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Type	Depth in	Unit Weight k/ft	Max. Span ft	Relative Cost Factor	Fabrication Cost Range		Final In-Place Cost**
W42G	42.00	0.424	85	0.75	\$85	\$90	\$99
W50G	50.00	0.585	110	0.83	\$95	\$100	\$110
W58G	58.00	0.672	125	0.92	\$105	\$110	\$121
W74G	73.50	0.831	150	1.00*	\$115	\$120	\$132
WF42G	42.00	0.806	115	1.35	\$150	\$155	\$178
WF50G	50.00	0.859	130	1.44	\$160	\$165	\$190
WF58G	58.00	0.913	145	1.52	\$170	\$175	\$201
WF74G	74.00	1.020	165	1.61	\$180	\$185	\$213
W83G	82.61	1.087	175	1.70	\$190	\$195	\$224
W95G	94.49	1.167	160	2.00	\$200	\$230	\$265
WBT32G	32.00	0.598	75	1.57	\$150	\$180	\$207
WBT38G	38.00	0.638	90	1.61	\$155	\$185	\$213
WBT62G	62.00	0.798	130	1.74	\$170	\$200	\$230
U54G4	54.00	1.154	130	3.40	\$290	\$390	\$449
U54G5	54.00	1.234	130	3.44	\$295	\$395	\$454
U54G6	54.00	1.394	120	3.48	\$300	\$400	\$460
U66G4	66.00	1.343	155	3.44	\$295	\$395	\$454
U66G5	66.00	1.423	150	3.48	\$300	\$400	\$460
U66G6	66.00	1.583	145	3.53	\$305	\$405	\$466
U78G4	78.00	1.531	170	3.70	\$325	\$425	\$489
U78G5	78.00	1.611	170	3.79	\$335	\$435	\$500
U78G6	78.00	1.771	165	3.88	\$345	\$445	\$512
UF60G4	60.00	1.342	150	3.48	\$300	\$400	\$460
UF60G5	60.00	1.422	150	3.53	\$305	\$405	\$466
UF60G6	60.00	1.582	135	3.57	\$310	\$410	\$472
UF72G4	72.00	1.530	165	3.62	\$315	\$415	\$477
UF72G5	72.00	1.610	170	3.66	\$320	\$420	\$483
UF72G6	72.00	1.770	160	3.70	\$325	\$425	\$489
UF84G4	84.00	1.719	190	3.96	\$355	\$455	\$523
UF84G5	84.00	1.799	185	4.05	\$365	\$465	\$535
UF84G6	84.00	1.959	170	4.14	\$375	\$475	\$546
WF74PTG	74.00	1.020	175	1.31	\$120	\$150	\$173
W83PTG	82.61	1.087	205	1.35	\$130	\$155	\$178
W95PTG	94.49	1.167	235	1.31	\$145	\$150	\$173

* W74G is used as basis for relative cost analysis

** The final In-Place Cost is based on 1.15 x Fabrication Cost. Producers should be consulted for shipping circumstances

Precast Prestressed Girder Cost Estimate (Per Linear Foot)

Table 5.6.4-1

3. Girder Spacing

Consideration must be given to the slab cantilever length to determine the most economical girder spacing. This matter is discussed in Section 5.6.4.B. The slab cantilever length should be made a maximum if a line of girders can be saved. The spacing of the interior girders must be considered at the same time. Once the positions of the exterior girders have been set, the positions and lengths of interior girders can be established. The following guidance is suggested.

a. Straight Spans

On straight constant width roadways, all girders should be parallel to bridge centerline and girder spacing should be equal.

b. Tapered Spans

On tapered roadways, the minimum number of girder lines should be determined as if all girder spaces were to be equally flared. As many girders as possible, within the limitations of girder capacity should be placed. Slab thickness may have to be increased in some locations in order to accomplish this.

c. Curved Spans

On curved roadways, normally all girders will be parallel to each other. It is critical that the exterior girders are positioned properly in this case, as described in Subsection 5.6.4.B.

d. Geometrically Complex Spans

Spans which are combinations of taper and curves will require especially careful consideration in order to develop the most effective and economical girder arrangement. Where possible, girder lengths and numbers of straight and harped strands should be made the same for as many girders as possible in each span.

e. Number of Girders in a Span

Usually all spans will have the same number of girders. Where aesthetics of the underside of the bridge is not a factor and where a girder can be saved in a short side span, consideration should be given to using unequal numbers of girders. It should be noted that this will complicate crossbeam design by introducing torsion effects and that additional reinforcement will be required in the crossbeam.

B. Slab Cantilevers

The selection of the location of the exterior girders with respect to the curb line of a bridge is a critical factor in the development of the framing plan. This location is established by setting the curb distance, which is that dimension from centerline of the exterior girder to the adjacent curb line. For straight bridges, the distance between the edge of girder and the curb will normally be no less than 2'-6" for W42G, W50G, and W58G; 3'-0" for W74G; and 3'-6" for WF74G, W83G, and W95G. Some considerations which affect this are noted below.

1. Appearance

In the past, some prestressed girder bridges have been designed by placing the exterior girders directly under the curb (traffic barrier). This gives a very poor bridge appearance and is uneconomical. Normally, for best appearance, the largest slab overhang which is practical should be used.

5.7 Roadway Slab

The following information is intended to provide guidance for slab thickness and transverse and longitudinal reinforcement of roadway slab. Information on deck deterioration prevention systems is section 5.7.4.

5.7.1 Roadway Slab Requirements

A. Slab Thickness

Slab thickness for prestressed girder bridges shall be taken as shown in Table 5.7.2-2.

The minimum slab thickness is established in order to ensure that overloads on the bridge will not result in premature slab cracking.

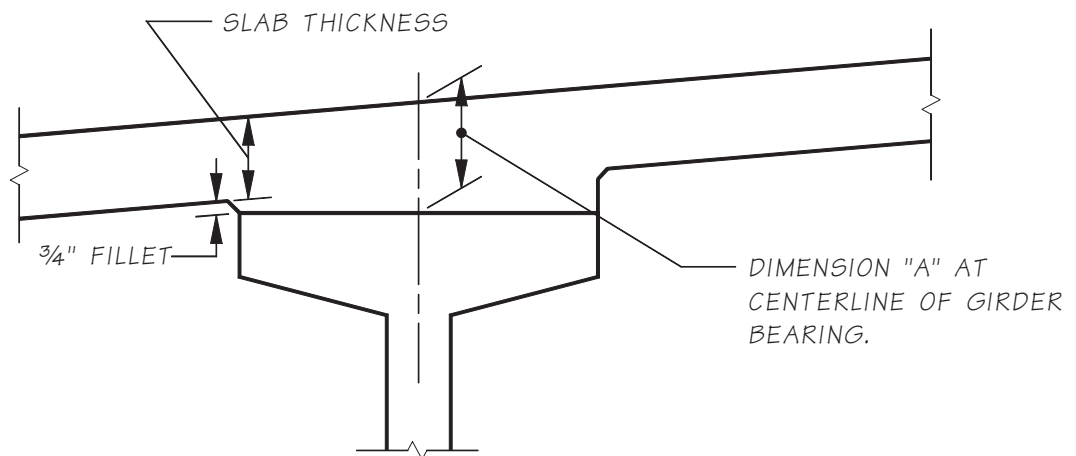
B. Computation of Slab Strength

The thickness for usual slabs are shown in Figure 5.7.1-1 and Figure 5.7.1-2. The slab design span and thickness are defined in Table 5.7.2-2

The thickness of the slab and reinforcement in the area of the cantilever may be governed by traffic barrier loading. Wheel loads plus dead load shall be resisted by the sections shown in Figure 5.7.1-2.

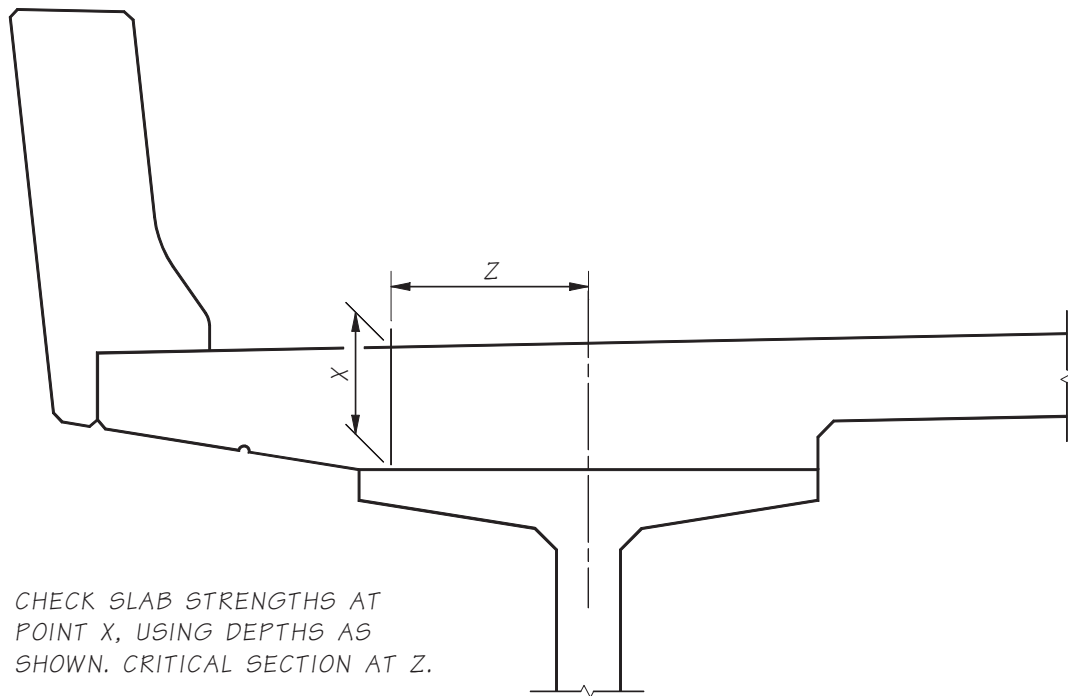
Cantilever loads may govern the slab thickness just inside the exterior girder as shown by "Z" in Figure 5.7.1-2.

Design of the cantilever is normally based on the expected depth of slab at centerline of girder span. This is less than the dimensions at the girder ends (sometimes).



Depths for Slab Design at Centerline of Girder Span

Figure 5.7.1-1



$$Z = \frac{b_f - b_w}{2}$$

b_f = WIDTH OF TOP FLANGE

b_w = WEB THICKNESS

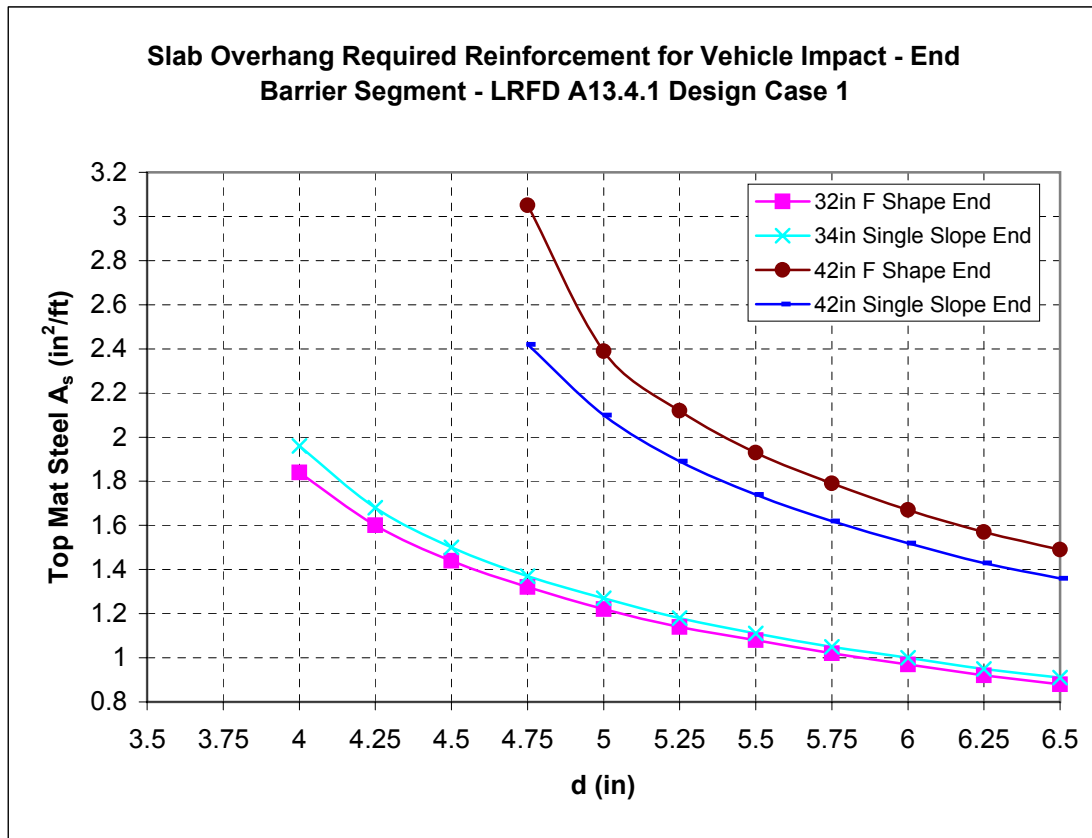
Depths for Slab Design at Deck Overhang

Figure 5.7.1-2

C. Computation of "A" Dimension

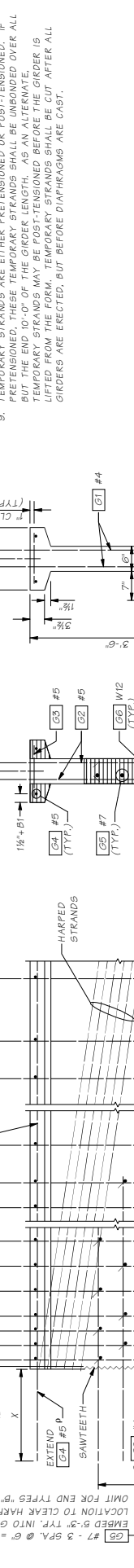
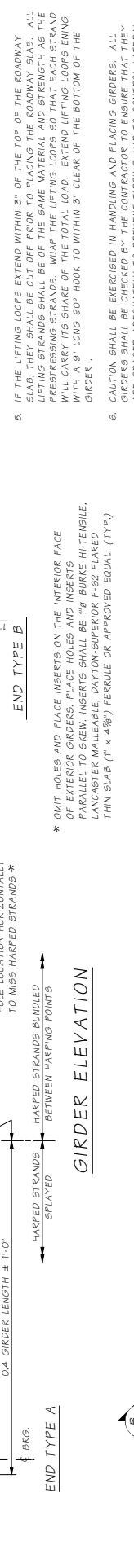
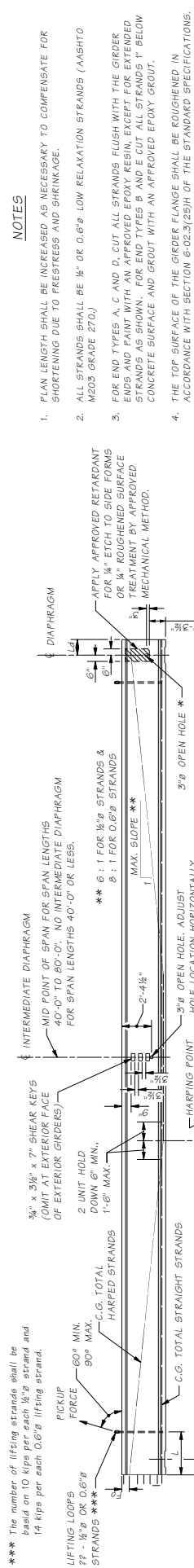
The distance from the top of the slab to the top of the girder at centerline bearing is represented by the "A" Dimension. It is calculated in accordance with the guidance of Appendix B. This ensures that adequate allowance will be made for excess camber, transverse deck slopes, vertical and horizontal curvatures. Ideally the section at centerline of span will have the final geometry shown in Figure 5.7.1-1. Where temporary prestress strands at top of girder are used to control the girder stresses due to shipping and handling, the "A" dimension must be adjusted accordingly.

The note in left margin of the Layout Sheet should read: "A" Dimen. = X" (not for design).



Notes:

1. Top and bottom mats each carry one-half the tension impact load.
2. Only Design Case 1 of LRFD A13.4.1 is considered. Designer must also check Design Cases 2 and 3.
3. Section considered is a vertical section through the slab overhang at the toe of the barrier.



MARK	LOCATION	SIZE
G1	GIRDER END STIRRUPS	4
G2	GIRDER END STIRRUPS	5
G3	GIRDER TOP FLANGE	5
G4	GIRDER LENGTH FULL LENGTH	5
G5	GIRDER END LENGTH	7
G6	GIRDER TOP FLANGE TIES	2
G7	GIRDER BOT FLANGE TIES	2
G8	GIRDER END LENGTH	4
G9	GIRDER END LENGTH	4

Diaphragm Type	END TYPE	BEARING RECESS	X	Y	Z	SAWTEETH
End Diaph. on Girder	A	YES	1'-10"	1'-6"	9"	YES
"U" Abutment	B	YES	0"	0"	0"	NO
Hinge Diaph. on Interim. Pier	C	NO	1'-10"	1'-6"	9"	YES
Fixed Diaph. @ Interim. Pier	D	NO	1'-10"	1'-6"	9"	YES
Multi. Simple Spans @ Interim. Pier	E	YES	0"	0"	0"	NO

BEARING DIAGRAM (ALL DIMENSIONS ARE OUT TO OUT)

NOTE: FOR DIMENSION "A", SEE "GIRDER SCHEDULE"

- NOTES**
- PLAN LENGTH SHALL BE INCREASED AS NECESSARY TO COMPENSATE FOR SHORTENING DUE TO PRESTRESS AND SHRINKAGE.
 - ALL STRANDS SHALL BE 1/2" OR 0.69" LOW RELAXATION STRANDS (AASHTO M205 GRADE 270).
 - FOR END TYPES A, C AND D, CUT ALL STRANDS FLUSH WITH THE GIRDER AND PAINT WITH AN APPROVED EPOXY RESIN, EXCEPT FOR EXTENDED STRANDS AS SHOWN. FOR END TYPES B AND E CUT ALL STRANDS 1" BELOW CONCRETE SURFACE AND GROUT WITH AN APPROVED EPOXY GROUT.
 - THE TOP SURFACE OF THE GIRDER FLANGE SHALL BE ROUGHENED IN ACCORDANCE WITH SECTION 6-02.3.(25H) OF THE STANDARD SPECIFICATIONS.
 - IF THE LIFTING LOOPS EXTEND WITHIN 3" OF THE TOP OF THE ROADWAY SLAB, THEY SHALL BE CUT OFF PRIOR TO PLACING THE ROADWAY SLAB. ALL LIFTING STRANDS SHALL BE OF THE SAME MATERIAL AND STRENGTH AS THE ROADWAY SLAB. THE LIFTING STRANDS SHALL BE PLACED WITHIN THE SLAB WITH CARE (1% SHARE OF THE TOTAL LOAD). EXTEND LIFTING LOOPS WITH A 9" LONG 90° HOOK TO WITHIN 3" CLEAR OF THE BOTTOM OF THE GIRDER.
 - CAUTION SHALL BE EXERCISED IN HANDLING AND PLACING GIRDERS. ALL GIRDERS SHALL BE CHECKED BY THE CONTRACTOR TO ENSURE THAT THEY ARE BRACED ADEQUATELY TO PREVENT TIPPING AND TO CONTROL LATERAL BENDING DURING SHIPPING. ONCE ERRECTED, ALL GIRDERS SHALL BE BRACED LATERALLY TO PREVENT TIPPING UNTIL THE DIAPHRAGMS ARE CAST AND CURED.
 - FORMS FOR BEARING PAD RECESSES SHALL BE CONSTRUCTED AND FASTENED IN SUCH A MANNER AS TO NOT CAUSE DAMAGE TO THE GIRDER DURING THE STRAND RELEASE OPERATION.
 - FOR SAWTOOTH DETAILS SEE W42G GIRDER DETAILS 2 OF 2.
 - TEMPORARY STRANDS ARE EITHER PRETENSIONED OR POST-TENSIONED. IF PRETENSIONED, THESE TEMPORARY STRANDS SHALL BE UNBROKEN OVER ALL BUT THE END 10'-0" OF THE GIRDER LENGTH. AS AN ALTERNATE, TEMPORARY STRANDS MAY BE POST-TENSIONED BEFORE THE GIRDER IS ERRECTED. TEMPORARY STRANDS SHALL BE CUT AFTER ALL GIRDERS ARE ERRECTED, BUT BEFORE DIAPHRAGMS ARE CAST.

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS

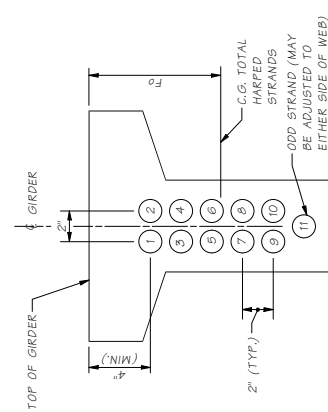
W42G GIRDER DETAILS 1 OF 2

DATE: _____ BY: _____

REVISION: _____

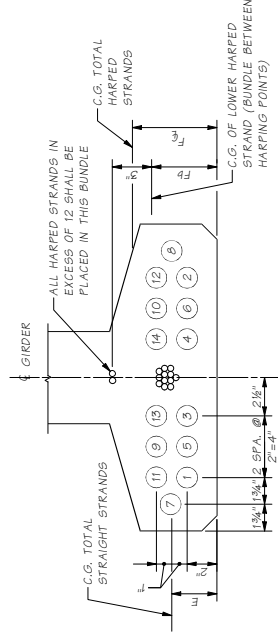
JOB NO. _____ SHEET _____ OF _____

5.6-A3-1



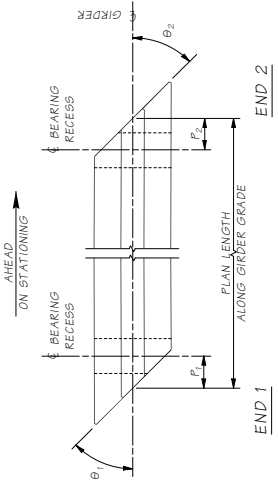
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



STRAND PATTERN AT $\frac{1}{4}$ SPAN

STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



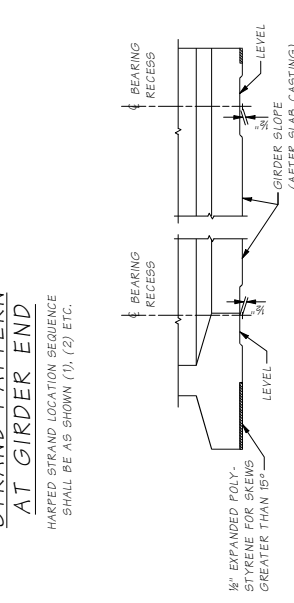
SAWTOOTH DETAILS

SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - W42C GIRDER DETAILS 1 OF 2.

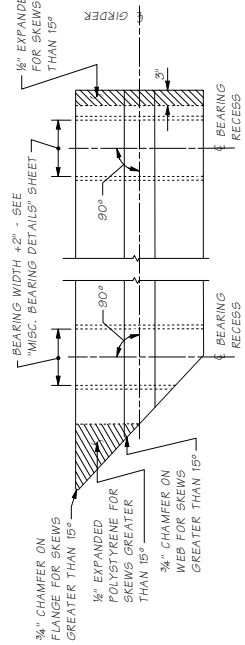
GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (20 DAYS)

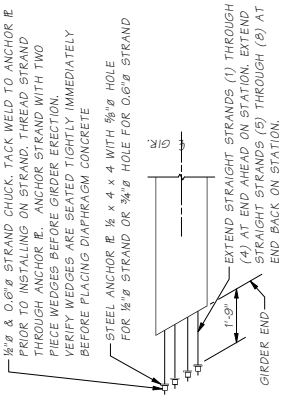
SPAN	GIRDER	END 1 TYPE	END 2 TYPE	L	θ_1	θ_2	F ₁	F ₂	PLAN LENGTH (ALONG GIRDER GRADE)	MIN. CONC. COMP. STRENGTH		NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	TEMPORARY	LOCATION OF C.G. STRANDS (IN)			LD (IN)	
										FINAL	RELEASE						E	F _E	F _P		F _O
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



ELEVATION



BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION

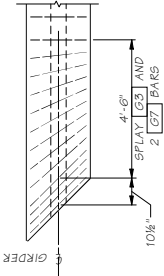


ALTERNATE #1

ALTERNATE #2

TRANSVERSE REINFORCING SKEWED ENDS

ONLY TRANSVERSE REINF. SHOWN



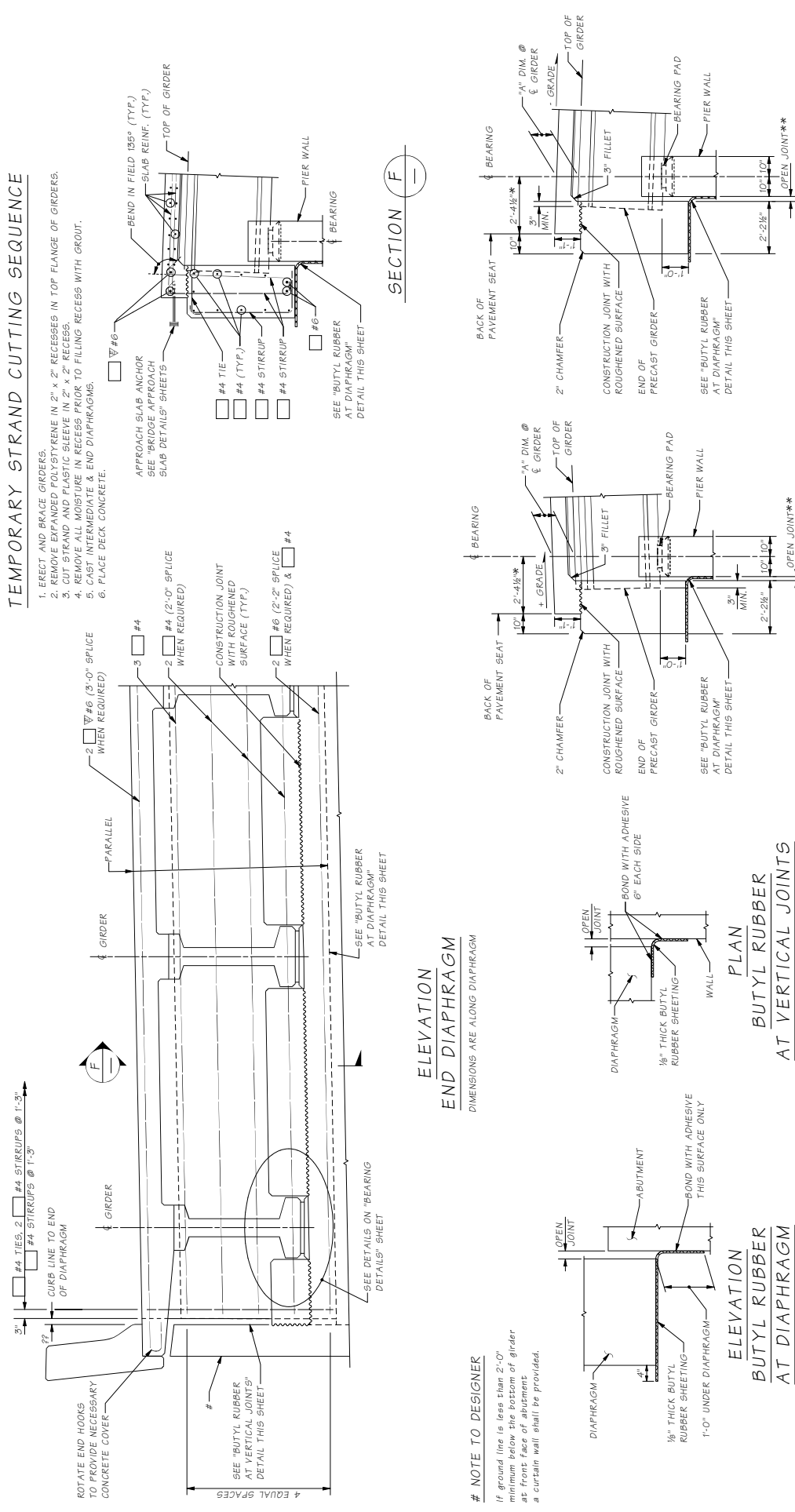
STRAND EXTENSION DETAIL

n = ? TOTAL NUMBER OF EXTENDED STRANDS

ALTERNATE #1

ALTERNATE #2

<p>Washington State Department of Transportation</p>		<p>BRIDGE AND STRUCTURES OFFICE</p>		<p>STANDARD PRESTRESSED CONCRETE GIRDERS</p>	
<p>W42C GIRDER DETAILS 2 OF 2</p>		<p>DATE</p>		<p>REVISION</p>	
<p>DATE</p>		<p>BY / APD</p>		<p>SHEET TOTAL</p>	
<p>DESIGNED BY</p>		<p>CHECKED BY</p>		<p>STATE</p>	
<p>DETAILED BY</p>		<p>PROJECT NUMBER</p>		<p>FED. AID PROJ. NO.</p>	
<p>PREPARED BY</p>		<p>JOB NUMBER</p>		<p>REVISION</p>	
<p>ARCHITECT/SPECIFIER</p>		<p>DATE</p>		<p>BY / APD</p>	



TEMPORARY STRAND CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESS.
4. REMOVE ALL MOISTURE IN RECESS PRIOR TO FILLING RECESS WITH GROUT.
5. CAST INTERMEDIATE & END DIAPHRAGMS.
6. PLACE DECK CONCRETE.

ELEVATION
END DIAPHRAGM

DIMENSIONS ARE ALONG DIAPHRAGM

NOTE TO DESIGNER
If ground line is less than 2'-0" minimum below the bottom of girder at front face of abutment, a curtain wall shall be provided.

