNS, MEASURED ABOVE ROADWAY ELEVATION; SHALL BE AS FOLLOWS:
  - a) RURAL - 1.5 m WHEN PARKED CARS, CONSTRUCTION EQUIPMENT, ETC WILL NOT OBSCURE SIGN VISIBILITY.
  - b) RURAL AREAS WITH PARKED CARS OR CONSTRUCTION EQUIPMENT - 2.1 m
  - c) URBAN - 2.1 m
  - d) CARE SHALL BE TAKEN TO ASSURE THAT SIGNS WILL NOT BE OBSCURED BY CONSTRUCTION EQUIPMENT, TREES, WEEDS OR OTHER OBSTACLES. BRUSH, WEEDS OR GRASS WITHIN THE RIGHT OF WAY SHALL BE TRIMMED AS NECESSARY. SIGNS SHALL NORMALLY BE VISIBLE TO TRAFFIC 122 m TO 183 m IN ADVANCE OF THE SIGN.
- 3) SUPPORTS FOR SIGNS WHICH WILL REMAIN IN PLACE MORE THAN ONE DAY SHALL BE FIXED RATHER THAN PORTABLE EXCEPT IN SITUATIONS WHERE THE SIGN MUST REST ON PERMANENT PAVEMENT OR OTHER SURFACE WHICH WOULD BE DAMAGED BY INSERTION OF POST TYPE SUPPORTS.

## B. PLACEMENT OF SIGNS WHICH WILL REMAIN FOR ONE DAY OR LESS:

- 1) SAME AS A-1 ABOVE EXCEPT THAT SIGNS MAY BE PLACED ON THE ROADWAY ONLY IF THEY DO NOT INTRUDE INTO A TRAFFIC LANE IN USE.
- 2) MINIMUM OF 0.3 m ABOVE ROADWAY

## C. CLASSES OF SUPPORTS:

ALL TEMPORARY SIGN SUPPORTS SHALL BE OF THE FOLLOWING TYPES:

### 1) CLASS A:

SUPPORTS SHALL BE USED FOR EXPOSED LOCATIONS ON HIGHWAYS WHERE TRAFFIC APPROACH SPEEDS OF 40 MPH AND HIGHER ARE ENCOUNTERED. THEY ARE ALSO SUITABLE FOR USE IN ALL OTHER LOCATIONS.

### 2) CLASS B:

SUPPORTS SHALL BE USED FOR EXPOSED LOCATIONS ON HIGHWAYS WHERE TRAFFIC APPROACH SPEEDS OF LESS THAN 40 MPH ARE ENCOUNTERED. THEY ARE ALSO SUITABLE FOR USE IN ALL APPLICATIONS DEFINED FOR CLASS C SUPPORTS.

### 3) CLASS C:

SUPPORTS MAY ONLY BE USED WHERE FULLY PROTECTED BY GUARDRAIL, CONCRETE BARRIER AND IN LOCATIONS POSITIVELY PROTECTED FROM TRAFFIC SUCH AS ON RETAINING WALLS OR WHERE TRAFFIC APPROACH SPEEDS ARE LESS THAN 25 MPH.

## D. TRAFFIC APPROACH SPEEDS:

TRAFFIC APPROACH SPEEDS SHALL BE THE LOCALLY POSTED SPEED (NOT ADVISORY SPEED SIGNS) OR THE MEASURED ACTUAL (85TH PERCENTILE) SPEED (IF AVAILABLE) OF APPROACHING TRAFFIC, WHICHEVER IS HIGHER, ADJACENT TO THE SIGN LOCATION.

## TABLE

APPROACH SPEED (MPH)	COMPLETELY PROTECTED BY GUARDRAIL OR BARRIER	PARTLY PROTECTED BY GUARDRAIL OR BARRIER *	GREATER THAN 9 m FROM EDGE OF PAVEMENT	WITHIN 9 m FROM EDGE OF PAVEMENT
40 AND HIGHER	A, B OR C	A OR B	A OR B **	A ONLY
26 TO 39	A, B OR C	A OR B	A OR B	A OR B
0 TO 25	A, B OR C	A, B OR C	A, B OR C	A, B OR C

\* IF SUPPORTS ARE BEHIND GUARDRAIL BUT NOT FULLY 1.7 m BEHIND FACE OF RAIL OR IF SIGN IS NOT 0.3 m BEHIND FACE OF CONCRETE BARRIER.

\*\* 9 m CRITERION IS BASED UPON STRAIGHT ROADWAY AND A SLOPE OF 6 TO 1 OR FLATTER. SUPPORTS ON THE OUTSIDE OF CURVES OR LOCATED DOWN A SLOPE (STEEPER THAN 6 : 1) WILL REQUIRE USE OF CLASS A SUPPORTS.

## E. BALLASTING

BALLASTING OF PORTABLE SUPPORTS SHALL BE WITH SANDBAGS PLACED WITHIN 0.3 m OF THE GROUND. IN NO CASE SHALL HARD OBJECTS BE USED FOR BALLAST.

## F. STRENGTH OF SIGN SUPPORTS

THE CONTRACTOR SHALL CHOOSE SIGN SUPPORTS OF ADEQUATE STRENGTH AND WITH ADEQUATE FOUNDATIONS AND ANCHORAGE TO SUPPORT THE SIGN SIZES ERECTED. PROPRIETARY DEVICES SHALL NOT BE LOADED BEYOND THE LIMITS RECOMMENDED BY THE MANUFACTURER. SLIP BASE TYPE BREAKAWAY BEAM CONNECTIONS SHALL BE AT LEAST PARTIALLY EMBEDDED IN CONCRETE CONSISTING OF A 0.3 m DEEP BY 0.3 m DIAMETER COLLAR. SIGN SUPPORTS WHICH FAIL UNDER TYPICAL WIND LOAD CONDITIONS SHALL BE IMMEDIATELY MODIFIED OR REPLACED WITH A SUPPORT OF ADEQUATE STRENGTH.

## G. PROHIBITED SUPPORTS

THE FOLLOWING SUPPORT TYPES SHALL NOT BE PERMITTED ON PROJECTS:

- 1) SUPPORTS FABRICATED FROM AUTOMOTIVE AXLE DIFFERENTIAL ASSEMBLIES AND SIMILARLY HEAVY ASSEMBLIES WHICH CANNOT BE CONSIDERED BREAKAWAY TYPE.
- 2) SUPPORTS CONSISTING OF VERTICAL POSTS WITH ANGLED BRACES MADE FROM DRIVEPOST OR OTHER RIGID ELEMENTS.

# CLASS A SUPPORTS

## FIXED SUPPORTS

- 1) ALL #2 AND #3 POST WHEN INSTALLED SINGLY OR IN PAIRS (SIDE BY SIDE) ACCORDING TO THE DETAILS OF TC-41.20M. THE NUMBER OF SUPPORTS SHALL BE AS SHOWN ON TC-52.10M AND TC-52.20M.
- 2) THE FOLLOWING POST TYPES, WHEN INSTALLED SINGLY, BY IMBEDMENT OR DRIVING INTO EARTH TO A DEPTH OF ABOUT 1.1 m.
  - a) - UP TO 102 X 102 mm WOOD.
  - b) - UP TO 51 mm DIAMETER SCHEDULE 40 STEEL PIPE.
  - c) - UP TO 76 mm DIAMETER SCHEDULE 40 ALUMINUM PIPE.
  - d) - UP TO 56.4 mm SQUARE, 12 GAUGE WALL, PUNCHED STEEL POST.
  - e) - UP TO 152 X 203 mm WOOD WITH BREAKAWAY HOLES SHOWN BELOW.
- 3) THE FOLLOWING POST TYPES WHEN INSTALLED IN PAIRS (SIDE BY SIDE) WITH LESS THAN 2 m BETWEEN POSTS, BY IMBEDMENT OR DRIVING INTO EARTH TO A DEPTH OF ABOUT 1.1 m:
  - a) - UP TO 102 X 102 mm WOOD.
  - b) - UP TO 51 mm DIAMETER SCHEDULE 40 STEEL PIPE.
  - c) - UP TO 76 mm DIAMETER SCHEDULE 40 ALUMINUM PIPE.
  - d) - UP TO 51 mm SQUARE, 14 GAUGE WALL, PUNCHED STEEL POST.
- 4) FIXED TYPE III BARRICADES:
- 5) ALL BREAKAWAY CONNECTION BEAM SUPPORTS, WHEN INSTALLED ACCORDING TO THE PROPER DETAILS SHOWN ON TC-41.10M WITH A MINIMUM CLEAR DISTANCE BETWEEN SUPPORTS OF 2.1 m FOR SUPPORTS LARGER THAN W6 X 9.
- 6) ANY BREAKAWAY POST OR POST AND CONNECTION WHICH HAS BEEN CRASH TESTED AND APPROVED BY THE FHWA AS SATISFYING THE BREAKAWAY CRITERIA DESCRIBED IN 630.06.

( CONTINUED ON MT-105.11M )

# M E T R I C

BUREAU OF DESIGN SERVICES  
DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

DATE

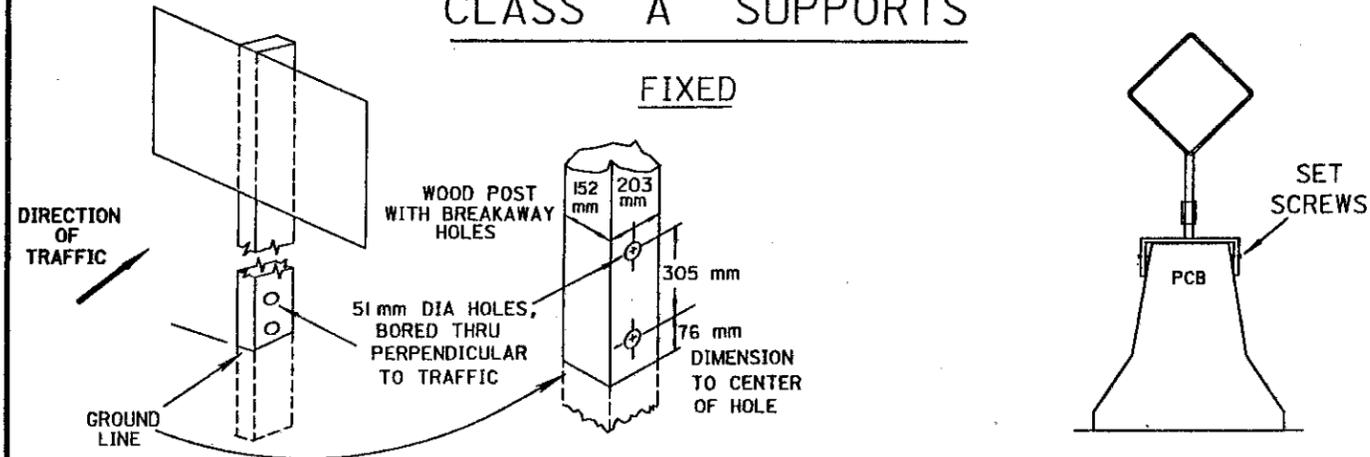
04/25/94

TEMPORARY SIGN SUPPORT

STANDARD  
CONSTRUCTION  
DRAWING  
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

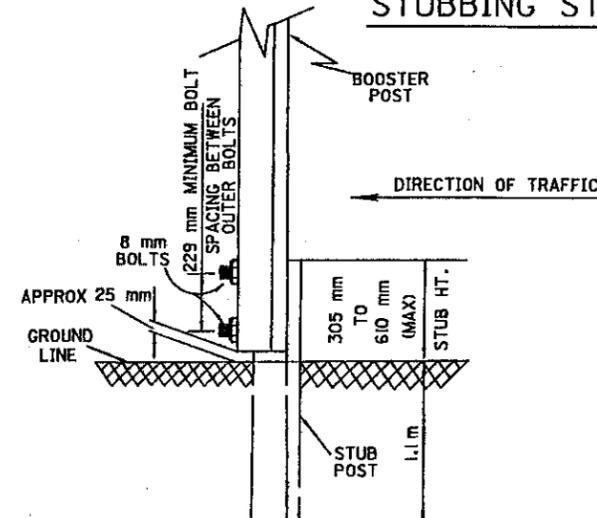
MT-105.10M

## CLASS A SUPPORTS



## CLASS A SUPPORTS

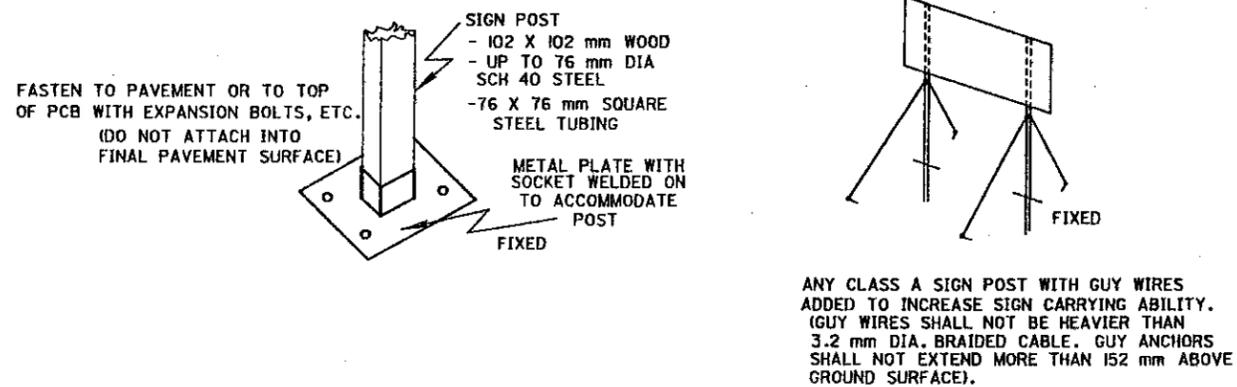
### STUBBING STANDARD



### NOTES

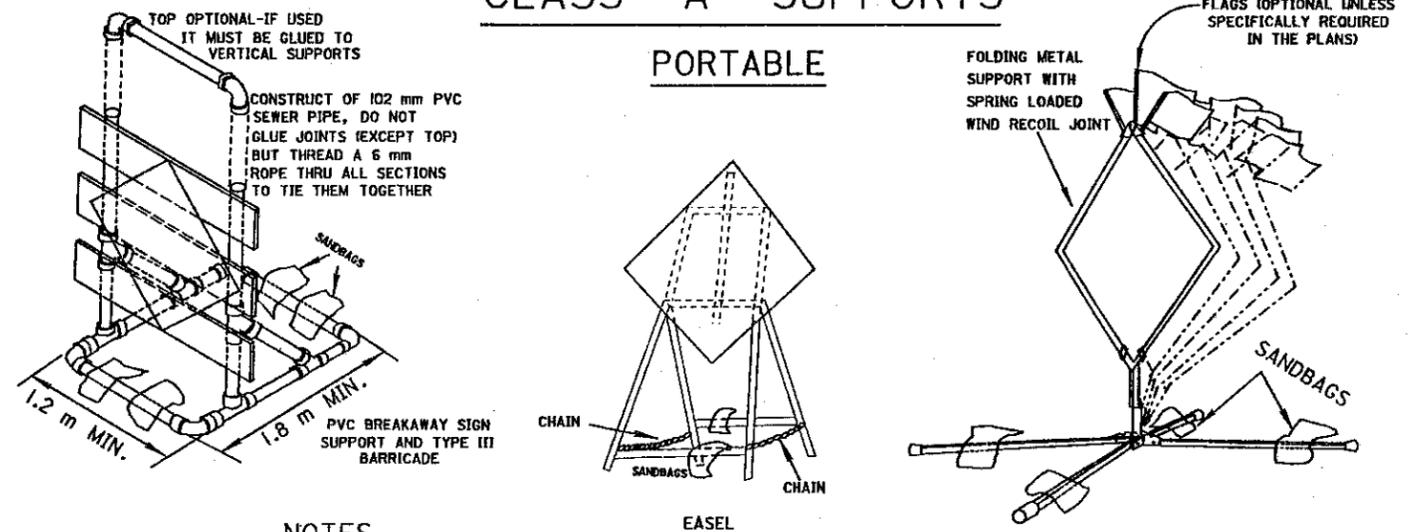
1. FOR USE WITH #3 POST OR SMALLER ONLY
2. BOLTS SHALL BE STEEL OR ALUMINUM
3. A MINIMUM OF TWO FASTENERS SHALL BE USED PER ASSEMBLY
4. BOOSTER POST SHALL BE MOUNTED BEHIND STUB POST
5. BOOSTER POST SHALL BE THE SAME OR 1.5 kg/m LESS THAN STUB POST

## CLASS B SUPPORTS



## CLASS A SUPPORTS

### PORTABLE

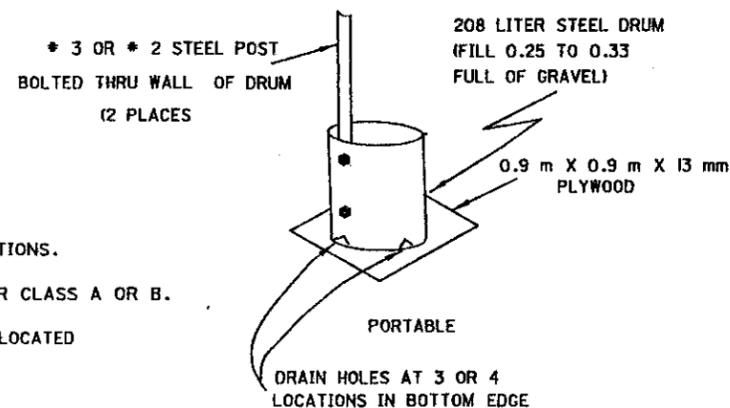


### NOTES

#### RAIL MATERIALS:

- 25 X 203 mm OR 51 X 203 mm COMMON LUMBER
- 203 mm X (16 mm TO 25 mm) THICK EXTERIOR PLYWOOD
- EXTRUDED PLASTIC OR FORMED SHEET METAL WITH A 203 mm WIDE SURFACE AND OF SUFFICIENT STIFFNESS TO RESIST TYPICAL WIND LOADS OF UP TO 147 kg/m<sup>2</sup>, BUT HAVING A WEIGHT OF NOT MORE THAN 7.5 kg/m.

## CLASS C SUPPORTS



1. ALL BEAM TYPE SUPPORTS WITHOUT BREAKAWAY CONNECTIONS.
2. SUPPORTS SIMILAR TO BUT LARGER THAN PERMITTED FOR CLASS A OR B.
3. THE STEEL DRUM(S) SHOWN BELOW MAY BE USED ONLY WHEN LOCATED BEHIND GUARDRAIL OR BARRIER.

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF THE OMTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

BUREAU OF DESIGN SERVICES  
DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

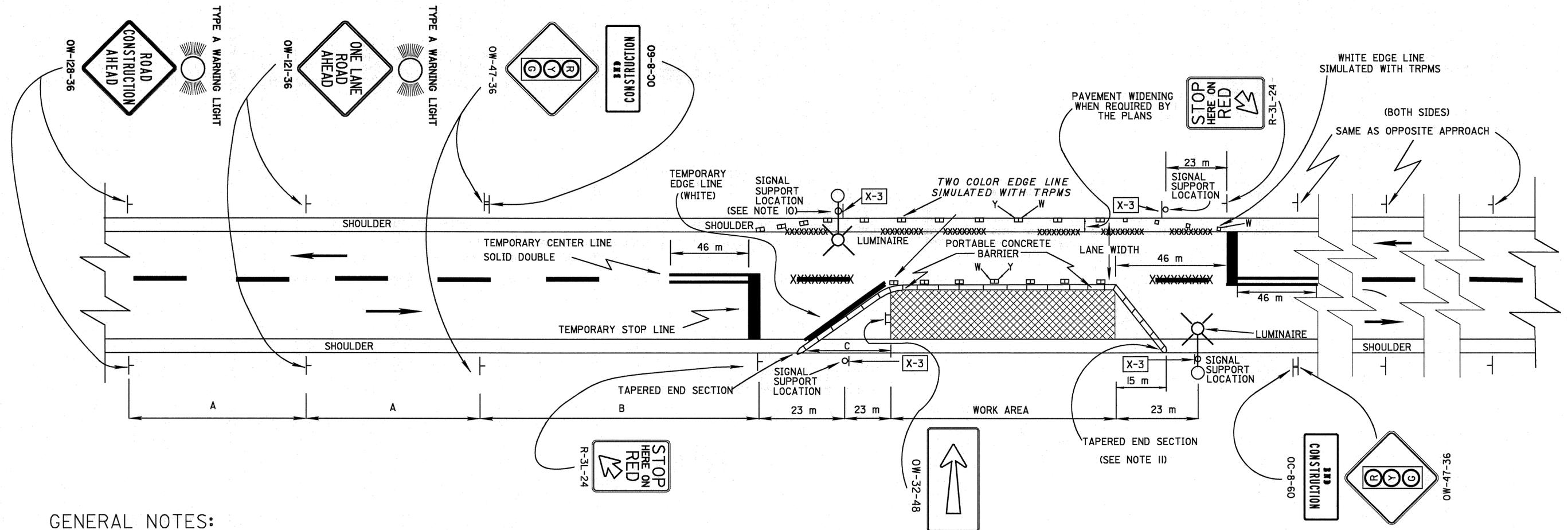
DATE  
04/25/94

TEMPORARY SIGN SUPPORT

STANDARD CONSTRUCTION DRAWING  
MT-105.IIM

APPROVED *David J. C...* ENGR. OF DESIGN SERVICES

METRIC



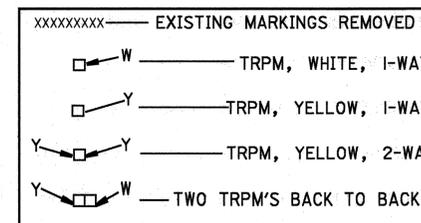
**GENERAL NOTES:**

- INITIAL SIGNAL TIMING AND PHASING SHALL BE AS SHOWN IN THE PLANS. CHANGES SHALL BE APPROVED BY THE ENGINEER.
- SIGNALS SHALL BE INSTALLED AND OPERATED IN ACCORDANCE WITH THE REQUIREMENTS OF PART 6 OF THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
- TEMPORARY CENTER LINE, SOLID, DOUBLE, SHALL BE INSTALLED AND MAINTAINED WHEN EXISTING CENTER LINE, SOLID DOUBLE IS NOT IN PLACE. 305 mm STOP LINES SHALL BE INSTALLED. TEMPORARY RAISED PAVEMENT MARKERS (TRPMS) TO SIMULATE A TWO COLOR EDGE LINE SHALL BE PROVIDED. EXISTING CONFLICTING PAVEMENT MARKINGS AND RAISED PAVEMENT MARKER REFLECTORS SHALL BE REMOVED. TEMPORARY EDGE LINES WHICH WOULD CONFLICT WITH FINAL TRAFFIC LANES SHALL BE REMOVABLE (740.05 TYPE C) TAPE UNLESS THE AREA WILL BE RESURFACED IN THE NEXT WORK PHASE. AFTER COMPLETION OF THE WORK, PAVEMENT MARKINGS OTHER THAN 740.05 TYPE C SHALL BE REMOVED IN ACCORDANCE WITH 641.10. THE ORIGINAL MARKINGS AND PAVEMENT MARKER REFLECTORS SHALL BE RESTORED AT NO ADDITIONAL COST.
- PCB SHALL BE DELINEATED AS FOLLOWS:
 