ELEVATION
BUTYL RUBBER
AT DIAPHRAGM

PLAN
BUTYL RUBBER
AT VERTICAL JOINTS

Bridge Length:
L ≤ 200
200 < L ≤ 300
300 < L ≤ 400
L > 400

Open Joint:
** = 1.5 IN.
*** = 2.0 IN.
**** = 2.5 IN.
Special design

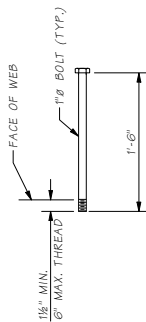
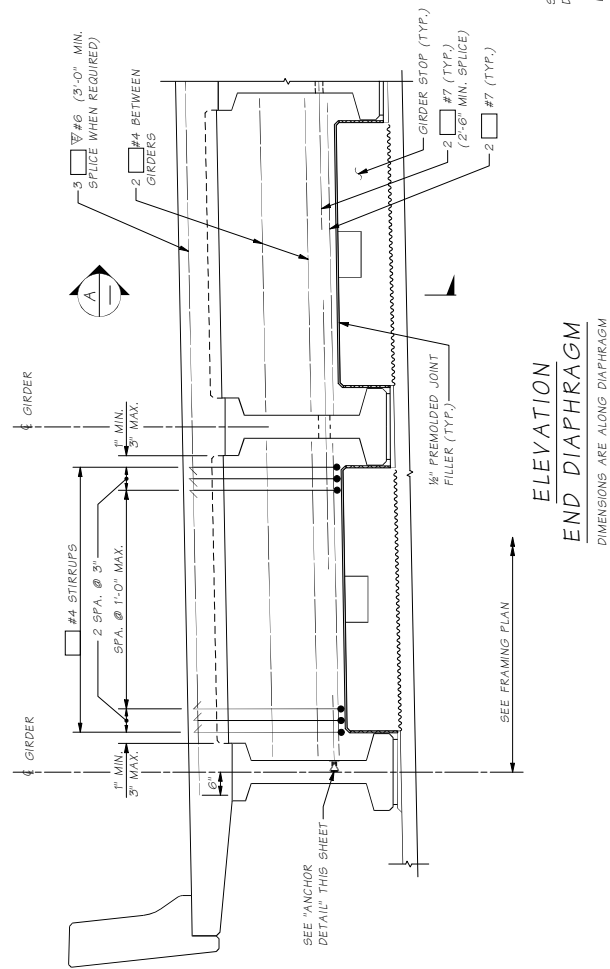
NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.

* Revise based on size of Open Joint

END DIAPHRAGM GEOMETRY

SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".
ALL LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.

Bridge Design Engr.	MAJST AND ACP51-Girder/End Diaphragm/W42G/W42G	END DIA ON GIR-MAN	NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Supervisor							
Designed By							
Checked By							
Bridge Projects Engr.							
Printed By							
Architect/Specifier							
DATE		REVISION	BY	APPD			
BRIDGE AND STRUCTURES OFFICE							
Washington State Department of Transportation							
STANDARD PRESTRESSED CONCRETE GIRDERS							
W42G END DIAPHRAGM ON GIRDER DETAILS							



ANCHOR DETAIL

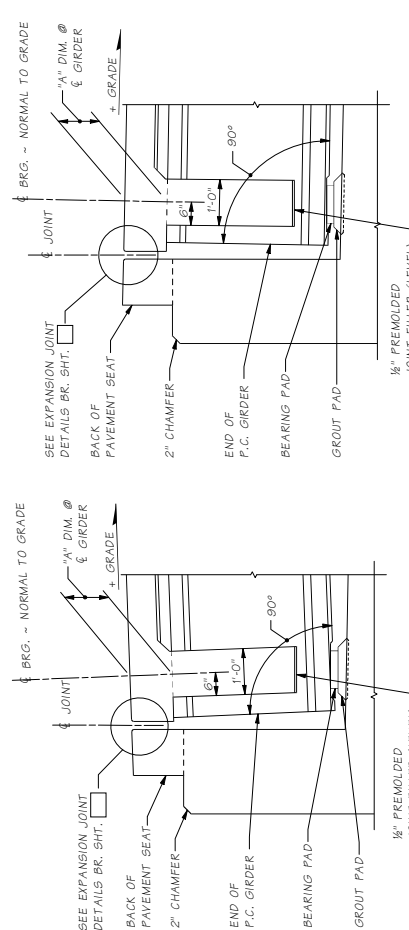
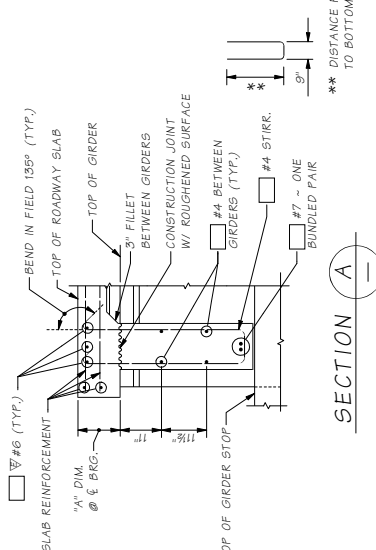
ASTM A-307

NOTE:

- GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

**TEMPORARY STRAND
CUTTING SEQUENCE**

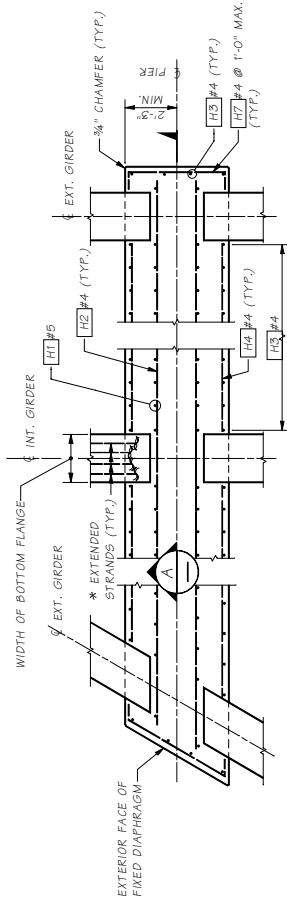
1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESSES.
4. REMOVE ALL MOISTURE IN RECESS PRIOR TO FILLING RECESS WITH GROUT.
5. CAST INTERMEDIATE & END DIAPHRAGMS.
6. PLACE DECK CONCRETE.



ROADWAY EXPANSION JOINT AT END PIERS

LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.
GIRDER STOP NOT SHOWN FOR CLARITY.

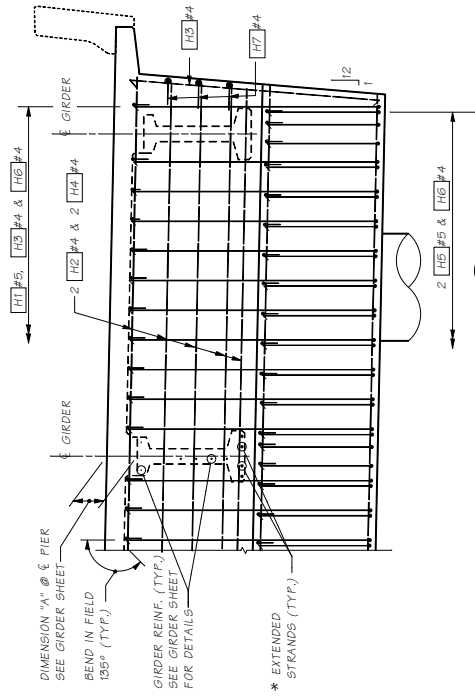
BRIDGE DESIGN ENGR.		WA1STANDARD5(Girder)V1-GirderW42C-ABUT_PIER_DIAPH_DET.MAN	
DESIGNED BY	10	STATE	WASH
CHECKED BY		FED. AID PROJ. NO.	
DATE		JOB NUMBER	
REVISION		BY	APPD
BRIDGE AND STRUCTURES OFFICE		WASHINGTON STATE DEPARTMENT OF TRANSPORTATION	
STANDARD PRESTRESSED CONCRETE GIRDERS		W42C ABUTMENT TYPE PIER DIAPHRAGM DETAILS	
JOB NO.		SHEET	
SR		OF	
DATE		SEETS	



NO SKEW

PLAN - FIXED FLUSH-FACE DIAPHRAGM

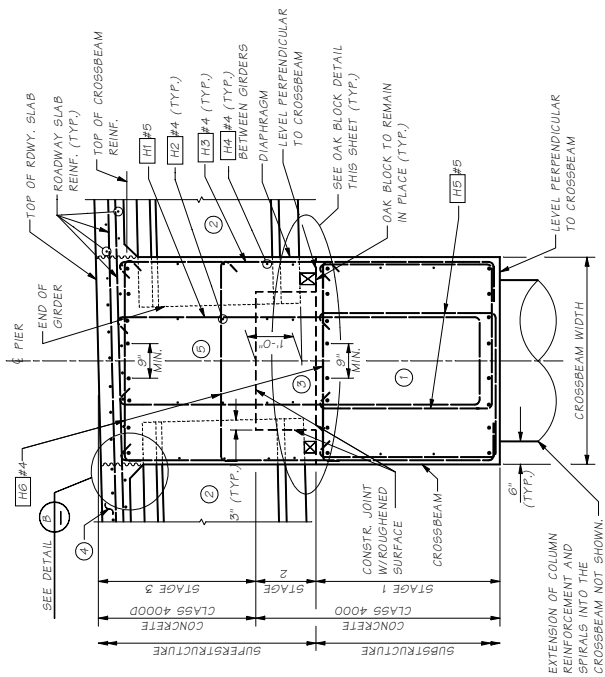
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



SECTION A-A

NOTES TO DESIGNER

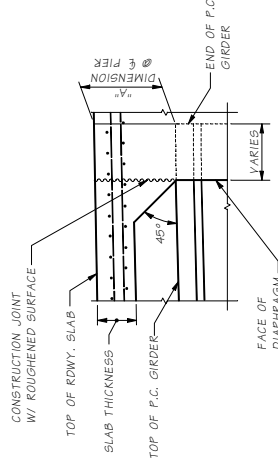
Fixed bar plan is shown for Designer. The actual bar spacing shall be determined by the Designer.
Oak block wedges shall be shown on crossbeam plan sheet, parallel to the \perp pier. If skewed, Crossbeam width is dictated by oak block location.



TYPICAL FIXED FLUSH-FACE DIAPHRAGM

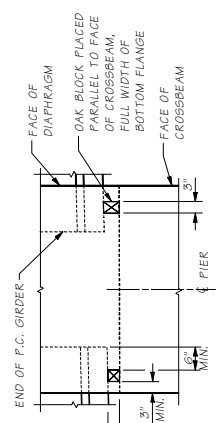
CONSTRUCTION SEQUENCE

- 1 CROSSBEAM
- 2 PLACE GIRDER ON BLOCKS
- 3 DIAPHRAGM STAGE 2
- 4 ROADWAY SLAB
- 5 COMPLETE DIAPHRAGM

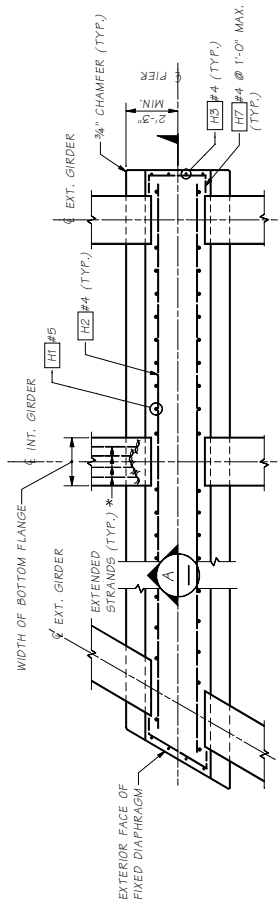


DETAIL B-B

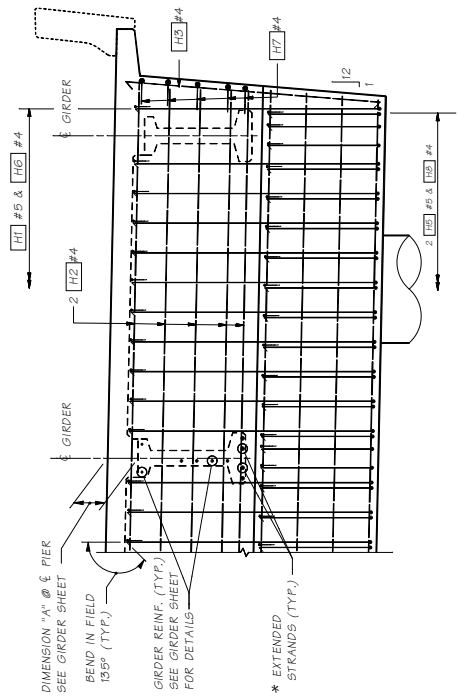
OAK BLOCK DETAIL



Bridge Design Eng.	MULT AND AC25:Girders Lt-Girders W42G W42G-FIX FLUSH-FACE INTER-PIER DIAPHRAGM	NO. SHEETS	NO. SHEETS
Supervisor	WA STATE	NO. SHEETS	NO. SHEETS
Designed By	10 WASH	NO. SHEETS	NO. SHEETS
Checked By		NO. SHEETS	NO. SHEETS
Bridge Projects Eng.		NO. SHEETS	NO. SHEETS
Prints Plan By		NO. SHEETS	NO. SHEETS
Architect/Specifier		NO. SHEETS	NO. SHEETS
DATE	REVISION	NO. SHEETS	NO. SHEETS
BY	APPD	NO. SHEETS	NO. SHEETS



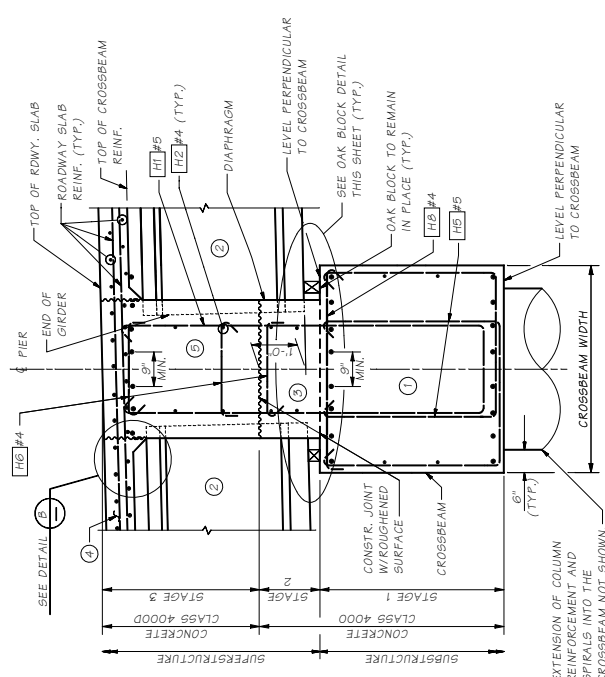
PLAN - FIXED RECESSED-FACE DIAPHRAGM
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



SECTION A-A

NOTES TO DESIGNER

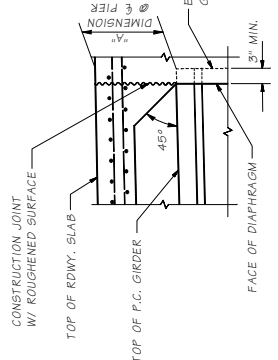
Fixed bar plan is shown for Designer. The actual bar spacing shall be determined by the Designer.
Oak block wedges shall be shown on crossbeam plan sheets, parallel to the 1/4\"/>



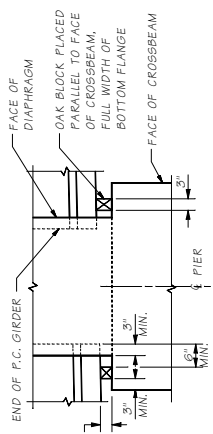
TYPICAL FIXED RECESSED-FACE DIAPHRAGM

CONSTRUCTION SEQUENCE

- 1 CROSSBEAM
- 2 PLACE GIRDER ON BLOCKS
- 3 DIAPHRAGM STAGE 2
- 4 ROADWAY SLAB
- 5 COMPLETE DIAPHRAGM



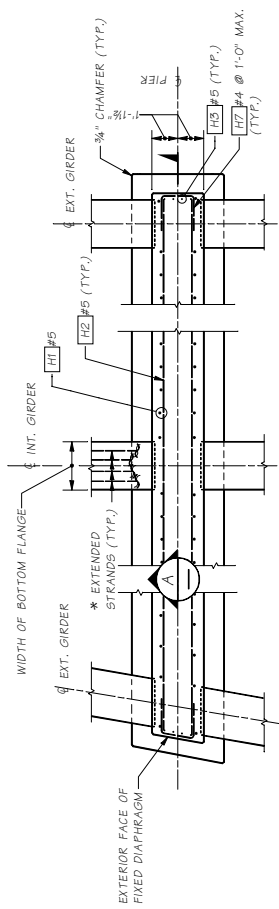
DETAIL B



OAK BLOCK DETAIL

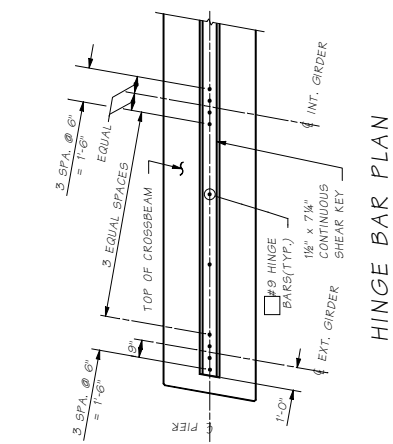
Bridge Design Engr. Supervisor Designed By Checked By Bridge Projects Engr. Prelim Plan By Architect/Specifier		WA1STANDARD@Ginteral-Ginteral\W42G\W42G-FIX-RECESSED-FACE-INTER-PIER-DIAPHR DET.MAN DRAWING NO. 10 STATE WASH FED. AID PROJ. NO. JOB NUMBER DATE REVISION		STANDARD PRESTRESSED CONCRETE GIRDERS W42G FIXED RECESSED-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS	
Washington State Department of Transportation		BRIDGE AND STRUCTURES OFFICE		SHEET NO. 5.6-A3-6 OF 6 SHEETS	

Wzst Apr 26 08:03:50 2006

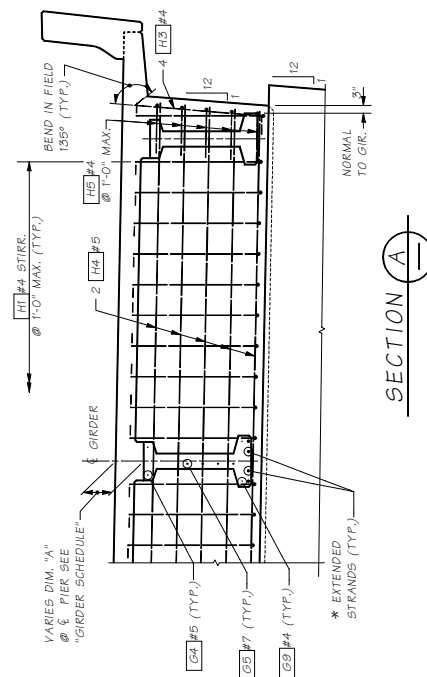


PLAN - HINGE DIAPHRAGM

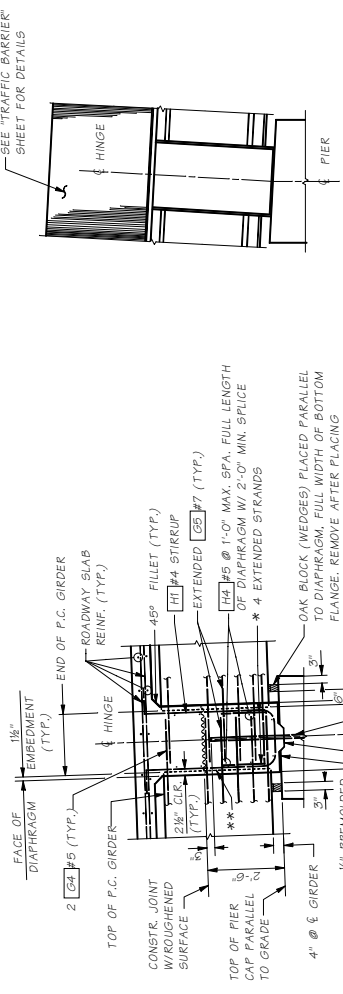
10⁰ MAX. SKEW FOR HINGE DIAPHRAGM.
FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



HINGE BAR PLAN



SECTION A



TYPICAL HINGE SECTION

** FOR SAWTOOTH SHEAR KEY DETAILS, SEE GIRDER SHEETS.

NOTES TO DESIGNER

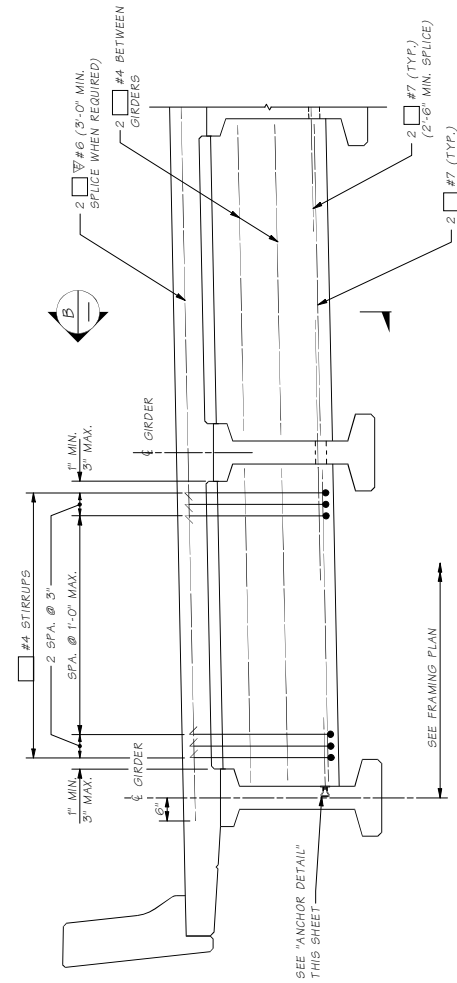
Hinge bar plan is shown for designer. The actual hinge bars shall be located along the pier on the crossbeam details sheet, for final contract plans. The hinge bars shall be deleted from this sheet prior to the award copy of the contract plans.

Oak block wedges shall be shown on crossbeam plan sheet, parallel to the pier. If skewed, crossbeam width is dictated by the oak block location.

Bridge Design Dept.	WASH	STATE	INTER. PIER	DIAPHR. DET. MAN
Supervisor	10	WASH	FED. AID PROJ. NO.	
Designed By				
Checked By				
Bridge Project Engr.				
Printed By				
Approval	DATE	REVISION		

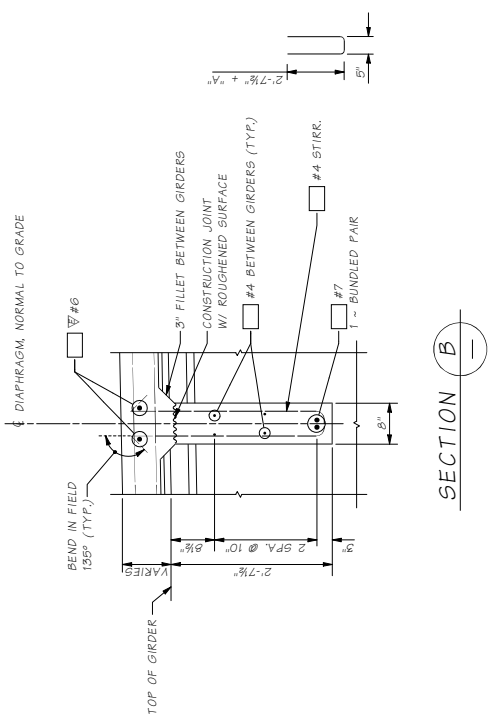
BRIDGE AND STRUCTURES OFFICE	Washington State Department of Transportation	STANDARD CONCRETE GIRDERS	10	10	10
		PRESTRESSED CONCRETE GIRDERS	W42C HINGE DIAPHRAGM AT INTERMEDIATE PIER DETAILS	10	10

SHEET NO.	10
OF SHEETS	10

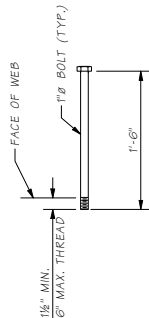


ELEVATION
INTERMEDIATE DIAPHRAGM

DIMENSIONS ARE ALONG DIAPHRAGM



SECTION B

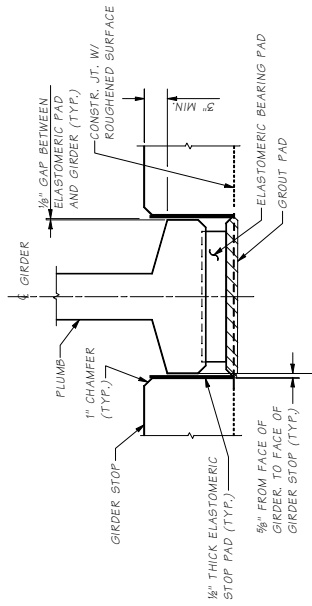


ANCHOR DETAIL

ASTM A-307

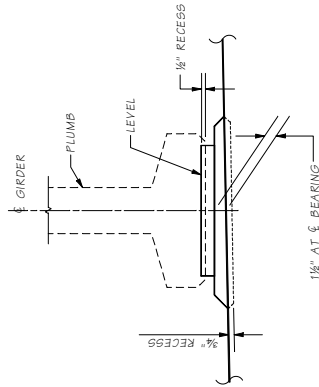
NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

Bridge Design Eng:	MA162ANDKDS\Girders\1-Girders\W42C\INTER_DIAPHRAGM_DET.MAN	WORK	STATE	WASH	JOB NUMBER	DATE	REVISION	BY	APPD
Supervisor		10							
Designed By									
Checked By									
Drawn By									
Bridge Projects Engr:									
Project Mgr									
Architect/Engineer									
Washington State Department of Transportation									
BRIDGE AND STRUCTURES OFFICE									
STANDARD PRESTRESSED CONCRETE GIRDERS									
W42C INTERMEDIATE DIAPHRAGM DETAILS									
SHEETS									



SECTION **G**

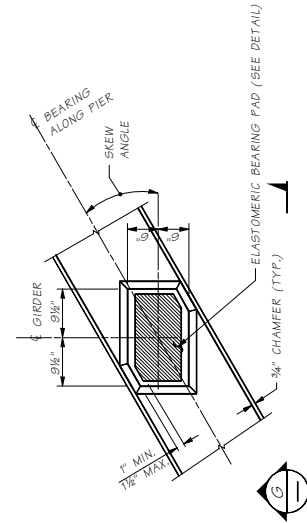
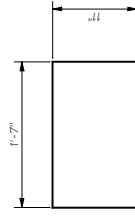
- NOTE:
- GIRDER STOPS SHALL BE CONSTRUCTED AFTER PLACEMENT OF PRESTRESSED GIRDERS.
 - ELASTOMERIC PADS BETWEEN GIRDER AND GIRDER STOPS SHALL BE PLACED AFTER CONSTRUCTING THE GIRDER STOPS. THE PADS SHALL BE COATED WITH APPROVED CEMENTITIOUS ADHESIVE PRIOR TO INSTALLATION.



GROUT PAD ELEVATION

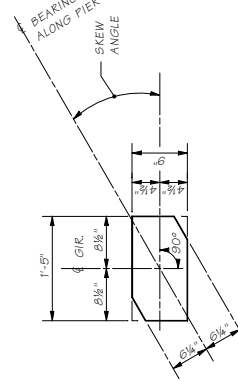
ELASTOMERIC STOP PAD

DUROMETER HARDNESS = 60



GROUT PAD DETAIL

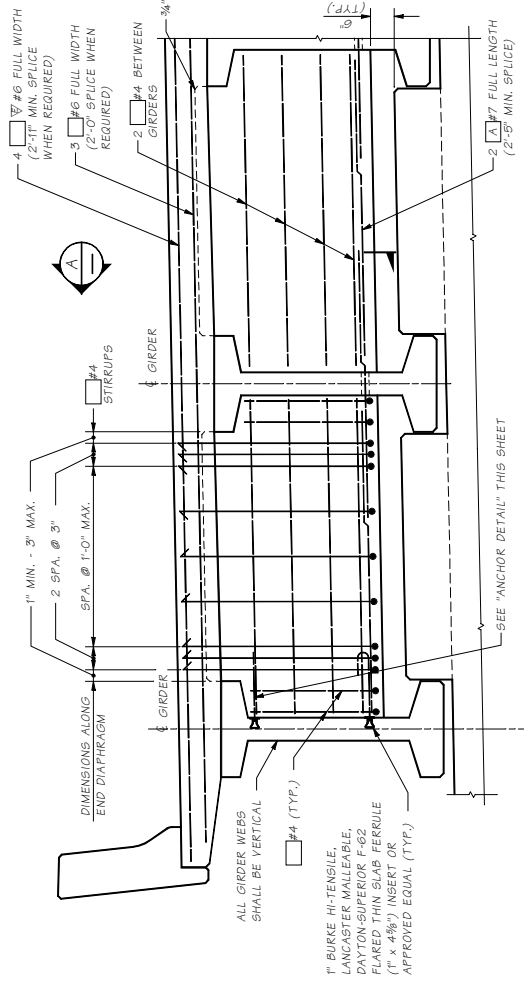
(SKEW ANGLE SHOWN @ 30°)
(SHOWN FOR END DIAPHRAGM ON GIRDER)



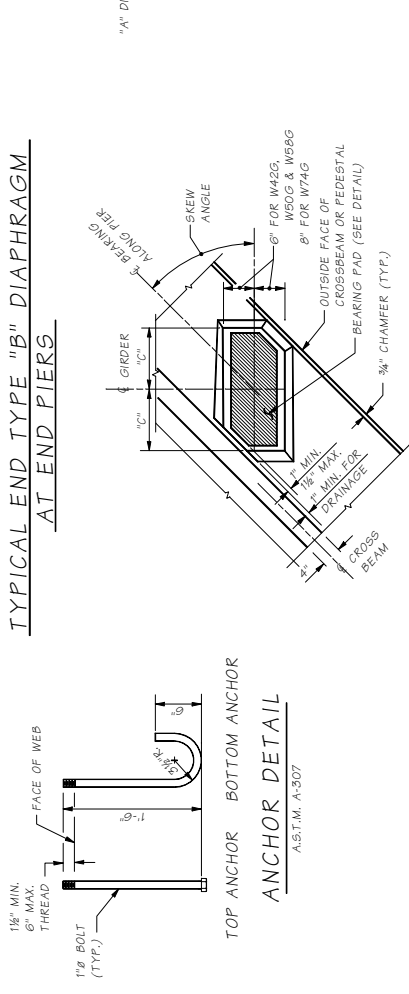
ELASTOMERIC BEARING PAD

LAMINATED ELASTOMERIC BRIDGE
FLOOR FRICTION (SHIMS)
DUROMETER HARDNESS = 60
(30 DEG. SKEW ANGLE SHOWN)

Bridge Design Eng. Supervision By Designed By Checked By Prime, Plan By Architect/Specifier	WASHINGTON STATE 10 WASH JOB NUMBER	MISC. PAV.P.H. DET./MAN W42G-11-Girder/End Diaphragm	SHEET NO. OF	TOTAL SHEETS	REVISION
					DATE
Washington State Department of Transportation			BRIDGE AND STRUCTURES OFFICE		STANDARD PRESTRESSED CONCRETE GIRDERS W42G MISCELLANEOUS BEARING DETAILS
				SHEET NO.	OF
				SHEET NO.	OF

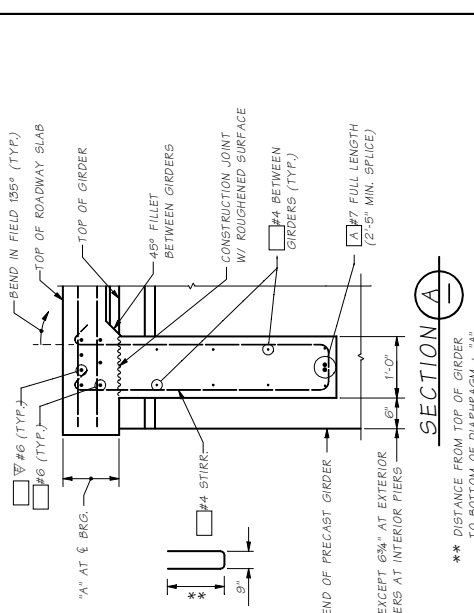


TYPICAL END TYPE "B" DIAPHRAGM AT END PIERS

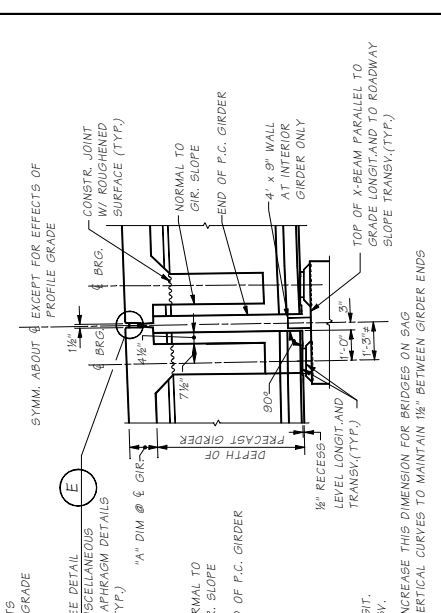


BEARING PAD DETAILS AT INTERMEDIATE PIERS

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE PLANS FOR "TRAFFIC BARRIER" DIMENSIONS AND LOCATION. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".