PCB TYPE	DELINEATION
813 mm HIGH WITHOUT GLARE SCREEN	BARRIER REFLECTORS AT 7.6 m C-C (MAX.) ALTERNATED WITH TOP MOUNTED OBJECT MARKERS (229 X 381 mm) AT 7.6 m C-C (MAX.)
813 mm HIGH WITH GLARE SCREEN	BARRIER REFLECTORS AT 7.6 m C-C VERTICAL ORANGE REFLECTORIZED STRIPES ON PADDLES (305 X 305 mm) AT 3.8 m C-C (MAX.)
1270 mm HIGH	BARRIER REFLECTORS AT 3.8 m C-C (MAX.)
TAPERED END SECTION AND EXPOSED END	OBJECT MARKERS (229 X 381 mm) TOP MOUNTED AT EACH END
- THE HORIZONTAL OR VERTICAL ALIGNMENT OF THE ROADWAY MAY REQUIRE ADJUSTMENTS IN THE LOCATION OF THE ADVANCE WARNING SIGNS OR THE SIGNAL HEADS. TREE OR BRUSH TRIMMING TO PROVIDE ADEQUATE SIGHT DISTANCE TO SIGN AND SIGNALS SHALL BE PROVIDED AS DIRECTED BY THE ENGINEER. THE DISTANCES SHOWN FOR ADVANCE WARNING SIGN SPACINGS ARE MINIMUM.
- THE SPACING BETWEEN PROPOSED SIGNS SHOULD BE ADJUSTED TO NOT CONFLICT WITH AND TO PROVIDE A MINIMUM OF 61 m CLEARANCE TO EXISTING SIGNS.
- ALL TRAFFIC SIGNAL AND LIGHTING EQUIPMENT USED IN THIS INSTALLATION, SUCH AS SIGNAL OR LIGHTING CABLE, SIGNAL HEADS, LUMINAIRES OR SIGNAL CONTROLLER SHALL BE IN CONFORMANCE WITH SPECIFICATION ITEMS 625, 632, 633, 713, 732 AND 733. HOWEVER, THE PERFORMANCE TESTS OF 625.22E AND 632.27(6), THE WORKING DRAWING REQUIREMENTS OF 625.04, 632.03 AND 633.03, THE WIRING DIAGRAM AND SERVICE MANUAL REQUIREMENT OF 633.04 AND THE TESTING AND PREQUALIFICATION REQUIREMENT OF 633.05 ARE WAIVED. ALSO THE REQUIREMENTS OF 733.01 CONCERNING EXPANSIBLE 3-DIAL UNITS AND TWELVE SIGNAL CIRCUITS ARE WAIVED. USED EQUIPMENT IS ACCEPTABLE. CONFLICT MONITORS SHALL BE USED EXCEPT WITH ELECTROMECHANICAL PRETIMED CONTROLLERS WITH CAMSHAFT.
- IF THE SIGNAL IS CHANGED TO FLASHING OPERATION, RED SHALL BE FLASHED TO ALL APPROACHES ON ALL SIGNAL HEADS.
- EXISTING BARRIER BETWEEN TEMPORARY STOP LINES SHALL BE DELINEATED WITH ITEM 614-BARRIER REFLECTORS.
- FOR SIDE MOUNTED SIGNALS, SEE MT-96.20M. FOR OVERHEAD MOUNTED SIGNALS, SEE MT-96.21M.

- DURING WORKING HOURS ONLY A LENGTH OF BARRIER SUFFICIENT TO PROVIDE A 3.0 m ACCESS ON THE SHOULDER AND PART OF ROADWAY, MAY BE REMOVED FOR ACCESS. A SIMILAR BARRIER REMOVAL AT THE OPPOSITE END OF THE WORK AREA MAY ALSO BE PERMITTED ONLY WHEN NECESSARY.

DISTANCE (METERS)	A	B
URBAN	61	107
RURAL	152	229

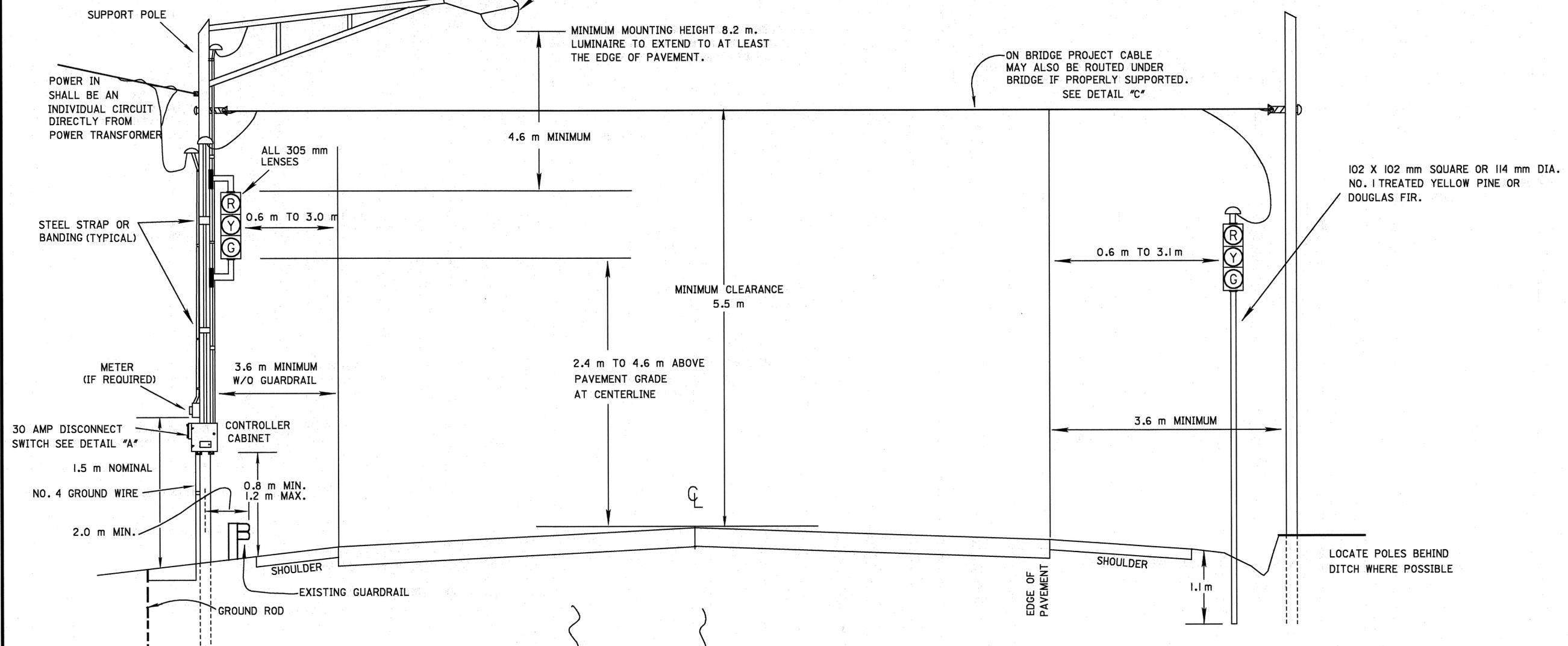


# METRIC

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF OMUTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

<b>BUREAU OF DESIGN SERVICES</b> DIVISION OF HIGHWAYS OHIO DEPARTMENT OF TRANSPORTATION	
<b>MAINTENANCE OF TRAFFIC</b>	DATE 01/30/95
SIGNALIZED CLOSING 1 LANE OF A 2 LANE HIGHWAY WITH PCB	
STANDARD CONSTRUCTION DRAWING	<b>MT-96.IIM</b>
APPROVED <i>[Signature]</i> ENGR. OF DESIGN SERVICES	

AREA ILLUMINATION SHALL BE PROVIDED BY USING 150 WATT MINIMUM HIGH PRESSURE SODIUM LUMINAIRES OR 250 WATT MINIMUM MERCURY LUMINAIRES



POWER IN SHALL BE AN INDIVIDUAL CIRCUIT DIRECTLY FROM POWER TRANSFORMER

ALL 305 mm LENSES

0.6 m TO 3.0 m

STEEL STRAP OR BANDING (TYPICAL)

METER (IF REQUIRED)

3.6 m MINIMUM W/O GUARDRAIL

30 AMP DISCONNECT SWITCH SEE DETAIL "A"

CONTROLLER CABINET

1.5 m NOMINAL

NO. 4 GROUND WIRE

0.8 m MIN. 1.2 m MAX.

2.0 m MIN.

SHOULDER

EXISTING GUARDRAIL

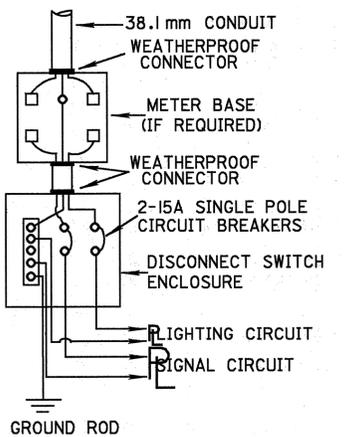
GROUND ROD

EDGE OF PAVEMENT

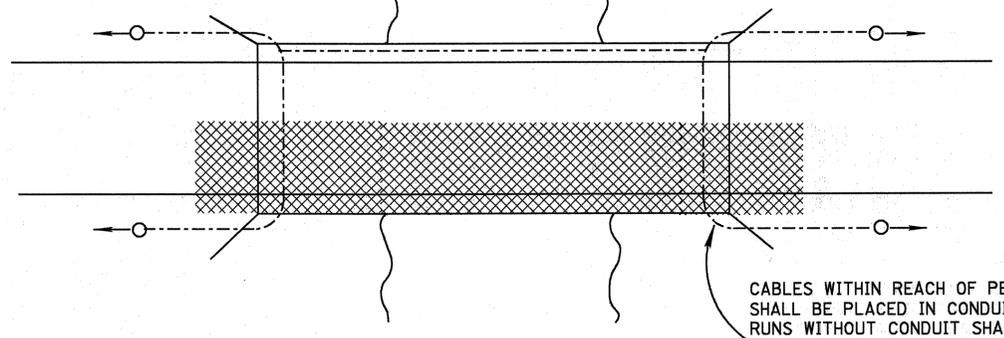
SHOULDER

1.1 m

LOCATE POLES BEHIND DITCH WHERE POSSIBLE



DETAIL "A"



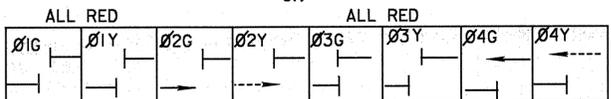
ALTERNATE CABLE ROUTING

DETAIL "C"

INTERVAL	1	2	3	4	5	6
	—	—	—	—	—	—

USING A PRETIMED CONTROL

OR



WHEN CALLED FOR IN THE PLANS, Ø2 GREEN AND Ø4 GREEN SHALL BE ACTUATED BY DETECTORS AT APPROACH TO THE WORK ZONE. Ø1 & Ø3 ARE DUMMY PHASES TO TIME ALL RED INTERVAL. TIMING INITIALIZES ON PHASE ONE.

USING A 4 PHASE ACTUATED CONTROL

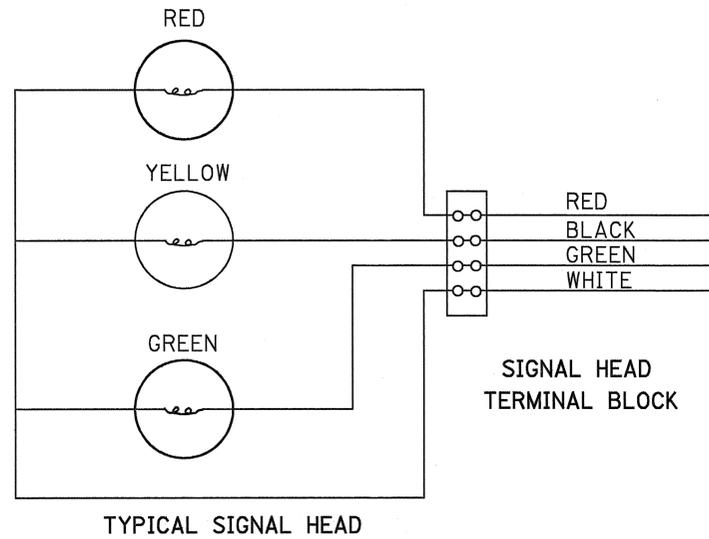
DETAIL "B" SIGNAL PHASING



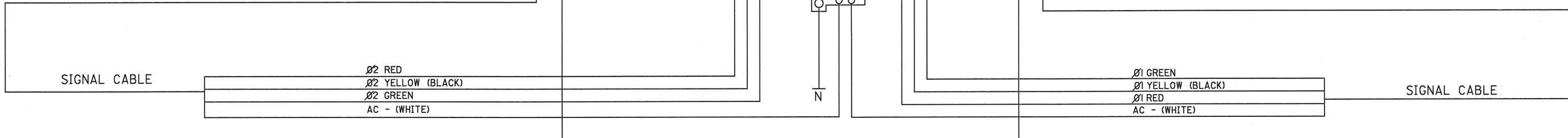
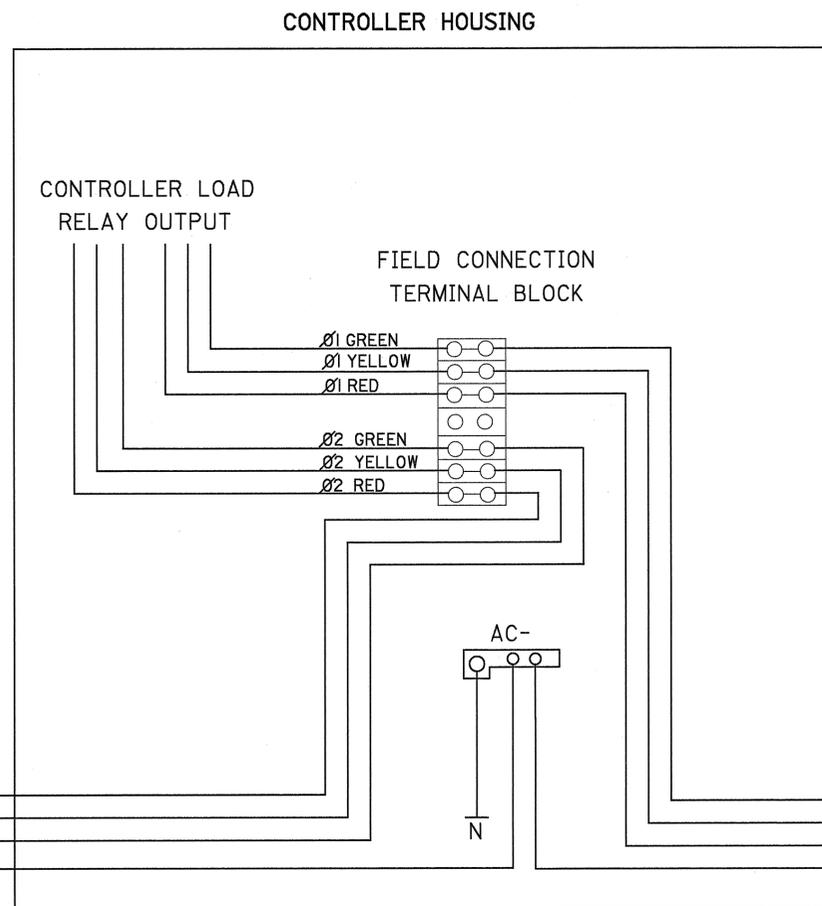
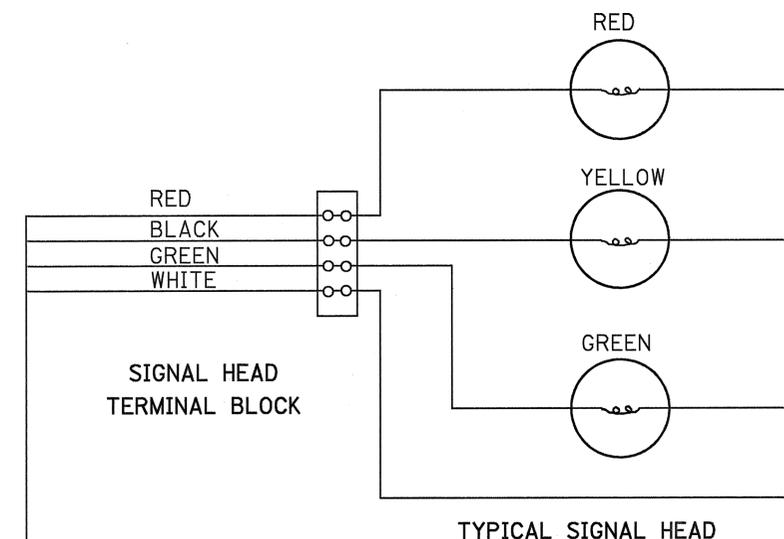
BUREAU OF DESIGN SERVICES  
DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC  
DATE 01/30/95  
DETAILS FOR SIGNALIZED CLOSING  
1 LANE OF A 2 LANE HIGHWAY  
-SIDE MOUNTED

STANDARD CONSTRUCTION DRAWING  
DRAWING MT-96.20M  
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES



CABLE SHALL BE RUN INTO SIGNAL HEAD AND CONNECTIONS ARE TO BE MADE AT TERMINAL BLOCKS.



TYPICAL SIGNAL HEAD HOOK-UP

**GENERAL NOTES:**

1. LIGHTNING PROTECTION, AS REQUIRED IN 733.04 SHALL BE PROVIDED FOR SOLID STATE ELECTRONIC CONTROLLERS AND DETECTORS.
2. SIGNAL CABLE SHALL BE 5/C NO. 14 AWG AS SPECIFIED IN 732.19. ALL ELECTRICAL CONNECTIONS TO BE MADE AT TERMINAL BLOCKS USING LOCK FORK TERMINALS. SPLICES IN SIGNAL CABLE SHOULD BE AVOIDED BUT IF NECESSARY SPLICE KITS SHALL BE USED. ALL CONNECTIONS AT SPLICE POINTS SHALL BE SOLDERED.
3. SIGNAL TIMING SETTINGS SHALL BE AS SHOWN IN THE PLANS OR PROVIDED TO THE CONTRACTOR BY THE ENGINEER PRIOR TO IMPLEMENTATION OF SIGNAL CONTROL. THE CONTRACTOR SHALL PERIODICALLY MONITOR THE SIGNAL OPERATION TO DETERMINE FAILURE OR INEFFICIENT OPERATION.

ALL EQUIPMENT FAILURES INCLUDING TIMING MECHANISMS AND DETECTORS SHALL BE REPORTED TO THE ENGINEER AND FULLY REPAIRED BY THE CONTRACTOR AS SOON AS POSSIBLE, BUT IN NO CASE LONGER THAN 8 HOURS FOLLOWING NOTIFICATION OF THE

CONTRACTOR BY THE ENGINEER. ALL FAILURES RESULTING IN UNSAFE OPERATIONS OF THE SIGNAL (i.e., SIGNAL OR LAMP FAILURE, SHORT-TIMING OF YELLOW OR ALL RED INTERVALS, MIS-AIMED SIGNALS, CONFLICTING DISPLAYS) SHALL RESULT IN THE CONTRACTOR 2-WAY RADIOS, TO CONTROL TRAFFIC THROUGH THE WORK AREA UNTILL THE SIGNAL IS FULLY REPAIRED. FAILURES SHALL INCLUDE SITUATIONS CAUSED BY TRAFFIC ACCIDENTS, ACTS OF GOD OR ANY OTHER CAUSE WHETHER UNDER THE CONTROL OF THE CONTRACTOR OR NOT.

IF THE ENGINEER DETERMINES THAT THE SIGNAL OPERATION, ALTHOUGH IN ACCORDANCE WITH THE PLANS AND PREVIOUS ORDERS, IS NOT PROVIDING ACCEPTABLE SAFE AND EFFICIENT MOVEMENT OF TRAFFIC, THE ENGINEER SHALL ORDER THAT APPROPRIATE CHANGES SUCH AS TIMING ALTERATIONS, SIGNAL OR DETECTOR RELOCATIONS, ETC. BE MADE TO REMEDY THE SITUATION, AT NO ADDITIONAL COST TO THE STATE. TIMING CHANGES AND SIGNAL RELOCATIONS SHALL BE IMPLEMENTED WITHIN FOUR HOURS, DETECTOR RELOCATIONS AND CHANGES WITHIN 24 HOURS. FAILURE TO MAKE REQUIRED CHANGES WITHIN THESE TIME LIMITS SHALL RESULT IN THE ASSESSMENT OF LIQUIDATED DAMAGES OF \$100.00 PER CALENDAR DAY UNTILL THE CHANGES ARE COMPLETED.

**M E T R I C**

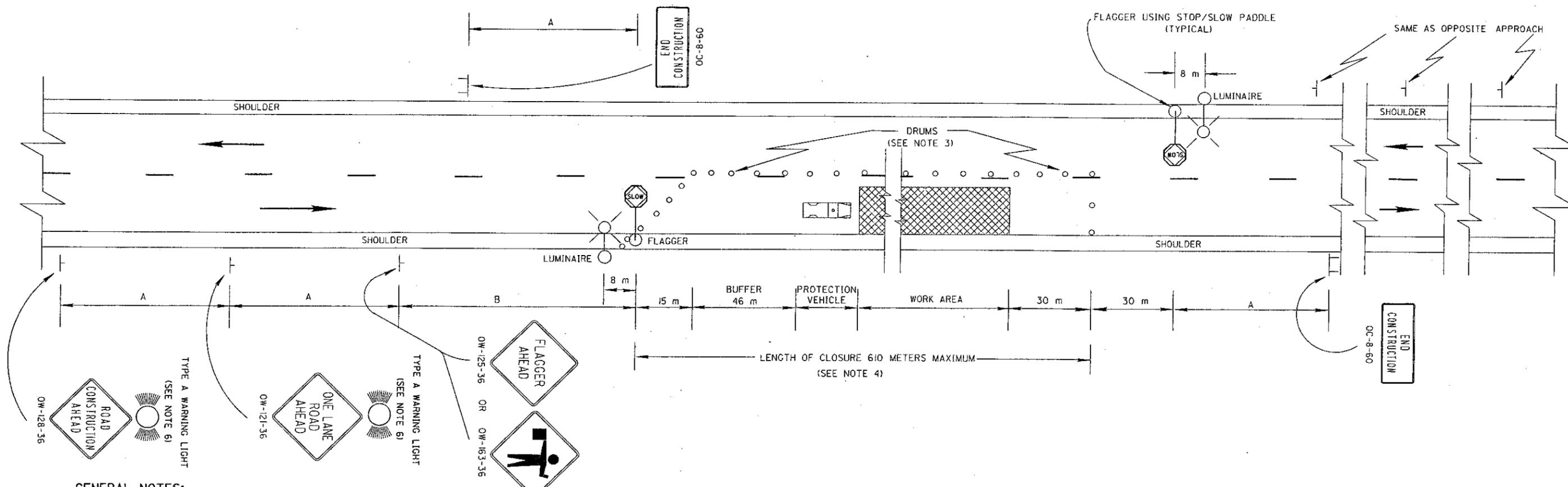
BUREAU OF DESIGN SERVICES  
DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC  
PRE-TIMED-WIRING DIAGRAM  
FOR SIGNALIZED CLOSING 1 LANE  
OF A 2 LANE HIGHWAY

DATE  
01/30/95

STANDARD  
CONSTRUCTION  
DRAWING  
MT-96.25M

APPROVED *[Signature]* ENGR. OF DESIGN SERVICES



**GENERAL NOTES:**

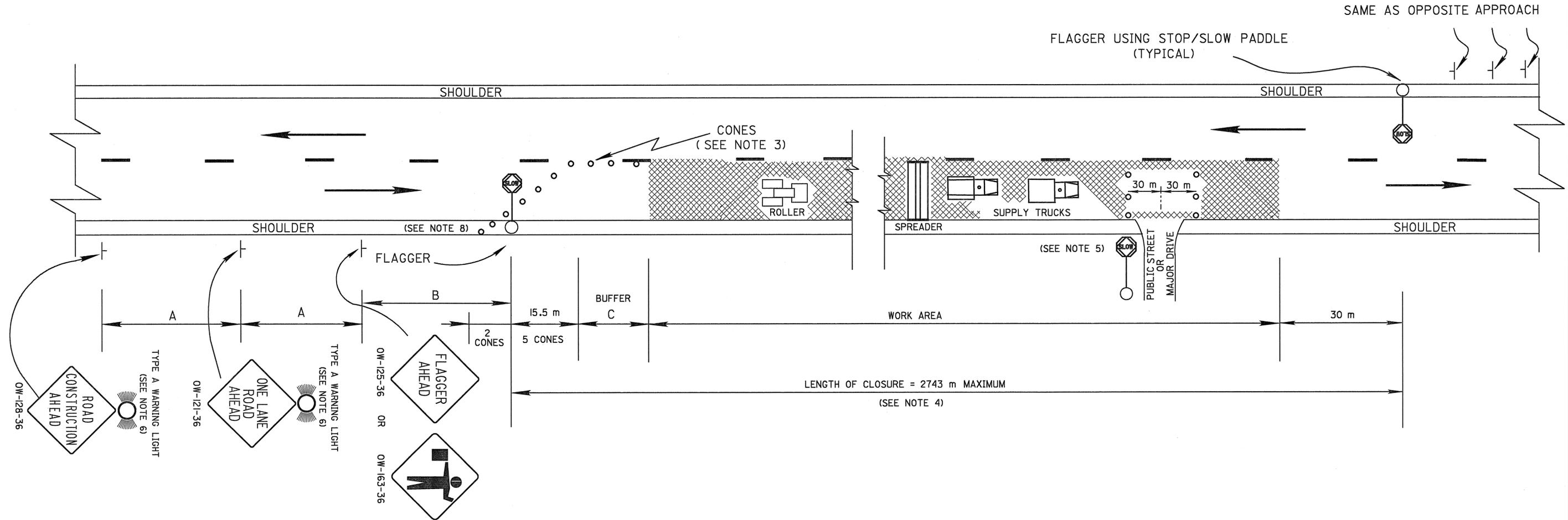
1. THE LOCATION OF THE ADVANCE WARNING SIGNS SHOULD BE ADJUSTED TO PROVIDE FOR ADEQUATE SIGHT DISTANCE FOR THE EXISTING VERTICAL AND HORIZONTAL ROADWAY ALIGNMENT. THE DISTANCES SHOWN ARE MINIMUMS. DISTANCE B MAY ALSO BE INCREASED, PRIOR TO IMPLEMENTATION OF THE CLOSURE OR AFTER IT IS IN EFFECT, AS DIRECTED BY THE ENGINEER FOR SUCH OCCURENCES AS LONG TRAFFIC BACKUPS.
2. FLAGGERS, ONE FOR EACH DIRECTION SHALL BE USED TO CONTROL TRAFFIC CONTINUOUSLY FOR AS LONG AS A ONE LANE OPERATION IS IN EFFECT. THE FLAGGERS SHALL BE ABLE TO COMMUNICATE WITH EACH OTHER AT ALL TIMES.
3. DRUMS SHALL BE SPACED AT 15 m CENTER TO CENTER ALONG THE CLOSURE. DRUMS ON THE ADVANCE TAPER SHALL BE SPACED AT 3 m CENTER TO CENTER. CONES HAVING A MINIMUM HEIGHT OF 0.7 m MAY BE SUBSTITUTED FOR DRUMS FOR DAYTIME LANE CLOSURES. PROVISIONS SHALL BE MADE TO STABILIZE THE CONES TO PREVENT THEM FROM BLOWING OVER.
4. SEVERAL SMALL WORK AREAS CLOSE TOGETHER SHALL BE COMBINED INTO ONE WORK ZONE. HOWEVER, THE CLOSURE SHALL NOT BE MORE THAN 610 m LONG UNLESS APPROVED BY THE ENGINEER. THE MINIMUM LENGTH BETWEEN CLOSURES SHALL BE 610 m ONLY ONE SIDE OF THE ROAD SHALL BE CLOSED IN ANY ONE WORK ZONE.
5. THE PROTECTION VEHICLE SHOWN AT THE BEGINNING OF THE WORK AREA SHALL BE IN PLACE AND UNOCCUPIED WHENEVER WORKERS ARE IN THE WORK AREA. THIS PROTECTION VEHICLE SHALL BE REMOVED FROM THE PAVEMENT WHEN WORKERS ARE NOT IN THE WORK AREA. OTHER PROTECTIVE DEVICES MAY BE USED IN LIEU OF THE PROTECTION VEHICLE SHOWN WHEN APPROVED BY THE ENGINEER. THE VEHICLE SHALL BE EQUIPPED WITH A 360° ROTATION OR FLASHING AMBER BEACON CLEARLY VISIBLE A MINIMUM OF 402 m.
6. THE TYPE A FLASHING WARNING LIGHTS SHOWN ON THE OW-128 AND THE OW-121 SIGNS ARE REQUIRED WHENEVER A NIGHT LANE CLOSURE IS NECESSARY.
7. ADEQUATE AREA ILLUMINATION OF EACH FLAGGER STATION SHALL BE PROVIDED AT NIGHT BY USING 150 WATT MINIMUM HIGH PRESSURE SODIUM LUMINAIRES OR 250 WATT MINIMUM MERCURY LUMINAIRES. LUMINAIRES SHALL BE LOCATED ADJACENT TO ONE FLAGGER STATION FOR EACH DIRECTION OF TRAFFIC AS SHOWN ABOVE. THE MOUNTING HEIGHT FOR LUMINAIRES SHALL BE A MINIMUM OF 8.2 m ABOVE THE PAVEMENT AND MOUNTED ON A SUPPORT OF ADEQUATE STRENGTH TO PROVIDE A SATISFACTORY INSTALLATION. THE OVERHEAD CONDUCTOR CLEARANCE SHALL BE A MINIMUM OF 5.5 m ABOVE THE PAVEMENT. THE LUMINAIRE ARM SHALL BE OF SUFFICIENT LENGTH TO EXTEND TO THE EDGE OF THE PAVEMENT. POLES SHALL BE ERECTED A MINIMUM OF 1.7 m BEHIND FACE OF GUARDRAIL WHERE EXISTING, OR 3.6 m FROM THE EDGE OF PAVEMENT. WHERE POSSIBLE LOCATE BEHIND DITCH. LIGHTING MATERIAL SHALL COMPLY WITH SPECIFICATION 713.
8. WITHIN THE LENGTH OF CLOSURE, PROVISION SHALL BE MADE TO CONTROL TRAFFIC ENTERING FROM INTERSECTING STREETS AND MAJOR DRIVES AS NECESSARY TO PREVENT WRONG WAY MOVEMENTS AND TO KEEP VEHICLES OFF OF NEW PAVEMENT NOT READY FOR TRAFFIC. THE METHOD OF CONTROL SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.

MINIMUM DISTANCE (METERS)	A	B
URBAN	61	61
RURAL	152	152

# METRIC

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF ODOTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCIDENTAL TO THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

BUREAU OF DESIGN SERVICES DIVISION OF HIGHWAYS OHIO DEPARTMENT OF TRANSPORTATION	
MAINTENANCE OF TRAFFIC FLAGGERS CLOSING 1 LANE OF A 2 LANE HIGHWAY STATIONARY OPERATION	DATE 04/25/94
STANDARD CONSTRUCTION DRAWING MT-97.10M	
APPROVED <i>[Signature]</i> ENGR. OF DESIGN SERVICES	



**GENERAL NOTES:**

1. THE LOCATION OF THE ADVANCE WARNING SIGNS SHOULD BE ADJUSTED TO PROVIDE FOR ADEQUATE SIGHT DISTANCE FOR THE EXISTING VERTICAL AND HORIZONTAL ROADWAY ALIGNMENT.
2. FLAGGERS, ONE FOR EACH DIRECTION, SHALL BE USED TO CONTROL TRAFFIC CONTINUOUSLY FOR AS LONG AS A ONE LANE OPERATION IS IN EFFECT. THE FLAGGERS SHALL BE ABLE TO COMMUNICATE WITH EACH OTHER AT ALL TIMES.
3. CONES ON THE TAPERS SHALL BE SPACED AT 3 m CENTER TO CENTER. CONES IN THE BUFFER SHALL BE SPACED AT 12 m CENTER TO CENTER. CONES SHALL HAVE A MINIMUM HEIGHT OF 0.7 m AND SHALL BE SAFELY STABILIZED TO PREVENT THEM FROM BLOWING OVER. CLOSURES AT NIGHT SHALL USE DRUMS RATHER THAN CONES.
4. IT IS REQUIRED THAT THE LENGTH OF CLOSURE BE KEPT TO A MINIMUM AT ALL TIMES, AS DIRECTED BY THE ENGINEER.

WHEN THE AMBIENT TEMPERATURE EXCEEDS 27° C, THE ENGINEER MAY INCREASE THE MAXIMUM ALLOWABLE LENGTH OF CLOSURE TO ALLOW FOR SUFFICIENT COOLING OF NEW PAVEMENT.

THE ENGINEER MAY SHORTEN THE MAXIMUM ALLOWABLE LENGTH OF CLOSURE TO RELIEVE EXCESSIVE TRAFFIC BACKUPS OR TO IMPROVE TRAFFIC OPERATION.

4. ALL TRAFFIC CONTROL SIGNS, CONES (OR DRUMS), AND THE FLAGGER SHALL BE MOVED FORWARD AS A GROUP BEFORE THE CLOSURE REACHES THE MAXIMUM ALLOWABLE LENGTH. ONLY ONE SIDE OF THE ROAD SHALL BE CLOSED AT ANY TIME.

5. WITHIN THE LENGTH OF CLOSURE, PROVISION SHALL BE MADE TO CONTROL TRAFFIC ENTERING FROM INTERSECTING STREETS AND MAJOR DRIVES AS NECESSARY TO PREVENT WRONG WAY MOVEMENTS AND TO KEEP VEHICLES OFF OF NEW PAVEMENT NOT READY FOR TRAFFIC. AS A MINIMUM, THE CONTRACTOR SHALL:

- A) PROVIDE AN ADDITIONAL FLAGGER AT EVERY PUBLIC STREET INTERSECTION AND MAJOR DRIVEWAY OR -
- B) PLACE A ROW OF 3 CONES ACROSS THE CLOSED LANE APPROXIMATELY 30 m ON EACH SIDE OF THE INTERSECTION OR DRIVEWAY.

ROWS OF CONES MAY BE MOVED OFF THE ROAD TO ALLOW PASSAGE OF ROLLERS, PAVING SPREADER OR SUPPLY TRUCKS BUT SHALL BE MOVED BACK ONTO THE ROAD WHEN THE ACTIVITY HAS PASSED.

6. THE TYPE A FLASHING WARNING LIGHTS ARE REQUIRED ON THE OW-128 AND THE OW-121 SIGNS WHENEVER A NIGHT LANE CLOSURE IS NECESSARY.

7. ADEQUATE AREA ILLUMINATION OF EACH FLAGGER STATION SHALL BE PROVIDED AT NIGHT BY USING 150 WATT MINIMUM HIGH PRESSURE SODIUM LUMINAIRES OR 250 WATT MINIMUM MERCURY LUMINAIRES. LUMINAIRES SHALL BE LOCATED ADJACENT TO ONE FLAGGER STATION FOR EACH DIRECTION OF TRAFFIC.

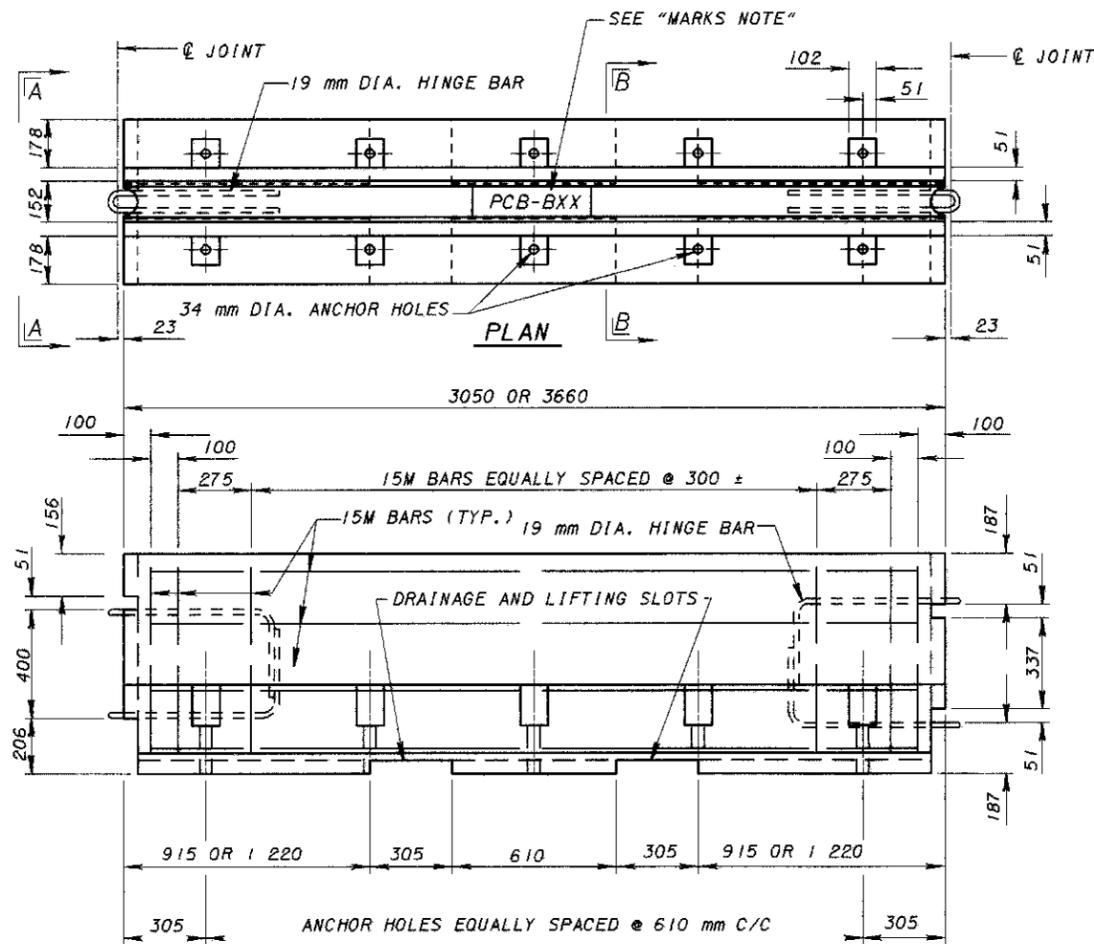
8. TWO (2) CONES REQUIRED ON PAVED SHOULDER.

MINIMUM DISTANCE (METERS)	A MINIMUM	B RANGE	C MINIMUM
URBAN	61	61 TO 107	30
RURAL	152	152 TO 305	61

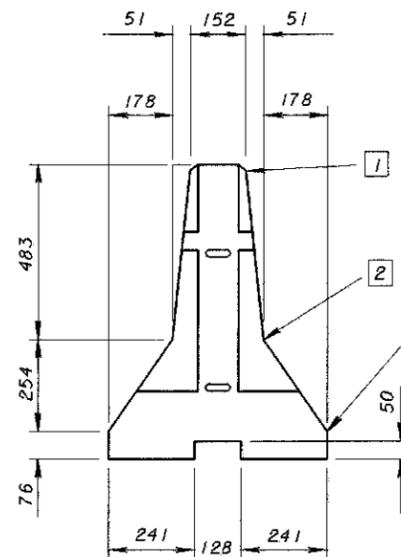
# M E T R I C

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF OMTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

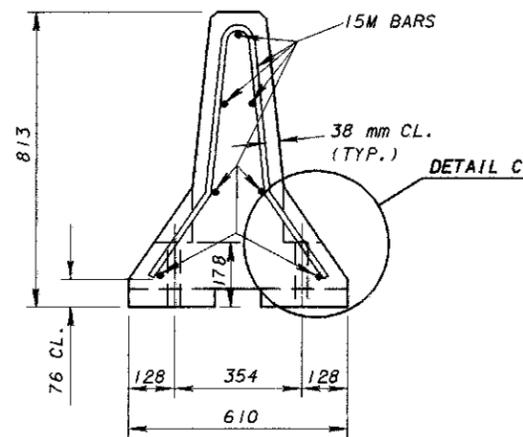
<b>BUREAU OF DESIGN SERVICES</b> DIVISION OF HIGHWAYS <b>OHIO DEPARTMENT OF TRANSPORTATION</b>	
<b>MAINTENANCE OF TRAFFIC</b> <b>FLAGGER CLOSING</b> <b>1 LANE OF A 2 LANE HIGHWAY</b> <b>FOR PAVING OPERATIONS</b>	DATE 01/30/95
STANDARD CONSTRUCTION DRAWING <b>MT-97.11M</b>	ENGR. OF DESIGN SERVICES



ELEVATION

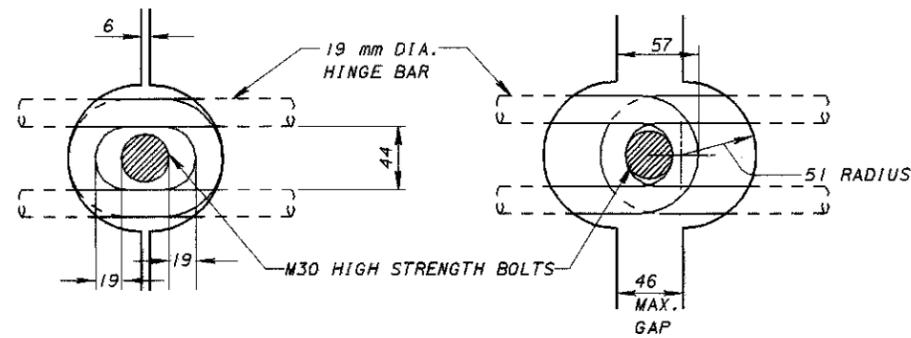


VIEW A-A



SECTION B-B

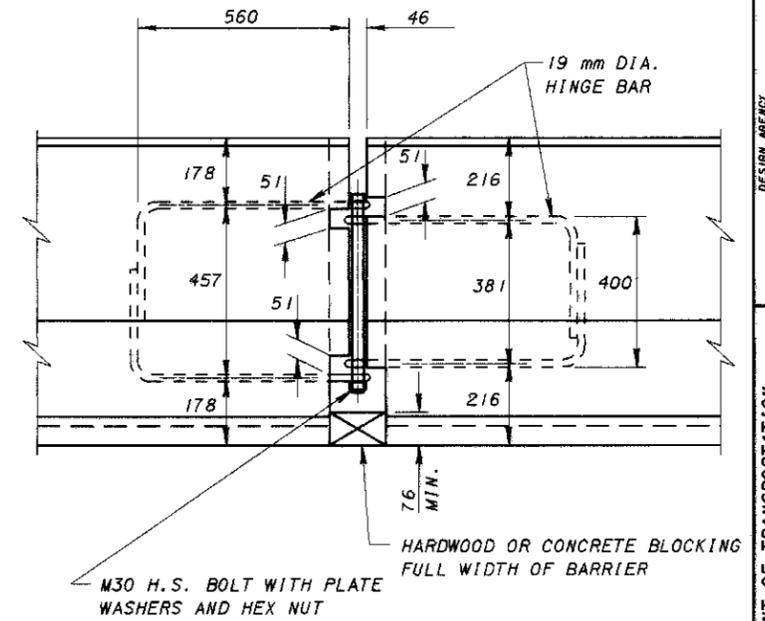
- 1 25 mm RADIUS OR 19 mm CHAMFER, ALL TOP AND END CORNERS.
- 2 PERMISSIBLE 250 mm RADIUS.
- 3 PERMISSIBLE 25 mm RADIUS.