SECTION A-A



SECTION E-E

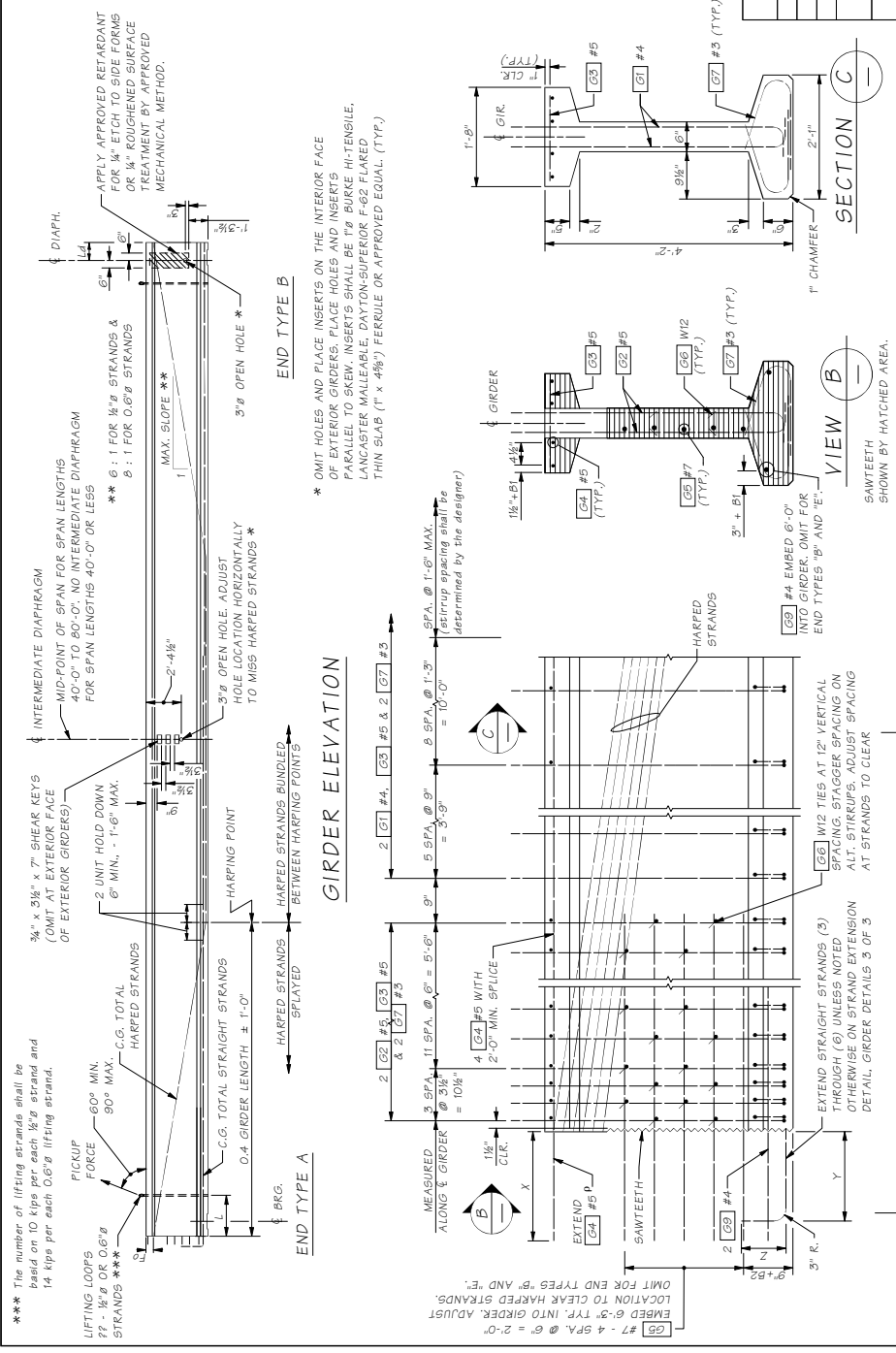
NOTE:
LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW. NOT TO BE USED WITH SERIES W83G & W95G GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

JOB NO.		SHEET		DATE		REVISION		BY		APPD.	
BRIDGE DESIGN EXP.		SUPERVISOR		DESIGNED BY		CHECKED BY		DRAWN BY		DATE	
MULTI-SPAN		STATE		FED. AID PROJ. NO.		SHEET NO.		SHEETS		STANDARD DIAPHRAGMS	
MULTI-SPAN		STATE		FED. AID PROJ. NO.		SHEET NO.		SHEETS		MULTIPLE SIMPLE SPANS INTERMEDIATE PIER DETAILS	
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION		BRIDGE AND STRUCTURES OFFICE		STANDARD DIAPHRAGMS		MULTIPLE SIMPLE SPANS INTERMEDIATE PIER DETAILS		STANDARD DIAPHRAGMS		MULTIPLE SIMPLE SPANS INTERMEDIATE PIER DETAILS	

Prestressed Concrete Superstructure

FEBRUARY 2007

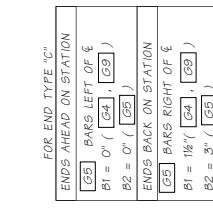
**W50G Girder
Details 1 of 2**



- NOTES**
- PLAN LENGTH SHALL BE INCREASED AS NECESSARY TO COMPENSATE FOR SHORTENING DUE TO PRESTRESS AND SHRINKAGE.
 - ALL STRANDS SHALL BE $\frac{1}{2}$ " OR $0.6\frac{1}{8}$ LOW RELAXATION STRANDS (AASHTO M205 GRADE 270.)
 - FOR END TYPES A, C AND D, CUT ALL STRANDS FLUSH WITH THE GIRDER ENDS AND PAINT WITH AN APPROVED EPOXY RESIN, EXCEPT FOR EXTENDED STRANDS AS SHOWN. FOR END TYPES B AND E CUT ALL STRANDS 1" BELOW CONCRETE SURFACE AND GROUT WITH AN APPROVED EPOXY GROUT.
 - THE TOP SURFACE OF THE GIRDER FLANGE SHALL BE ROUGHENED IN ACCORDANCE WITH SECTION 6-02.3(29)H OF THE STANDARD SPECIFICATIONS.
 - IF THE LIFTING LOOPS EXTEND WITHIN 3" OF THE TOP OF THE ROADWAY SLAB, THEY SHALL BE CUT OFF PRIOR TO PLACING THE ROADWAY SLAB. ALL LIFTING STRANDS SHALL BE OF THE SAME MATERIAL AND STRENGTH AS THE PRESTRESSING STRANDS. WAP THE LIFTING LOOPS SO THAT EACH STRAND WILL CARRY ITS SHARE OF THE TOTAL LOAD. EXTEND LIFTING LOOPS ENDING WITH A 9" LONG 90° HOOK TO WITHIN 3" CLEAR OF THE BOTTOM OF THE GIRDER.
 - CAUTION SHALL BE EXERCISED IN HANDLING AND PLACING GIRDERS. ALL GIRDERS SHALL BE CHECKED BY THE CONTRACTOR TO ENSURE THAT THEY ARE BRACED ADEQUATELY TO PREVENT TIPPING AND TO CONTROL LATERAL BENDING DURING SHIPPING. ONCE ERECTED, ALL GIRDERS SHALL BE BRACED LATERALLY TO PREVENT TIPPING UNTIL THE DIAPHRAGMS ARE CAST AND CURED.
 - FORMS FOR BEARING PAD RECESSES SHALL BE CONSTRUCTED AND FASTENED IN SUCH A MANNER AS TO NOT CAUSE DAMAGE TO THE GIRDER DURING THE STRAND RELEASE OPERATION.
 - FOR SAWTOOTH DETAILS SEE W50G GIRDER DETAILS 2 OF 2.
 - TEMPORARY STRANDS ARE EITHER PRETENSIONED OR POST-TENSIONED. IF PRETENSIONED, THESE TEMPORARY STRANDS SHALL BE UNBONDED OVER ALL BUT THE END 10'-0" OF THE GIRDER LENGTH. AS AN ALTERNATE, TEMPORARY STRANDS MAY BE POST-TENSIONED BEFORE THE GIRDER IS LIFTED FROM THE FORM. TEMPORARY STRANDS SHALL BE CUT AFTER ALL GIRDERS ARE ERECTED, BUT BEFORE DIAPHRAGMS ARE CAST.

BENDING DIAGRAM (ALL DIMENSIONS ARE OUT TO OUT)

Diaphragm Type	END TYPE	BEARING RECESS	X	Y	Z	SAWTEETH
End Diaph. on Girder	A	YES	1'-10"	1'-6"	9"	YES
"U" Adjustment	B	YES	0"	0"	0"	NO
Hinge Diaph. on Interim Pier	C	NO	1'-10"	1'-6"	9"	YES
Fixed Diaph. @ Interim Pier	D	NO	1'-10"	1'-6"	9"	YES
Mult. Simple Spans @ Interim Pier	E	YES	0"	0"	0"	NO

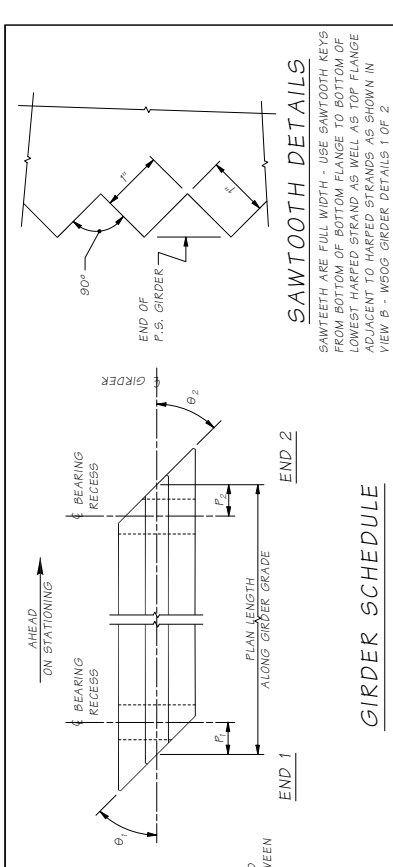


MARK	LOCATION	SIZE
G1	GIRDER STIRRUPS	4
G2	GIRDER END STIRRUPS	5
G3	GIRDER TOP FLANGE	5 STR.
G4	GIRDER LONGIT. FULL LENGTH	5 STR.
G5	GIRDER END LONGIT.	7 STR.
G6	GIRDER BOT. FLANGE TIES	W2x8
G7	GIRDER BOT. FLANGE	4
G8	GIRDER END LONGIT.	4
G9	GIRDER END LONGIT.	4

NOTE: FOR DIMENSION "A", SEE "GIRDER SCHEDULE"
 α - VARIES FOR SKEWED SPANS.
 β - SHALL BE CHECKED FOR EFFECT OF ROWY VERTICAL CURVE.
 δ - #5 OR #4 MAY BE SUBSTITUTED, FIELD BENDING IS OPTIONAL.

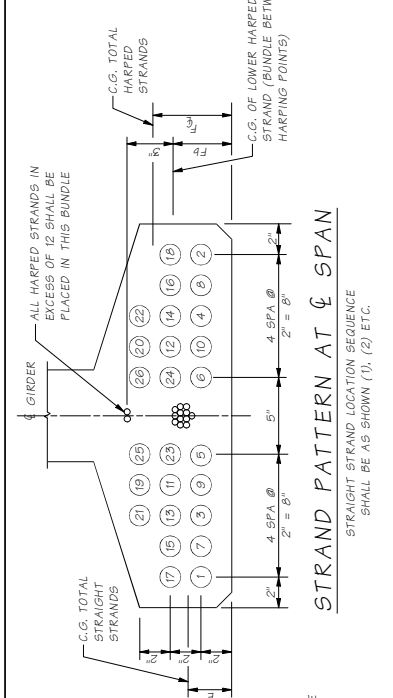
Washington State Department of Transportation		STANDARD PRESTRESSED CONCRETE GIRDERS
BRIDGE AND STRUCTURES OFFICE		W50G GIRDER DETAILS 1 OF 2

Bridge Design Eng.	MJL:ST.FINDAK25-Girders\1-Girders\W50G\W50G1.rvt	REVISION	DATE	BY	APPRO
Supervisor					
Designed By					
Checked By					
Bridge Projects Eng.					
Proj. Plan By					
Architect/Specifier					
Scale					
Job No.					
Sheet No.					



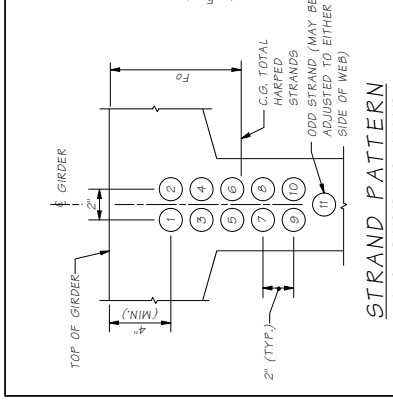
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



STRAND PATTERN AT SPAN

STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



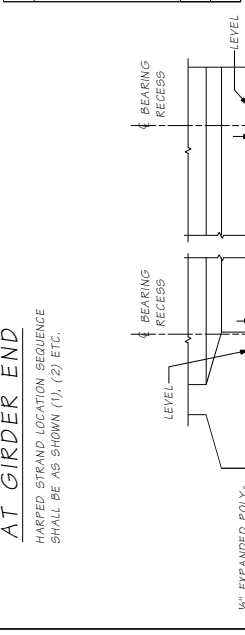
SAWTOOTH DETAILS

SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - W50G GIRDER DETAILS 1 OF 2

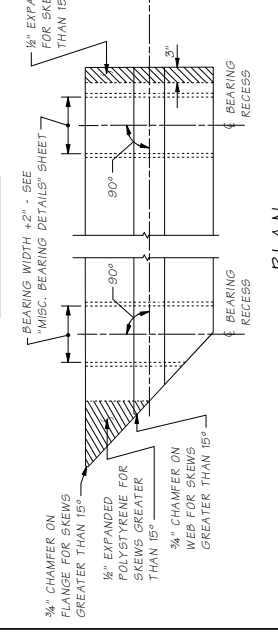
GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

SPAN	GIRDER	END 1 TYPE	END 2 TYPE	PLAN LENGTH (ALONG GIRDER GRADE)		MIN. CONC. COMP. STRENGTH		HARPED	STRAIGHT	TEMPORARY	LOCATION OF C.G. STRANDS (IN.)		Ld (IN.)
				F ₁	F ₂	F.C. (KSI)	F.C.I (KSI) @ RELEASE				JACKING NO. OF STRANDS (KIPS)	JACKING NO. OF STRANDS (KIPS)	
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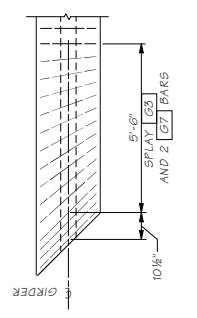
ELEVATION



BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION

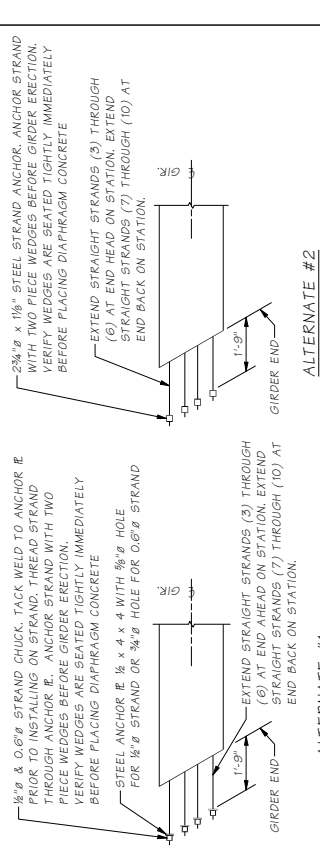
TRANSVERSE REINFORCING SKEWED ENDS

ONLY TRANSVERSE REIN. SHOWN



ALTERNATE #1

ALTERNATE #2



STRAND EXTENSION DETAIL

n = # TOTAL NUMBER OF EXTENDED STRANDS

ALTERNATE #1

ALTERNATE #2

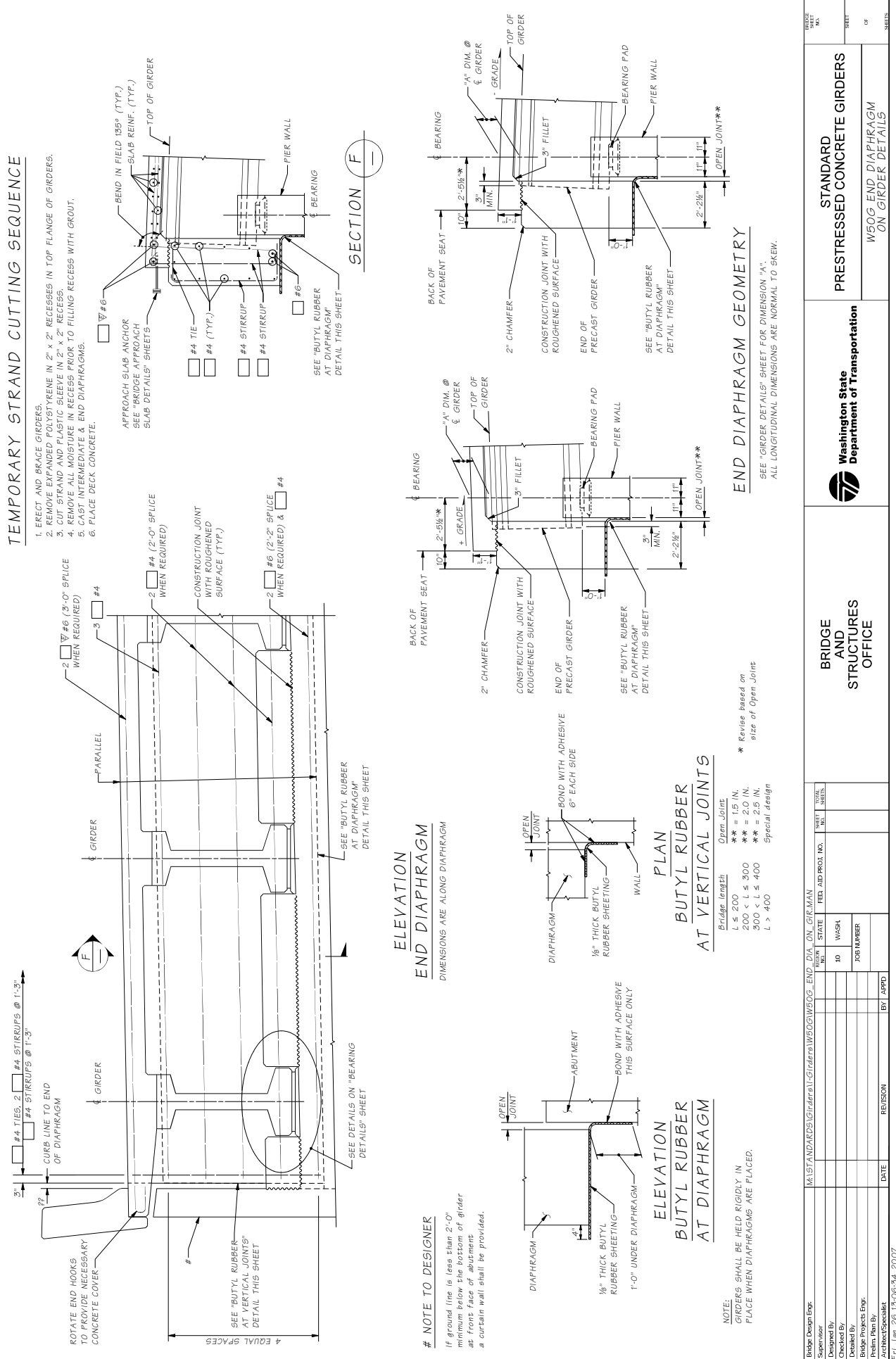
STRAND EXTENSION DETAIL

n = # TOTAL NUMBER OF EXTENDED STRANDS

BRIDGE DESIGN MANUAL FEBRUARY 2007 W50G Girder Details 2 of 2

Bridge Design Eng. Supervisor Designed By Checked By Drawn By				HUMAN STATE 10 WASH 1001 NUMBER	
MAIST AND AKDIS(Girder)A1-Girder)W50G2 main				SHEET NO. TOTAL SHEETS	
DATE REVISION BY APP				BRIDGE AND STRUCTURES OFFICE	
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION				STANDARD PRESTRESSED CONCRETE GIRDERS W50G GIRDER DETAILS 2 OF 2	

JOB NO. 5.6-A4-2 SHEET



Bridge Design Eng.:	M. LEF AND A. R. S. Girders I-Girders W50G W50G	END DIA. ON GIR. MAN.	NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Supervised By:			10	WASH			
Designed By:							
Checked By:							
Bridge Projects Eng.:							
Program Plan By:							
Architect/Specifier:							
DATE:							
REVISION:							
BY:							
APPRO:							

BRIDGE AND STRUCTURES OFFICE

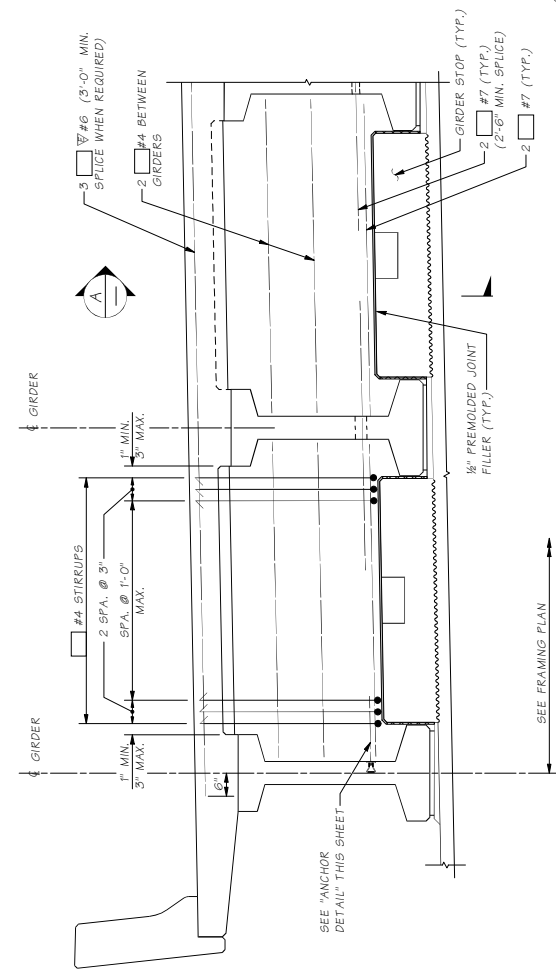
Washington State Department of Transportation

STANDARD PRESTRESSED CONCRETE GIRDERS

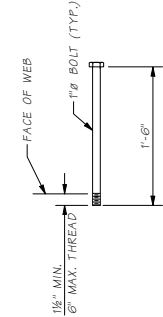
W50G END DIAPHRAGM ON GIRDER DETAILS

58 JOB NO. SHEET OF SHEETS

9.6-A4-3



ELEVATION END DIAPHRAGM
DIMENSIONS ARE ALONG DIAPHRAGM



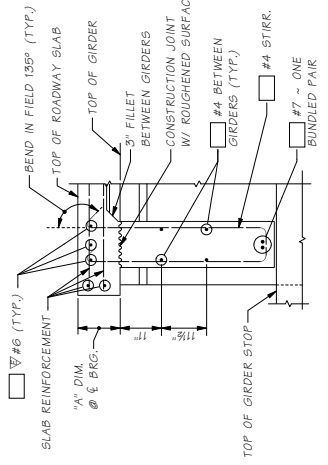
ANCHOR DETAIL
ASTM A-307

TEMPORARY STRAND CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESS.
4. REMOVE ALL MOISTURE IN RECESS PRIOR TO FILLING RECESS WITH GROUT.
5. CAST INTERMEDIATE & END DIAPHRAGMS.
6. PLACE DECK CONCRETE.

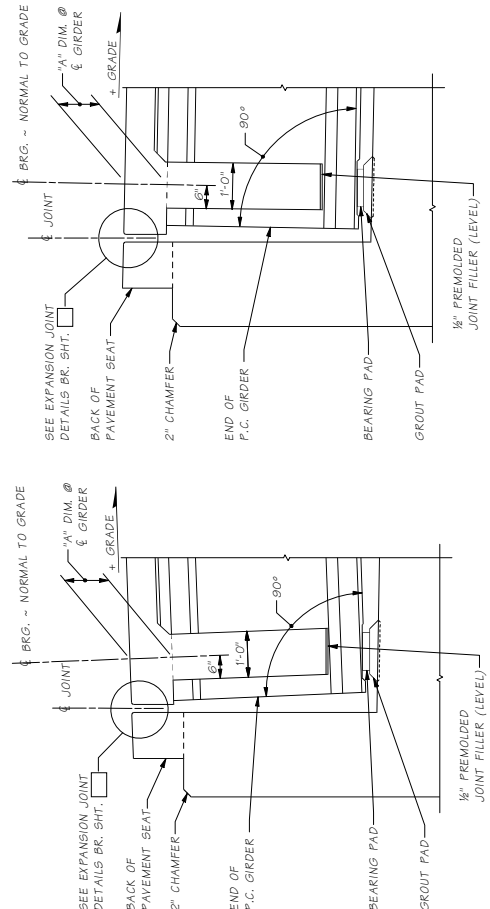
NOTE:

GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".



SECTION A

** DISTANCE FROM TOP OF GIRDER TO BOTTOM OF DIAPHRAGM + 1/4"



ROADWAY EXPANSION JOINT AT END PIERS

LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW. GIRDER STOP NOT SHOWN FOR CLARITY.

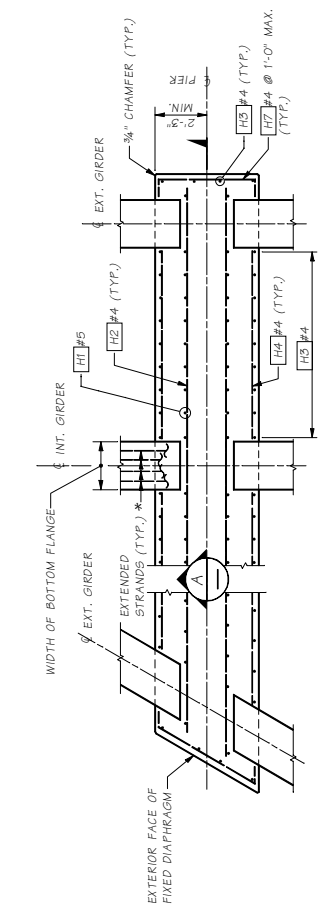
Bridge Design Eng.	MAST AND AKDIS/Girder/Abutment/W50G-ABUT_PIER_DIAPHR_DET.MAN	DATE	REVISION	BY	APPD
Supervisor					
Designed By					
Checked By					
Drawn By					
Project No.					
Job No.					
Sheet No.					