- 1 CLOSED JOINT
- 2 OPEN JOINT

JOINT CONNECTION DETAILS

- 1 BARRIER SHALL INITIALLY BE PLACED CLOSER TOGETHER SO BOLTS CAN BE EASILY INSERTED THROUGH HINGE BAR LOOPS.
- 2 BARRIER JOINTS SHALL BE FULLY OPEN BEFORE NUT IS TIGHTENED ONTO BOLT AND OPENING IS SNUGGLY BLOCKED.



DETAIL AT HINGED CONNECTION

GENERAL NOTES

**HARDWARE:**  
BOLTS, DECK ANCHORING BOLTS AND ALL NUTS AND WASHERS SHALL CONFORM TO ASTM A325M. THEY SHALL BE GALVANIZED IN ACCORDANCE WITH CMS 711.02.

**REINFORCING STEEL:**  
ALL REINFORCING STEEL (INCLUDING THE 19 mm DIAMETER HINGE BARS) SHALL MEET THE REQUIREMENTS OF CMS 509.02. HINGE BARS SHALL BE GALVANIZED AFTER FABRICATION.

**CONCRETE:**  
PORTABLE CONCRETE BARRIER SEGMENTS SHALL BE CONSTRUCTED OF CLASS C CONCRETE WITH A MINIMUM COMPRESSIVE STRESS OF 28 MPa.

**BRIDGE DECK SURFACE PREPARATION:**  
THE SURFACE AREA ON WHICH THE PORTABLE CONCRETE BARRIER WILL REST SHALL BE CLEAR OF ALL LOOSE SAND, GRAVEL, DIRT AND DEBRIS.

ANY IRREGULARITIES IN THE BRIDGE DECK AREAS, UNLESS JUDGED BY THE ENGINEER TO BE INCONSEQUENTIAL, SHALL BE LEVELED WITH GROUT AND/OR ASPHALT.

ASPHALT ROLL ROOFING SHALL BE PLACED ON THOSE BRIDGE DECK AREAS, AS JUDGED BY THE ENGINEER, TO HAVE A SURFACE ROUGHNESS WHICH WOULD INHIBIT FRICTION CONTACT BETWEEN BARRIER SEGMENTS AND DECK.

**ANCHORS:**  
ONCE ALL BARRIER SECTIONS HAVE BEEN PROPERLY SECURED, ANY PORTION OF AN ANCHOR THAT PROTRUDES BEYOND THE FACE OF THE BARRIER SHALL BE REMOVED.

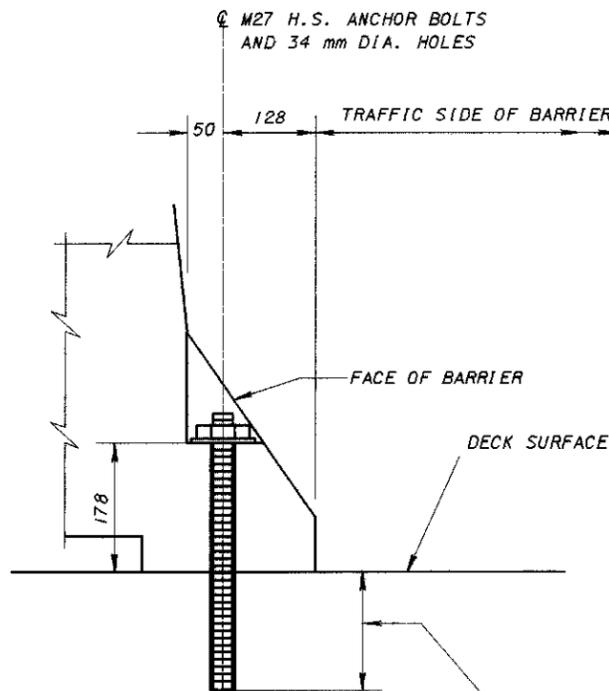
**MARKS:**  
ALL BARRIER SEGMENTS SHALL BE CLEARLY MARKED, WHERE "XX" IS THE YEAR IN WHICH THE BARRIER WAS CAST. EACH SHALL ALSO HAVE, ON ITS TOP SURFACE, A UNIQUE IDENTIFICATION OF THE MANUFACTURER AND, SOMEWHERE ON THE BARRIER, THE DAY AND MONTH THE BARRIER WAS CAST.

ALL MARKINGS SHALL BE PERMANENTLY IMPRINTED ON THE BARRIER USING A MINIMUM OF 50 mm HIGH LETTERING.

**HANDLING DEVICES** MAY BE USED IN LIEU OF THE LIFTING SLOTS FOR MOVING THE BARRIER. THEY MAY BE OF ANY DESIGN SUFFICIENT TO HANDLE THE WEIGHT OF THE SECTION BEING LIFTED. NO REMAINING HANDLING DEVICES SHALL PROTRUDE ABOVE THE BARRIER SURFACE.

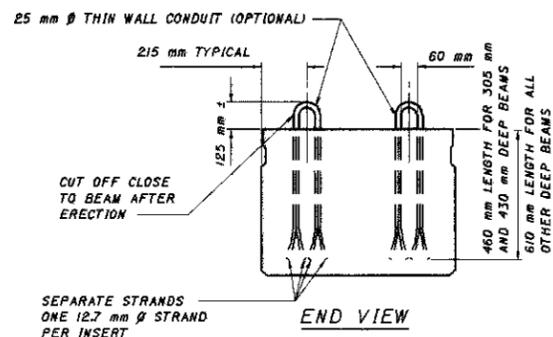
THE PROJECT PLANS SHALL INDICATE THE NUMBER OF ANCHORS PER SEGMENT, AS WELL AS THE BARRIER LOCATION ON THE BRIDGE DECK, AND ANY SPECIAL ANCHORAGE REQUIREMENTS.

"J-J HOOKS" CONNECTIONS MAY BE UTILIZED IN LIEU OF THE END CONNECTIONS DETAILED. EACH BRIDGE BARRIER SECTION USING "J-J HOOKS" SHALL REQUIRE ANCHORING AS PER DETAIL C. THE NUMBER OF ANCHORS SHALL BE THE GREATER OF TWO ANCHORS, IF THE PROJECT PLANS DO NOT SPECIFY A NUMBER OF ANCHORS PER BARRIER SECTION, OR DOUBLE THE NUMBER OF ANCHORS SPECIFIED BY THE PLANS. "J-J HOOKS" IS A TRADEMARK OF EASI-SET INDUSTRIES, P.O. BOX 300, MIDLAND, VA 22728.



DETAIL C

ANCHORS SHALL BE THROUGH BOLTS OR APPROVED RESIN ANCHORS. WHEN RESIN ANCHORS ARE USED THEY MUST BE EMBEDDED A MINIMUM OF 165 mm INTO FIRM CONCRETE. WHEN NO LONGER NEEDED, ANCHORS SHALL BE REMOVED AS DIRECTED BY THE ENGINEER. WHERE DECK IS TO REMAIN, HOLES SHALL BE FILLED WITH AN EPOXY NON-SHRINK GROUT.

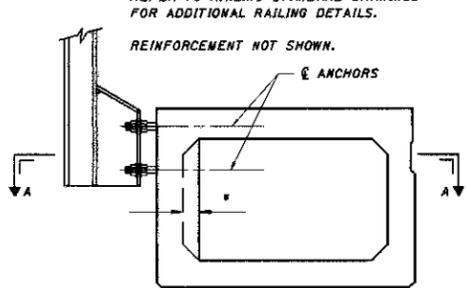


NOTE: ALL LIFTING INSERTS MUST BE UNIFORMLY ENGAGED DURING HANDLING.

FOR SHALLOW BEAMS BEND LOWER ENDS OF INSERTS TOWARD MIDSPAN TO MAINTAIN MINIMUM COVER OF 45 mm



ELEVATION



SECTION A-A  
WALL THICKENING AT  
GUARDRAIL ANCHORS

NOTES:  
TRANSVERSE TIE RODS SHALL BE 25 mm DIAMETER STEEL RODS OF GRADE A311 G1018 STEEL, THREADED BOTH ENDS, AND WITH NUT AND WASHER AT EACH END. THREADS MAY BE CUT OR ROLLED. IF ROLLED THREADS ARE USED, MINIMUM DIAMETER OF ROD AT ROOT OF THREADS SHALL BE 21 mm. TENSION SHALL BE APPLIED BY A TORQUE OF APPROXIMATELY 340 N·M AFTER THE TIE RODS ARE TIGHTENED THE RECESSES IN THE FASCIA BEAMS SHALL BE FILLED WITH NON-SHRINKING MORTAR OF THE SAME COLOR AS THE BEAM. ONE TRANSVERSE TIE ROD WILL BE PERMITTED TO TIE A MAXIMUM OF THREE BEAMS TOGETHER.

PRESTRESSING STRANDS: SHALL BE ASTM 416 GRADE 270, 12.7 mm DIAMETER SEVEN-WIRE, UNCOATED, LOW-RELAXATION STRANDS

GALVANIZING: ALL ANCHOR BOLTS, STUDS, INSERTS, TIE RODS, NUTS AND WASHERS SHALL BE GALVANIZED PER 711.02.

ANCHOR DOWELS: THE BEAM ENDS TO BE ANCHORED SHALL BE INDICATED ON THE PROJECT PLANS. ANCHOR DOWEL HOLES AND PRESTRESSING STRANDS SHALL BE LOCATED TO AVOID MUTUAL INTERFERENCE. THE LATERAL SPACING OF THE HOLES IN THE BEAM SHALL BE SUCH THAT THE ANCHOR DOWELS CLEAR THE ELASTOMERIC BEARING, AND ARE AS CLOSE TO THE  $\epsilon$  OF BEAM AS POSSIBLE.

AFTER TENSIONING OF THE TRANSVERSE TIE RODS THE DOWEL HOLES SHALL BE DRILLED INTO THE ABUTMENT OR PIER SEAT AND DOWELS INSTALLED.

ELASTOMERIC BEARINGS: FOUR ELASTOMERIC BEARINGS ARE REQUIRED PER BEAM. POSITIONED AS SHOWN ON SHEET 4 OF 4.

PREFORMED BEARING PADS ON SKEWED BRIDGES, PREFORMED BEARING PADS PER 711.21, 3 mm THICK AND OF THE SAME PLAN DIMENSIONS AS THE ELASTOMERIC BEARING PADS SHOULD BE PROVIDED AS SHOWN.

NOTCHES SHALL BE PROVIDED IN BEAM ENDS WHERE SHOWN ON THE PROJECT PLANS TO ELIMINATE AN OPEN JOINT OVER PIERS (SEE SHEET 4 OF 4) OR TO ACCOMMODATE ANCHORAGE FOR END DAMS OR EXPANSION JOINTS.

ENDS OF BEAMS, AGAINST WHICH CONCRETE IS NOT TO BE PLACED, SHALL BE PROTECTED BY TYPE B WATER PROOFING AS PER 512.06 AND APPLIED IN THE FIELD.

SEALING OF CONCRETE SURFACES (NON-EPOXY) SHALL BE PROVIDED FOR THE FASCIA AND THE BOTTOM OF THE EXTERIOR BEAMS.

DRIP GROOVES: ON THE UNDERSIDE OF THE FASCIA BEAM SHALL NOT BE PERMITTED.

PREPARATION OF CONCRETE SURFACES IN CONTACT WITH MORTAR: THE KEYWAY SURFACES SHALL BE GIVEN A MEDIUM SANDBLAST AT THE PLANT WITHIN FOUR DAYS BEFORE THE BEAMS LEAVE THE PLANT. BEFORE MORTARING, THE KEYWAYS SHALL BE THOROUGHLY CLEANED OF ALL DIRT, DUST AND OTHER FOREIGN MATTER BY MEANS OF HIGH PRESSURE WASHING OF AT LEAST 7 MPa AND A DELIVERY RATE OF NOT LESS THAN 16 L/MIN.

MORTAR: MORTAR OR GROUT FOR KEYWAYS BETWEEN PRESTRESSED CONCRETE BOX BEAMS, FOR TIE ROD RECESSES AND FOR ANCHOR DOWEL HOLES SHALL BE A NON-SHRINKING MORTAR. THE MORTAR SELECTED AS DEFINED IN THE BELOW ALTERNATIVES SHALL BE PREPARED, PLACED AND CURED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. AT LEAST THREE (3) 75 mm DIAMETER BY 150 mm LONG MORTAR TEST CYLINDERS OF THE GROUTING MATERIAL SHALL BE TAKEN DURING THE ACTUAL GROUTING OPERATION AND SUBMITTED TO THE TESTING LABORATORY FOR COMPRESSION TESTING OF MINIMUM STRENGTH OF GROUT.

ALTERNATE 1  
IF EITHER CONSTRUCTION OR NORMAL VEHICLE TRAFFIC WILL NOT BE ON THE BOX BEAMS WITHIN 7 DAYS OF PLACEMENT OF THE MORTAR OR GROUT, THE MORTAR MATERIAL SHALL CONFORM WITH CORPS OF ENGINEER'S SPECIFICATION CRD-C621-89A OR SHEAR KEY MORTAR AS PER PROPOSAL NOTE. MINIMUM STRENGTH OF THE MORTAR SHALL BE 35 MPa BEFORE ANY TRAFFIC IS ALLOWED ON THE STRUCTURE.

ALTERNATE 2  
IF PART-WIDTH CONSTRUCTION IS BEING USED, OR ANY CONSTRUCTION OR NORMAL VEHICLE TRAFFIC WILL BE ON THE BOX BEAMS WITHIN 7 DAYS OF PLACEMENT OF THE MORTAR OR GROUT, THE MORTAR MATERIAL SHALL BE SHEAR KEY MORTAR AS PER PROPOSAL NOTE. MINIMUM STRENGTH OF THE MORTAR SHALL BE 35 MPa BEFORE ANY TRAFFIC IS ALLOWED ON THE STRUCTURE.

MORTARING OF SHEAR KEYS: AFTER THE TRANSVERSE TIE RODS HAVE BEEN TIGHTENED SHEAR KEYS SHALL BE FILLED WITH NON-SHRINKING MORTAR. BEFORE MORTARING WITH CRD-C621-89A, THE KEYWAY SURFACES SHALL BE WETTED, BUT NO FREE WATER SHALL BE ALLOWED TO REMAIN IN THE KEYWAYS. SURFACES WHEN OTHER MORTAR IS USED SHALL BE AS PER MANUFACTURER'S RECOMMENDATION. MORTAR SHALL BE PLACED INTO THE KEYWAYS IN A MANNER THAT INSURES COMPLETE AND SOLID FILLING

COMPOSITE BRIDGES: THE FOLLOWING NOTES APPLY TO COMPOSITE BRIDGES ONLY:

1.) CLEANING PRIOR TO PLACEMENT OF COMPOSITE SLAB: BEFORE PLACEMENT OF THE SLAB CONCRETE, THE TOPS OF ALL BEAMS SHALL BE THOROUGHLY CLEANED OF ALL DIRT, DUST AND OTHER FOREIGN MATTER. THE SURFACE SHALL BE FLUSHED WITH CLEAR WATER AND SHALL BE WET, WITHOUT FREE WATER, WHEN THE CONCRETE IS PLACED.

2.) SLAB PLACEMENT: ON MULTI-SPAN BRIDGES WITH SLAB CONTINUOUS OVER PIERS, CONSTRUCTION JOINTS PERPENDICULAR TO THE CENTERLINE OF ROADWAY MAY BE PLACED NEAR THE CENTER OF A SPAN. HOWEVER, COMPOSITE SLAB POURS SHALL BE AS LONG AS PRACTICABLE. ON MULTI-SPAN BRIDGES WITH JOINTS AT PIERS, COMPOSITE SLABS SHALL BE PLACED BETWEEN JOINTS WITHOUT ADDITIONAL CONSTRUCTION JOINTS, BUT SHALL COMPLY WITH THE REQUIREMENTS OF ITEM 511.

PROJECT PLANS: SHALL SPECIFY THE DETAILS OF THE STANDARD DRAWING WHICH ARE TO APPLY AND WILL INCLUDE THE FOLLOWING:

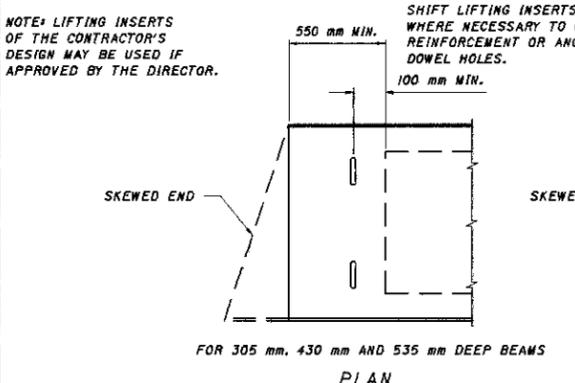
A BEAM LAYOUT PLAN SHOWING SPAN LENGTH, BEAM LENGTH, SKEW ANGLE, FIXED AND EXPANSION ENDS OF BEAMS, LOCATION OF ANCHOR DOWELS, SIZE, LOCATION AND HARDNESS OF ELASTOMERIC BEARING PADS, LOCATION OF DIAPHRAM CENTERLINES AND LOCATIONS OF RAILING POSTS.  
A TRANSVERSE CROSS-SECTION THRU THE DECK.  
A CROSS-SECTION OF THE BEAM SHOWING BEAM TYPE, SIZE, NUMBER, STRENGTH AND LOCATION OF STRANDS, DEBONDED STRANDS, ALL REINFORCING STEEL DETAILS AND THE DESIGN DATA.

DETAILS AT ABUTMENTS AND PIERS.  
ALL OTHER NECESSARY DETAILS AND INFORMATION.  
IT IS NOT INTENDED THAT DETAILS SHOWN ON THIS STANDARD DRAWING BE REPEATED ON THE PROJECT PLANS EXCEPT AS MAY BE REQUIRED FOR CLARITY.

ITEMS INCLUDED WITH ITEM 515 FOR PAYMENT:

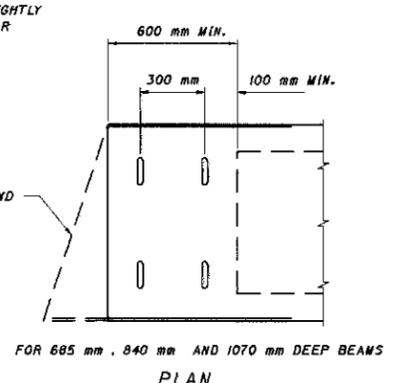
1. ANCHOR DOWELS AND INSTALLATION
2. ALL PREFORMED EXPANSION JOINT FILLER REQUIRED.
3. TYPE B WATER PROOFING AT ENDS OF BEAMS
4. MORTAR AND LABOR REQUIRED.
5. ALL OTHER MATERIAL & LABOR REQUIRED FOR FABRICATION AND ERECTION.

ALL DIMENSIONS ARE IN mm



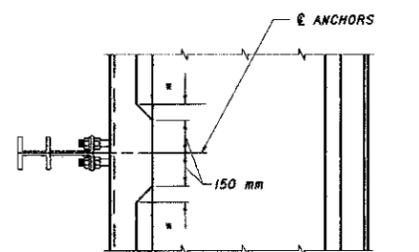
FOR 305 mm, 430 mm AND 535 mm DEEP BEAMS

PLAN



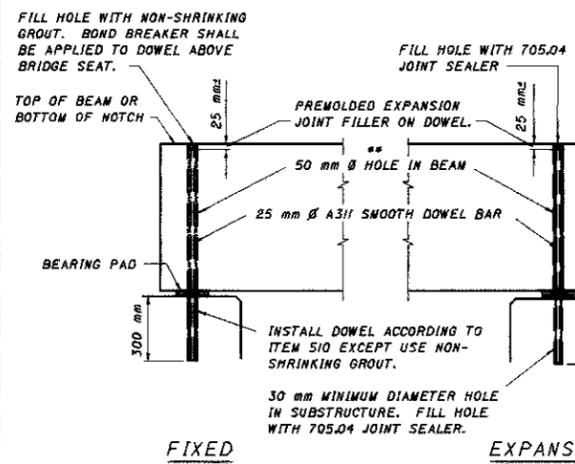
FOR 685 mm, 840 mm AND 1070 mm DEEP BEAMS

PLAN



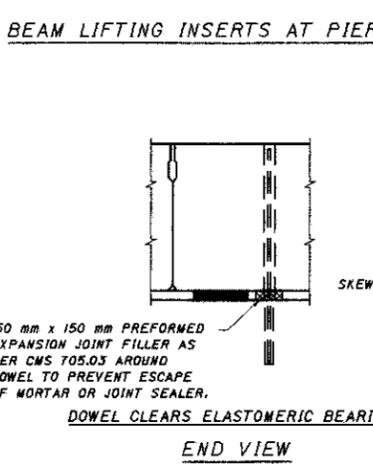
\* THIS DIMENSION SAME AS WIDTH OF FILLET IN VOID.