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

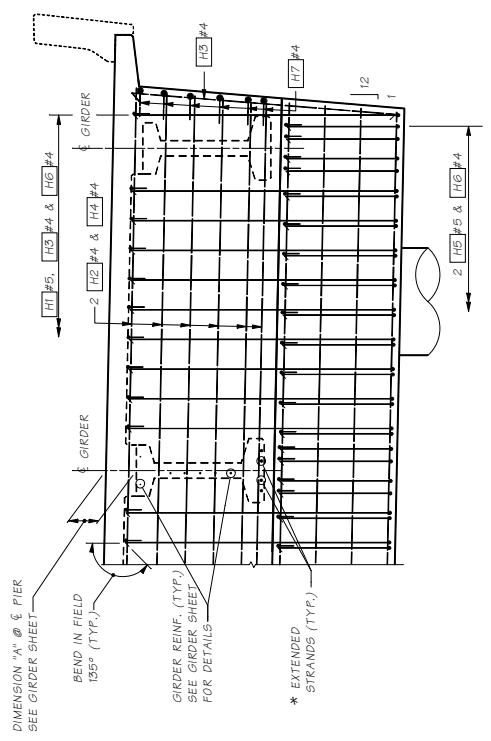
STANDARD PRESTRESSED CONCRETE GIRDERS

W50G ABUTMENT TYPE PIER DIAPHRAGM DETAILS



PLAN - FIXED FLUSH-FACE DIAPHRAGM

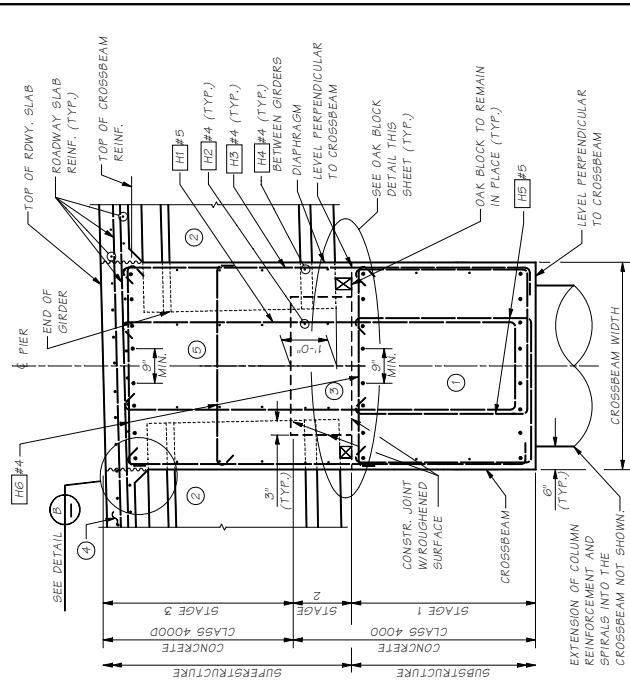
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



SECTION A

NOTES TO DESIGNER

- Fixed bar plan is shown for Designer. The actual bar spacing shall be determined by the Designer.
- Oak block wedges shall be shown on crossbeam plan sheets, parallel to the 6 pier if skewed. Crossbeam width is dictated by oak block location.

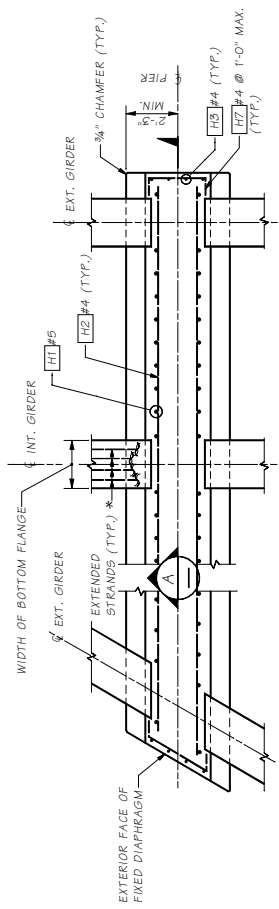


TYPICAL FIXED FLUSH-FACE DIAPHRAGM

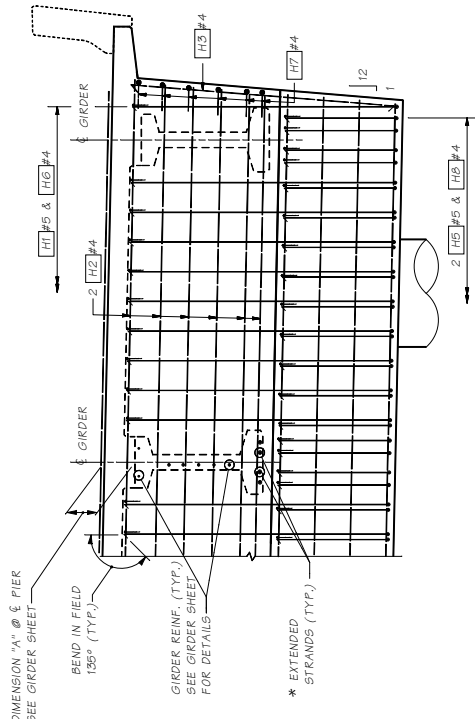
CONSTRUCTION SEQUENCE

- CROSSBEAM
- PLACE GIRDER ON BLOCKS
- DIAPHRAGM STAGE 2
- ROADWAY SLAB
- COMPLETE DIAPHRAGM

JOB NO. SR		SHEET		OF		SHEETS	
SUPERVISOR		DESIGNED BY		CHECKED BY		DATE	
BRIDGE PROJECTS ENGR.		ARCHITECT/SPECIALLIST		BY		APPD	
STANDARD PIER		FIXED FLUSH-FACE		INTER. PIER		DIAPHR. DETAIL	
W50C		W50C		W50C		W50C	
NO.		STATE		FED. AID PROJ. NO.		NO.	
10		WASH				NO.	
		JOB NUMBER				NO.	
		DATE		REVISION		NO.	
BRIDGE DESIGN MANUAL		WASHINGTON STATE DEPARTMENT OF TRANSPORTATION		STANDARD CONCRETE GIRDERS		PRESTRESSED CONCRETE GIRDERS	
W50C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS		WASHINGTON STATE DEPARTMENT OF TRANSPORTATION		STANDARD CONCRETE GIRDERS		PRESTRESSED CONCRETE GIRDERS	



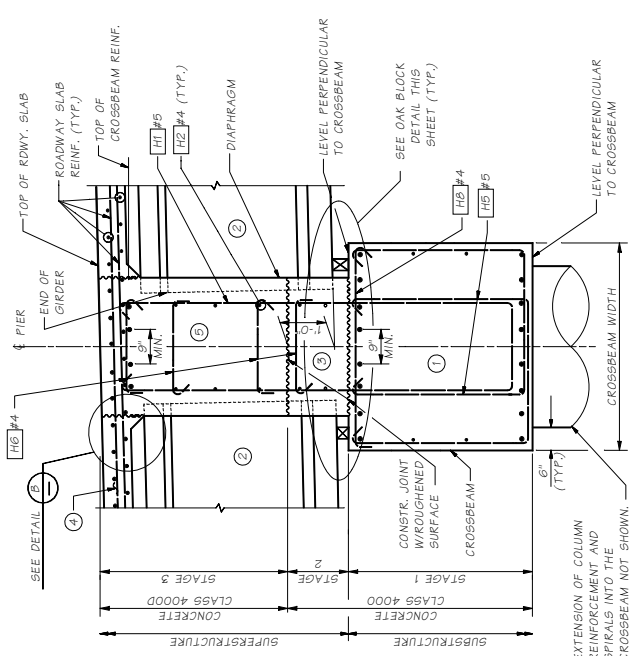
NO SKEW
 PLAN - FIXED RECESSED-FACE DIAPHRAGM
 * FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



SECTION A

NOTES TO DESIGNER

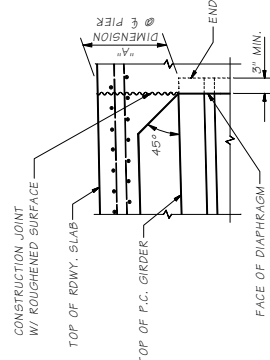
Fixed bar plan is shown for Designer. The actual bar spacing shall be determined by the Designer.
 Oak block wedges shall be shown on crossbeam plan sheets, parallel to the 1/2\"/>



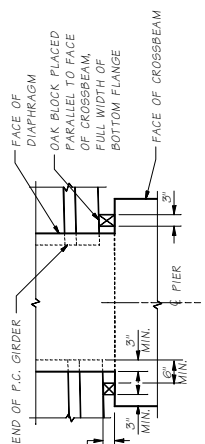
TYPICAL FIXED RECESSED-FACE DIAPHRAGM

CONSTRUCTION SEQUENCE

- 1 CROSSBEAM
- 2 PLACE GIRDER ON BLOCKS
- 3 DIAPHRAGM STAGE 2
- 4 ROADWAY SLAB
- 5 COMPLETE DIAPHRAGM

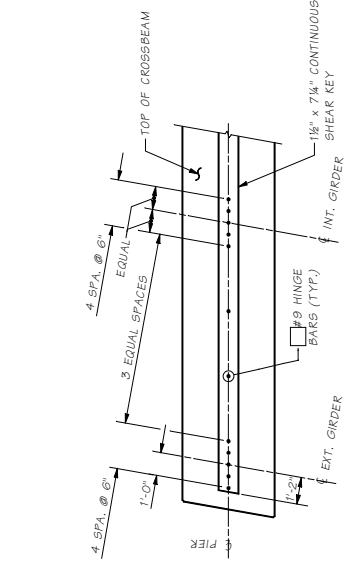


DETAIL B

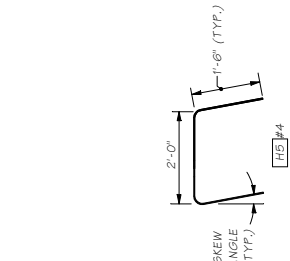


OAK BLOCK DETAIL

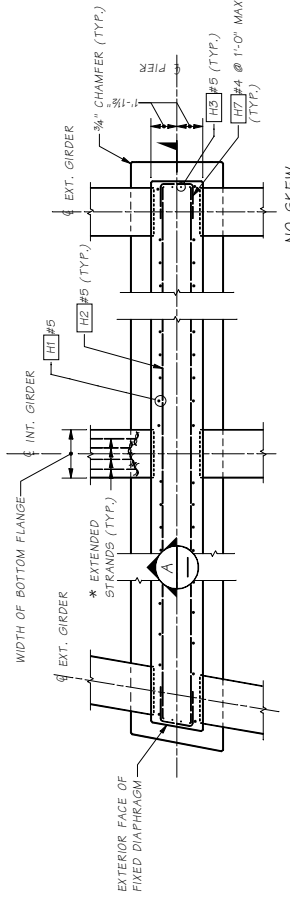
Bridge Design Exp. Supervisor Designed By Checked By Bridge Projects Engr. Printed By Architect/Specifier	MAIN STATE TO WASH JOB NUMBER	REVISION DATE BY APPD	STANDARD PRESTRESSED CONCRETE GIRDERS W50G FIXED RECESSED-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS	SHEET NO. OF SHEETS
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HINGE BAR PLAN

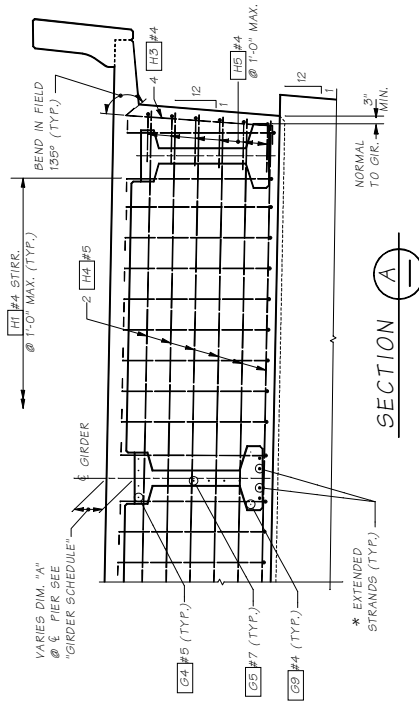


TYPICAL HINGE SECTION



PLAN - HINGE DIAPHRAGM

10" MAX. SKEW FOR HINGE DIAPHRAGM
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET

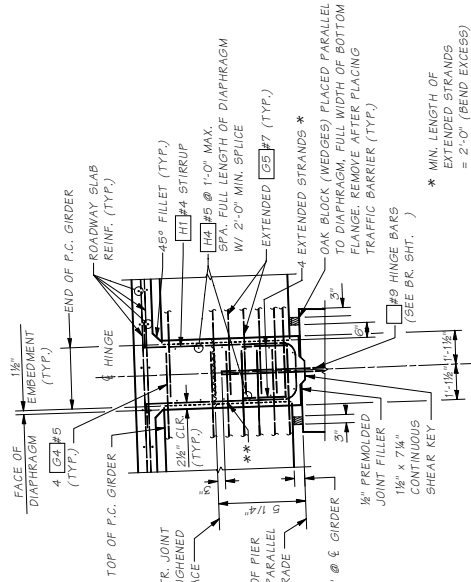


SECTION A-A

NOTES TO DESIGNER

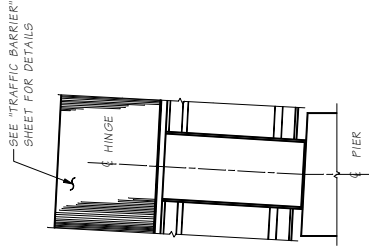
Hinge bar plan is shown for designer. The actual hinge bars shall be located along the pier on the crossbeam details sheets, for final contract plans. The hinge bars shall be deleted from this sheet prior to the award copy of the contract plans.

Oak block wedges shall be shown on crossbeam plan sheet, parallel to the pier if skewed. Crossbeam width is dictated by the oak block location.



* MIN. LENGTH OF EXTENDED STRANDS = 2'-0" (BEND EXCESS)

** FOR SAWTOOTH SHEAR KEY DETAILS, SEE GIRDER SHEETS.



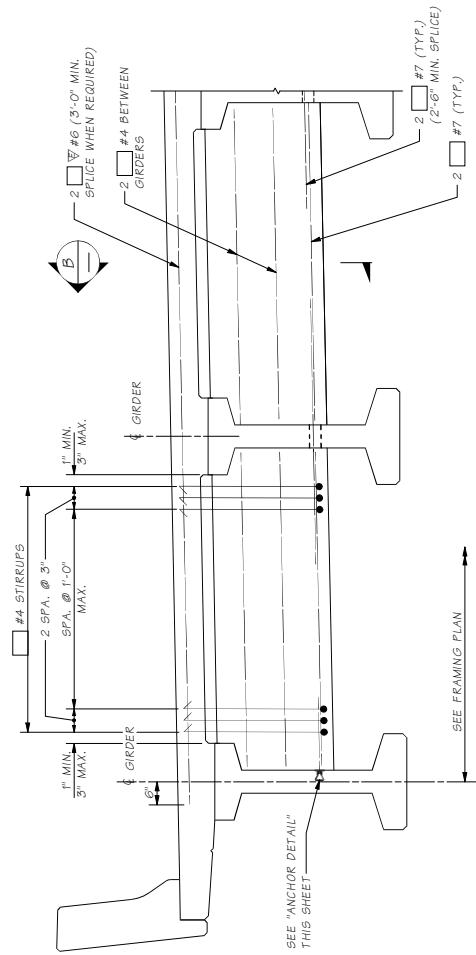
TYP. END VIEW
HINGE DIAPHRAGM

Supervisor	MA	STATE	INTER. PIER DIAPHR. PLAN
Designed by	10	WASH	
Checked by		JOB NUMBER	
Bridge Projects Eng.		DATE	
Printed by		REVISION	
Architect/Engineer		BY	APPD

BRIDGE AND STRUCTURES OFFICE

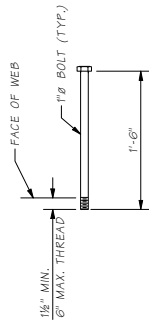
Washington State Department of Transportation

STANDARD PRESTRESSED CONCRETE GIRDERS
W50G HINGE DIAPHRAGM AT INTERMEDIATE PIER DETAILS



ELEVATION
INTERMEDIATE DIAPHRAGM

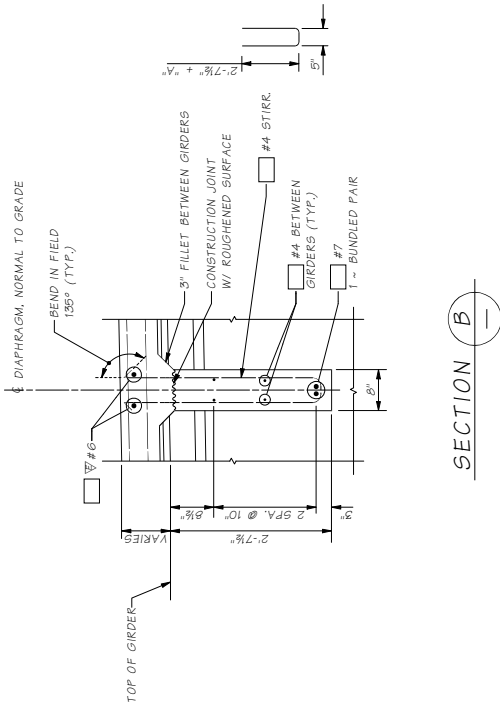
DIMENSIONS ARE ALONG DIAPHRAGM



ANCHOR DETAIL

ASTM A-307

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.
REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".



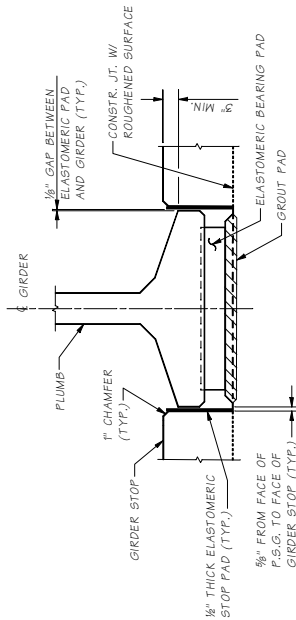
SECTION B-B

Bridge Design Eng: Supervisor: Designed By: Checked By: Detailed By: Bridge Projects Engr: Prelim Plan By: Architect/Specifier:	MA12STANDARDS\Girders\1-Intermediate\W50G\INTER_DIAPHRAGM_DET.MAN 10 WASH JOB NUMBER DATE REVISION BY/APPD	FEDERAL PROJECT NO. STATE WASH JOB NUMBER DATE REVISION BY/APPD	SHEET NO. SHEETS	STANDARD PRESTRESSED CONCRETE GIRDERS W50G INTERMEDIATE DIAPHRAGM DETAILS	SHEET OF SHEETS
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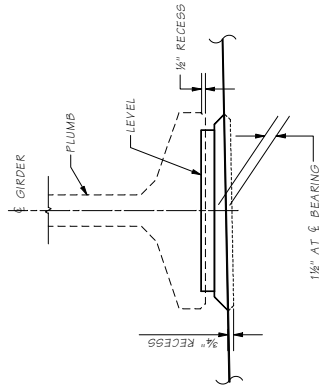
Washington State
Department of Transportation

BRIDGE
AND
STRUCTURES
OFFICE

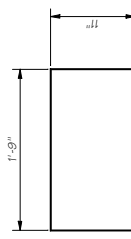


SECTION G

- NOTE:
- GIRDER STOPS SHALL BE CONSTRUCTED AFTER PLACEMENT OF PRESTRESSED GIRDERS.
 - ELASTOMERIC PADS BETWEEN GIRDER AND GIRDER STOPS SHALL BE PLACED AFTER CONSTRUCTING THE GIRDER STOPS. THE PADS SHALL BE COATED WITH APPROVED CEMENTITIOUS ADHESIVE PRIOR TO INSTALLATION.

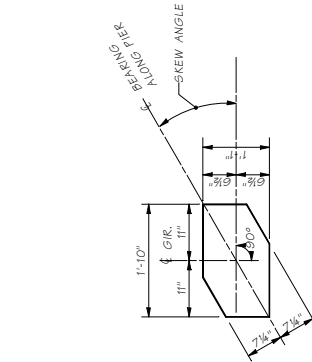


GROUT PAD ELEVATION



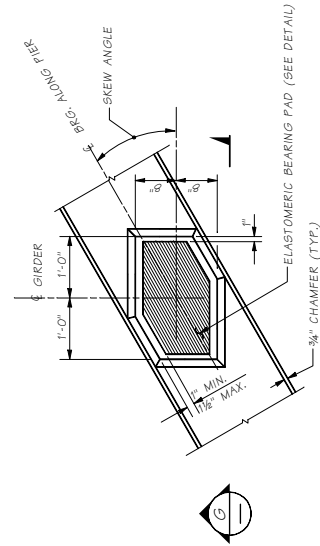
ELASTOMERIC STOP PAD

DUROMETER HARDNESS = 60



ELASTOMERIC BEARING PAD

LAMINATED ELASTOMERIC BRIDGE PAD THICK (SHIMS)
(SKEW ANGLE SHOWN @ 30°)



GROUT PAD DETAIL

(SKEW ANGLE SHOWN @ 30°)
(SHOWN FOR END DIAPHRAGM ON GIRDER)

BEARING DESIGN TABLE

SERVICE - I LIMIT STATE	
DEAD LOAD REACTION	KIPS
LIVE LOAD REACTION (I/WO IMPACT)	KIPS
UNLOADED HEIGHT	IN.
LOADED HEIGHT (DL)	IN.
DUROMETER HARDNESS	

Bridge Design Eng.
Supervisor By
Designed By
Checked By
Bridge Projects Eng.
Project Man By
Architect/Specifier

PROJECT AND AGENCY	MULTI-STATE	STATE	WASH
WASH	10	WASH	
DATE		REVISION	
		BY	APPD

TOTAL SHEETS	
SHEET NO.	
REV. AND PROD. NO.	

BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

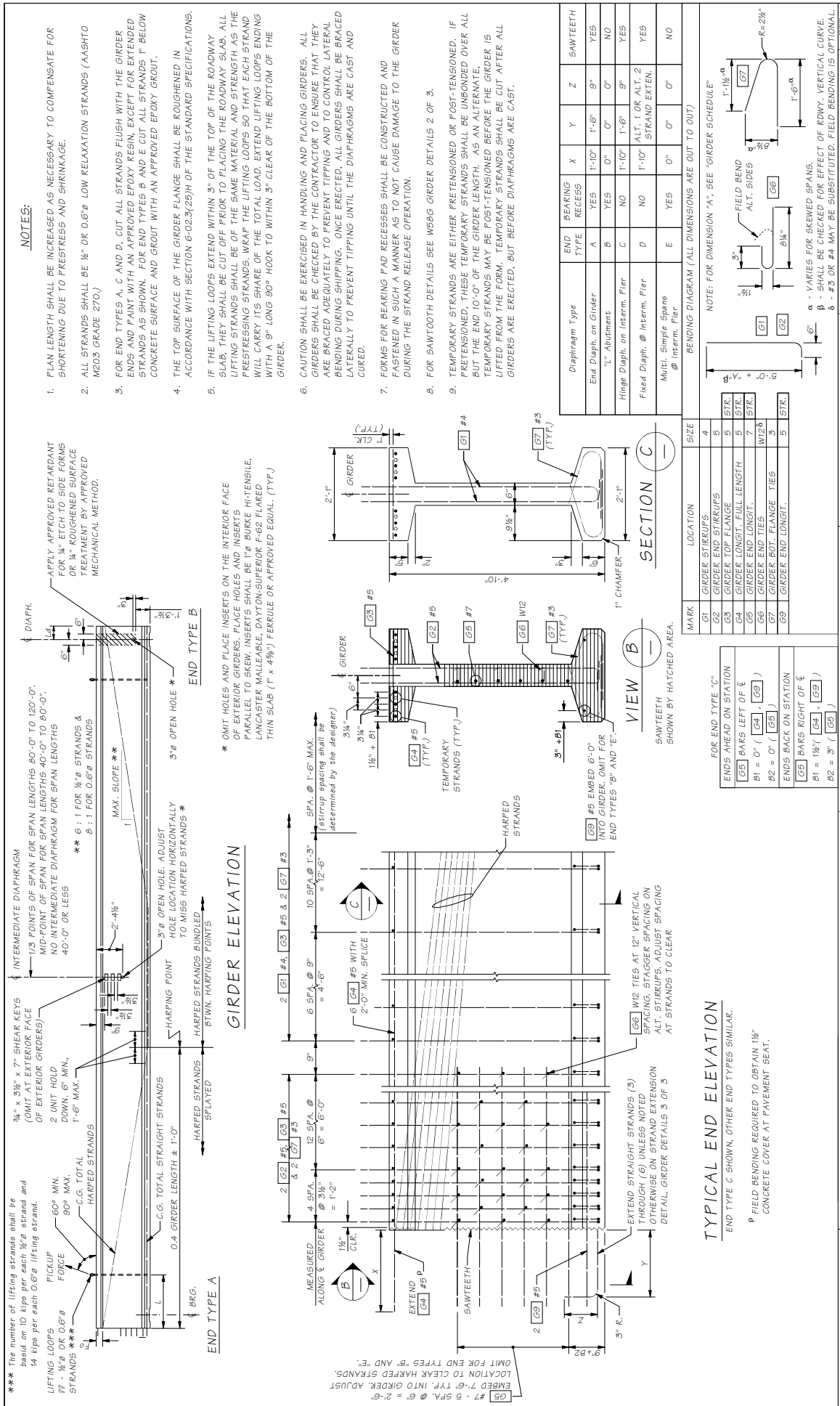
STANDARD PRESTRESSED CONCRETE GIRDERS
W50G MISCELLANEOUS BEARING DETAILS

BRIDGE SHEET NO. SHEET OF SHEETS

BRIDGE DESIGN MANUAL
FEBRUARY 2007

W58C Girder
Details 1 of 3

Prestressed Concrete Superstructure



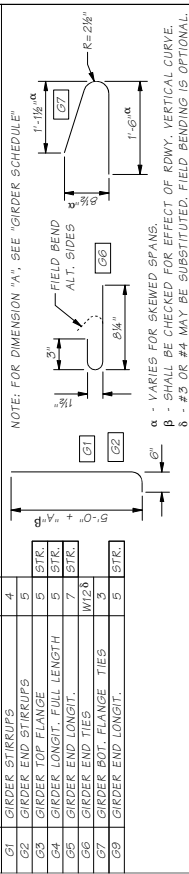
NOTES:

1. PLAN LENGTH SHALL BE INCREASED AS NECESSARY TO COMPENSATE FOR SHORTENING DUE TO PRESTRESS AND SHRINKAGE.
2. ALL STRANDS SHALL BE 1/2" OR 0.6" g LOW RELAXATION STRANDS (AASHTO M203 GRADE 270)
3. FOR END TYPES A, C AND D, CUT ALL STRANDS FLUSH WITH THE GIRDER ENDS AND PAINT WITH AN APPROVED EPOXY RESIN, EXCEPT FOR EXTENDED STRANDS AS SHOWN. FOR END TYPES B AND E CUT ALL STRANDS 1" BELOW CONCRETE SURFACE AND GROUT WITH AN APPROVED EPOXY GROUT.
4. THE TOP SURFACE OF THE GIRDER FLANGE SHALL BE ROUGHENED IN ACCORDANCE WITH SECTION 6-02.3(25)H OF THE STANDARD SPECIFICATIONS.
5. IF THE LIFTING LOOPS EXTEND WITHIN 3" OF THE TOP OF THE ROADWAY SLAB, THEY SHALL BE CUT OFF PRIOR TO PLACING THE ROADWAY SLAB. ALL LIFTING STRANDS SHALL BE OF THE SAME MATERIAL AND STRENGTH AS THE PRESTRESSING STRANDS. WRAP THE LIFTING LOOPS SO THAT EACH STRAND WILL CARRY ITS SHARE OF THE TOTAL LOAD. EXTEND LIFTING LOOPS ENDING WITH A 9" LONG 90° HOOK TO WITHIN 3" CLEAR OF THE BOTTOM OF THE GIRDER.
6. CAUTION SHALL BE EXERCISED IN HANDLING AND PLACING GIRDERS. ALL GIRDERS SHALL BE CHECKED BY THE CONTRACTOR TO ENSURE THAT THEY ARE BRACED ADEQUATELY TO PREVENT TIPPING AND TO CONTROL LATERAL BENDING DURING SHIPPING. ONCE ERRECTED, ALL GIRDERS SHALL BE BRACED LATERALLY TO PREVENT TIPPING UNTIL THE DIAPHRAGMS ARE CAST AND CURED.
7. FORMS FOR BEARING PAD RECESSES SHALL BE CONSTRUCTED AND FASTENED IN SUCH A MANNER AS TO NOT CAUSE DAMAGE TO THE GIRDER DURING THE STRAND RELEASE OPERATION.
8. FOR SAWTOOTH DETAILS SEE W58G GIRDER DETAILS 2 OF 3.
9. TEMPORARY STRANDS ARE EITHER PRETENSIONED OR POST-TENSIONED. IF PRETENSIONED, THESE TEMPORARY STRANDS SHALL BE UNBONDED OVER ALL BUT THE END 10'-0" OF THE GIRDER LENGTH. AS AN ALTERNATE, TEMPORARY STRANDS MAY BE POST-TENSIONED BEFORE THE GIRDER IS LIFTED FROM THE FORM. TEMPORARY STRANDS SHALL BE CUT AFTER ALL GIRDERS ARE ERRECTED, BUT BEFORE DIAPHRAGMS ARE CAST.

* OMIT HOLES AND PLACE INSERTS ON THE INTERIOR FACE OF EXTERIOR GIRDERS. PLACE HOLES AND INSERTS PARALLEL TO SKEW. INSERTS SHALL BE 1" BURKE HIT-INSULE, LANCASTER MALLEABLE, DAYTON-SUPERIOR F-62 FLARED THIN SLAB (1" x 4 3/8") FERRULE OR APPROVED EQUAL (TYP.)