SECTION A-A



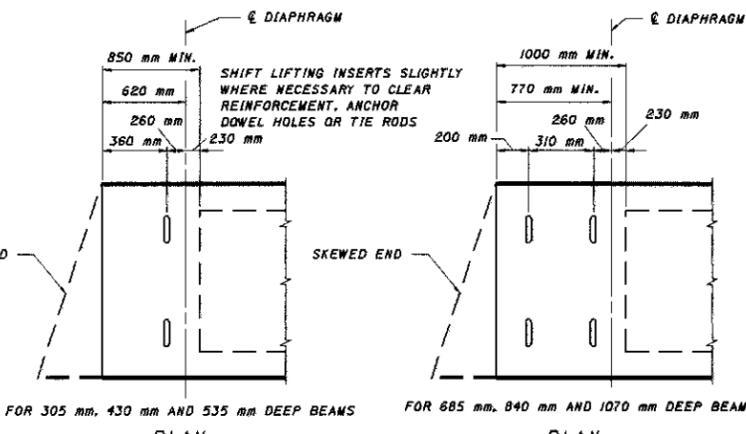
FIXED

EXPANSION



DOWEL CLEARS ELASTOMERIC BEARING

END VIEW



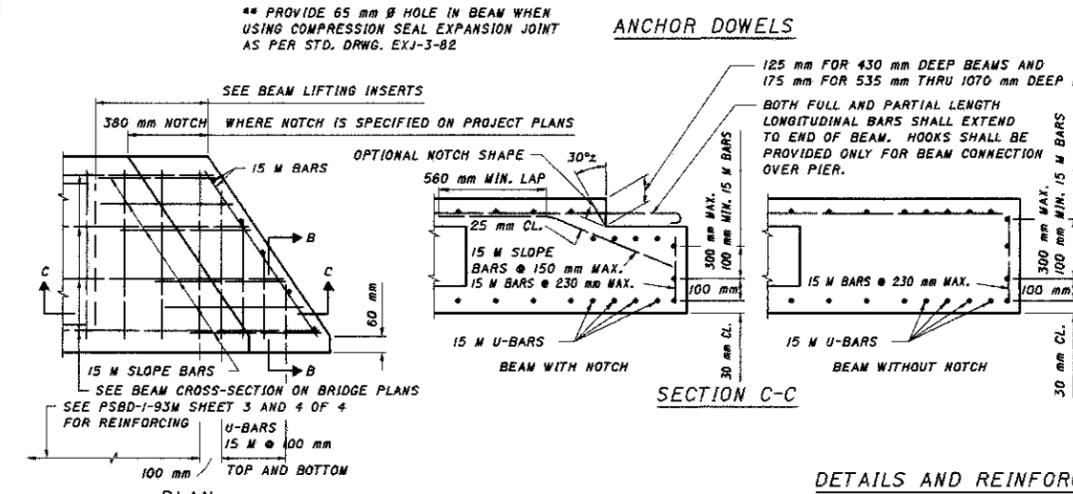
FOR 305 mm, 430 mm AND 535 mm DEEP BEAMS

PLAN

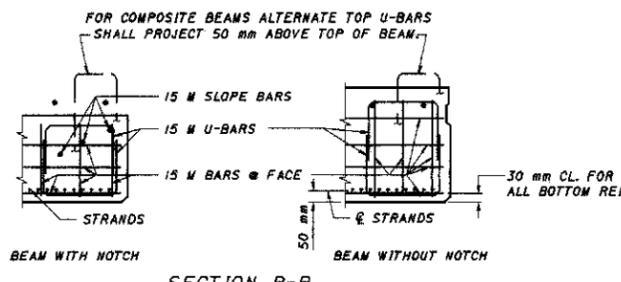
FOR 685 mm, 840 mm AND 1070 mm DEEP BEAMS

PLAN

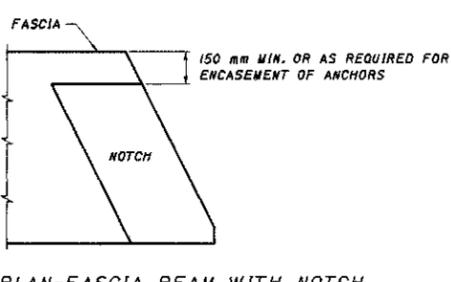
BEAM LIFTING INSERTS AT ABUTMENT



DETAILS AND REINFORCEMENT OF BEAM ENDS



SECTION B-B

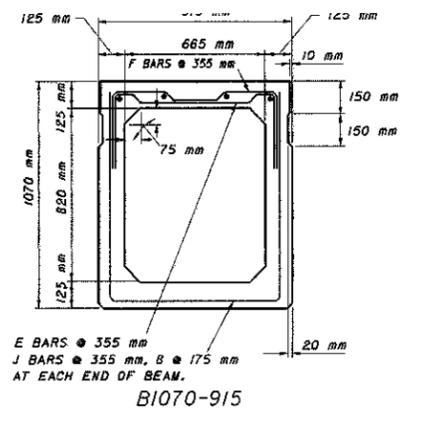
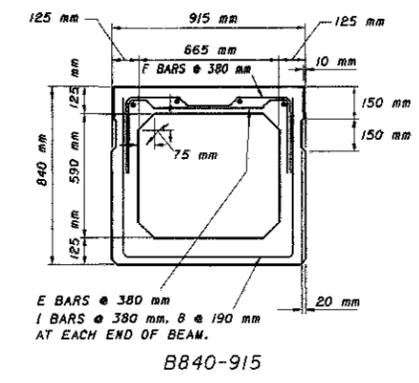
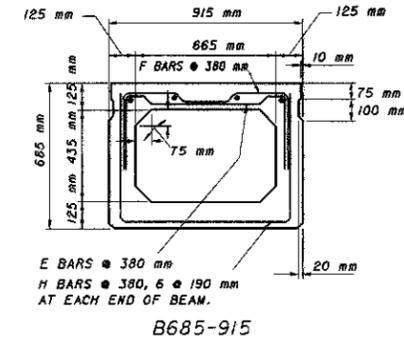
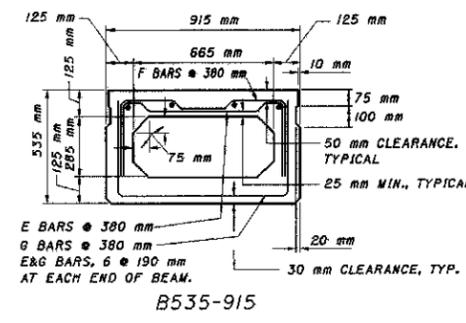
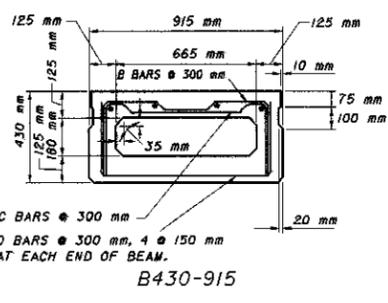
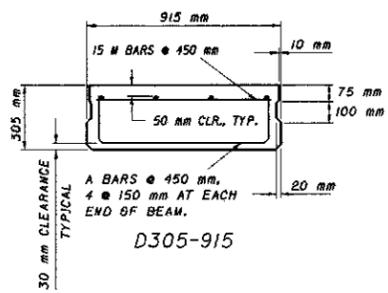


PLAN-FASCIA BEAM WITH NOTCH

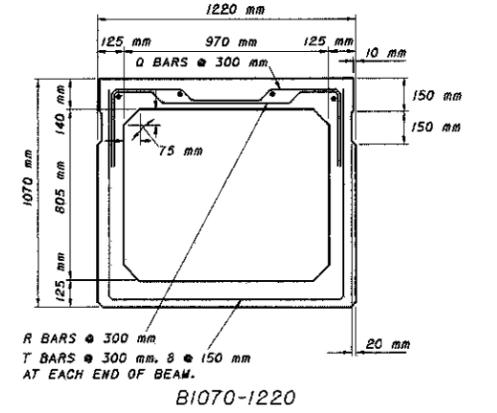
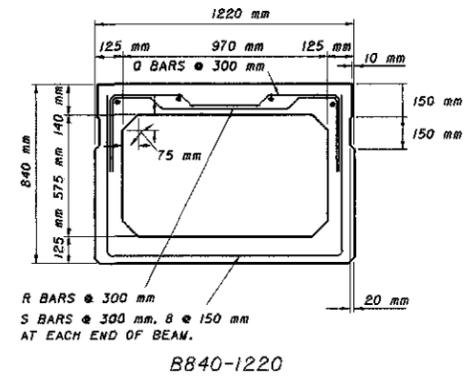
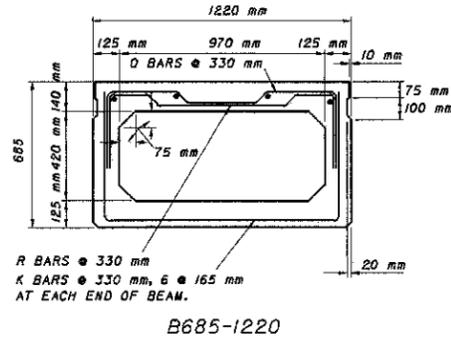
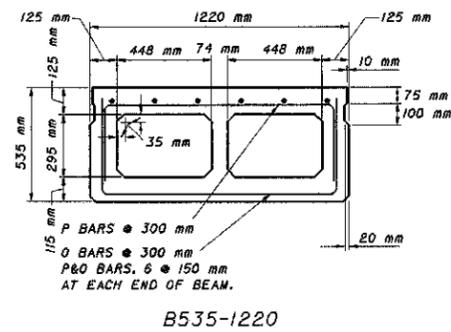
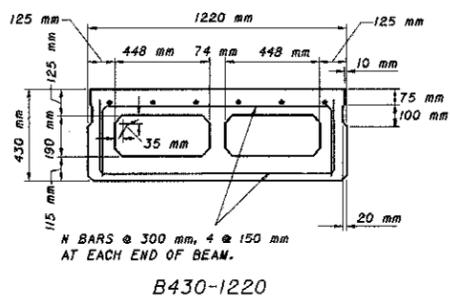
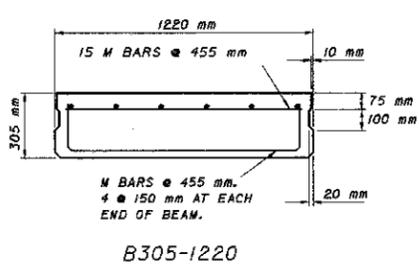
NOTE: THE FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF THE BEAM REINFORCING.

REVISIONS	STATE OF OHIO DEPARTMENT OF TRANSPORTATION BUREAU OF BRIDGES AND STRUCTURAL DESIGN			
	STANDARD PRESTRESSED CONCRETE BOX BEAM BRIDGE DETAILS			
APPROVED:	<i>Robert J. ...</i> ENGINEER OF BRIDGES			DRAWING NO. PSBD-1-93M
DATE: 10-19-94	PREPARED	DRAWN	CHECKED	REVIEWED
	MRG	REF	SEM	LMW
				SHEET NO. 1 OF 4 SHEETS

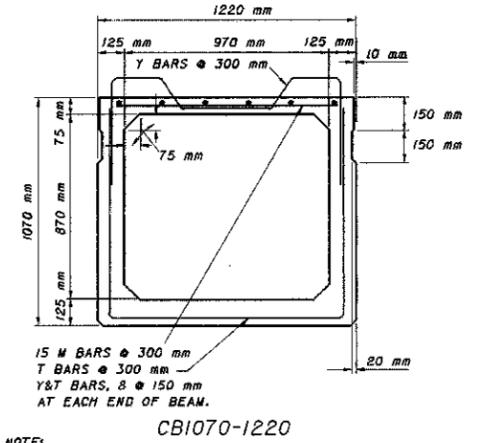
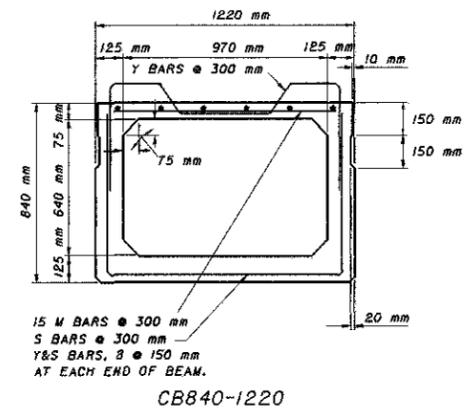
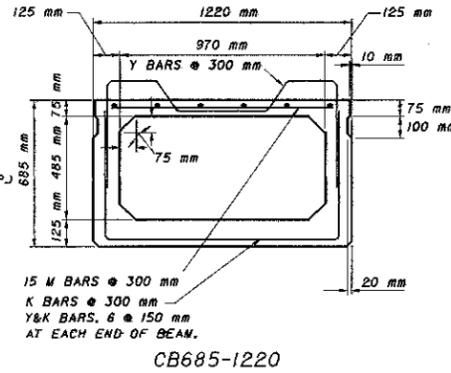
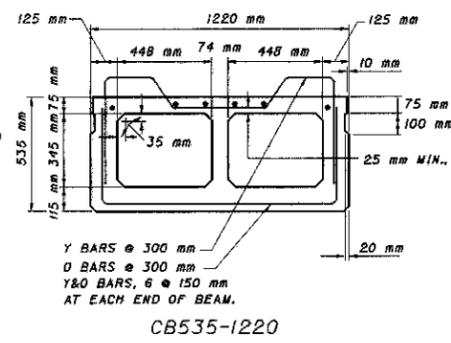
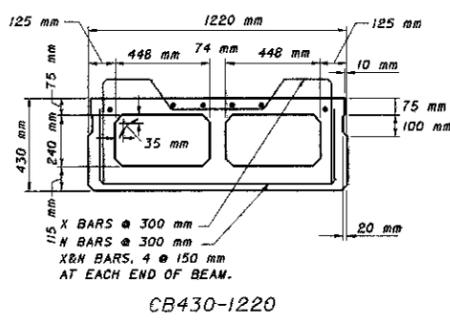
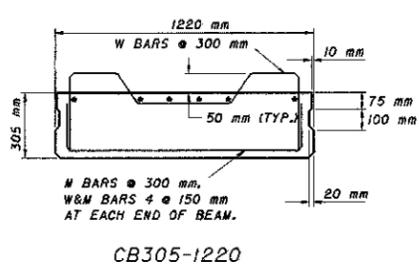




915 mm WIDE NON-COMPOSITE BEAMS

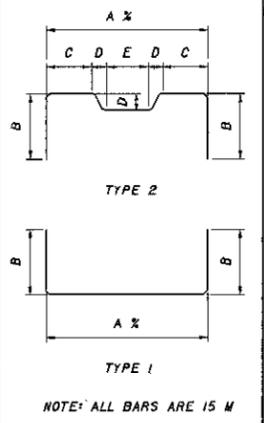


1220 mm WIDE NON-COMPOSITE BEAMS



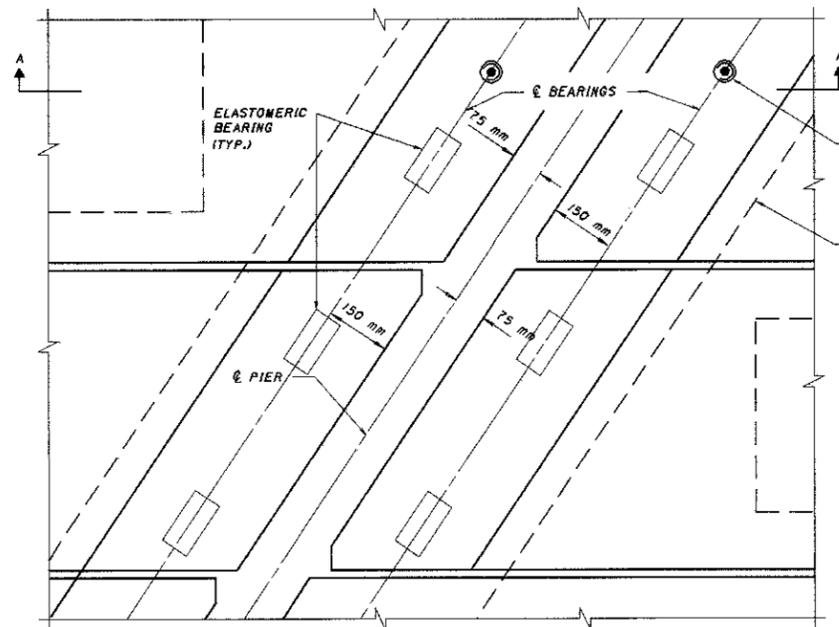
1220 mm WIDE COMPOSITE BEAMS

BENT REINFORCING BARS						BENDING DIAGRAMS
MARK	TYPE	A	B	C	D	
A	1	785 mm	200 mm			
B	2	785 mm	330 mm	250 mm	40 mm	205 mm
C	2	785 mm	330 mm	100 mm	40 mm	505 mm
D	1	785 mm	330 mm			
E	2	785 mm	430 mm	100 mm	40 mm	505 mm
F	2	785 mm	430 mm	250 mm	40 mm	205 mm
G	1	785 mm	430 mm			
H	1	785 mm	585 mm			
I	1	785 mm	735 mm			
J	1	785 mm	965 mm			
K	1	1090 mm	585 mm			
M	1	1090 mm	200 mm			
N	1	1090 mm	330 mm			
Q	1	1090 mm	430 mm			
P	1	1090 mm	430 mm			
R	2	1090 mm	430 mm	330 mm	50 mm	330 mm
S	1	1090 mm	430 mm	178 mm	50 mm	635 mm
T	1	1090 mm	965 mm			
W	2	1090 mm	255 mm	230 mm	100 mm	430 mm
X	2	1090 mm	430 mm	230 mm	100 mm	430 mm
Y	2	1090 mm	530 mm	230 mm	100 mm	430 mm
WW	2	785 mm	300 mm	150 mm	100 mm	280 mm
XX	2	785 mm	430 mm	150 mm	100 mm	280 mm
YY	2	785 mm	530 mm	150 mm	100 mm	280 mm

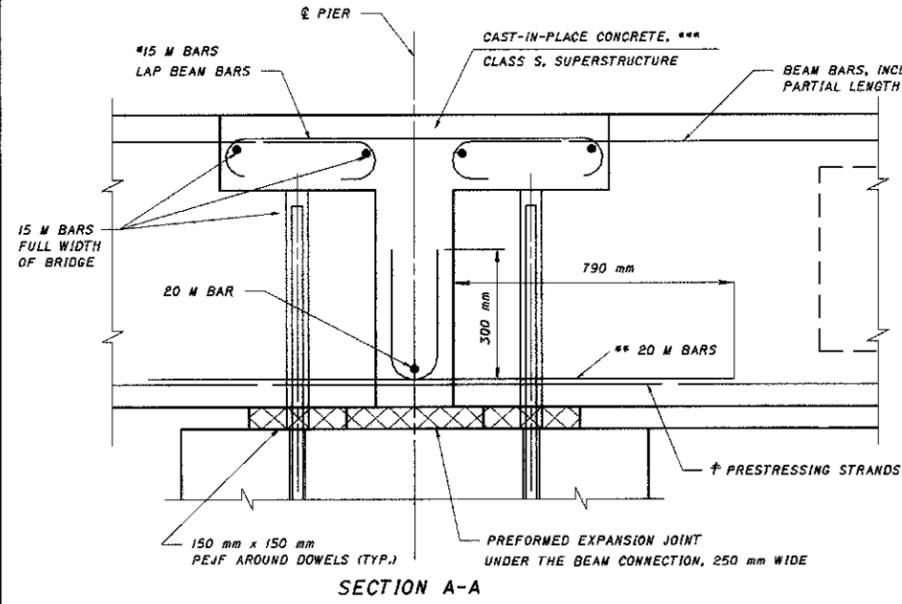
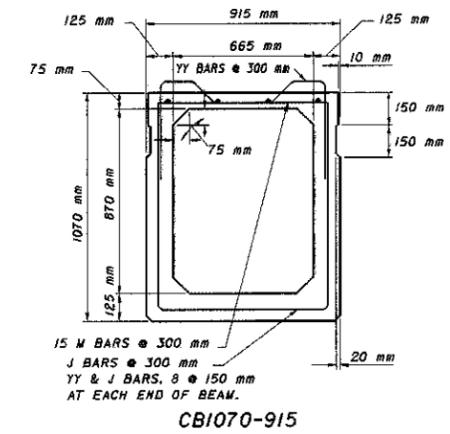
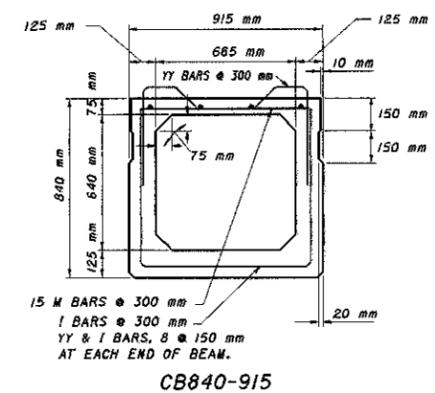
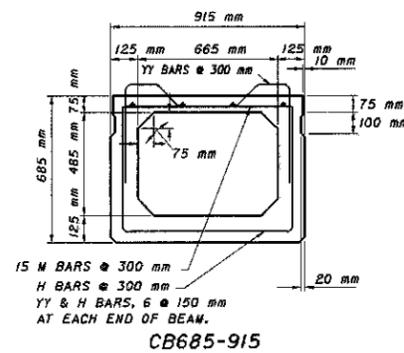
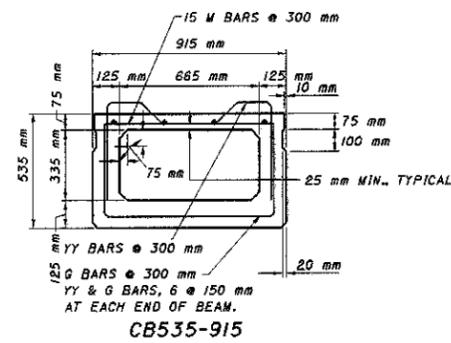
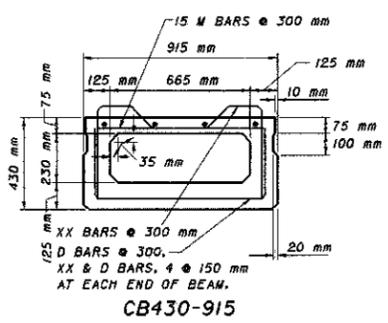
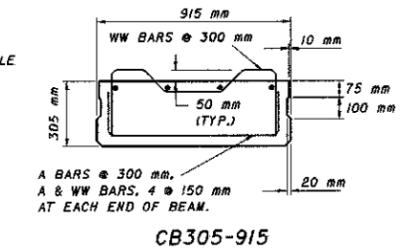


NOTE:  
ALTERNATE TOP STIRRUPS TO LAP BOTTOM STIRRUPS AT EACH END OF BEAM WHERE TWO TYPES OF TOP STIRRUPS ARE PROVIDED.  
915 mm WIDE COMPOSITE BEAMS ARE SHOWN ON SHEET 4 OF 4.  
MINIMUM TOP LONGITUDINAL REINFORCING STEEL  
915 mm WIDE NON-COMPOSITE & COMPOSITE BEAMS: 4-15 M BARS.  
1220 mm WIDE NON-COMPOSITE BEAMS: B305 THRU B535, 6-15 M BARS  
B685 THRU B1070, 4-15 M BARS  
1220 mm WIDE COMPOSITE BEAMS: 6-15 M BARS  
SEE PROJECT PLANS FOR ANY ADDITIONAL LONGITUDINAL REINFORCING STEEL BARS REQUIRED.  
ALL REINFORCING STEEL ARE GRADE 400 BARS