Diaphragm Type	END TYPE	BEARING RECESSES	X	Y	Z	SAWTEETH
End Diaphragm on Girder	A	YES	1'-10"	1'-6"	9"	YES
"1/2" Abutment	B	YES	0"	0"	0"	NO
Hinged Diaphragm on Interm. Pier	C	NO	1'-10"	1'-6"	9"	YES
Fixed Diaphragm on Interm. Pier	D	NO	1'-10"	1'-6"	9"	YES
Multi. Simple Spans @ Interm. Pier	E	YES	0"	0"	0"	NO

BENDING DIAGRAM (ALL DIMENSIONS ARE OUT TO OUT)



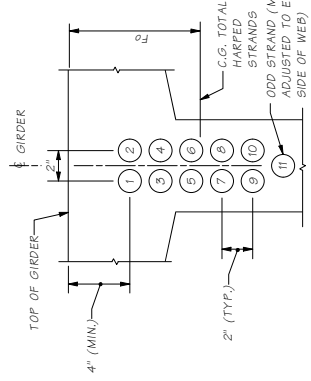
Bridge Design Engr.	W:\S\F\A\RD\S\Girder\1-Girder\W58C\W58C1.mxd	REGION	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Supervisor		10	WASH			
Checked By						
Drawn By						
Bridge Project Engr.						
Print Plan By						
Architect/Specifier						
DATE	REVISION	BY	APPD			
FR, JAN 26, 13:07:24, 2007						

BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

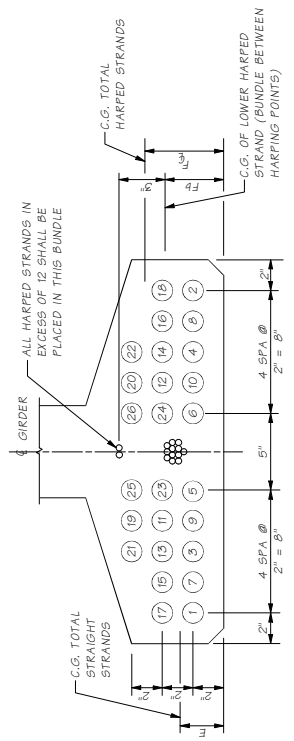
STANDARD PRESTRESSED CONCRETE GIRDERS

W58G GIRDER
DETAILS 1 OF 3



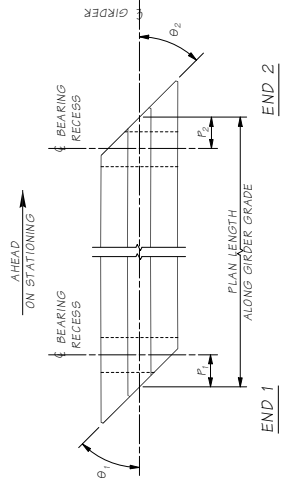
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



STRAND PATTERN AT ξ SPAN

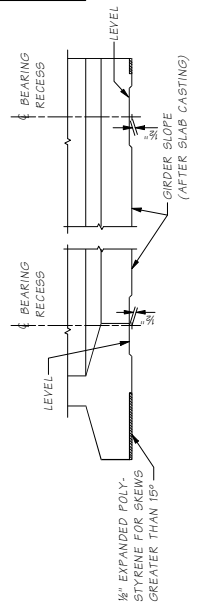
STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



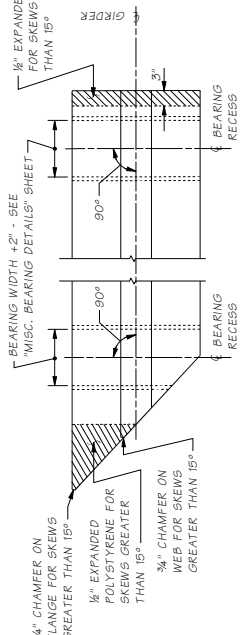
GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

SPAN		GIRDER		END 1 TYPE		END 2 TYPE		L	θ_1	θ_2	F ₁	F ₂	PLAN LENGTH (ALONG GIRDER GRADE)	MIN. CONC. COMP. STRENGTH	HARPED		STRAIGHT		TEMPORARY		LOCATION OF C.G. STRANDS (IN.)				
NO.	TYPE	NO.	TYPE	NO.	TYPE	NO.	TYPE								NO. OF STRANDS	NO. OF STRANDS	NO. OF STRANDS	NO. OF STRANDS	F _C (KSI)	F _{CI} (KSI)	NO. OF STRANDS	NO. OF STRANDS	E	F _h	F _b
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

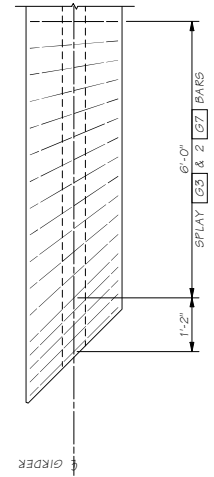


ELEVATION



PLAN

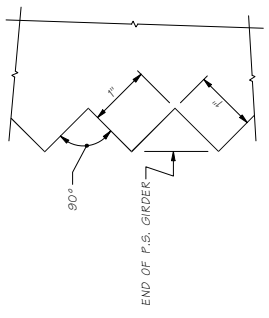
BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION



TRANSVERSE REINFORCING

SKewed ENDS

ONLY TRANSVERSE REINF. SHOWN



SAWTOOTH DETAILS

SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - W58G GIRDER DETAILS 1 OF 3

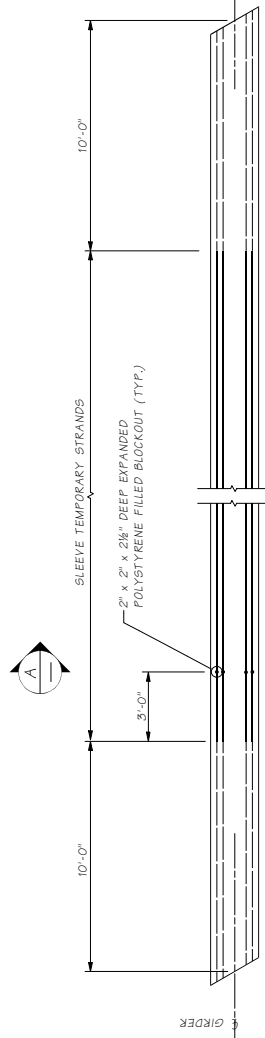
Bridge Design Eng:	MA16TANDKDS\Girders\W58G\W58G2.mxd	USER	STATE	FED. AID PROJ. NO.	SHEET NO.
Supervisor:		10	WASHA		
Designed By:					
Checked By:					
Drawn By:					
Architect/Engineer:					
DATE	REVISION	BY / APPD			

Washington State Department of Transportation

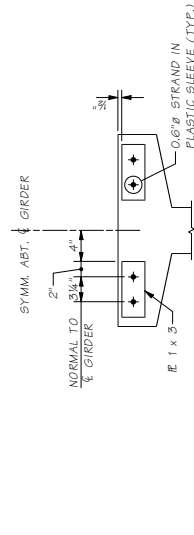
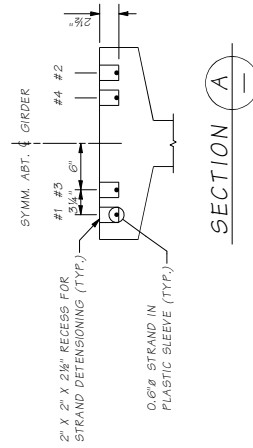
BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS

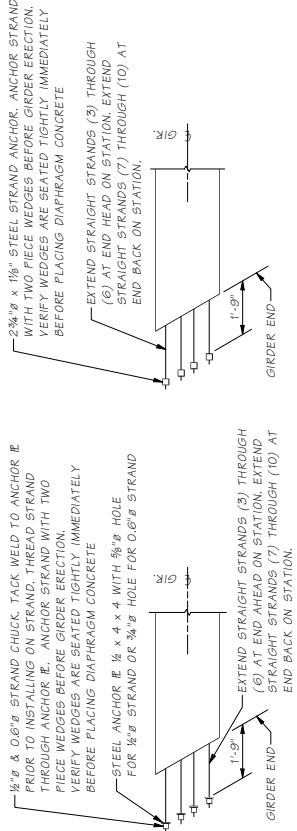
W58G GIRDER DETAILS 2 OF 3



PLAN
TEMPORARY STRANDS



END VIEW
TEMPORARY STRAND
POST-TENSIONED ALTERNATE



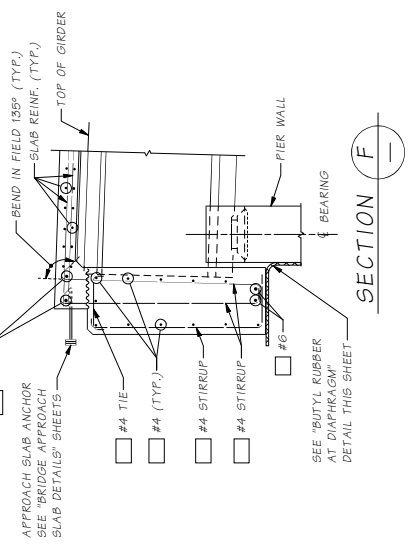
STRAND EXTENSION DETAIL

n = ? TOTAL NUMBER OF EXTENDED STRANDS

Bridge Design Eng.	ML1ST AND AK25-Girders I-Girders W58C W58G	REVISION	DATE	BY	APPRO
Supervisor		REVISION			
Designed By		REVISION			
Checked By		REVISION			
Bridge Projects Eng.		REVISION			
Project Plan By		REVISION			
Architect/Specifier		REVISION			
JOB NO.	10	STATE	WASH	FED. AID PROJ. NO.	
SHEET	3	NO.		SHEET	NO.
				TOTAL	SHEETS
BRIDGE AND STRUCTURES OFFICE					
STANDARD PRESTRESSED CONCRETE GIRDERS					
W58G GIRDER DETAILS 3 OF 3					

TEMPORARY STRAND CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESSES.
4. REMOVE POLYSTYRENE AND PLASTIC SLEEVE IN 2" x 2" RECESSES.
5. CAST INTERMEDIATE END DIAPHRAGMS.
6. PLACE DECK CONCRETE.

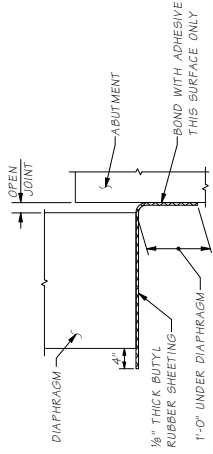


SECTION F

ELEVATION END DIAPHRAGM

DIMENSIONS ARE ALONG DIAPHRAGM

NOTE TO DESIGNER
If ground line is less than 2'-0" minimum below the bottom of girder at front face of abutment, a curtain wall shall be provided.



ELEVATION BUTYL RUBBER AT DIAPHRAGM

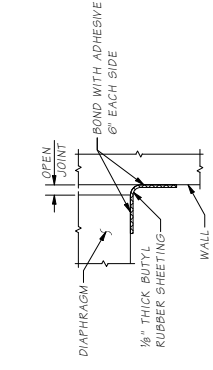
NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.

PLAN BUTYL RUBBER AT VERTICAL JOINTS

Bridge Length
L ≤ 200
200 < L ≤ 300
300 < L ≤ 400
L > 400

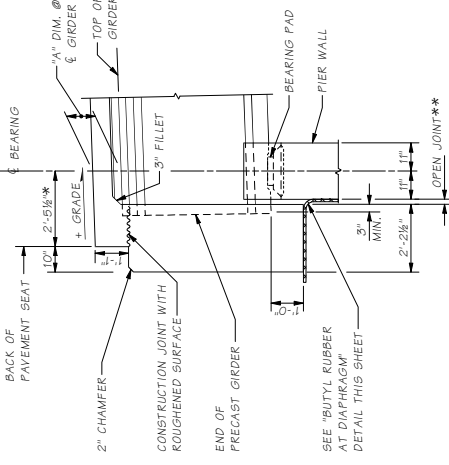
Open Joint
** = 1.5 IN.
** = 2.0 IN.
** = 2.5 IN.
Special design

* Revises based on size of Open Joints



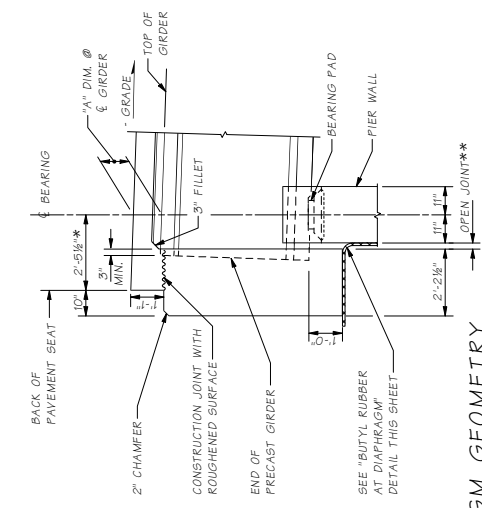
ELEVATION BUTYL RUBBER AT DIAPHRAGM

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.

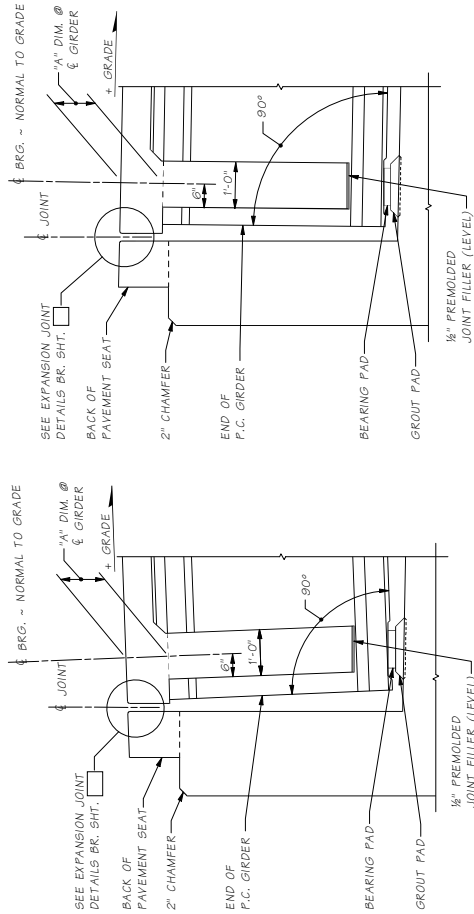
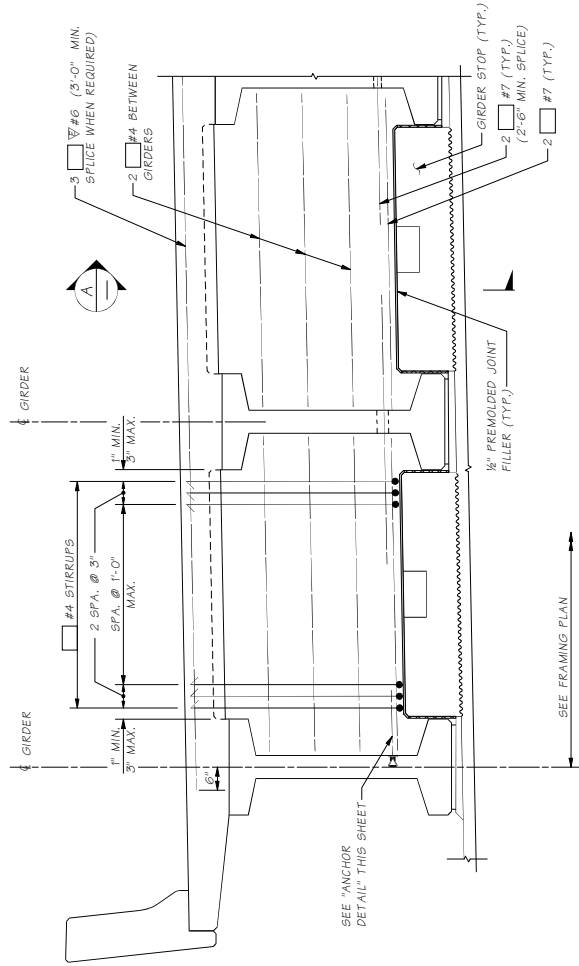


END DIAPHRAGM GEOMETRY

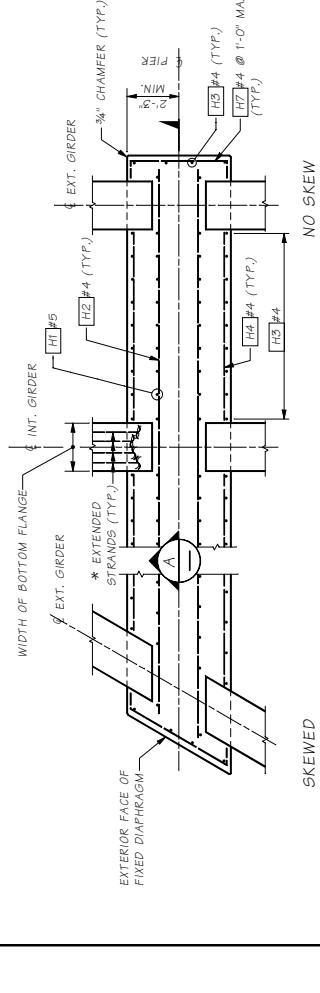
SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".
ALL LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.



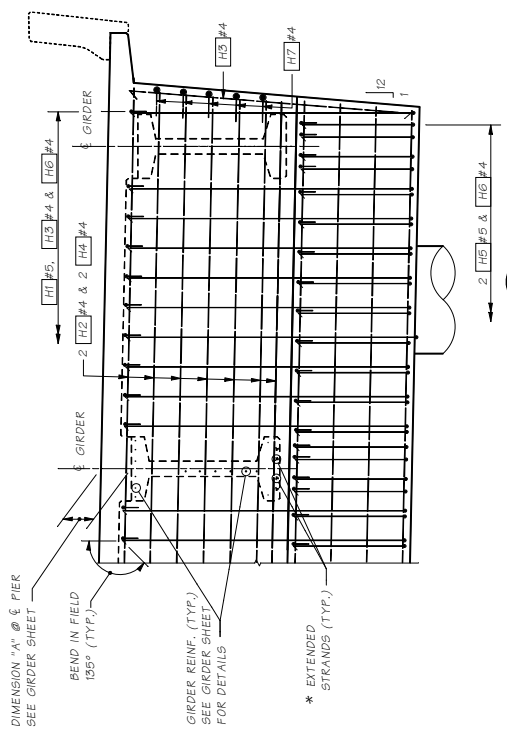
JOB NO. SR		SHEET NO. SR	
DATE		REVISION	
BY		APRD	
ARCHITECT/SPECIES		ARCHITECT/SPECIES	
BRIDGE PROJECT ENGR.		BRIDGE PROJECT ENGR.	
DESIGNED BY		DESIGNED BY	
CHECKED BY		CHECKED BY	
SUPERVISOR		SUPERVISOR	
STATE		STATE	
FED. AID PROJ. NO.		FED. AID PROJ. NO.	
SHEET NO.		SHEET NO.	
W58G END DIAPHRAGM ON GIRDER DETAILS		W58G END DIAPHRAGM ON GIRDER DETAILS	



BRIDGE DESIGN ENGR.	M157 AND RD51/Girders/Abut./Pier/Diaph./DET.MAN	NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
SUPERVISOR			10 WASH			
DESIGNED BY			JOB NUMBER			
CHECKED BY			DATE			
BRIDGE PROJECT ENGR.			REVISION			
PRIN. PIN. ENGR.						
ARCHITECT/SPECIALT.						

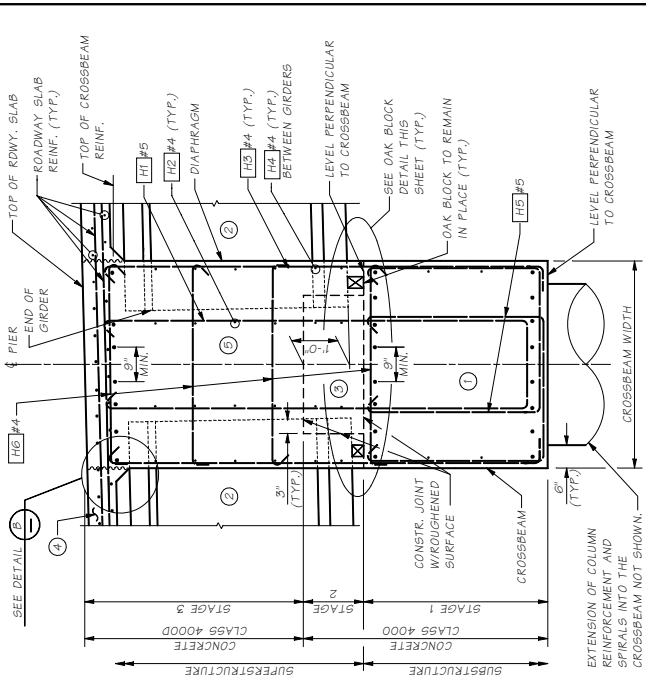


PLAN - FIXED FLUSH-FACE DIAPHRAGM
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



SECTION A-A
NOTES TO DESIGNER
Fixed bar plan is shown for Designer. The actual bar spacing shall be determined by the Designer.

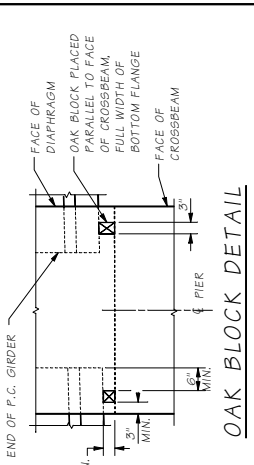
Oak block wedges shall be shown on crossbeam plan sheets, parallel to the 'E' pier if skewed. Crossbeam width is dictated by oak block location.



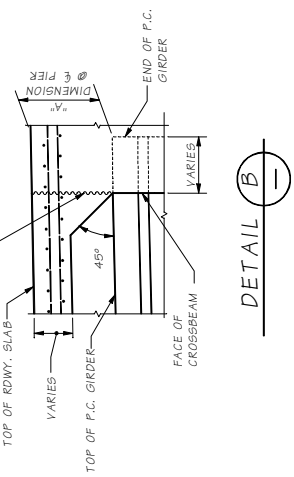
TYPICAL FIXED FLUSH-FACE DIAPHRAGM

CONSTRUCTION SEQUENCE

- ① CROSSBEAM
- ② PLACE GIRDER ON BLOCKS
- ③ DIAPHRAGM STAGE 2
- ④ ROADWAY SLAB
- ⑤ COMPLETE DIAPHRAGM



OAK BLOCK DETAIL



DETAIL B-B

Bridge Design Exp.	MASTANDARDO@Girder@a1-Girder@a1-W58G@W58G-FIX-FLUSH-FACE-INTER-PIER-DIAPHR-DET.MAN	DATE	REVISION
Supervisor		DATE	REVISION
Designed By	10 WASH	DATE	REVISION
Checked By		DATE	REVISION
Drawn By		DATE	REVISION
Bridge Projects Engr.		DATE	REVISION
Print Firm By		DATE	REVISION
Architect/Engineer		DATE	REVISION
Mod	Apr 26 08:06:33 2006	DATE	REVISION

Washington State
Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD CONCRETE GIRDERS

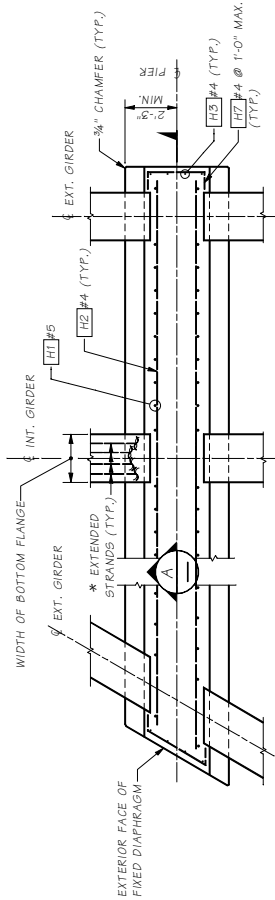
PRESTRESSED CONCRETE GIRDERS

W58C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

SHEET NO.

OF

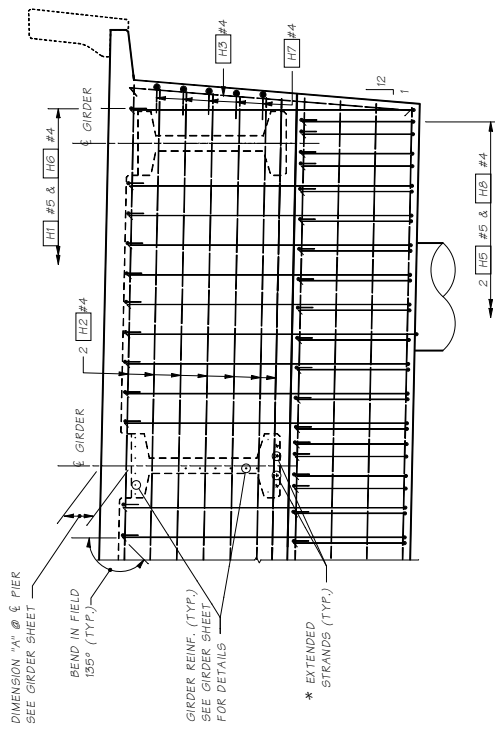
SHEETS



NO SKEW

PLAN - FIXED RECESSED-FACE DIAPHRAGM

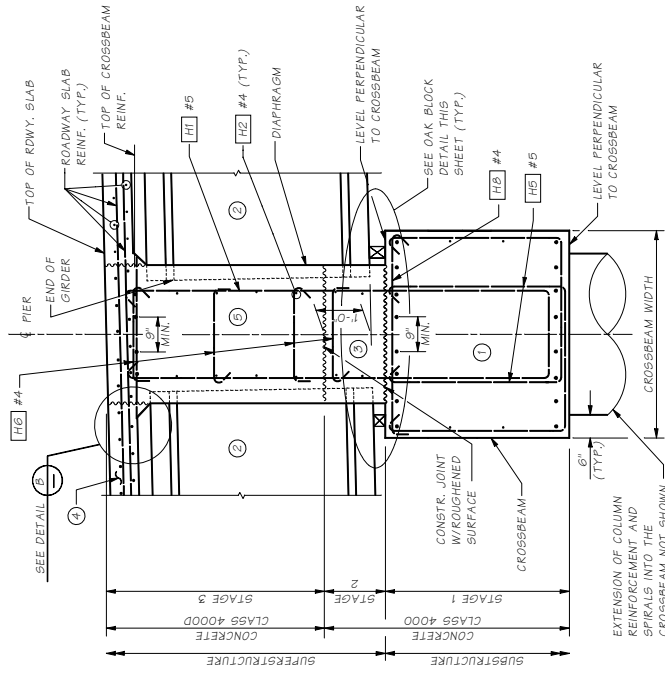
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



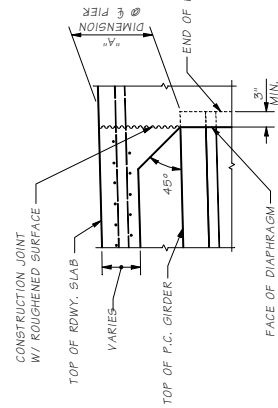
SECTION A-A

NOTES TO DESIGNER

- Fixed bar plan is shown for Designer. The actual bar spacing shall be determined by the Designer.
- Oak block wedges shall be shown on crossbeam plan sheet, parallel to the ξ pier. If skewed, Crossbeam width is dictated by oak block location.



TYPICAL FIXED RECESSED-FACE DIAPHRAGM



OAK BLOCK DETAIL

DETAIL B-B

CONSTRUCTION SEQUENCE

- CROSSBEAM
- PLACE GIRDER ON BLOCKS
- DIAPHRAGM STAGE 2
- ROADWAY SLAB
- COMPLETE DIAPHRAGM

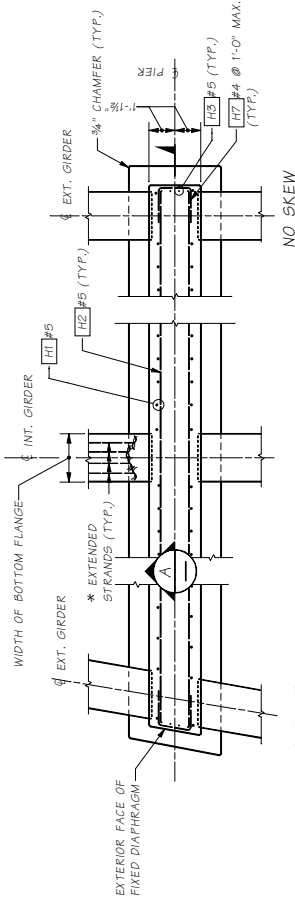
Bridge Design Eng.	MJL	AND	AK25	Girders	U-Girders	W58G	FIX	RECESSED	FACE	INTER	PIER	DIAPHR	DET	MAN
Supervisor														
Designed By														
Checked By														
Drawn By														
Project No.														
Architect/Engineer														
Date														
Revision														
By														
Job No.														
Sheet														

BRIDGE AND STRUCTURES OFFICE



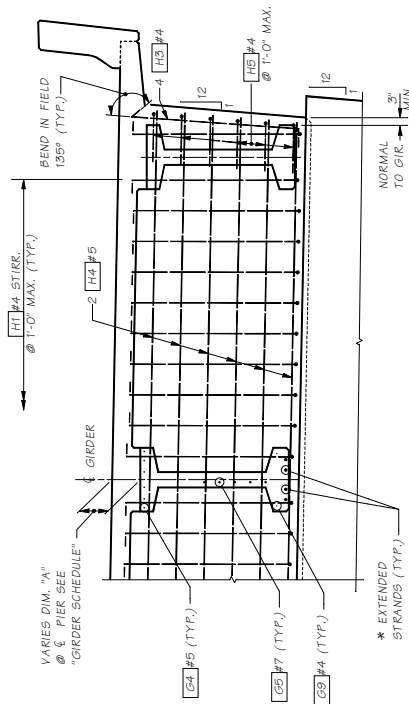
STANDARD PRESTRESSED CONCRETE GIRDERS
W58G FIXED RECESSED-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

BRIDGE SHEET NO. 58



PLAN - HINGE DIAPHRAGM

10° MAX. SKEW FOR HINGE DIAPHRAGM.
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET

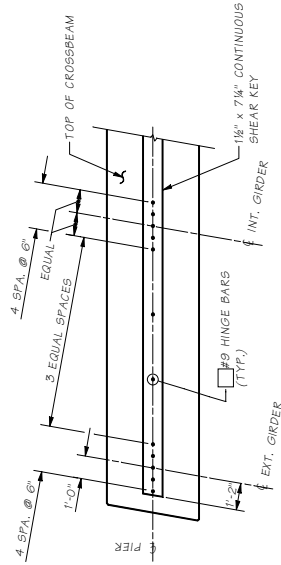


SECTION A-A

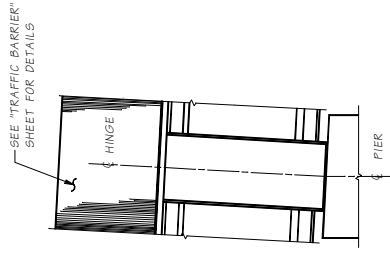
NOTES TO DESIGNER

Hinge bar plan is shown for designer. The actual hinge bars shall be located along the & pier on the crossbeam details sheets. For final contract plans, the hinge bars shall be deleted from this sheet prior to the award copy of the contract plans.