REVISIONS	STATE OF OHIO DEPARTMENT OF TRANSPORTATION BUREAU OF BRIDGES AND STRUCTURAL DESIGN			
	STANDARD PRESTRESSED CONCRETE BOX BEAM BRIDGE DETAILS			
	APPROVED:	ENGINEER OF BRIDGES		DRAWING NO. PSBD-1-93M
	DATE: 12-19-94	PREPARED	CHECKED	REVIEWED
	MRG	REF	SEM	LMW
				SHEET NO. 3 OF 4 SHEETS



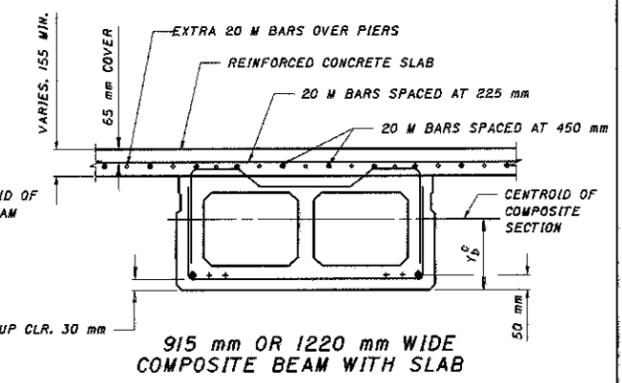
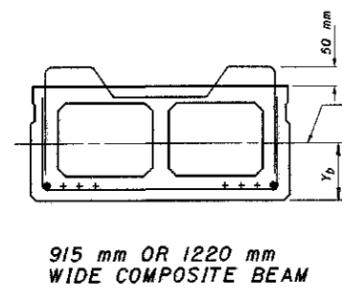
PARTIAL PLAN OF BEAM CONNECTION OVER PIER



SECTION A-A

915 mm WIDE COMPOSITE BEAMS

		SECTION PROPERTIES					
		1220 mm WIDE COMPOSITE BOX BEAM					
		CB305-1220	CB430-1220	CB535-1220	CB685-1220	CB840-1220	CB1070-1220
BEAM ONLY	A b x 10 <sup>3</sup>	366.3	312.5	346.1	376.7	411.9	470.1
	I b x 10 <sup>6</sup>	2844.1	6971.5	12183.9	23231.5	38,515.6	70515.9
	Y b	151.9	201.7	248.2	309.4	377.4	483.1
	Z t x 10 <sup>6</sup>	18.6	30.3	42.7	61.7	83.6	120.8
	Z b x 10 <sup>6</sup>	18.7	34.6	49.1	75.1	102.0	146.0
COMPOSITE SECTION	I c x 10 <sup>6</sup>	7777.3	15497.5	24498.1	43179.0	67429.9	115899.2
	Y c	211.8	292.6	348.7	428.5	510.5	631.7
	Z c t x 10 <sup>6</sup>	83.6	111.3	132.6	167.9	205.7	266.4
	Z c b x 10 <sup>6</sup>	36.7	53.0	70.3	100.7	132.1	183.9



		SECTION PROPERTIES					
		915 mm WIDE COMPOSITE BOX BEAM					
		CB305-915	CB430-915	CB535-915	CB685-915	CB840-915	CB1070-915
BEAM ONLY	A b x 10 <sup>3</sup>	273.5	241.5	276.1	314.8	350.2	408.1
	I b x 10 <sup>6</sup>	2124.9	5242.8	9377.3	18145.6	30467.7	56691.5
	Y b	151.6	198.4	245.1	314.7	384.0	491.7
	Z t x 10 <sup>6</sup>	13.9	22.4	32.5	48.9	67.1	98.6
	Z b x 10 <sup>6</sup>	14.0	26.4	38.3	57.6	79.3	115.3
COMPOSITE SECTION	I c x 10 <sup>6</sup>	5828.5	11849.3	18934.8	33162.0	52259.1	90895.8
	Y c	211.8	288.3	342.1	423.4	503.4	622.6
	Z c t x 10 <sup>6</sup>	62.6	82.5	99.0	126.4	156.2	204.6
	Z c b x 10 <sup>6</sup>	27.5	41.1	55.4	78.3	103.8	146.0

NOTE: REINFORCING BAR DATA AND NOTES ARE SHOWN ON SHEET 3 OF 4.

SECTION PROPERTIES FOR COMPOSITE SECTIONS ARE COMPUTED WITH A SLAB THICKNESS OF 125 mm. TOTAL THICKNESS OF SLAB IS 150 mm WHICH INCLUDES 25 mm MONOLITHIC WEARING SURFACE.

SLAB CONCRETE IS CLASS S CONCRETE + f'<sub>c</sub> = 31.0 MPa  
MINIMUM BEAM CONCRETE STRENGTH AT 28 DAYS + f'<sub>c</sub> = 38.0 MPa

ALL REINFORCING STEEL IN THE COMPOSITE DECK SLAB AND BARS PROJECTING FROM THE PRESTRESSED BOX BEAMS SHALL BE GRADE 400 EPOXY COATED BARS.

E<sub>slab</sub> = 0.90  
E<sub>beam</sub>

ALL DIMENSIONS ARE IN mm

- \* LAP BARS SAME SIZE AND NUMBER AS BEAM BARS. HOOKS MAY BE ROTATED FROM THE VERTICAL POSITION TO PROVIDE THE REQUIRED CLEARANCE.
  - \*\* PROVIDE 6-20 M BARS EACH BEAM END IN 1220 mm WIDE BEAMS AND 4-20 M BARS EACH BEAM END IN 915 mm WIDE BEAMS. 20 M BARS SHALL BE LOCATED ON TOP OF STIRRUPS AND SHALL BE UNIFORMLY SPACED ACROSS THE BEAM.
  - † AT THE FABRICATOR'S OPTION, STRANDS MAY BE EXTENDED AND BENT UP IN LIEU OF 20 M BARS. 1220 mm WIDE BEAMS WITH A TOTAL OF 12 OR MORE STRANDS SHALL HAVE A MINIMUM OF 6 STRANDS BENT UP. 1220 mm WIDE BEAMS WITH LESS THAN 12 STRANDS TOTAL SHALL HAVE APPROXIMATELY ONE HALF OF THE TOTAL NUMBER OF STRANDS BENT UP. 915 mm WIDE BEAMS WITH A TOTAL OF 8 OR MORE STRANDS SHALL HAVE A MINIMUM OF 4 STRANDS BENT UP. 915 mm WIDE BEAMS WITH LESS THAN 8 STRANDS TOTAL SHALL HAVE APPROXIMATELY ONE HALF OF THE TOTAL NUMBER OF STRANDS BENT UP.
  - \*\*\* IN LIEU OF CLASS S CONCRETE, THE CONTRACTOR AT HIS OPTION MAY USE OTHER CONCRETE MIXTURES IN ACCORDANCE WITH CMS 499.03 FOR ACHIEVING THE REQUIRED STRENGTH EARLIER.
- NOTE: THE PRESTRESSING STRANDS WHICH ARE BENT UP SHALL BE STAGGERED IN ABUTTING BEAM ENDS TO AVOID INTERFERENCE.

REVISIONS	STATE OF OHIO DEPARTMENT OF TRANSPORTATION BUREAU OF BRIDGES AND STRUCTURAL DESIGN			
	STANDARD PRESTRESSED CONCRETE BOX BEAM BRIDGE DETAILS			
	APPROVED:	<i>Robert P. Engel</i> ENGINEER OF BRIDGES		DRAWING NO. PSBD-1-93M
	DATE: 12-19-94	PREPARED MRG	DRAWN REF	CHECKED WLF SEW
	REVIEWED LMW	SHEET NO. 4 OF 4 SHEETS		

# NOTES

**PORTABLE CONCRETE BARRIER (PCB)** PCB, as shown, shall not be used on bridge deck edges. PCB, Bridge Mounted, shall be used at such locations in accordance with the Office of Structural Engineering's Standard Drawing PCB-91M.

**WIRE FABRIC** Shall meet the requirements of CMS 709.10.

**CONNECTING HARDWARE** Bolts, washers and hex nuts shall be galvanized after fabrication as per CMS 711.02 and shall meet the requirements of CMS 711.09 except that the Rotational Capacity test specified in ASTM A 325M shall be waived.

In lieu of the pin and loop connections detailed on this Standard Construction Drawing, barrier sections with "J-J Hooks" end connections may be utilized.

Transition barrier sections with pin and loop connections on one end and "J-J Hooks" on the other shall be used to connect runs of "J-J Hooks" barrier to other permitted barrier types. The heights of the transition sections shall be the same as the barrier runs being connected. "J-J Hooks" is a trademark of East-Set Industries, P.O. Box 300, Midland, VA 22728, (540) 439-8911 or (800) 547-4045.

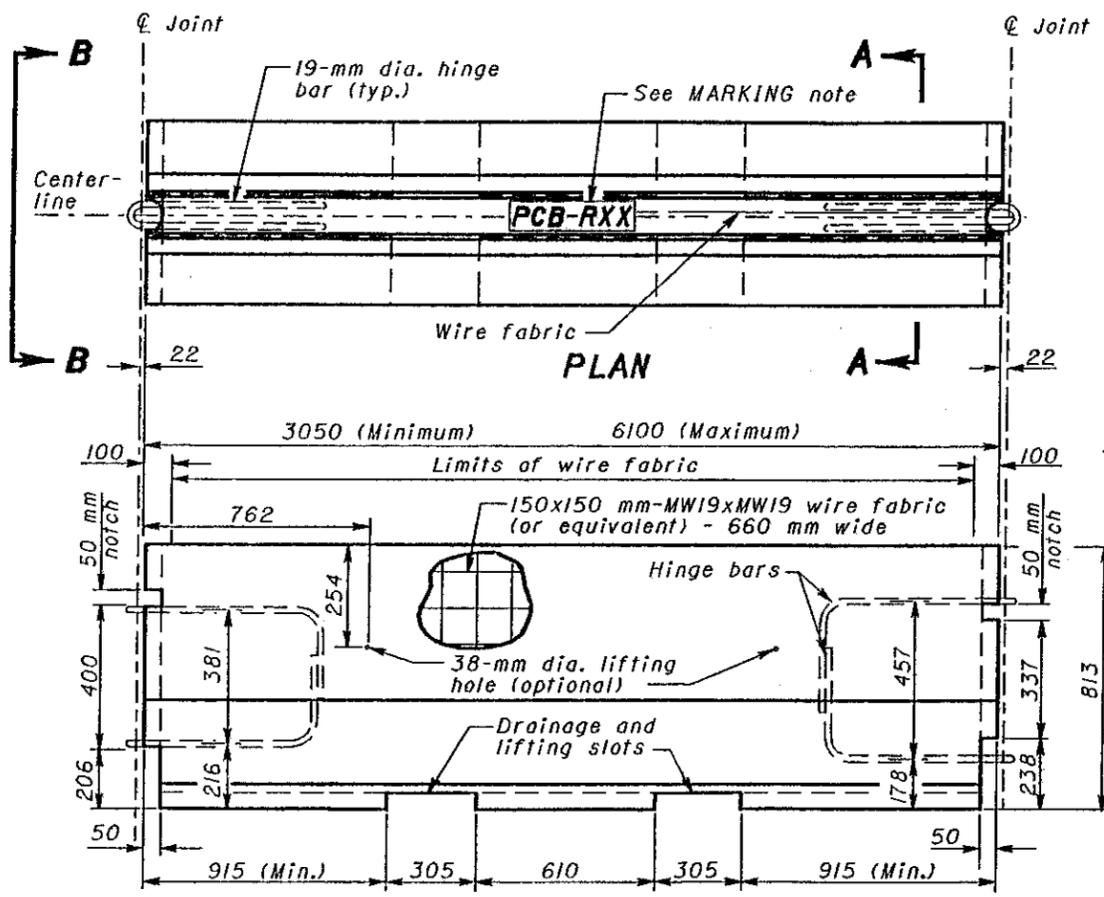
**HINGE AND REINFORCING BARS** The 19-mm hinge bars and #16M reinforcing bars shall meet the requirements of CMS 509.

**HANDLING DEVICES** Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

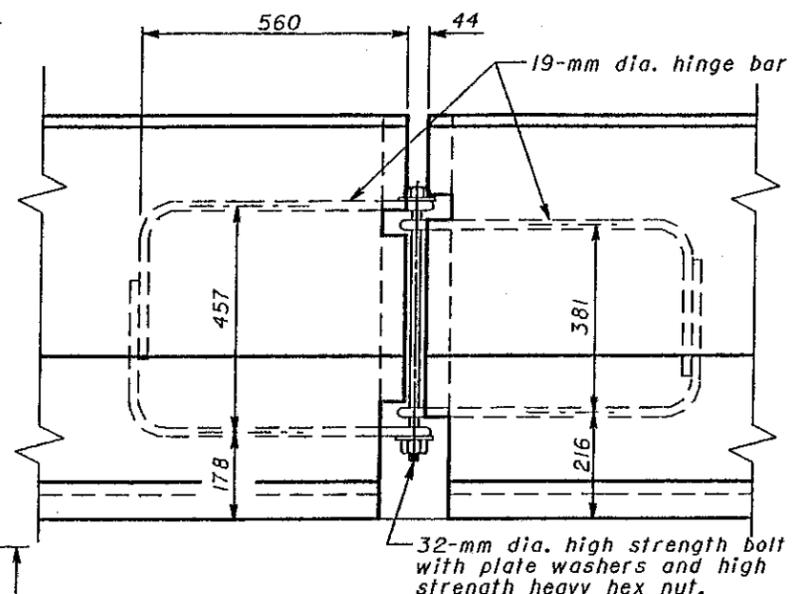
**MARKING** All barrier segments shall be marked as shown, where XX indicates the year cast. These markings shall be permanently impressed in the barrier using a minimum of 50-mm high lettering.

Each segment shall have, on its top, a unique identification as to its manufacturer and, somewhere on the barrier, the day and month that the barrier was manufactured.

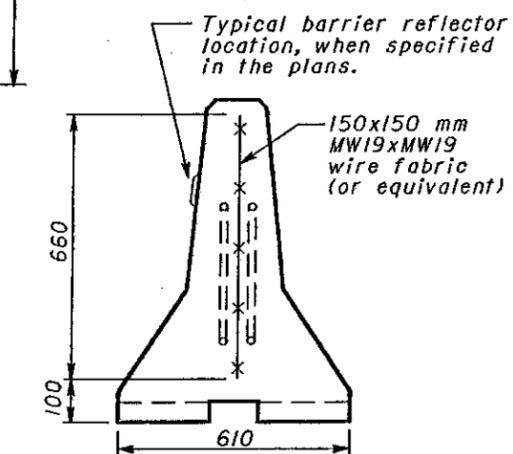
See CMS 622 for additional information.



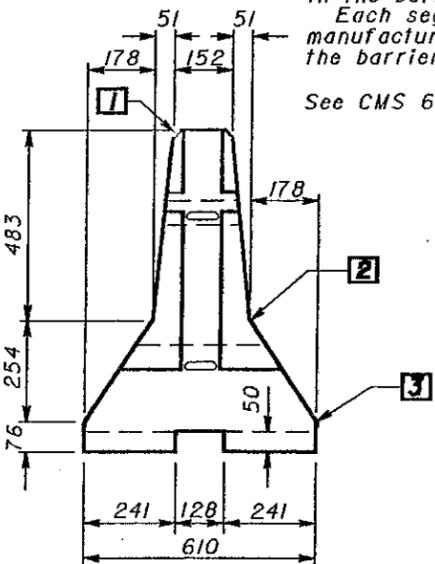
**ELEVATION  
BARRIER DETAILS**



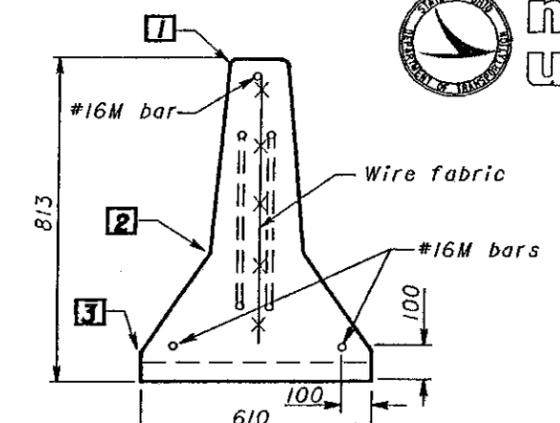
**DETAIL AT HINGED CONNECTION**



**SECTION A-A**

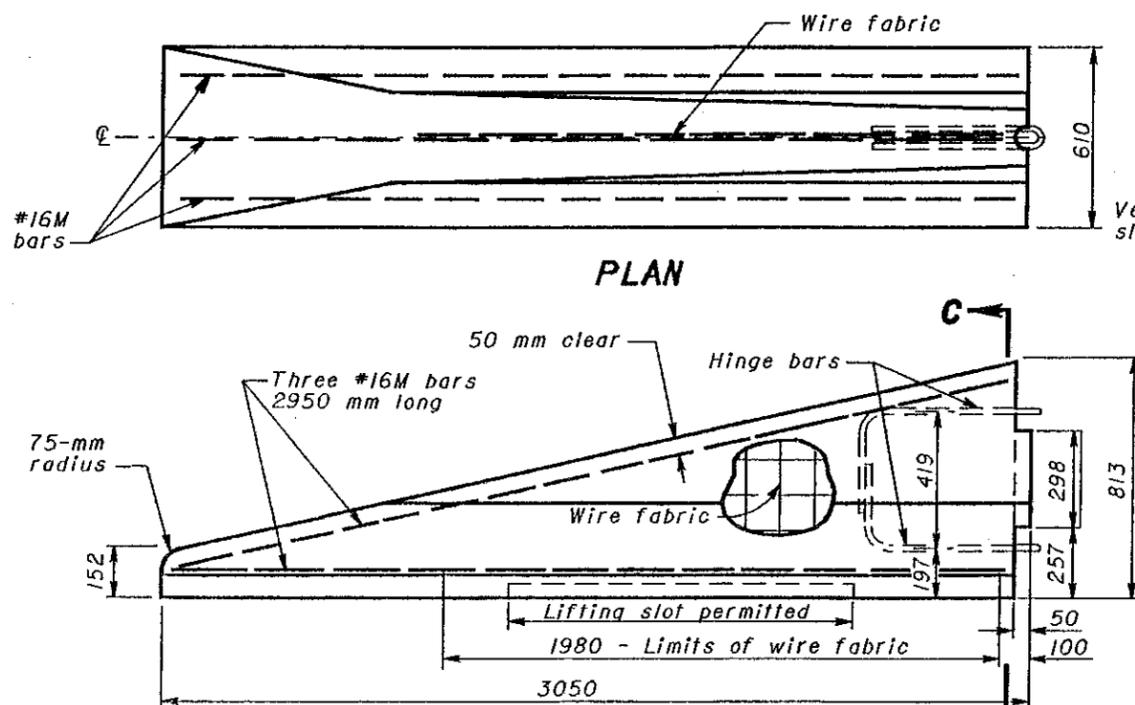


**VIEW B-B**

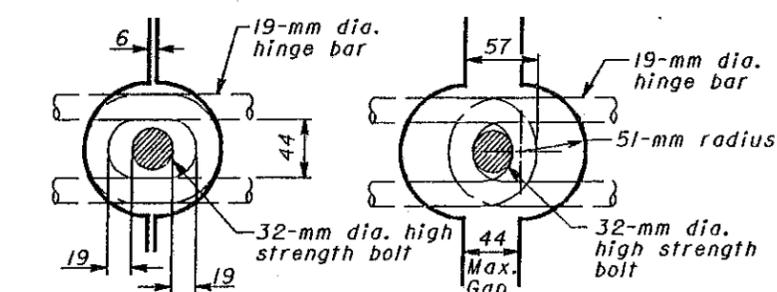


**SECTION C-C**

Vertical edges on keyway and drainage slots may be battered. Depth 50±6 mm.



**ELEVATION  
TAPERED END SECTION DETAILS**



**CLOSED JOINT**  
Barriers shall initially be placed close together so that bolts can be easily inserted through hinge bar loop.

**OPEN JOINT**  
Barrier joints shall be fully open before the nut is tightened onto bolt.

**JOINT CONNECTION DETAILS**

All dimensions are in millimeters unless otherwise noted.

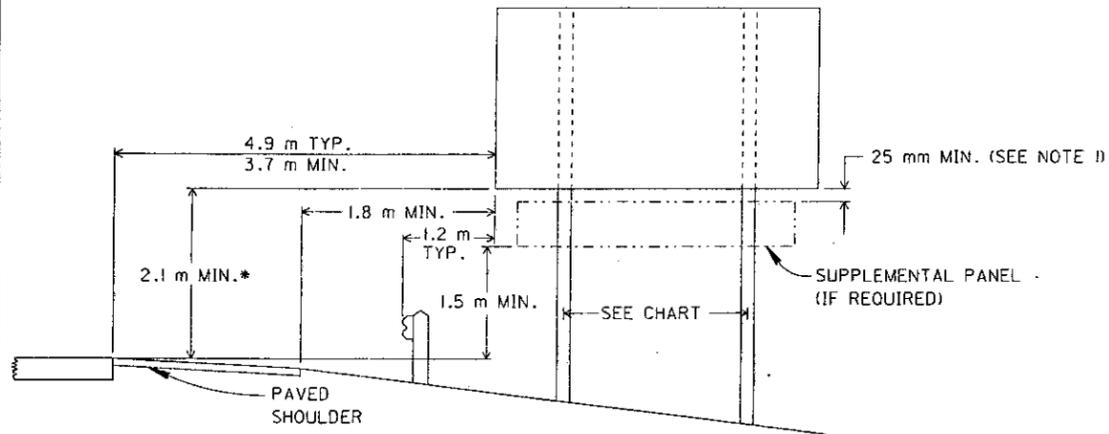
## LEGEND

- 1 25-mm radius or 19-mm chamfer, all top and end corners.
- 2 Permissible 250-mm radius.
- 3 Permissible 25-mm radius.