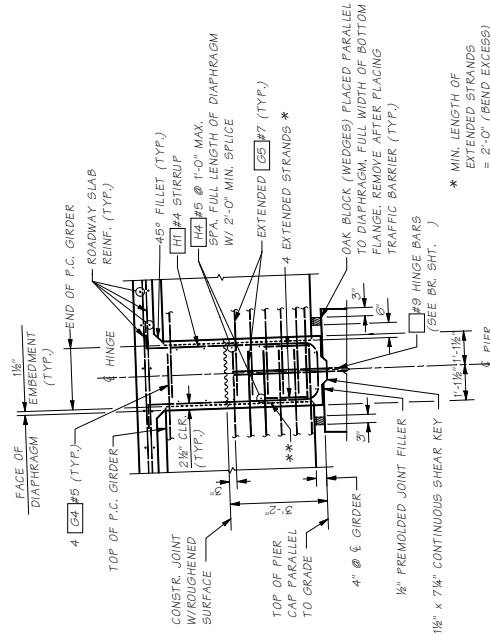
Oak block wedges shall be shown on crossbeam plan sheet, parallel to the & pier if skewed. Crossbeam width is dictated by the oak block location.



HINGE BAR PLAN



TYP. END VIEW
HINGE DIAPHRAGM



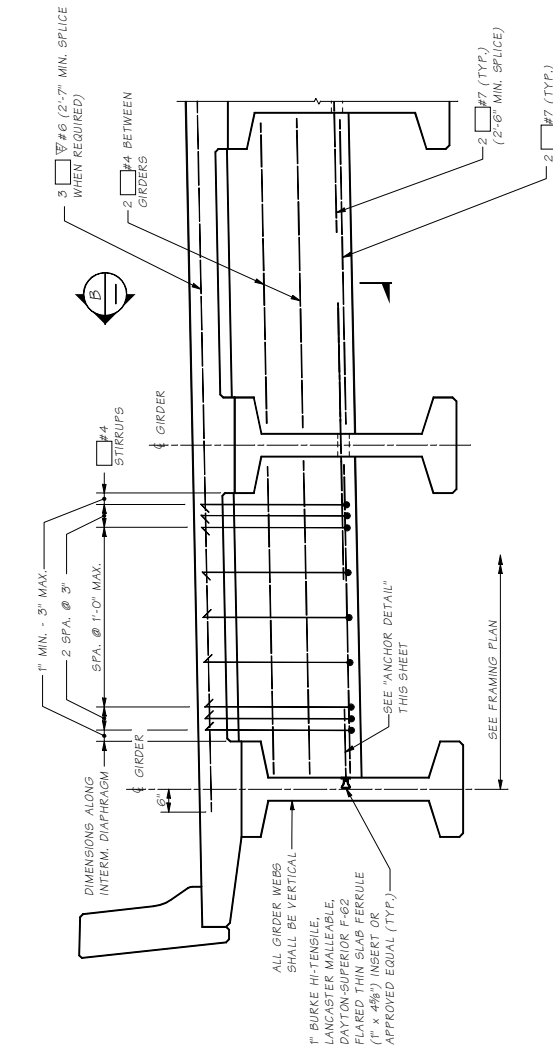
TYPICAL HINGE SECTION

** FOR SAWTOOTH SHEAR KEY DETAILS, SEE GIRDER SHEETS.

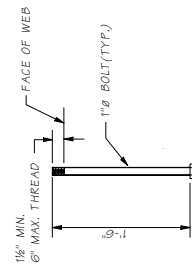
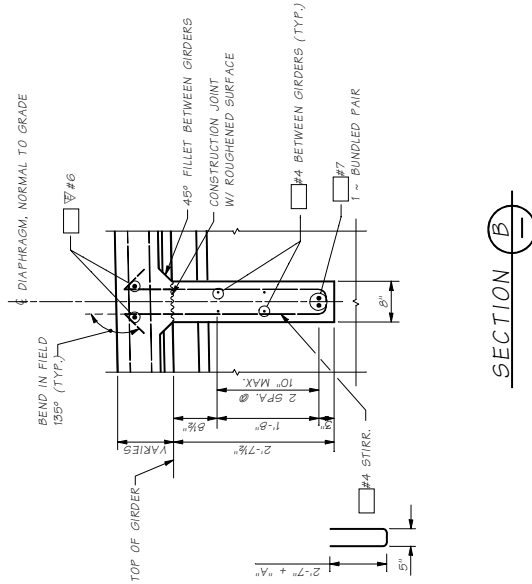
* MIN. LENGTH OF EXTENDED STRANDS = 2'-0" (BEND EXCESS)

** FOR SAWTOOTH SHEAR KEY (SEE BR. SHT.)

JOB NO. _____		DATE _____		REVISION _____		BY: JPP	
DESIGNED BY _____		CHECKED BY _____		BRIDGE PROJECTS ENGR. _____		ARCHITECT/ENGINEER _____	
SUPERVISOR _____		DESIGNED BY _____		CHECKED BY _____		BRIDGE PROJECTS ENGR. _____	
BRIDGE DESIGN ENGR. _____		MAGNITUDE/GIRDER/INT. PIER/DIAPHRAGM/HINGE		WASH. STATE		FED. AID PROJ. NO.	
PROJECT NO. _____		JOB NO. _____		SHEET NO. _____		SHEETS _____	
Washington State Department of Transportation				STANDARD PRESTRESSED CONCRETE GIRDERS			
BRIDGE AND STRUCTURES OFFICE				W58G HINGE DIAPHRAGM AT INTERMEDIATE PIER DETAILS			



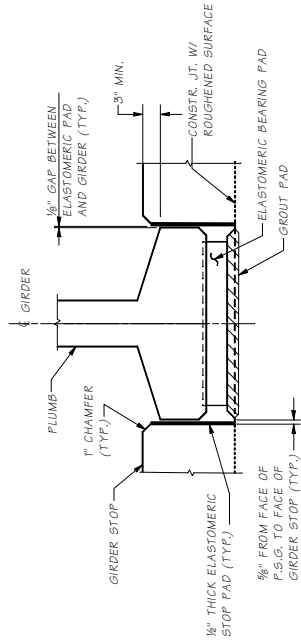
TYPICAL INTERMEDIATE DIAPHRAGM



ANCHOR DETAIL

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

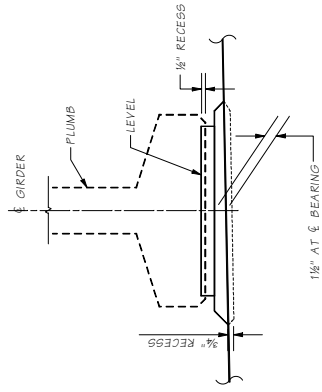
Bridge Design Eng.		MAST AND AEDS/Girder/Int-Grder/W58G/Int-Grder/W58G		INTER DIAPHRAGM DET. MAN.		SHEET NO.		OF	
Supervisor	Design By	Region	State	FED. AID PROJ. NO.	TOTAL SHEETS		PRESTRESSED CONCRETE GIRDERS		
Checked By	Checked By	10	WASH		SHEET NO.		W58G INTERMEDIATE DIAPHRAGM DETAILS		
Bridge Projects Eng.	Printed By	JOB NUMBER		DATE	REVISION	BY	APPD.	STANDARD	
Architect/Specifier								PRESTRESSED CONCRETE GIRDERS	
						WASHINGTON STATE DEPARTMENT OF TRANSPORTATION			
						BRIDGE AND STRUCTURES OFFICE			



SECTION G

NOTE:

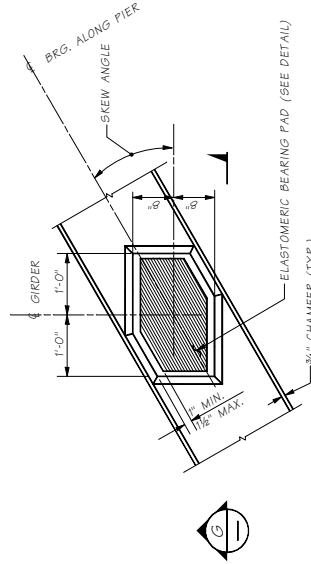
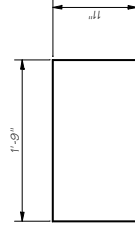
1. GIRDER STOPS SHALL BE CONSTRUCTED AFTER PLACEMENT OF CONCRETE BEARING PAD.
2. ELASTOMERIC PADS BETWEEN GIRDER AND GIRDER STOPS SHALL BE PLACED AFTER CONSTRUCTING THE GIRDER STOPS. THE PADS SHALL BE COATED WITH APPROVED CEMENTITIOUS ADHESIVE PRIOR TO INSTALLATION.



GROUT PAD ELEVATION

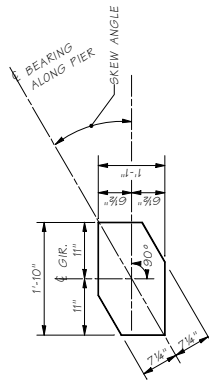
ELASTOMERIC STOP PAD

DUROMETER HARDNESS = 60



GROUT PAD DETAIL

(SKEW ANGLE SHOWN @ 30°)
(SHOWN FOR END DIAPHRAGM ON GIRDER)



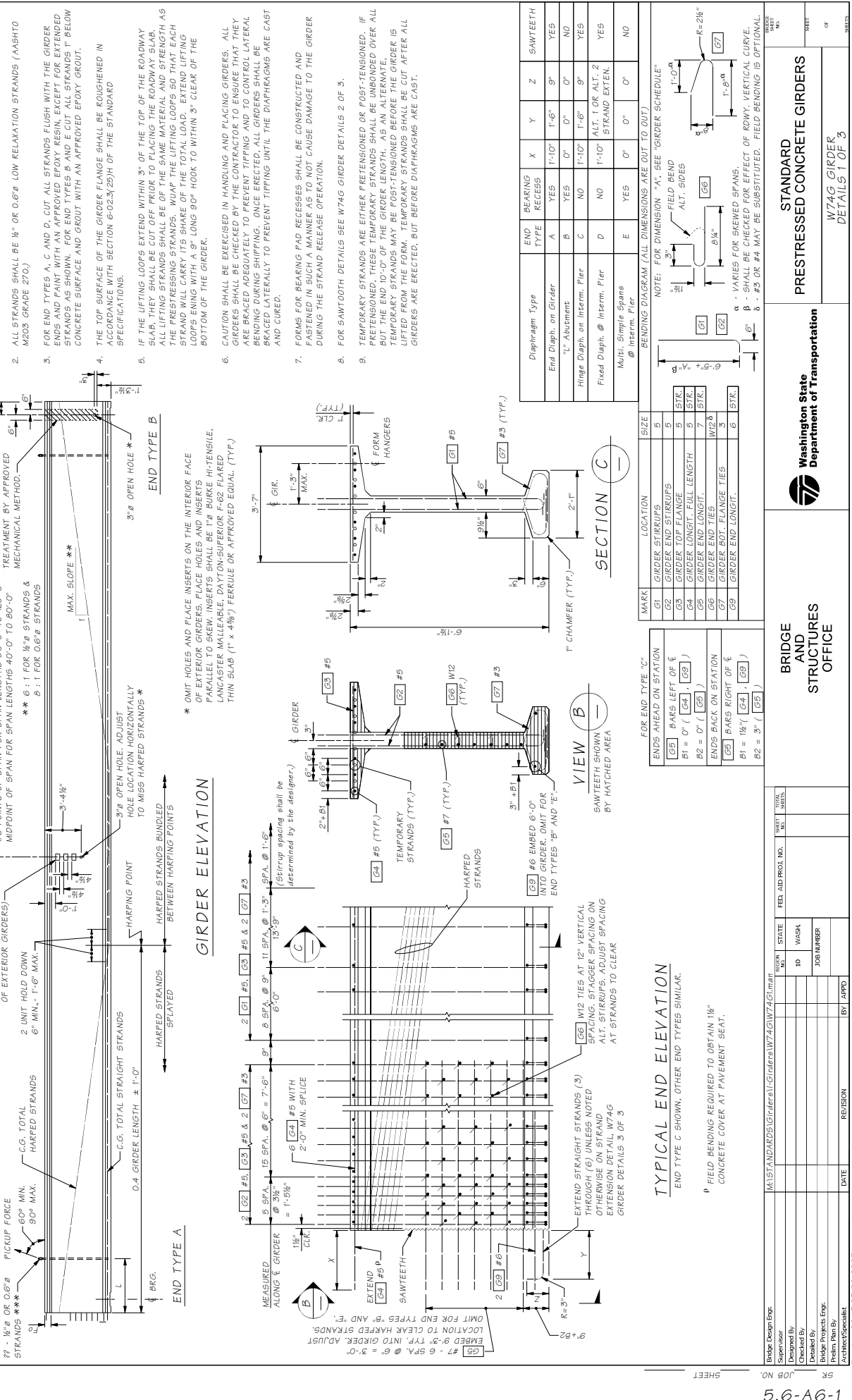
ELASTOMERIC BEARING PAD

LAMINATED ELASTOMERIC BEARING
PAD 1/4" THICK (4 SHIMS)
DUROMETER HARDNESS = 60
(SKEW ANGLE SHOWN @ 30°)

Bridge Design Exp.	Supervisor	Designed By	Checked By	Drawn By	Architect/Engineer	DATE	REVISION	BY	APPD.	FED. AID PROJ. NO.	STATE	COUNTY	SHEET NO.	SHEETS	JOB NO.	SR	SHEET	OF	SHEETS	STANDARD PRESTRESSED CONCRETE GIRDERS	Washington State Department of Transportation	W58C MISCELLANEOUS BEARING DETAILS
																						BRIDGE AND STRUCTURES OFFICE

*** The number of lifting strands shall be based on 10 kips per each 1/2" g strand and 14 kips per each 0.6" g lifting strand.

*** The number of lifting strands shall be based on 10 kips per each 1/2" g strand and 14 kips per each 0.6" g lifting strand.



MARK	LOCATION	SIZE
G1	GIRDER STIRRUPS	5
G2	GIRDER END STIRRUPS	5
G3	GIRDER TOP FLANGE	5
G4	GIRDER END FULL LENGTH	5
G5	GIRDER END TIE	5
G6	GIRDER END TIE	5
G7	GIRDER END TIE	5
G8	GIRDER END TIE	5

FOR END TYPE "C"

ENDS AHEAD ON STATION

G5 BARS LEFT OF §

81 = 0" (G4, G9)

82 = 0" (G5)

ENDS BACK ON STATION

G5 BARS RIGHT OF §

81 = 1/2" (G4, G9)

82 = 3" (G5)

END TYPE "C"

FOR DIMENSION "A", SEE "GIRDER SCHEDULE"

FIELD BEND

ALT. SIDES

R=24"

FIELD BEND

ALT. SIDES

R=24"

FIELD BEND

ALT. SIDES

R=24"

FIELD BEND

ALT. SIDES

R=24"

FIELD BEND

ALT. SIDES

R=24"

FIELD BEND

ALT. SIDES

R=24"

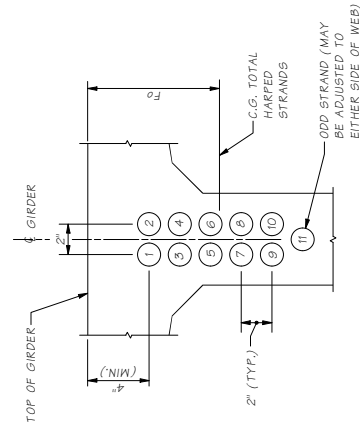
FIELD BEND

ALT. SIDES

R=24"

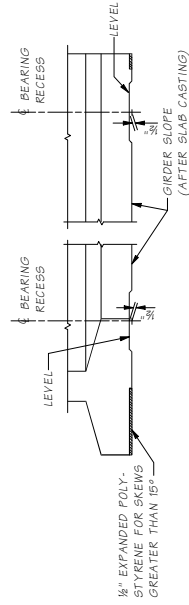
DATE	REVISION	BY	APPD

Bridge Design Eng.			
Supervisor			
Designed By			
Checked By			
Bridge Projects Eng.			
Project Plan By			
Architect/Specifier			

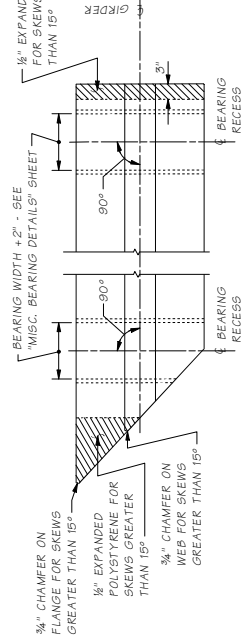


STRAND PATTERN AT GIRDER END

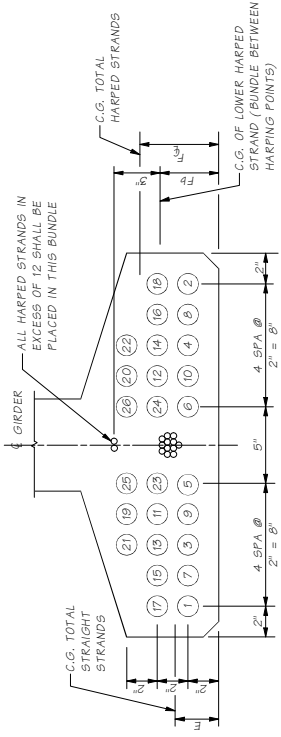
HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



ELEVATION

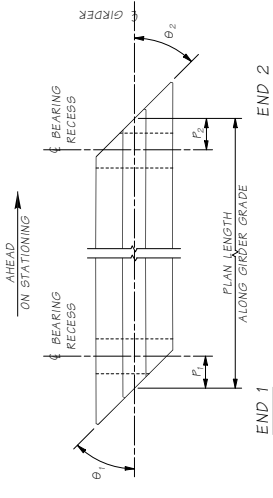


PLAN BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION



STRAND PATTERN AT \varnothing SPAN

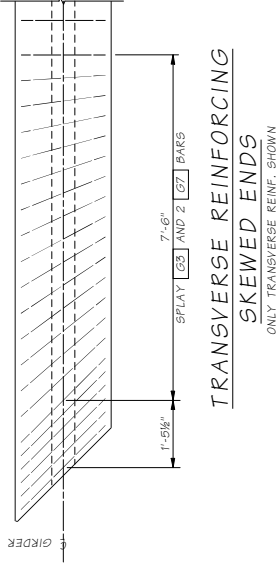
STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

SPAN	GIRDER	END 1 TYPE	END 2 TYPE	L	θ_1	θ_2	F ₁	F ₂	PLAN LENGTH (ALONG GIRDER GRADE)	MIN. CONC. COMP. STRENGTH @ FINAL F.C. (KSI)	MIN. CONC. COMP. STRENGTH @ RELEASE F.C.I. (KSI)	HARPED			STRAIGHT			TEMPORARY		LOCATION OF C.G. STRANDS (IN.)																						
												NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	E	F	F _b	F _o	C	D @ 40 DAYS (IN.)	D @ 120 DAYS (IN.)	L _d (IN.)																	



TRANSVERSE REINFORCING SKEWED ENDS

SAWTOOTH DETAILS

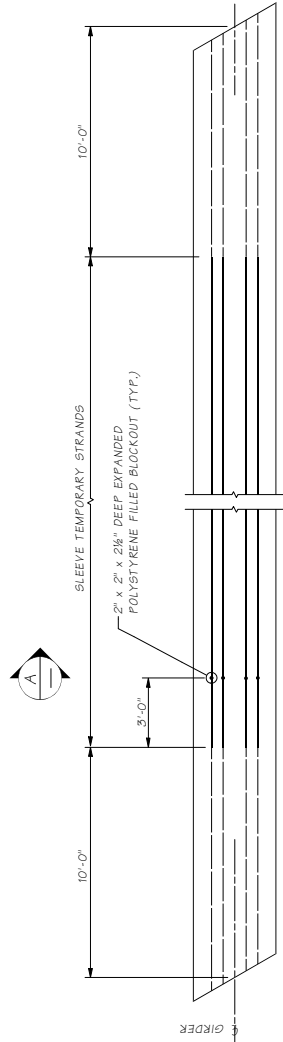
SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - W74C GIRDER DETAILS 1 OF 3

Bridge Design Eng.:	MA1ST AND AKD51(GirderA)~GirderA\W74C\W74G2.mxd	VISION	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Supervisor:		10	WASH			
Designed By:						
Checked By:						
Detailed By:						
Bridge Projects Eng.:						
Printed By:						
Architect/Engineer:						
DATE:	REVISION:	BY:	APP:			

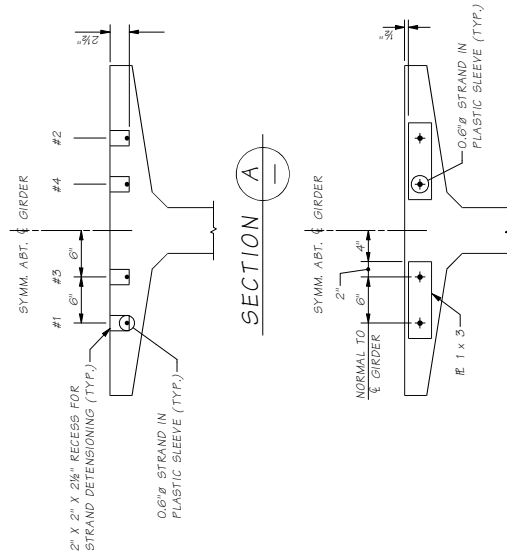
STANDARD PRESTRESSED CONCRETE GIRDERS		W74C GIRDER DETAILS 2 OF 3
Washington State Department of Transportation		

BRIDGE AND STRUCTURES OFFICE

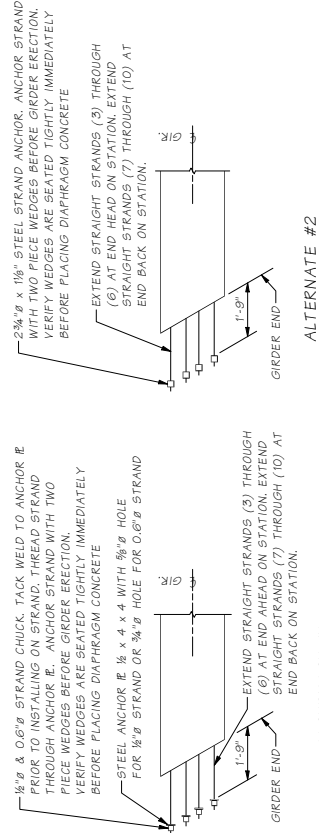
Job No. _____
SHEET NO. _____



PLAN
TEMPORARY STRANDS



END VIEW
TEMPORARY STRAND
POST-TENSIONED ALTERNATE



STRAND EXTENSION DETAIL

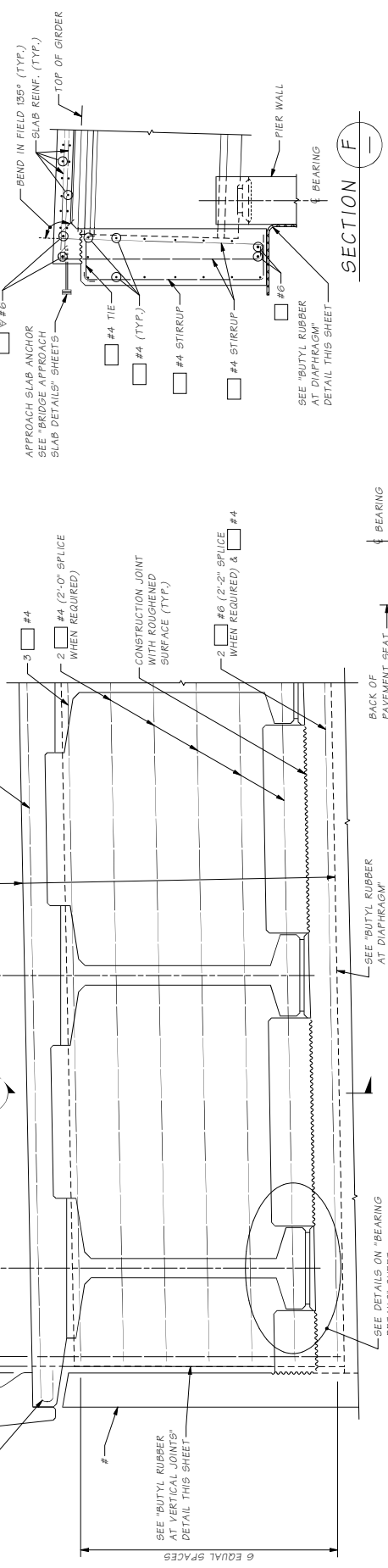
n = ? TOTAL NUMBER OF EXTENDED STRANDS

Bridge Design Eng. Supervision Designed By Checked By Bridge Projects Eng. Prems Plan By Architect/Specifier	REGION WASH	STATE WASH	FEEL. AID PROJ. NO.	SHEET NO. 3	TOTAL SHEETS 3
DATE Fri Jan 26 13:07:45 2007	REVISION	BY APPD	JOB NUMBER	BRIDGE AND STRUCTURES OFFICE	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
STANDARD PRESTRESSED CONCRETE GIRDERS			W74G GIRDER DETAILS 3 OF 3		

Prestressed Concrete Superstructure

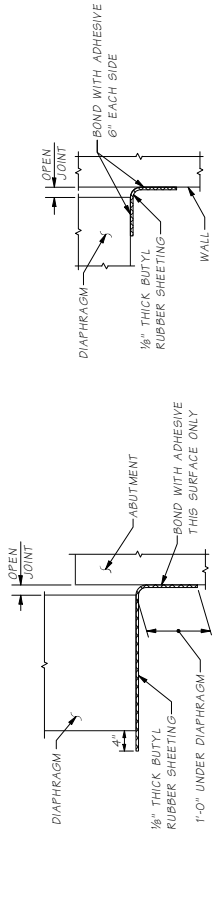
TEMPORARY STRAND CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SHEETS IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
4. CAST INTERMEDIATE END DIAPHRAGMS.
5. CAST INTERMEDIATE END DIAPHRAGMS.
6. PLACE DECK CONCRETE.



ELEVATION END DIAPHRAGM

DIMENSIONS ARE ALONG DIAPHRAGM



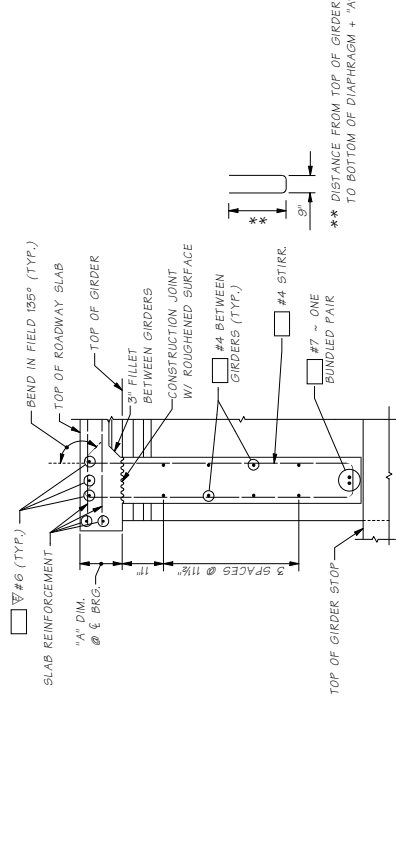
PLAN BUTYL RUBBER AT VERTICAL JOINTS

Bridge length
 L ≤ 200
 200 < L ≤ 300
 300 < L ≤ 400
 L > 400

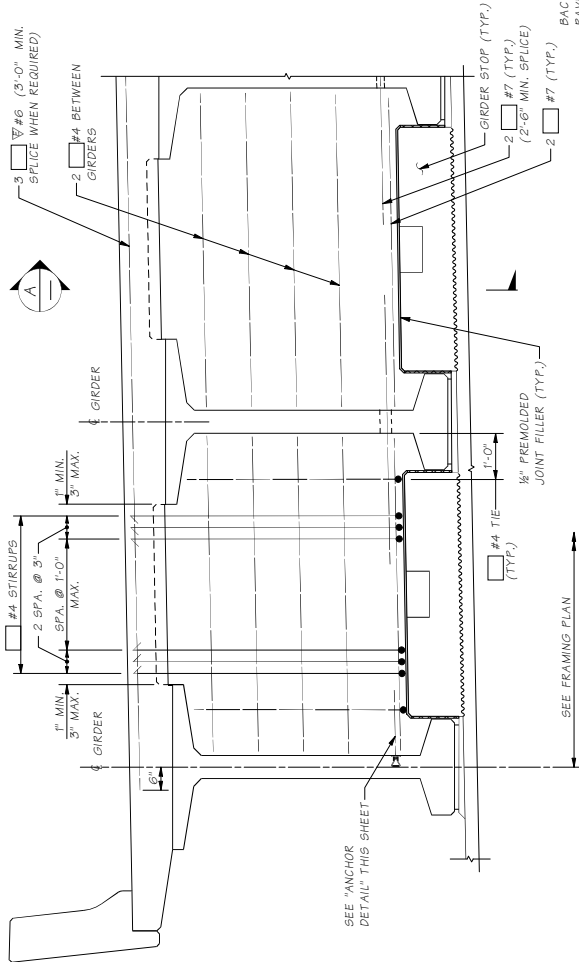
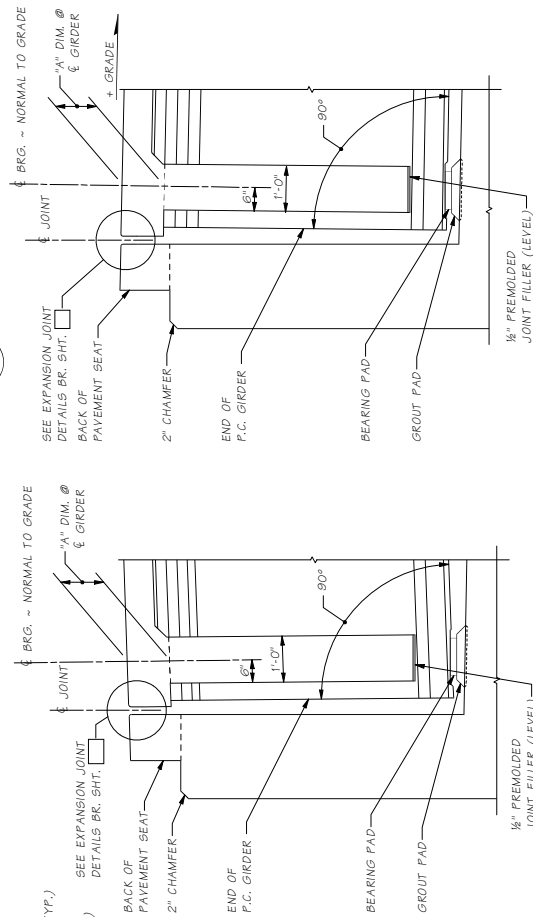
Open Joint
 ** = 1.5 IN.
 *** = 2.0 IN.
 **** = 2.5 IN.
 Special design

NOTE:
 GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.