This Drawing Replaces MC-9.2.

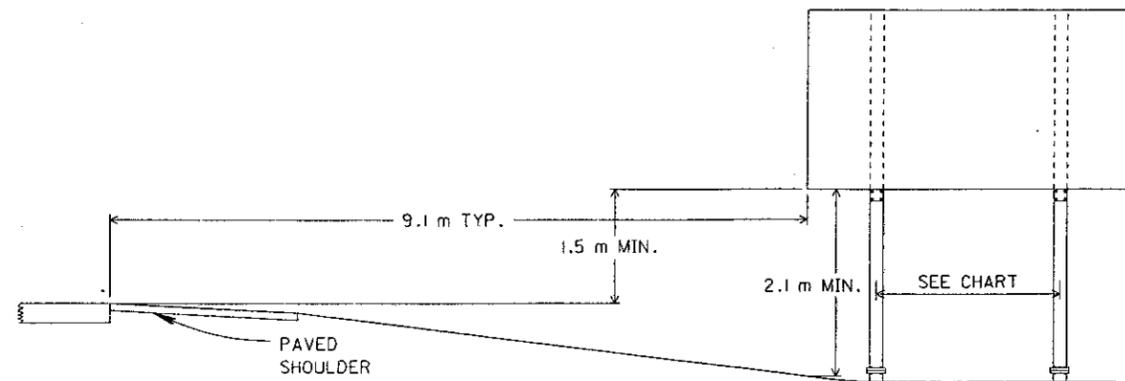
<b>OHIO DEPARTMENT OF TRANSPORTATION</b>	
<b>813-mm PORTABLE CONCRETE BARRIER</b>	<b>DATE</b> 6-30-95 10-21-97
<b>STANDARD CONSTRUCTION DRAWING RM-4.2M</b>	
APPROVED: <i>Roy T. Sutherland</i>	

### FREEWAYS AND EXPRESSWAYS

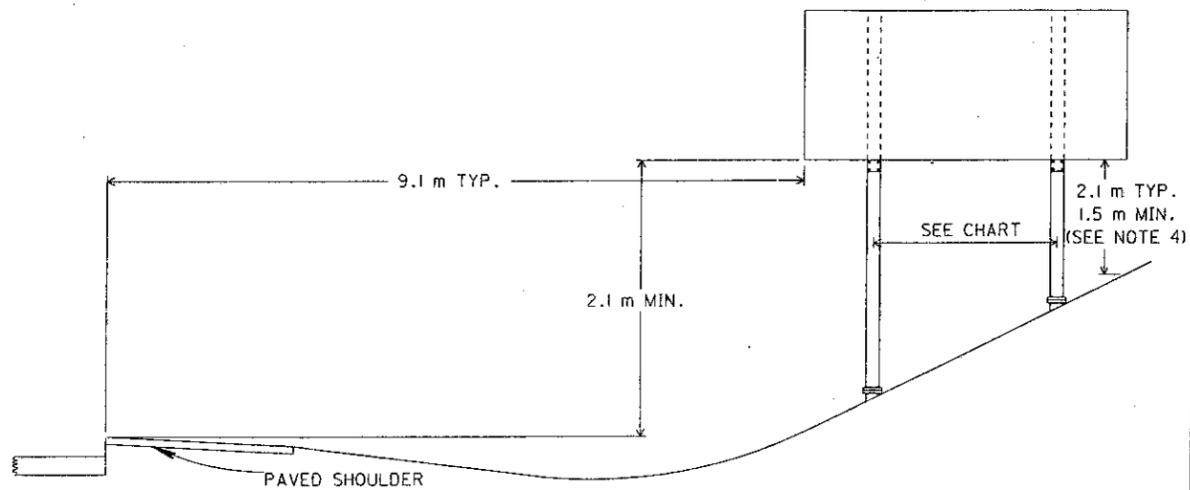


TYPICAL INSTALLATION WITH GUARDRAIL

\* 2.4 m MIN. WITH SUPPLEMENTAL PANEL

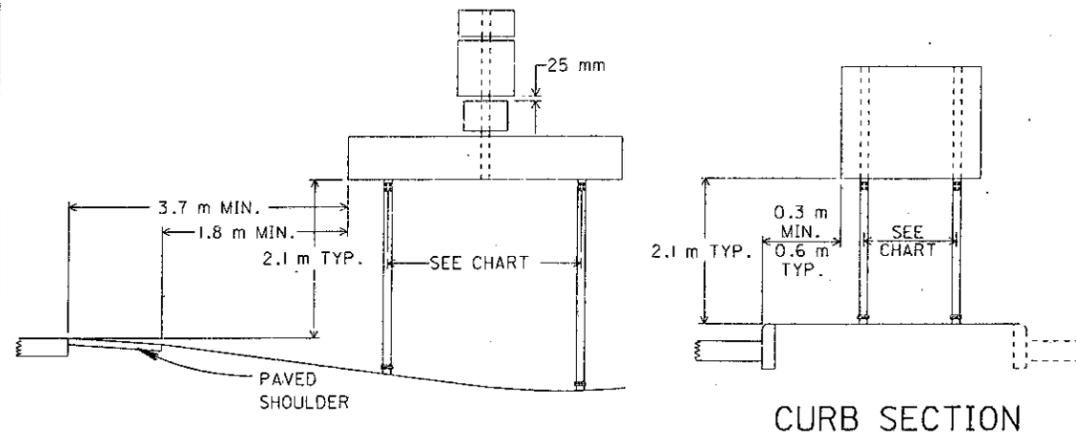


TYPICAL INSTALLATION, FILL SECTION, 9.1 m OFFSET



TYPICAL INSTALLATION, CUT SECTION, 9.1 m OFFSET

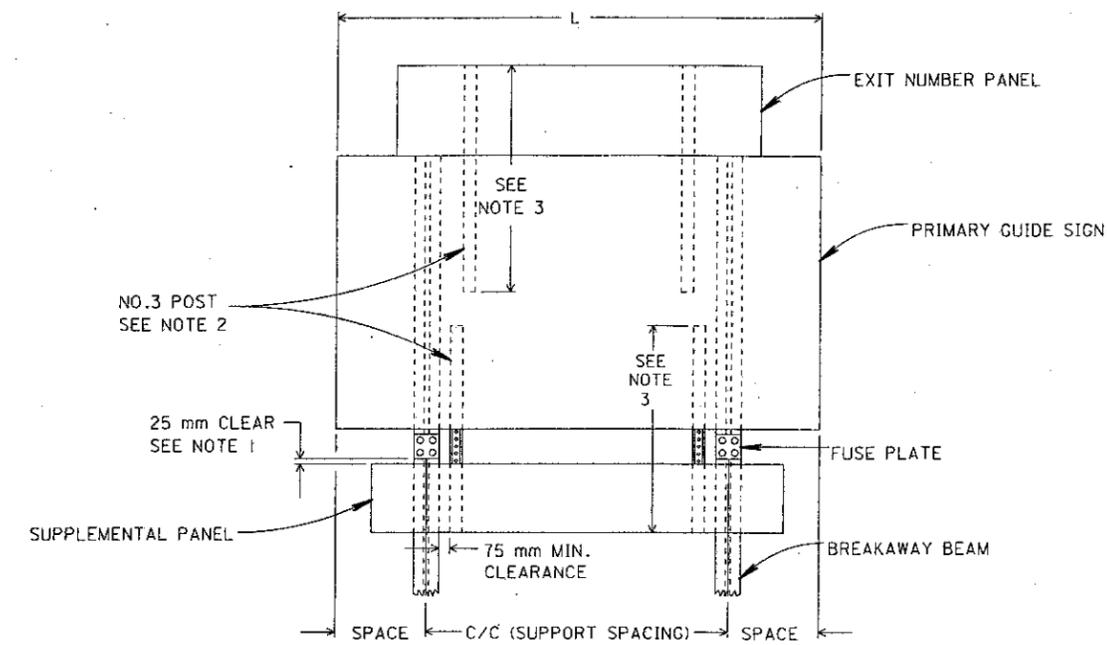
### STREETS-RAMPS-HIGHWAYS



CURB SECTION

### NOTES

- SUPPLEMENTAL PANELS SHALL BE MOUNTED 25 mm BELOW THE FUSE PLATE ON BREAKAWAY BEAM INSTALLATIONS AND 25 mm MINIMUM BELOW THE GUIDE SIGN WHEN THE SIGN SUPPORTS ARE RIGID BEAMS.
- NO. 3 POST SHALL BE ATTACHED TO BOTH THE GUIDE SIGN AND THE EXIT NUMBER OR OTHER SUPPLEMENTAL PANELS BY MOUNTING CLIPS FASTENED ALTERNATELY AT EACH HORIZONTAL EXTRUSION AND BOTH SIDES AT THE TOP AND BOTTOM OF THE POSTS. NO CONNECTIONS SHALL BE MADE BETWEEN THE SUPPLEMENTAL PANEL AND BREAKAWAY BEAMS.
- LENGTH OF POST SHALL BE 2.5 TIMES THE HEIGHT OF THE SUPPLEMENTAL PANEL. THE POST SPACING SHALL BE AS PER THE SUPPORT SPACING CHART.
- USE 1.5 m MINIMUM IF BACK SLOPES ARE GREATER THAN 3 TO 1.



SUPPLEMENTAL PANEL ATTACHMENT

SUPPORT SPACING CHART								
2 SUPPORTS				3 SUPPORTS				
L (meters)	SPACING (meters)			L (meters)	SPACING (meters)			
	SPACE	C/C	SPACE		SPACE	C/C	C/C	SPACE
1.5	0.33	0.84	0.33	6.0	0.40	2.60	2.60	0.40
1.8	0.40	1.00	0.40	6.3	0.55	2.60	2.60	0.55
2.1	0.46	1.18	0.46	6.6	0.70	2.60	2.60	0.70
2.4	0.52	1.36	0.52	6.9	0.85	2.60	2.60	0.85
2.7	0.59	1.52	0.59	7.2	1.00	2.60	2.60	1.00
3.0	0.65	1.70	0.65	7.5	1.00	2.75	2.75	1.00
3.3	0.72	1.86	0.72	7.8	1.05	2.85	2.85	1.05
3.6	0.80	2.00	0.80	8.1	1.10	2.95	2.95	1.10
3.9	0.85	2.10	0.85	8.4	1.15	3.05	3.05	1.15
4.2	0.90	2.20	0.90					
4.5	0.95	2.30	0.95					
4.8	1.00	2.40	1.00					
5.1	1.05	2.50	1.05					
5.4	1.10	2.60	1.10					
5.7	1.15	2.70	1.15					

METRIC

BUREAU OF DESIGN SERVICES  
DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

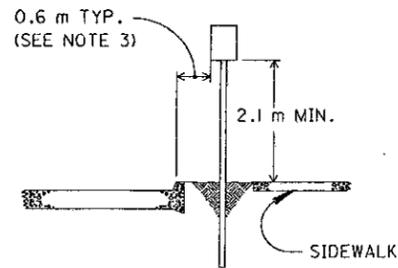
TRAFFIC CONTROL

DATE  
03/31/94

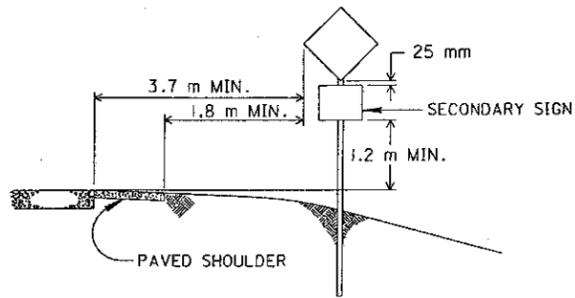
TYPICAL SIGN PLACEMENT  
GUIDE SIGNS

STANDARD CONSTRUCTION DRAWING  
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

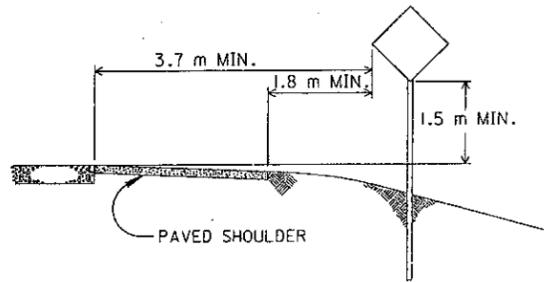
TC-42.10M



URBAN-RESIDENTIAL AND BUSINESS



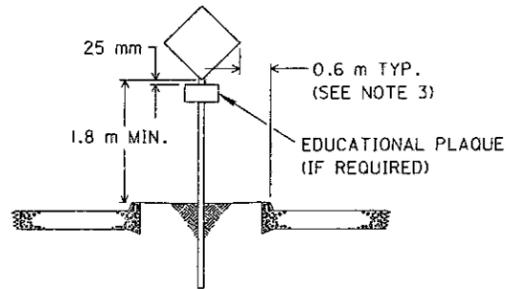
RURAL  
W/SECONDARY SIGN



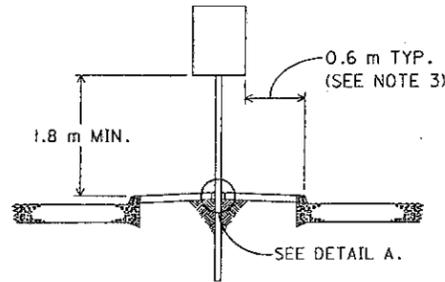
RURAL

NOTES

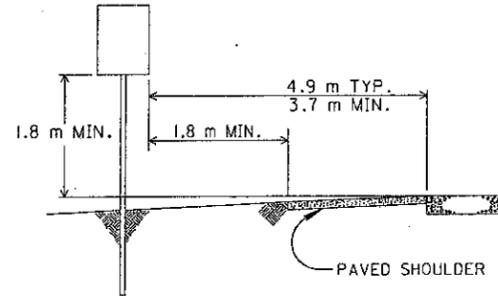
1. SEE DRAWING TC-41.20M FOR DETAILS ON YIELDING SUPPORTS.
2. ALL SIGNS SHALL BE PLACED 90° TO THE ROADWAY, EXCEPT PARKING SIGNS WITH ARROW SHALL BE SET AT AN ANGLE OF NOT LESS THAN 30° NOR MORE THAN 45° WITH A LINE PARALLEL TO THE FLOW OF TRAFFIC.
3. A CLEARANCE OF 0.3 m IS PERMISSIBLE WHERE SIDEWALK WIDTH IS LIMITED OR WHERE EXISTING POLES ARE CLOSE TO THE CURB.
4. SEE DRAWINGS TC-52.10M AND TC-52.20M FOR DIMENSIONS BETWEEN SUPPORTS.



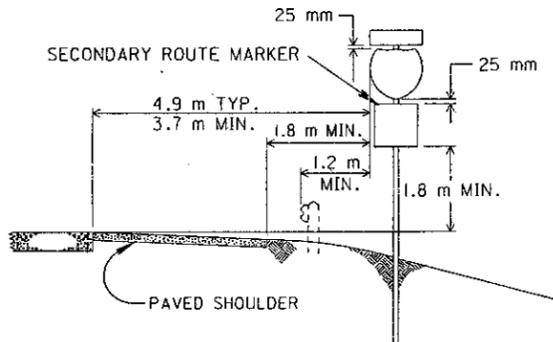
MEDIAN



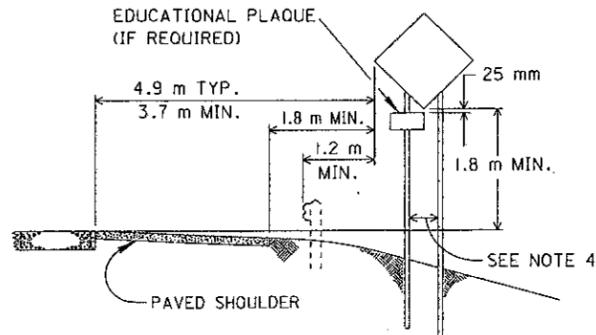
PAVED MEDIAN



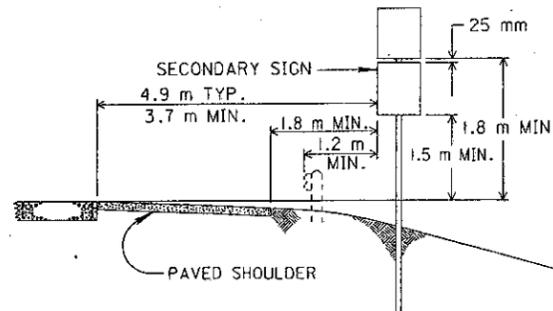
MEDIAN-EXPRESSWAY OR FREEWAY



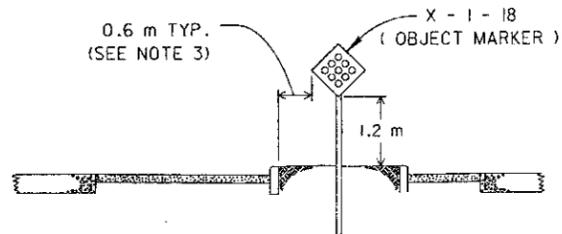
EXPRESSWAY OR FREEWAY  
W/SECONDARY SIGN



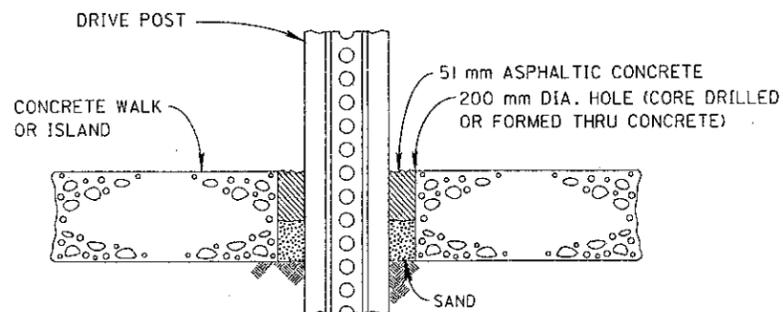
EXPRESSWAY OR FREEWAY



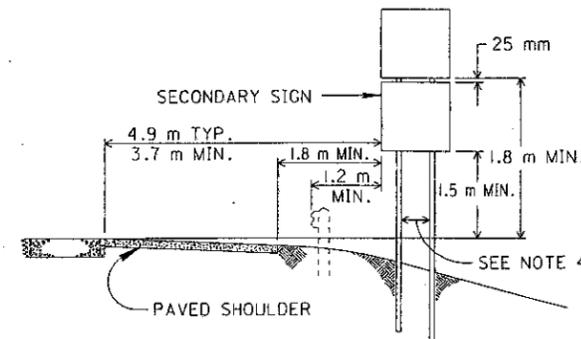
EXPRESSWAY OR FREEWAY  
W/SECONDARY SIGN



EXPRESSWAY OR FREEWAY



DETAIL A.



EXPRESSWAY OR FREEWAY  
W/SECONDARY SIGN

METRIC

BUREAU OF DESIGN SERVICES  
DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

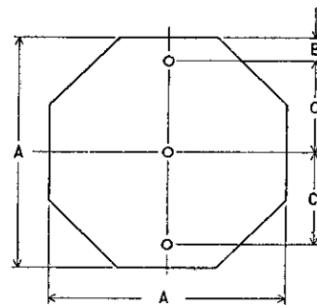
TRAFFIC CONTROL

DATE  
03/31/94

TYPICAL SIGN PLACEMENT  
REGULATORY, WARNING  
AND ROUTE MARKER SIGNS

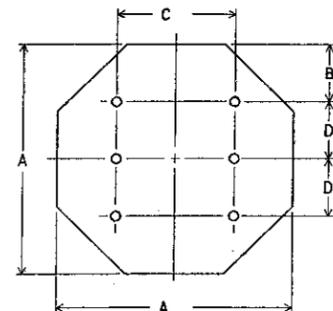
STANDARD  
CONSTRUCTION  
DRAWING  
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

TC-42.20M



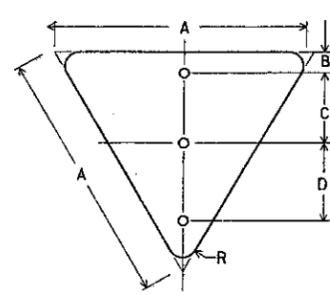
OCTA-1-3

A	B	C	THICKNESS	m <sup>2</sup>
750	75	300	2.0	0.56
900	150	300	2.0	0.81



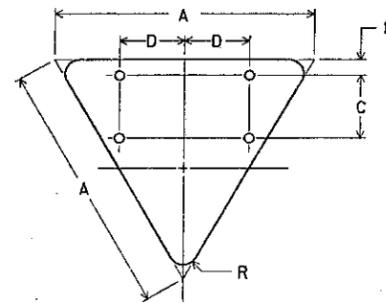
OCTA-2-6

A	B	C	D	THICKNESS	m <sup>2</sup>
1200	300	600	300	2.5	1.44



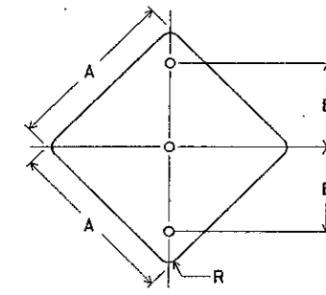
TRI-1-3

A	B	C	D	R	THICKNESS	m <sup>2</sup>
900	75	250	275	50	2.5	0.35



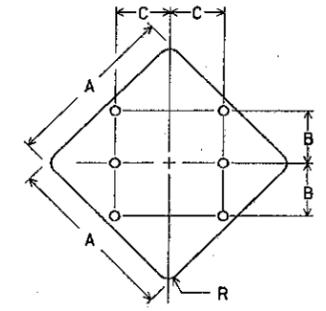
TRI-2-4

A	B	C	D	R	THICKNESS	m <sup>2</sup>
1200	75	300	300	75	2.5	0.62
1500	75	450	375	100	2.5	0.97



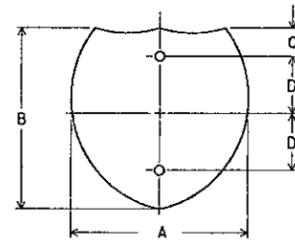
DIA-1-3

A	B	R	THICKNESS	m <sup>2</sup>
600	300	38	1.6	0.36
750	375	48	2.0	0.56
900	450	57	2.0	0.81



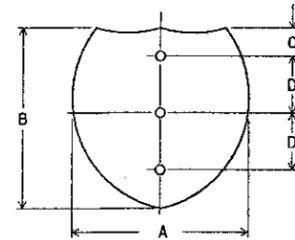
DIA-2-6

A	B	C	R	THICKNESS	m <sup>2</sup>
1200	375	375	75	2.5	1.44
1500	450	450	95	2.5	2.25



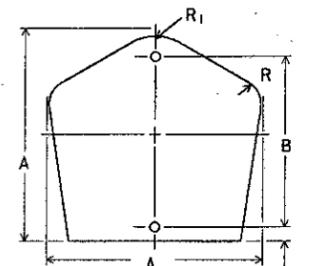
I.S.-1-2

A	B	C	D	THICKNESS	m <sup>2</sup>
600	600	75	225	1.6	0.36
750	600	75	225	2.0	0.45
750	750	75	300	2.0	0.56
1000	750	75	300	2.0	0.75



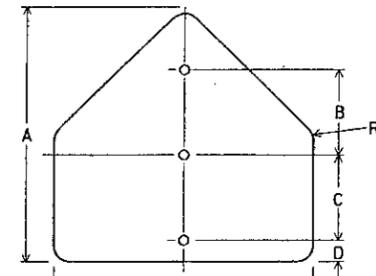
I.S.-1-3

A	B	C	D	THICKNESS	m <sup>2</sup>
900	900	150	300	2.0	0.81
1200	900	150	300	2.5	1.08



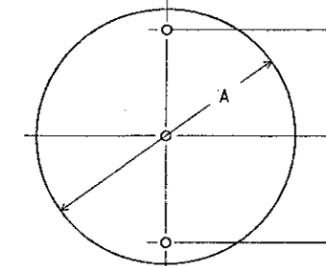
CO-1-2

A	B	C	R <sub>1</sub>	R	THICKNESS	m <sup>2</sup>
450	375	25	125	50	1.6	0.20
600	450	50	135	68	1.6	0.36
750	600	50	168	86	2.0	0.56



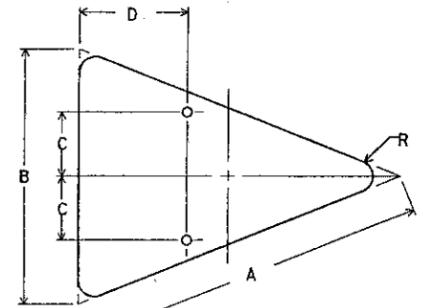
PENT-1-3

A	B	C	D	R	THICKNESS	m <sup>2</sup>
750	250	275	75	48	2.0	0.56
900	300	300	75	57	2.0	0.81
1050	350	325	100	64	2.5	1.10



CIR-1-3

A	B	THICKNESS	m <sup>2</sup>
750	300	1.6	0.56
900	375	2.0	0.81

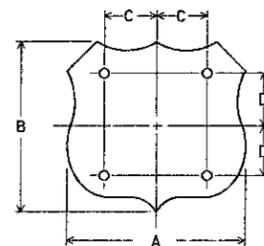


ISOS-1-2

A	B	C	D	R	THICKNESS	m <sup>2</sup>
1000	750	187	300	48	2.0	0.35
1200	900	225	375	57	2.5	0.50

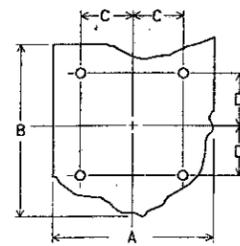
ROUTE SHIELDS

(FOR GUIDE SIGNS ONLY)



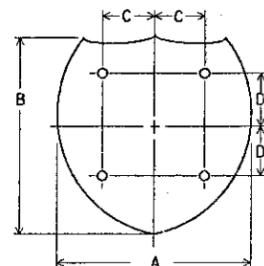
M-1C-

A	B	C	D
610	600	175	175
750	600	200	200
750	750	225	225
937	750	225	225
900	900	250	250
1125	900	375	250



M-2C-

A	B	C	D
600	600	175	175
750	600	200	200
750	750	225	225
937	750	225	225
900	900	250	250
1125	900	375	250



M-5C-

A	B	C	D
600	600	175	175
750	600	200	200
750	750	225	225
1000	750	225	225
900	900	250	250
1200	900	375	250

ALL SHIELDS SHALL BE 1.6 mm THICK

SHAPE  NO. BOLTS REQUIRED

OCTA-2-6

NO. SUPPORTS REQUIRED

NOTES

- ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
- ALL BOLT HOLES SHALL BE 10 MILLIMETERS IN DIAMETER, AND MAY BE DRILLED OR PUNCHED TO FINISHED SIZE.
- DIMENSIONS BETWEEN BOLT HOLES SHALL BE TO TOLERANCE OF ± 0.8 MILLIMETER.
- FOR ADDITIONAL BLANK DETAILS, SEE SIGN LAYOUT DRAWING.

METRIC

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DIVISION OF HIGHWAYS  
OHIO DEPARTMENT OF TRANSPORTATION

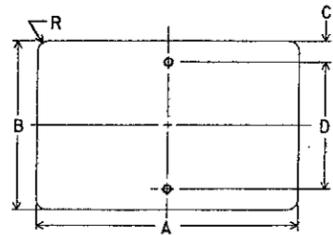
TRAFFIC CONTROL

DATE  
07/29/94

SIGN BLANK DETAILS I

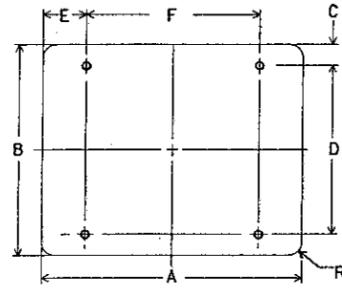
STANDARD CONSTRUCTION DRAWING  
TC-52.10M

APPROVED *[Signature]* ENGR. OF DESIGN SERVICES



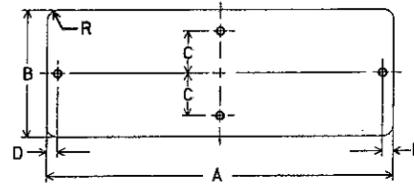
H-REC-1-2

A	B	C	D	R	THICKNESS	m <sup>2</sup>
300	150	37.5	75	38	1.6	0.05
450	150	37.5	75	38	1.6	0.07
450	300	37.5	225	38	1.6	0.14
525	375	37.5	300	38	1.6	0.20
525	450	75	300	38	1.6	0.24
600	150	37.5	75	38	1.6	0.09
600	200	37.5	125	38	1.6	0.12
600	250	37.5	175	38	1.6	0.15
600	300	37.5	225	38	1.6	0.18
600	450	75	300	38	1.6	0.27
750	200	37.5	125	38	1.6	0.15
750	250	37.5	175	38	1.6	0.19
750	300	37.5	225	38	2.0	0.23
750	375	37.5	300	38	2.0	0.28
750	400	37.5	325	38	2.0	0.30
750	450	75	300	38	2.0	0.34
750	600	75	450	38	2.0	0.45
900	150	37.5	75	38	2.0	0.14
900	300	37.5	225	38	2.0	0.27
900	375	37.5	300	38	2.0	0.34
900	450	75	300	38	2.0	0.41
900	600	75	450	38	2.0	0.54
937	750	75	600	38	2.0	0.70
1050	375	37.5	300	38	2.0	0.39
1200	500	75	350	38	2.0	0.60



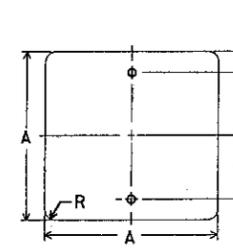
H-REC-2-4

A	B	C	D	E	F	R	THICKNESS	m <sup>2</sup>
900	600	75	450	150	600	38	2.0	0.54
900	750	75	600	150	600	48	2.0	0.68
1000	500	75	350	150	700	38	2.0	0.50
1050	900	150	600	225	600	57	2.5	0.95
1125	900	150	600	225	675	57	2.5	1.01
1200	200	37.5	125	225	750	38	2.0	0.24
1200	212	37.5	137	225	750	38	2.0	0.25
1200	350	37.5	275	225	750	38	2.0	0.42
1200	400	37.5	325	225	750	38	2.0	0.48
1200	450	75	300	225	750	38	2.0	0.54
1200	600	75	450	225	750	48	2.5	0.72
1200	750	75	600	225	750	48	2.5	0.90
1200	900	150	600	225	750	57	2.5	1.08
1200	1050	150	750	225	750	57	2.5	1.26
1400	200	37.5	125	300	800	38	2.5	0.28
1500	300	37.5	225	300	900	38	2.0	0.45
1500	600	75	450	300	900	38	2.5	0.90
1500	750	75	600	300	900	48	2.5	1.13
1500	900	150	600	300	900	57	2.5	1.35
1500	1000	150	700	300	900	57	2.5	1.50
1600	200	37.5	125	300	1000	38	2.5	0.32
1650	600	75	450	300	1050	38	2.5	0.99
1650	900	150	600	300	1050	57	2.5	1.49
1800	300	37.5	225	300	1200	38	2.5	0.54
1800	450	75	300	300	1200	38	2.5	0.81
1800	600	75	450	300	1200	38	2.5	1.08
1800	900	75	600	300	1200	38	2.5	1.62



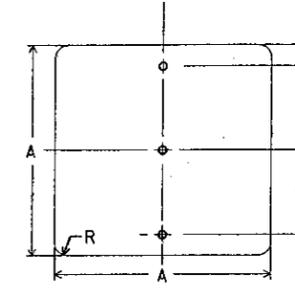
H-REC-1-4 (ONE WAY)

A	B	C	D	R	THICKNESS	m <sup>2</sup>
900	300	100	25	38	2.0	0.27
1200	450	150	38	38	2.5	0.54



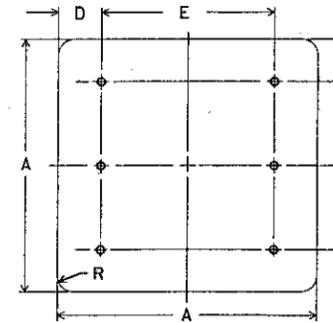
SQ-1-2

A	B	C	R	THICKNESS	m <sup>2</sup>
375	75	12.5	38	1.6	0.14
450	75	150	38	1.6	0.20
600	75	225	38	1.6	0.36



SQ-1-3

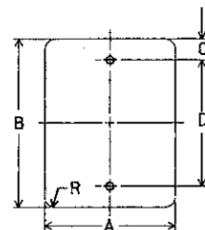
A	B	C	R	THICKNESS	m <sup>2</sup>
750	75	300	48	2.0	0.56
900	150	300	57	2.0	0.81



SQ-2-6

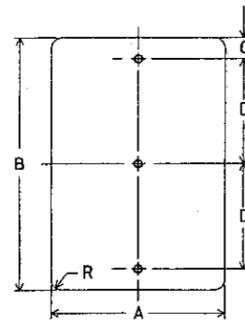
A	B	C	D	E	R	THICKNESS	m <sup>2</sup>
* 900	150	300	150	600	57	2.0	0.81
1200	150	450	225	750	75	2.5	1.44

\* "DO NOT ENTER" SIGN.



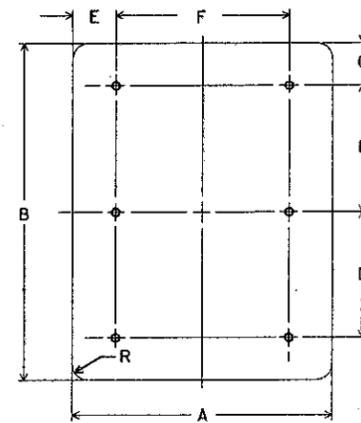
V-REC-1-2

A	B	C	D	R	THICKNESS	m <sup>2</sup>
200	650	125	400	38	1.6	0.13
225	300	37.5	225	38	1.6	0.07
300	450	37.5	375	38	1.6	0.14
300	600	75	450	38	1.6	0.18
450	600	75	450	38	1.6	0.27



V-REC-1-3

A	B	C	D	R	THICKNESS	m <sup>2</sup>
150	1350	225	450	38	2.0	0.20
300	900	75	375	38	1.6	0.27
300	1200	150	450	38	2.0	0.36
600	750	75	300	38	2.0	0.45
600	900	75	375	38	2.0	0.54
600	1200	225	375	38	2.5	0.72
750	900	75	375	48	2.0	0.68
750	950	75	400	38	2.0	0.68
750	1050	225	300	38	2.0	0.79
900	1050	225	300	57	2.5	0.95



V-REC-2-6

A	B	C	D	E	F	R	THICKNESS	m <sup>2</sup>
900	1200	150	450	150	600	57	2.0	1.08
900	1350	150	525	150	600	57	2.5	1.22
900	1500	150	600	150	600	57	2.5	1.35
900	1800	225	675	150	600	57	2.5	1.62
1200	1350	150	525	225	750	75	2.5	1.62
1200	1500	150	600	225	750	75	2.5	1.80
1200	2400	300	900	225	750	75	2.5	2.88

SHAPE          NO. BOLTS REQUIRED           
**H-REC-2-4**  
 NO. SUPPORTS REQUIRED         

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL BOLT HOLES SHALL BE 10 MILLIMETERS IN DIAMETER, AND MAY BE DRILLED OR PUNCHED TO FINISHED SIZE.
3. DIMENSIONS BETWEEN BOLT HOLES SHALL BE TO TOLERANCE OF ± 0.8 MILLIMETER.
4. FOR ADDITIONAL BLANK DETAILS SEE SIGN LAYOUT DRAWINGS.

M E T R I C

BUREAU OF DESIGN SERVICES  
 DIVISION OF HIGHWAYS  
 OHIO DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL DATE  
07/29/94

SIGN BLANK DETAILS II

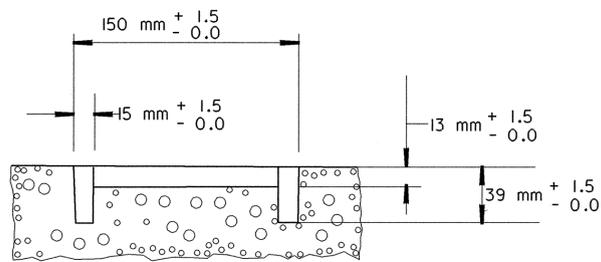
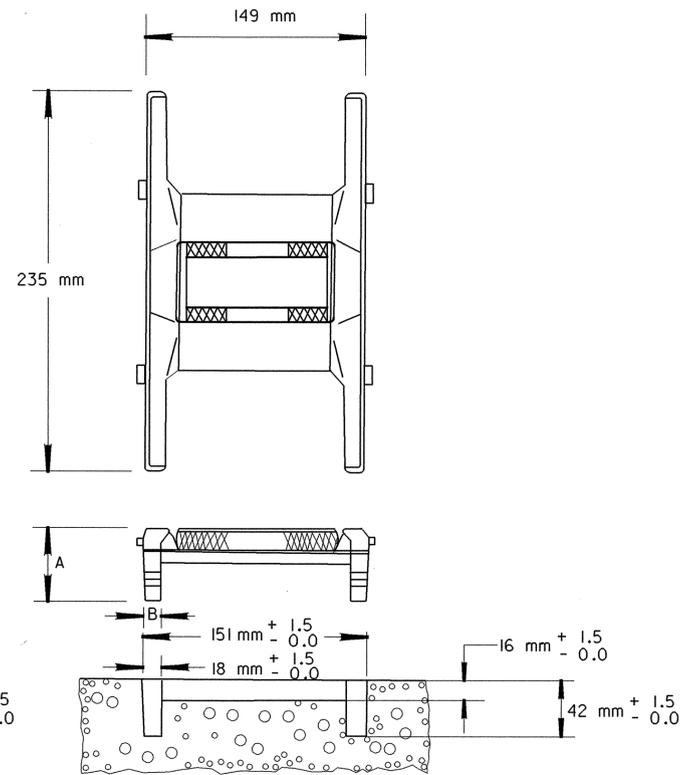
STANDARD CONSTRUCTION DRAWING **TC-52.20M**

APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

# NOTES

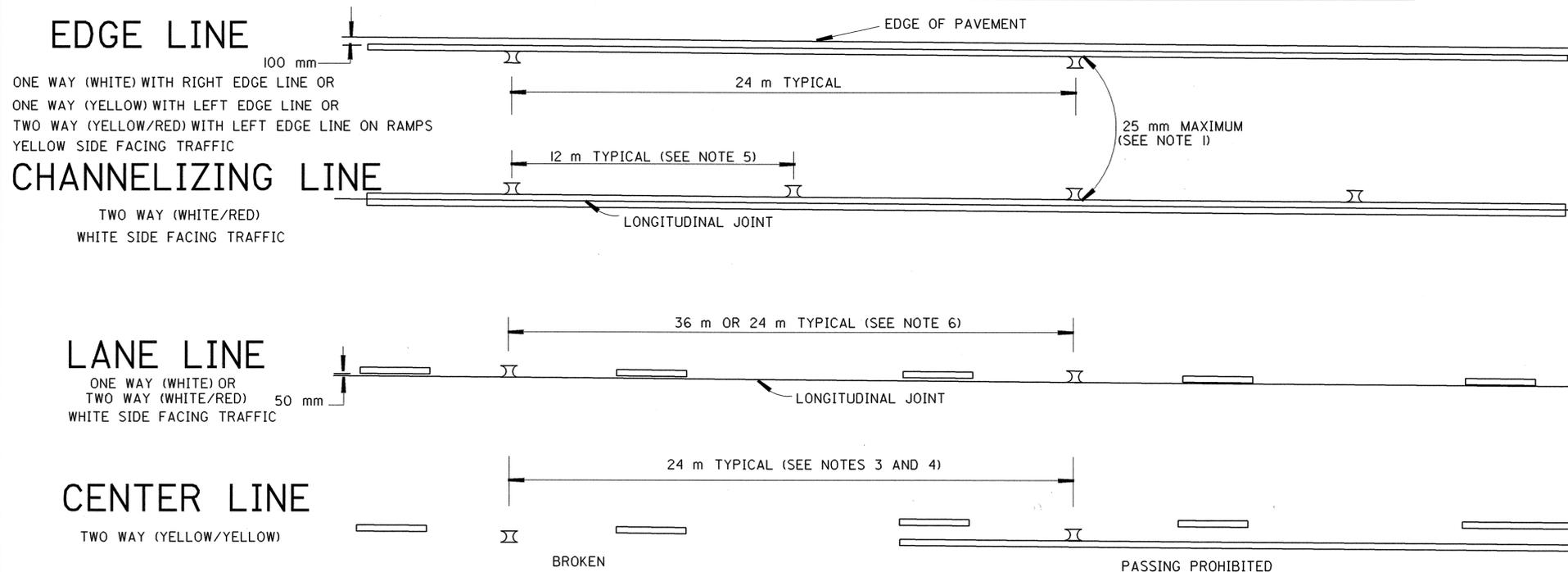
1. CENTER LINE MARKERS SHALL BE PLACED BETWEEN THE TWO LINES. MARKERS INSTALLED ALONG AN EDGE LINE OR CHANNELIZING LINE SHALL BE PLACED SO THAT THE CASTING IS NO MORE THAN 25 mm FROM THE NEAR EDGE OF THE LINE. MARKERS INSTALLED ALONG A LANE LINE OR DASHED YELLOW CENTER LINE SHALL BE PLACED BETWEEN AND IN LINE WITH THE DASHES. MARKERS SHALL NOT BE PLACED OVER THE LINES EXCEPT WHERE THE LINES DEVIATE VISIBLY FROM THEIR CORRECT ALIGNMENT, AND THEN ONLY WITH THE APPROVAL OF THE ENGINEER.
2. TO FACILITATE THE CUTTING OF THE TWO PARALLEL SLOTS AND INTERVENING CONCAVED SURFACE SIMULTANEOUSLY, IT IS RECOMMENDED THAT AN ARBOR AND SAW BLADES ASSEMBLY BE USED. FOR ADDITIONAL DETAILS AND TOLERANCES OF THE CASTING AND ARBOR-SAW ASSEMBLY CONTACT THE CASTING MANUFACTURE.
3. FOR HORIZONTAL CURVE RADIUS OF 380 METERS OR LESS, THE SPACING OF THE CENTER LINE MARKERS SHALL BE REDUCED TO 12 m BETWEEN P.C. OR T.S. AND P.T. OR S.T.
4. FOR HORIZONTAL CURVE RADIUS OF 250 METERS OR LESS, THE SPACING OF THE CENTER LINE MARKERS MAY BE REDUCED TO 6 m BETWEEN P.C. OR T.S. AND P.T. OR S.T. WHEN USING 6m SPACING, 12 RAISED PAVEMENT MARKERS AT 12 m SPACING SHALL BE INSTALLED ON EACH END OF THE 6 m SPACING.
5. WHEN A CHANNELIZING LINE IS LESS THAN 24 m IN LENGTH, ONE RAISED PAVEMENT MARKER SHALL BE PLACED AT EACH END OF THE LINE AND ONE SHALL BE PLACED IN THE CENTER OF THE LINE.
6. RAISED PAVEMENT MARKERS ON LANE LINES ON FREEWAYS SHALL BE ONE WAY WHITE SPACED AT 36 METERS. ALL OTHER RAISED PAVEMENT MARKERS ON LANE LINES ON MULTILANE OR DIVIDED ROADWAYS SHALL BE TWO WAY RED/WHITE SPACED AT 24 METERS.

	CONVENTIONAL TYPE	LOW PROFILE TYPE
A	44 mm	43 mm
B	12 mm	15 mm



OPTIONAL FOR CONVENTIONAL TYPE

## CASTING AND SAW CUT DETAILS



## TYPICAL RAISED PAVEMENT MARKER PLACEMENT WITH LONGITUDINAL PAVEMENT MARKINGS



OFFICE OF TRAFFIC ENGINEERING DIVISION OF ENGINEERING POLICY OHIO DEPARTMENT OF TRANSPORTATION	
TRAFFIC CONTROL	DATE 11/03/93 11/01/95
RAISED PAVEMENT MARKER INSTALLATION DETAILS	
STANDARD CONSTRUCTION DRAWING	TC-65.10M
APPROVED <i>[Signature]</i>	ADMINISTRATOR