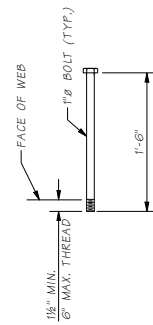
Bridge Design Exp.	MA/STANDARD/SG/Girders/1-Girders/W74G/W74G-EN/ DVA. ON GIRMAN	DATE	REVISION	BY	APPD
Supervisor					
Designed By					
Checked By					
Drawn By					
Bridge Projects Eng.					
Printed By					
Architect/Engineer					



SECTION A



ELEVATION
END DIAPHRAGM
DIMENSIONS ARE ALONG DIAPHRAGM



ANCHOR DETAIL
ASTM A-307

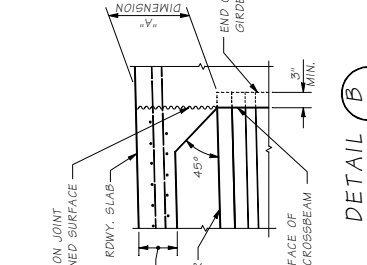
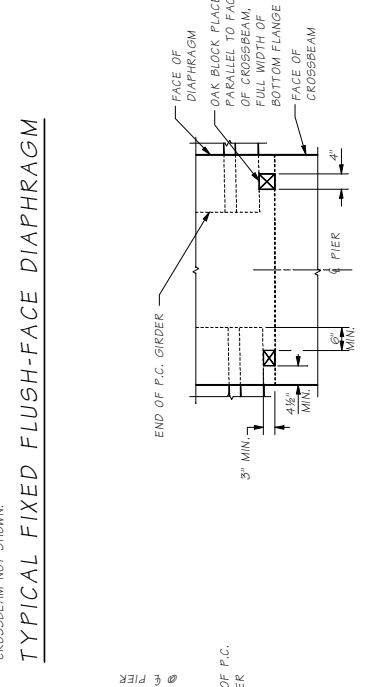
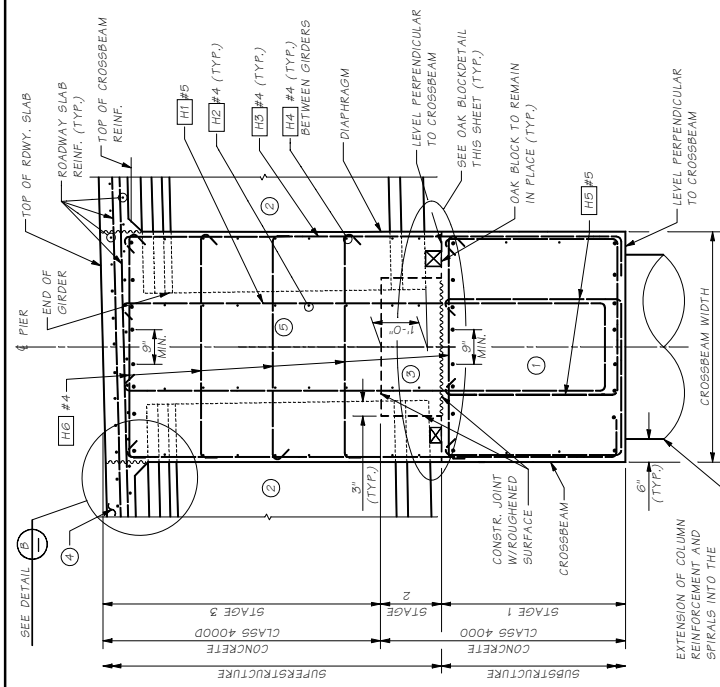
TEMPORARY STRAND
CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESS.
4. REMOVE ALL MOISTURE IN RECESS PRIOR TO FILLING WITH GROUT.
5. CAST INTERMEDIATE & END DIAPHRAGMS.
6. PLACE DECK CONCRETE.

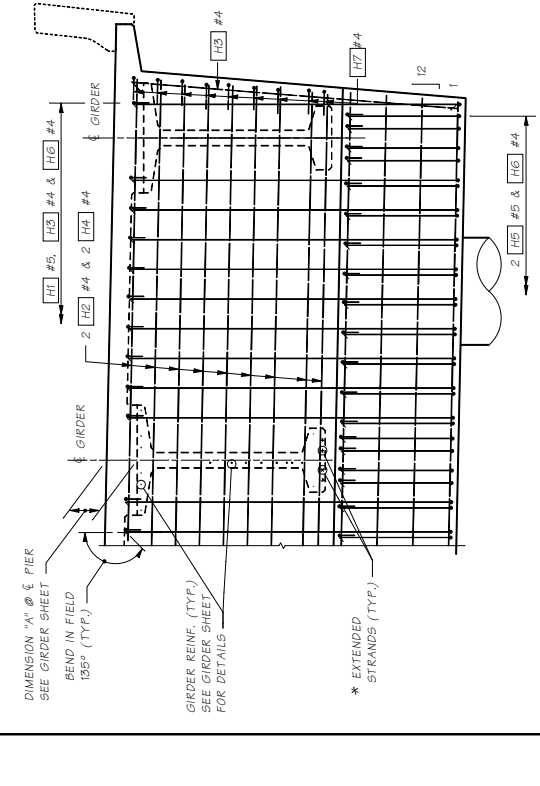
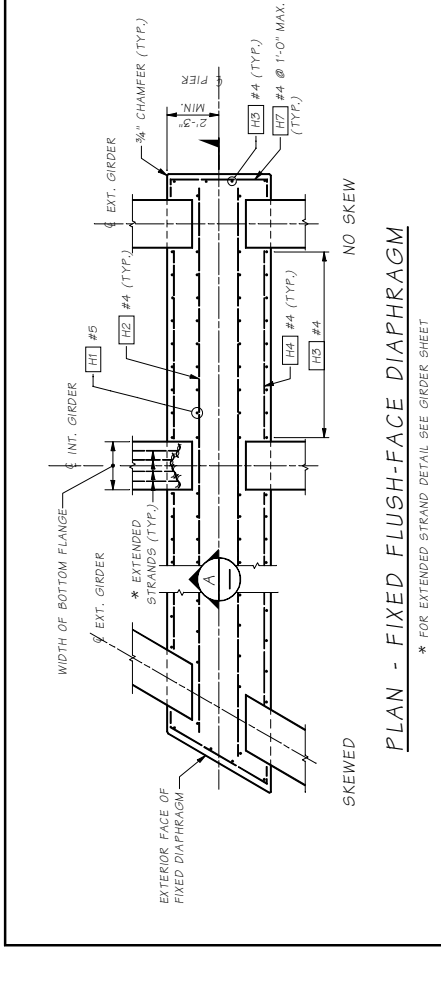
NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

ROADWAY EXPANSION JOINT AT END PIERS
LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.
GIRDER STOP NOT SHOWN FOR CLARITY.

BRIDGE DESIGN EXP.		WA		WA		WA	
SUPERVISOR		STATE		FED. AID PROJ. NO.		TOTAL SHEETS	
DESIGNED BY		10		WASH		SHEET NO.	
CHECKED BY		JOB NUMBER				OF SHEETS	
BRIDGE PROJECTS EMP.		DATE		REVISION		BY APPD	
ARCHITECT/SPECIALLIST							
				STANDARD PRESTRESSED CONCRETE GIRDERS W74G ABUTMENT TYPE PIER DIAPHRAGM DETAILS			



- CONSTRUCTION SEQUENCE**
- 1 CROSSBEAM
 - 2 PLACE GIRDER ON BLOCKS
 - 3 DIAPHRAGM STAGE 2
 - 4 ROADWAY SLAB
 - 5 COMPLETE DIAPHRAGM



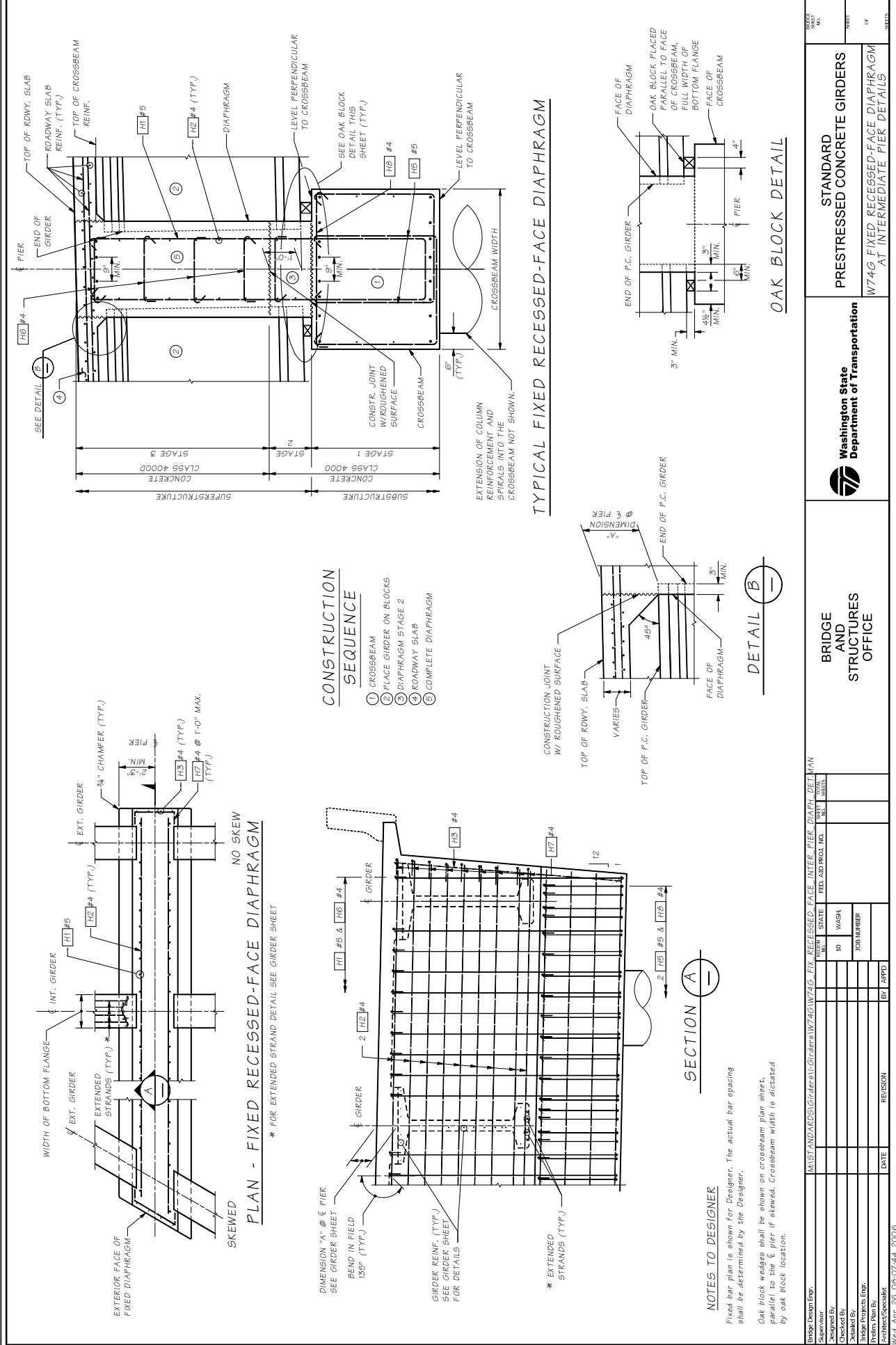
NOTES TO DESIGNER

FIXED BAR PLAN IS SHOWN FOR DESIGNER. THE ACTUAL FIXED BARS SHALL BE LOCATED ALONG THE PIER ON THE CROSSBEAM DETAILS SHEET FOR FINAL CONTRACT PLANS.

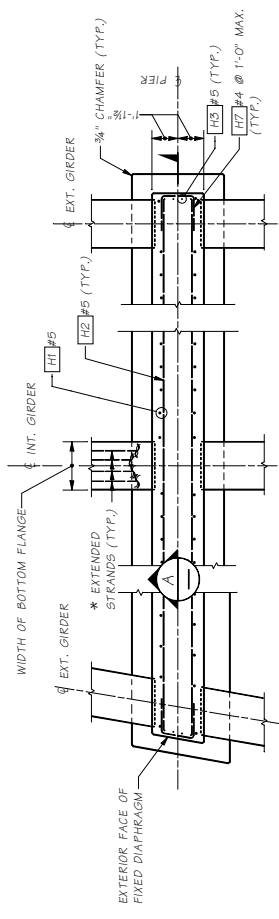
OAK BLOCK WEDGES SHALL BE SHOWN ON CROSSBEAM PLAN SHEET, PARALLEL TO THE PIER IF SKEWED. CROSSBEAM WIDTH IS DICTATED BY OAK BLOCK LOCATION.

Washington State Department of Transportation		STANDARD PRESTRESSED CONCRETE GIRDERS		W74C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS	OF SHEETS
BRIDGE AND STRUCTURES OFFICE		WASHINGTON STATE DEPARTMENT OF TRANSPORTATION		W74C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS	
MAINTANDARD51G1Grateral-GirderB-W74C-WZAG-FIX-FLUSH-FACE-INTER-PIER-DIAPH-DET.MAN	PROJECT NO.	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS	DATE
10	WASH	3001 NUMBER			BY APPD
		DATE	REVISION		
Bridge Design Eng. _____ Supervisor _____ Designer By _____ Checked By _____ Drawn By _____ Project No. _____ Date _____ Revision _____					

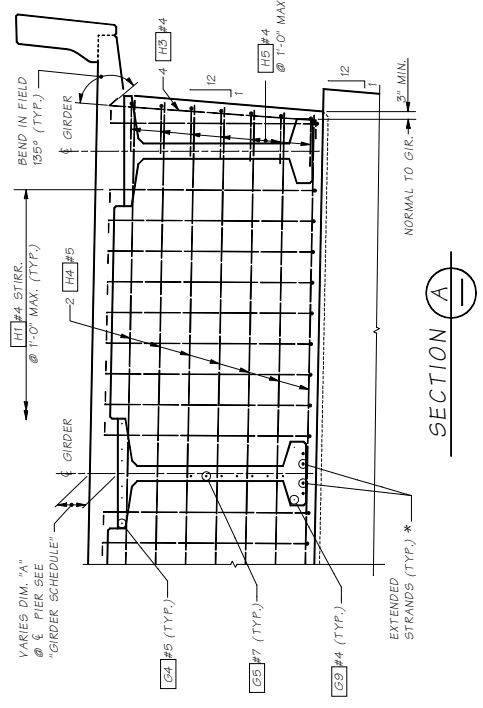
Wash. Apr. 26 08:07:49 2006



BRIDGE DESIGNER	DATE	REVISION	BY	APP'D
DESIGNED BY	10	WASH	JOB NUMBER	
CHECKED BY				
BRIDGE PROJECT ENGR.				
ARCHITECT/SPECIALLIST				
WASH. STATE DEPT. OF TRANSPORTATION				
BRIDGE AND STRUCTURES OFFICE				
STANDARD PRESTRESSED CONCRETE GIRDERS				
W74G FIXED RECESSED-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS				



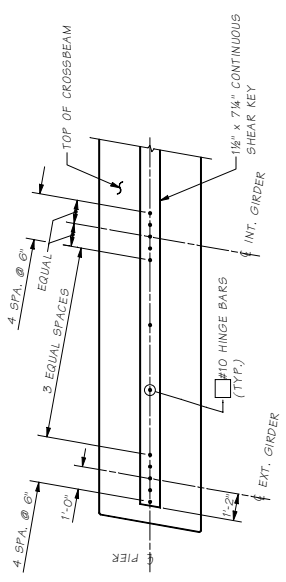
PLAN - HINGE DIAPHRAGM
10° MAX. SKEW FOR HINGE DIAPHRAGM.
* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET



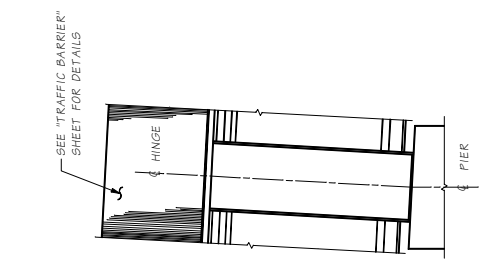
NOTES TO DESIGNER

Hinge bar plan is shown for designer. The actual hinge bars shall be located along the pier and on the crossbeam details sheets, for final contract plans. The hinge bars shall be deleted from this sheet prior to the award copy of the contract plans.

Oak block wedges shall be shown on crossbeam plan sheets, parallel to the pier if skewed. Crossbeam width is dictated by the oak block location.



HINGE BAR PLAN



**TYP. END VIEW
HINGE DIAPHRAGM**

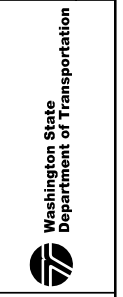
TYPICAL HINGE SECTION

** FOR SAWTOOTH SHEAR KEY DETAILS, SEE GIRDER SHEETS.

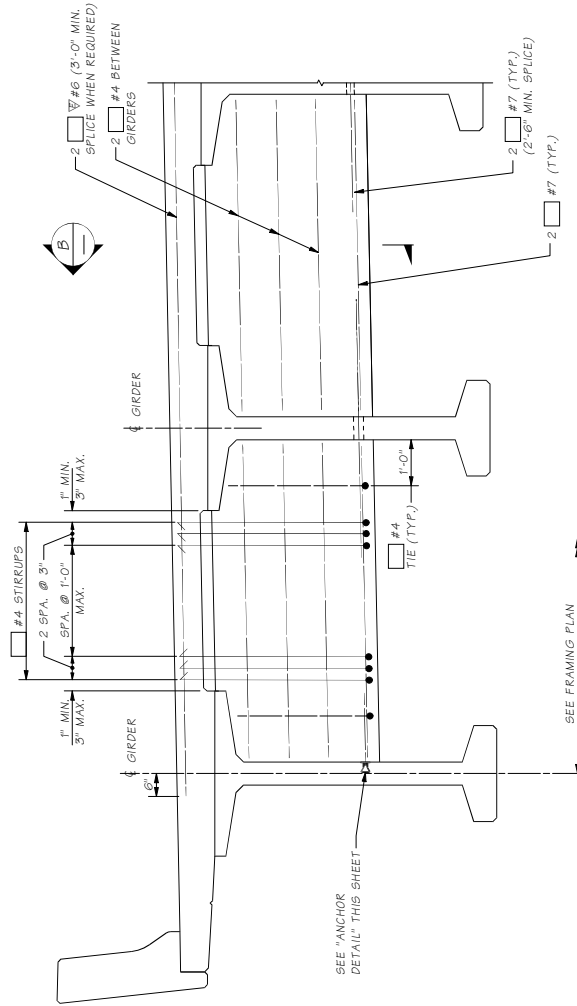
* MIN. LENGTH OF EXTENDED STRANDS = 2'-0" (BEND EXCESS)

BRIDGE DESIGNER	DATE	REVISION	BY	APPD.
DESIGNED BY				
CHECKED BY				
BRIDGE PROJECTS ENGR.				
PREPARED BY				
ARCHITECT/ENGINEER				
WASH. STATE DEPT. OF TRANSPORTATION				

STANDARD PRESTRESSED CONCRETE GIRDERS	W74G HINGE DIAPHRAGM AT INTERMEDIATE PIER DETAILS
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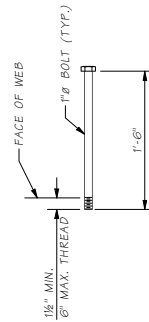


BRIDGE AND STRUCTURES OFFICE



ELEVATION INTERMEDIATE DIAPHRAGM

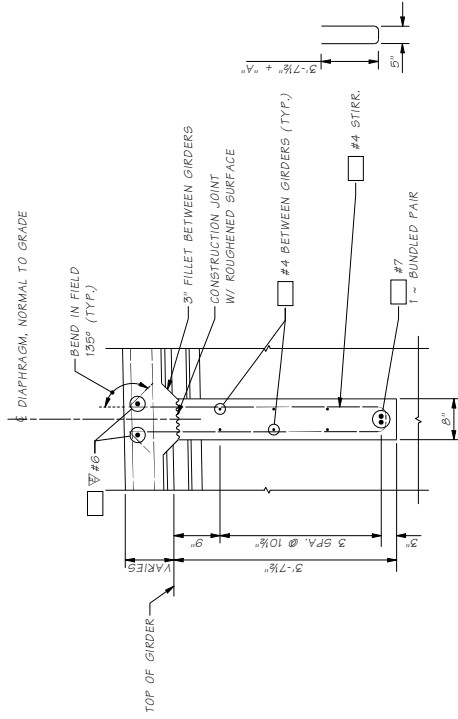
DIMENSIONS ARE ALONG DIAPHRAGM



ANCHOR DETAIL

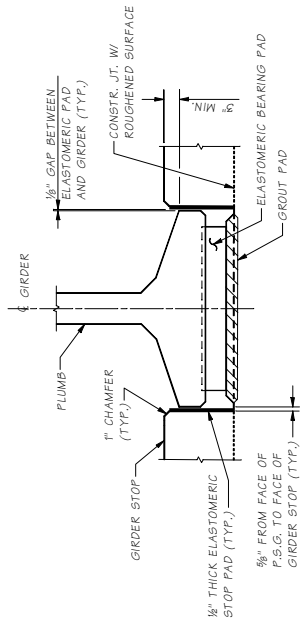
ASTM A-307

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.
REINFORCING BARS SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".



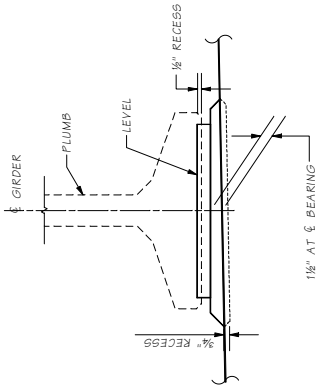
SECTION B

Bridge Design Eng.	M. STANFAN	Checkers	G. J. GARDNER	W74G	INT. DIAPHRAGM DET. MAN	SHEET NO.	TOTAL SHEETS
Supervisor		State	WASH	FED. PROJ. NO.			
Designed By		Job Number	10				
Checked By		Revision					
Bridge Projects Eng.		Date					
Architect/Engineer		By					

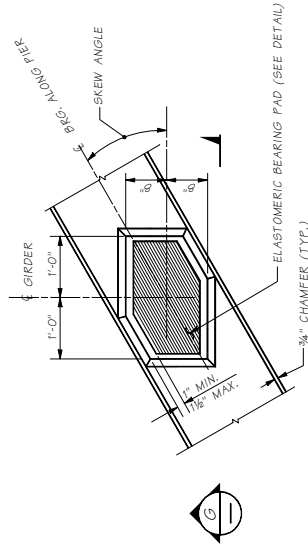


SECTION G

- NOTE:**
1. GIRDER STOPS SHALL BE CONSTRUCTED AFTER PLACEMENT OF PRESTRESSED GIRDERS.
 2. ELASTOMERIC PADS BETWEEN GIRDER AND GIRDER STOPS SHALL BE PLACED AFTER CONSTRUCTING THE GIRDER STOPS. THE PADS SHALL BE COATED WITH APPROVED CEMENTITIOUS ADHESIVE PRIOR TO INSTALLATION.

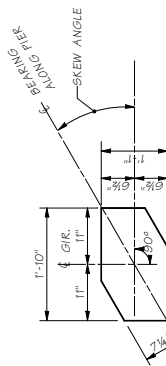


GROUT PAD ELEVATION



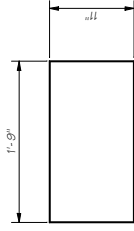
GROUT PAD DETAIL

(SKEW ANGLE SHOWN @ 30°)
(SHOWN FOR END DIAPHRAGM ON GIRDER)



ELASTOMERIC BEARING PAD

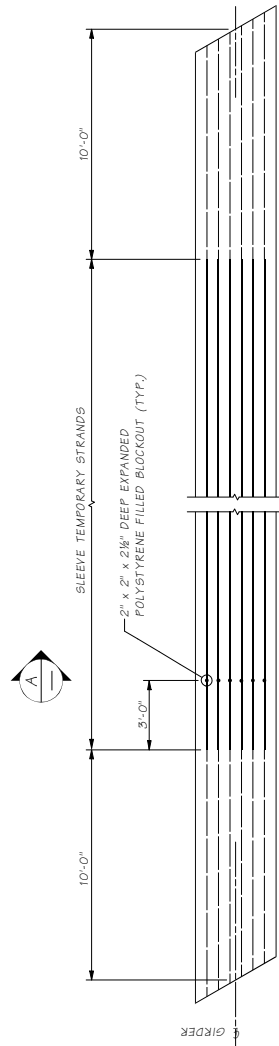
LAMINATED ELASTOMERIC BRIDGE PAD () THICK () SHIMS)
DUROMETER HARDNESS = 60
(SKEW ANGLE SHOWN @ 30°)



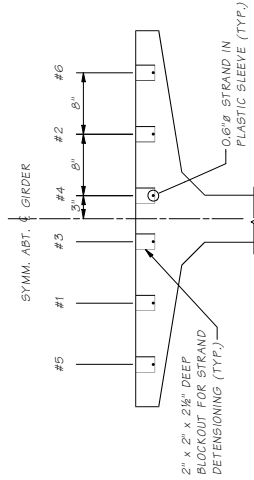
ELASTOMERIC STOP PAD

DUROMETER HARDNESS = 60

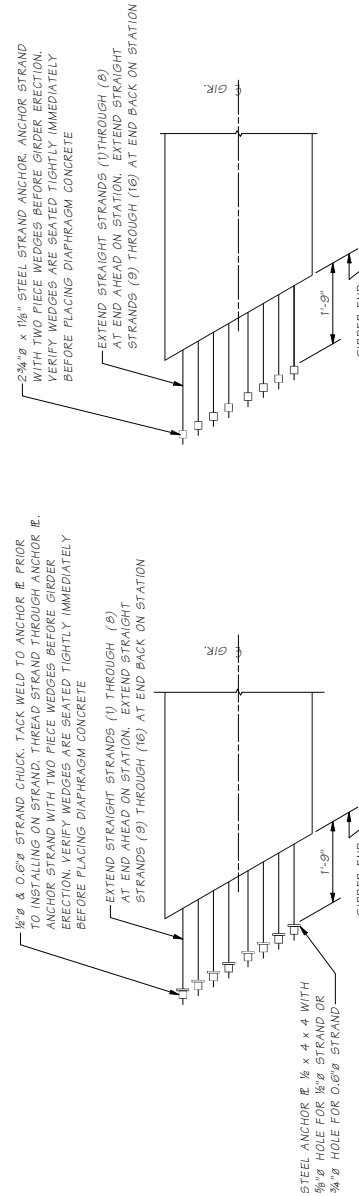
Bridge Design Exp.	MA16T AND RDS\Girders\1-Girders\W74G\MISC_DIAPHR_DET\MAN		DATE	REVISION	BY	APPD.
Supervisor	DESIGN	STATE	NO.	DATE	NO.	DATE
Designed By	TO	WASHA	FED. AID PROJ. NO.			
Checked By	JOB NUMBER					
Drawn By						
Bridge Projects Engr.						
Printed By						
Architect/Specifier						
1 Thu Jan 11 11:51:37 2007						



PLAN
TEMPORARY STRANDS



SECTION A-A



ALTERNATE #1

ALTERNATE #2

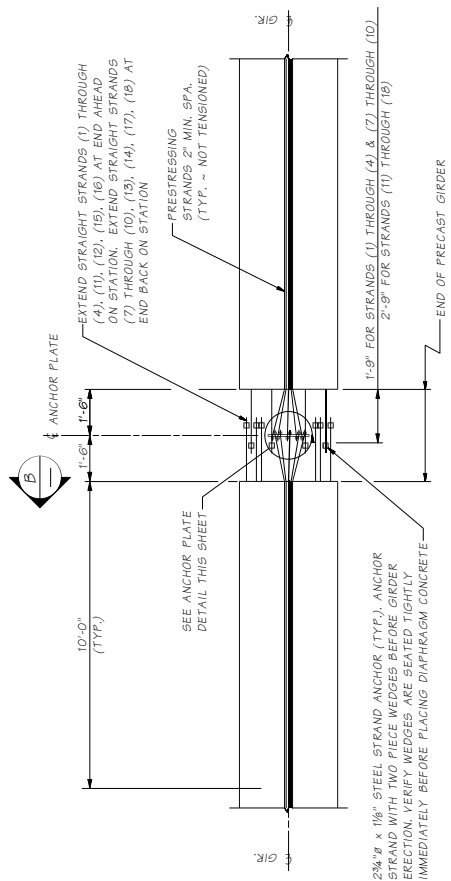
END VIEW
TEMPORARY STRAND
POST-TENSIONED ALTERNATE

STRAND EXTENSION DETAIL

n = ? TOTAL NUMBER OF EXTENDED STRANDS

MAINT STANDARDS/Girders/WF 1-Girders/WF Details/Girders/DETAILS 3 OF 3-MAN	DATE	REVISION	BY	APPRO	JOB NUMBER	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
					10	WASHA			

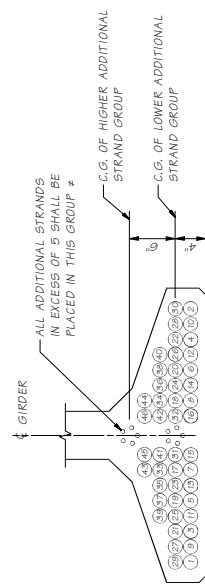
BRIDGE AND STRUCTURES OFFICE	Washington State Department of Transportation	STANDARD PRESTRESSED CONCRETE GIRDERS
		GIRDER DETAILS 3 OF 3



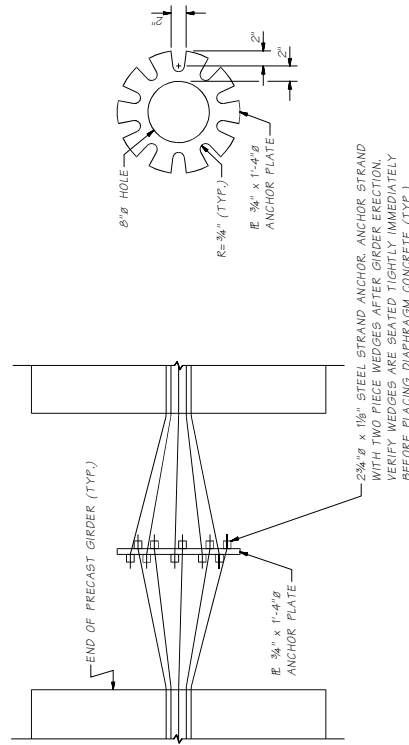
2 3/8" x 1/8" STEEL STRAND ANCHOR (TYP.) ANCHOR STRAND WITH TWO PIECE WEDGES BEFORE GIRDER ERECTION. VERIFY WEDGES ARE SEATED TIGHTLY IMMEDIATELY BEFORE PLACING DIAPHRAGM CONCRETE.

STRAND EXTENSION DETAIL

n = ? TOTAL NUMBER OF EXTENDED STRANDS



* The number of strands shall be determined by the designer.



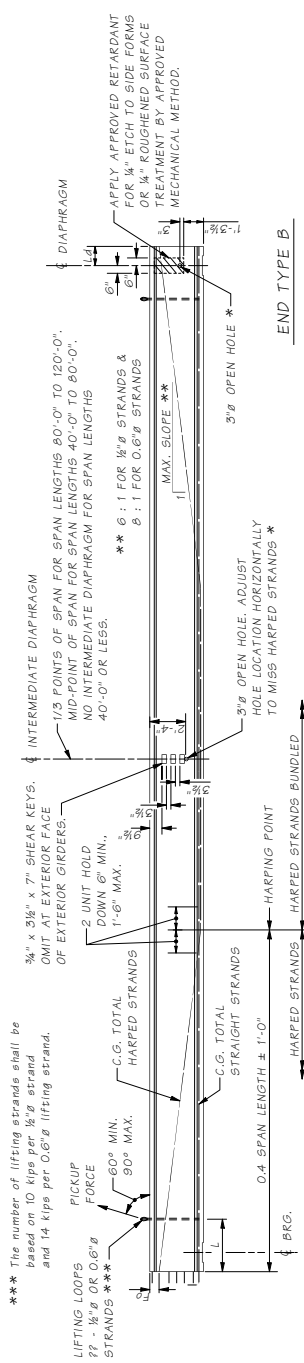
2 3/8" x 1/8" STEEL STRAND ANCHOR ANCHOR STRAND WITH TWO PIECE WEDGES AFTER GIRDER ERECTION. VERIFY WEDGES ARE SEATED TIGHTLY IMMEDIATELY BEFORE PLACING DIAPHRAGM CONCRETE (TYP.)

ANCHOR PLATE DETAIL

Bridge Design Exp.:	MA1STANDARDSGirdersaWF 1-GirdersaWF DetailsADDITIONAL STRANDS.MAN	DATE	REVISION	BY	APPD
Supervisor:		DATE	REVISION	BY	APPD
Designed By:		DATE	REVISION	BY	APPD
Checked By:		DATE	REVISION	BY	APPD
Drawn By:		DATE	REVISION	BY	APPD
Bridge Projects Engr.:		DATE	REVISION	BY	APPD
Project Plan By:		DATE	REVISION	BY	APPD
Architect/Engineer:		DATE	REVISION	BY	APPD
BRIDGE AND STRUCTURES OFFICE					
STANDARD PRESTRESSED CONCRETE GIRDERS ADDITIONAL EXTENDED STRANDS					
SHEET OF					

Prestressed Concrete Superstructure

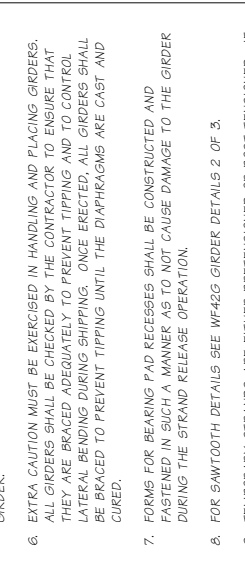
FEBRUARY 2007



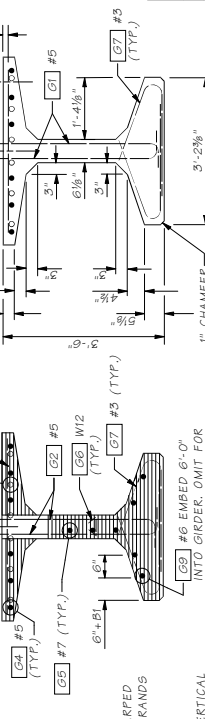
TYPICAL END ELEVATION

- NOTES:
- PLAN LENGTH SHALL BE INCREASED AS NECESSARY TO COMPENSATE FOR SHORTENING DUE TO PRESTRESS AND SHRINKAGE.
 - ALL STRANDS SHALL BE $\frac{1}{8}$ " OR 0.6 " LOW RELAXATION STRANDS (AASHTO M203 GRADE 270).
 - FOR END TYPES A, C AND D, CUT ALL STRANDS FLUSH WITH THE GIRDER ENDS AND PAINT WITH AN APPROVED EPOXY RESIN, EXCEPT FOR EXTENDED STRANDS AS SHOWN. FOR END TYPES B AND E CUT ALL STRANDS 1" BELOW CONCRETE SURFACE AND GROUT WITH AN APPROVED EPOXY GROUT.
 - THE TOP SURFACE OF THE GIRDER FLANGE SHALL BE ROUGHENED IN ACCORDANCE WITH SECTION 6-02.3(25)H OF THE STANDARD SPECIFICATIONS.
 - IF THE LIFTING LOOPS EXTEND WITHIN 3" OF THE TOP OF THE ROADWAY SLAB, THEY SHALL BE CUT OFF PRIOR TO PLACING THE ROADWAY SLAB. ALL LIFTING STRANDS SHALL BE OF THE SAME MATERIAL AND STRENGTH AS THE PRESTRESSING STRANDS. WRAP THE LIFTING LOOPS SO THAT EACH STRAND WILL CARRY ITS SHARE OF THE TOTAL LOAD. EXTEND LIFTING LOOPS ENDING WITH A 9" LONG 90° HOOK TO WITHIN 3" CLEAR OF THE BOTTOM OF THE GIRDER.
 - EXTRA CAUTION MUST BE EXERCISED IN HANDLING AND PLACING GIRDERS. ALL GIRDERS SHALL BE CHECKED BY THE CONTRACTOR TO ENSURE THAT THEY ARE BRACED ADEQUATELY TO PREVENT TIPPING AND TO CONTROL LATERAL BENDING DURING SHIPPING. ONCE ERECTED, ALL GIRDERS SHALL BE BRACED TO PREVENT TIPPING UNTIL THE DIAPHRAGMS ARE CAST AND CURED.
 - FORMS FOR BEARING PAD RECESSES SHALL BE CONSTRUCTED AND FASTENED IN SUCH A MANNER AS TO NOT CAUSE DAMAGE TO THE GIRDER DURING THE STRAND RELEASE OPERATION.
 - FOR SAWTOOTH DETAILS SEE WF42G GIRDER DETAILS 2 OF 3.
 - TEMPORARY STRANDS ARE EITHER PRETENSIONED OR POST-TENSIONED. IF PRETENSIONED, THESE TEMPORARY STRANDS SHALL BE UNBONDED OVER ALL BUT THE END 10'-0" OF THE GIRDER LENGTH. AS AN ALTERNATE, TEMPORARY STRANDS MAY BE POST-TENSIONED BEFORE THE GIRDER IS LIFTED FROM THE FORM. TEMPORARY STRANDS SHALL BE CUT AFTER ALL GIRDERS ARE ERECTED, BUT BEFORE DIAPHRAGMS ARE CAST.

GIRDER ELEVATION

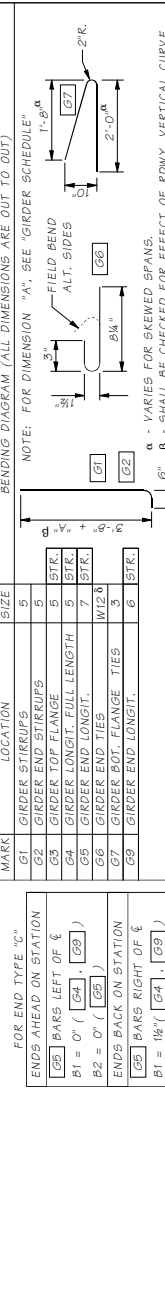


- *** OMIT HOLES AND PLACE INSERTS ON THE INTERIOR FACE OF EXTERIOR GIRDERS. PLACE HOLES AND INSERTS PARALLEL TO SKEW. INSERTS SHALL BE 1" BURKE HI-TENSILE, LAMINATED MALLEABLE, DAYTON-SUPERIOR F-62 FLARED THIN SLAB (1" x 4 3/4") FERRULE INSERT OR APPROVED EQUAL. (TYP.)

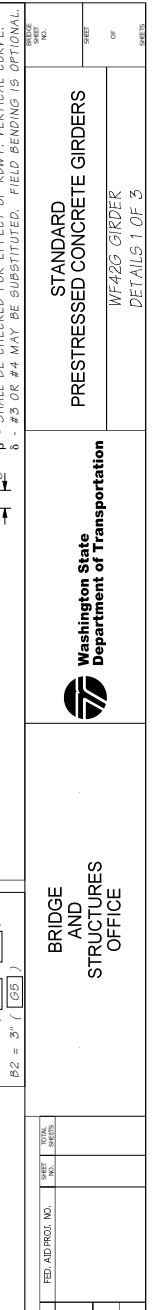


TYPICAL END ELEVATION

- END TYPE A
- END TYPE B
- END TYPE C
- END TYPE D
- END TYPE E
- END TYPE F
- END TYPE G
- END TYPE H
- END TYPE I
- END TYPE J
- END TYPE K
- END TYPE L
- END TYPE M
- END TYPE N
- END TYPE O
- END TYPE P
- END TYPE Q
- END TYPE R
- END TYPE S
- END TYPE T
- END TYPE U
- END TYPE V
- END TYPE W
- END TYPE X
- END TYPE Y
- END TYPE Z



Diaphragm Type	END TYPE	BEARING RECESS	X	Y	Z	SAWTEETH
End Diaph. on Girder	A	YES	1'-6"	9"	YES	YES
"I" Abutment	B	YES	0"	0"	NO	NO
Hinge Diaph. on Intern. Pier	C	NO	1'-6"	9"	YES	YES
Fixed Diaph. @ Intern. Pier	D	NO	1'-6"	ALT. 1 OR ALT. 2 STRAND EXTEN.	YES	YES
Multi. Simple Spans @ Intern. Pier	E	YES	0"	0"	NO	NO



MARK	LOCATION	SIZE
G1	GIRDER STRIRUPS	5
G2	GIRDER END STRIRUPS	5
G3	GIRDER TOP FLANGE	5
G4	GIRDER LONGIT. FULL LENGTH	5
G5	GIRDER END LONGIT.	7
G6	GIRDER ROT. FLANGE TIES	W12 8
G7	GIRDER END LONGIT.	3
G9	GIRDER END LONGIT.	6

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS

WF42G GIRDER

DETAILS 1 OF 3

Supervisor _____

Designed By _____

Checked By _____

Bridge Projects Engr _____

Printed On _____

DATE _____

REVISION _____

DATE _____

BY _____

APPD _____

STATE _____

WASH _____

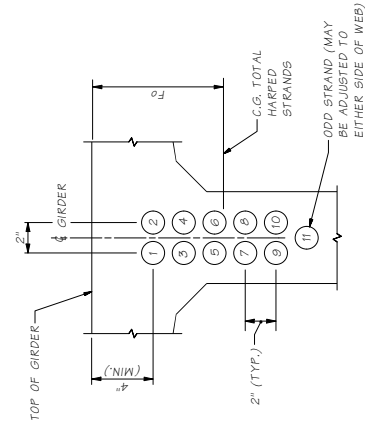
JOB NUMBER _____

PROJECT NUMBER _____

DATE _____

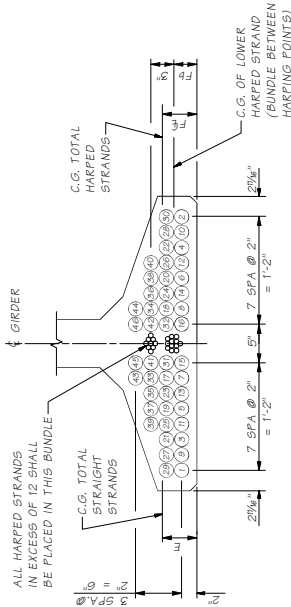
BY _____

APPD _____



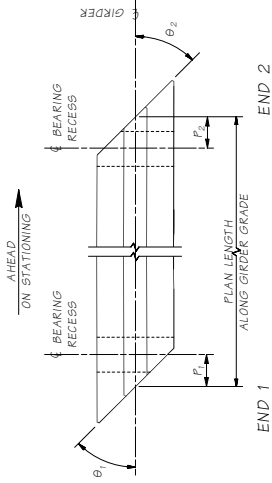
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



STRAND PATTERN AT $\frac{1}{2}$ SPAN

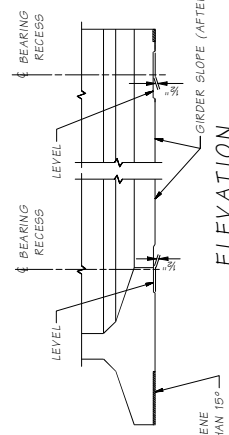
STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



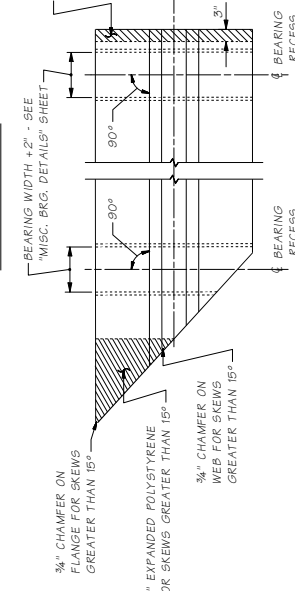
GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

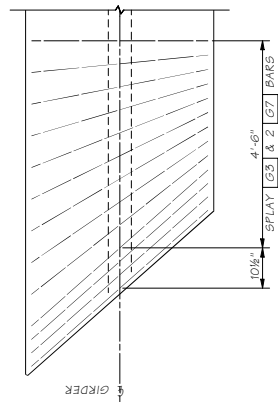
SPAN	GIRDER	END 1 TYPE	END 2 TYPE	L	θ_1	θ_2	P ₁	P ₂	PLAN LENGTH (ADJUSTED FOR GRADE)	MIN. CONC. COMP. STRENGTH	HARPED		STRAIGHT		TEMPORARY		LOCATION OF C.G. STRANDS (IN.)																					
											F.C (KSI) @ FINAL	F.C (KSI) @ RELEASE	NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	E	F _a	F _b	F _c	C	D @ 40 DAYS	D @ 120 DAYS	(N ₁) PL												
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



ELEVATION

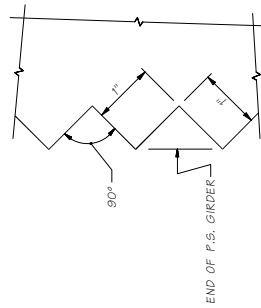


PLAN - BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION DETAIL



TRANSVERSE REINFORCING SKEWED ENDS

ONLY TRANSVERSE REINF. SHOWN



SAWTOOTH DETAILS

SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - WF42G GIRDER DETAILS 1 OF 3

Bridge Design Eng. _____
 Supervisor _____
 Checked By _____
 Created By _____
 Printm Plan By _____
 Architect/Specifier _____

DATE _____ REVISION _____ BY _____ APPD _____

JOB NO. _____ SHEET _____

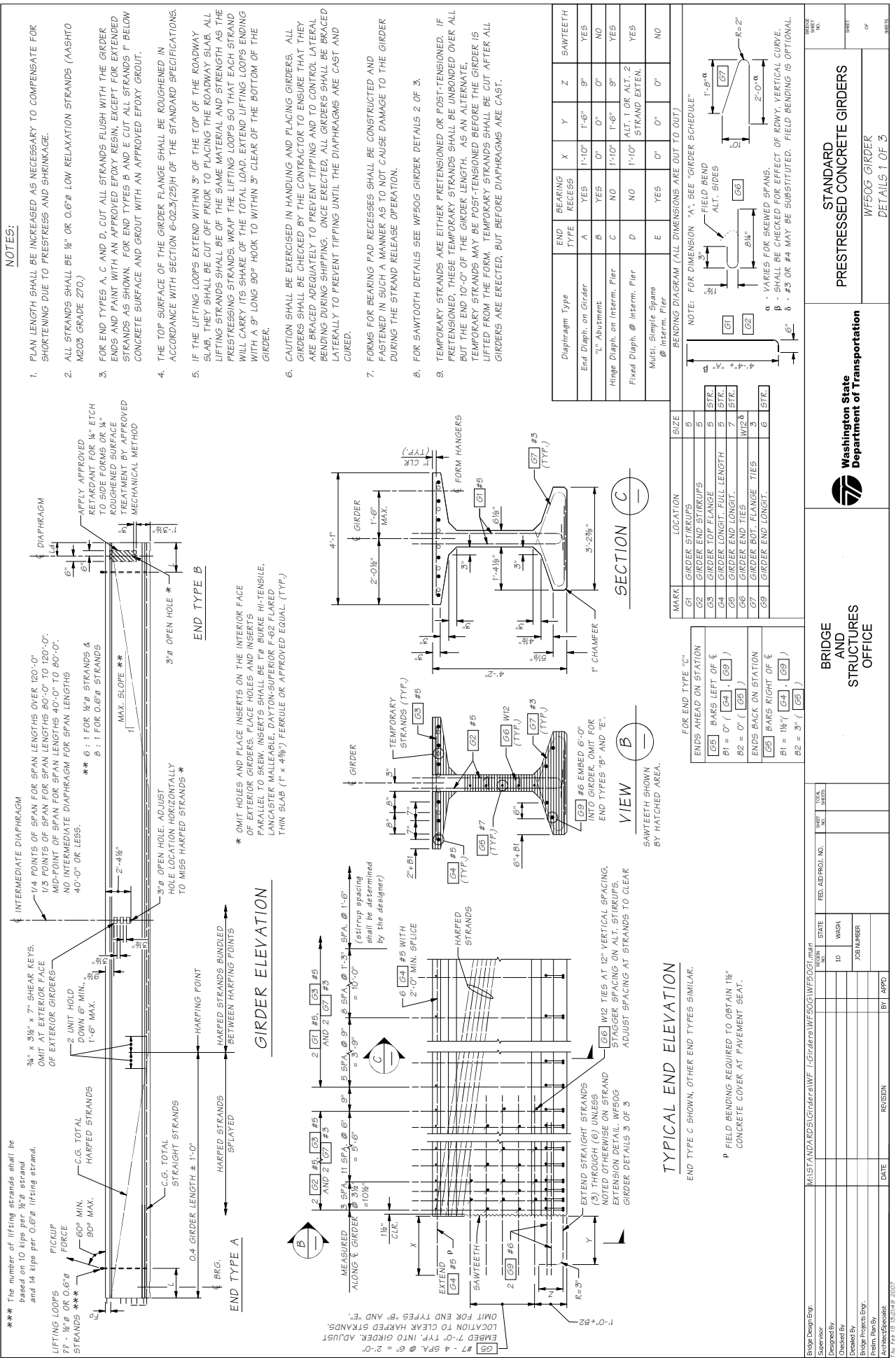
STATE _____ FEDERAL PROJECT NO. _____ SHEET NO. _____ TOTAL SHEETS _____

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS
 WF42G GIRDER
 DETAILS 2 OF 3

DATE _____ SHEET _____ OF _____ SHEETS _____



Diaphragm Type	END BEARING RECESS	X	Y	Z	SAWTEETH
End Diaphragm on Girder	A	YES	1'-6"	9"	YES
"I" Abutment	B	YES	0"	0"	NO
Hinge Diaphragm on Interm. Pier	C	NO	1'-6"	9"	YES
Fixed Diaphragm on Interm. Pier	D	NO	1'-10"	ALT. 1 OR ALT. 2 STRAND EXTEN.	YES
Multi. Simple Spans @ Interm. Pier	E	YES	0"	0"	NO

MARK	LOCATION	SIZE
G1	GIRDER STRIRRUPS	5
G2	GIRDER END STRIRRUPS	5
G3	GIRDER TOP FLANGE	5
G4	GIRDER LONGIT. FULL LENGTH	5
G5	GIRDER END LONGIT.	5
G6	GIRDER END TIES	W12, W16, W20
G7	GIRDER END FLANGE TIES	3
G8	GIRDER END LONGIT.	3

FOR END TYPE "C"			
ENDS AHEAD ON STATION	ENDS BACK ON STATION	BARS LEFT OF &	
G5	G5	B1 = 0"	(G4, G9)
B2 = 0"	(G5)	B2 = 0"	(G5)
G5	G5	B1 = 1 1/2"	(G4, G9)
B2 = 3"	(G5)	B2 = 3"	(G5)

BRIDGE AND STRUCTURES OFFICE		Washington State Department of Transportation		STANDARD CONCRETE GIRDERS	
PRESTRESSED CONCRETE GIRDERS		WF50G GIRDER		DETAILS 1 OF 3	

Job No. _____ SHEET _____ OF _____

Scale _____

Design By _____

Checked By _____

Bridge Projects Eng. _____

Printed On _____

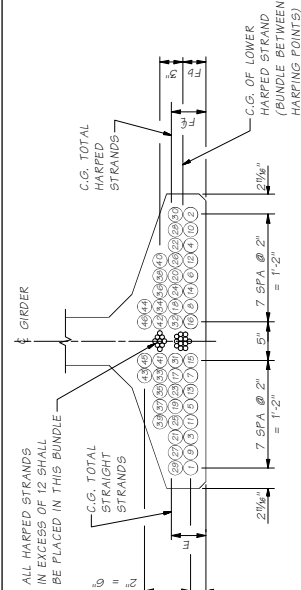
Architect/Assoc. _____

Date _____

Revised _____

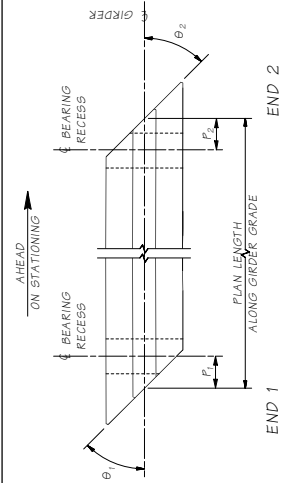
By _____

Appd _____



STRAND PATTERN AT 1/4 SPAN

STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



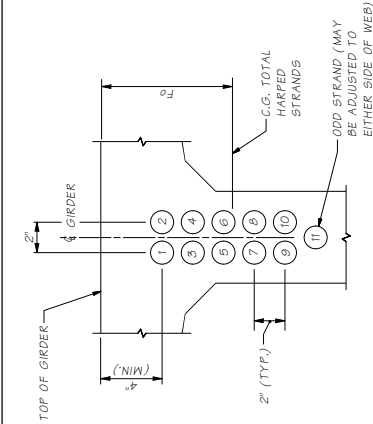
GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

SPAN	GIRDER	END 1 TYPE	END 2 TYPE	L	θ_1	θ_2	F ₁	F ₂	PLAN LENGTH (ALONG GIRDER GRADE)	MIN. CONC. COMP. STRENGTH	F.C. (KSI) @ FINAL	F.C. (KSI) @ RELEASE	TEMPORARY			LOCATION OF C.G. STRANDS (IN)			D @ 40 DAYS (IN)	D @ 120 DAYS (IN)	L _D (IN)		
													NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)				E	F _E

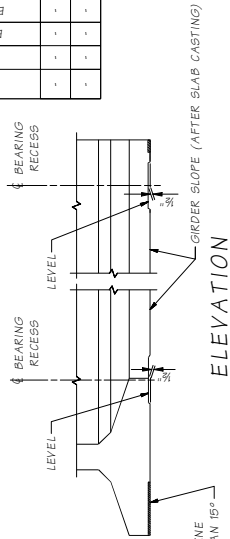
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.

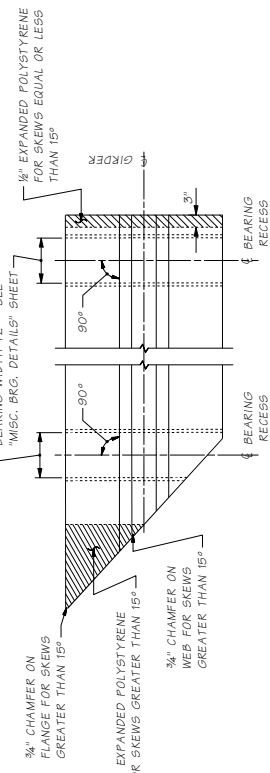


STRAND PATTERN AT GIRDER END

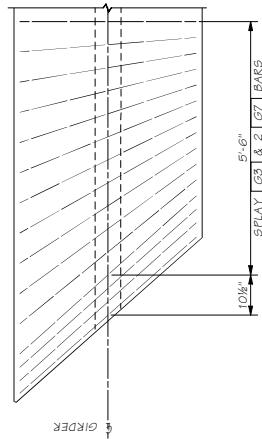
HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



ELEVATION



PLAN - BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION DETAIL



TRANSVERSE REINFORCING SKEWED ENDS

ONLY TRANSVERSE REINF. SHOWN

SAWTOOTH DETAILS

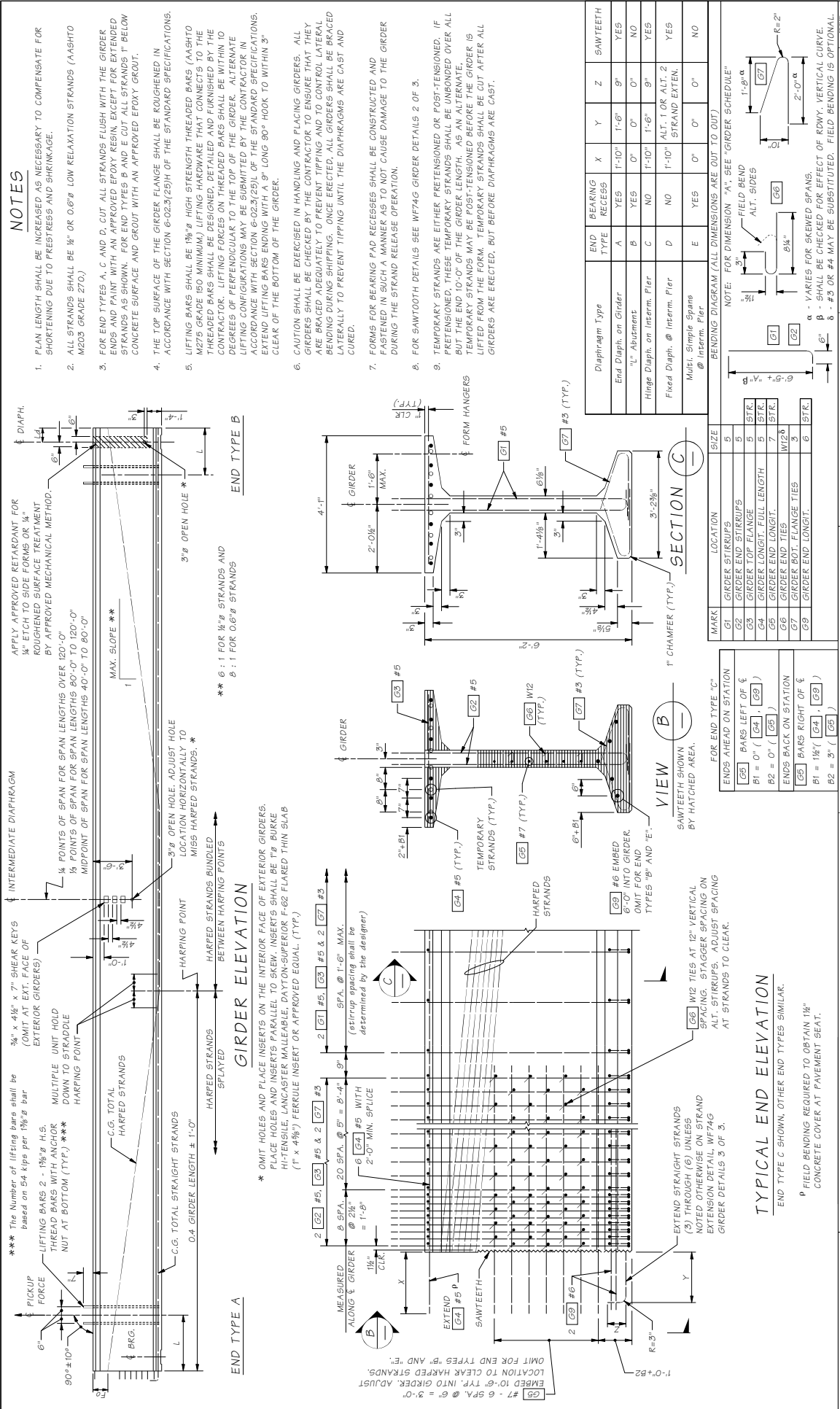
SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - WF50G GIRDER DETAILS 1 OF 3

Bridge Design Engr.	M151STANDARD@Girdera\WF 1-Girdera\WF50G\WF50G2.mxd	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Supervisor		WA			
Checked By		ID	WASH		
Detailled By		PCN NUMBER			
Bridge Project Engr.		DATE	REVISION	BY	APPD
Architect/Specifier					

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDER
WF50G GIRDER
DETAILS 2 OF 3



BRIDGE DESIGN MANUAL FEBRUARY 2007

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS
WF74G GIRDER
DETAILS 1 OF 3

Bridge Design Eng: _____
 Supervisor: _____
 Checked By: _____
 Bridge Projects Eng: _____
 Print Run By: _____
 Architect/Specifier: _____

DATE: _____

REVISION: _____

BY: _____

APPRO: _____

M:\STANDARD\Bridges\WF74G\WF74G.dwg

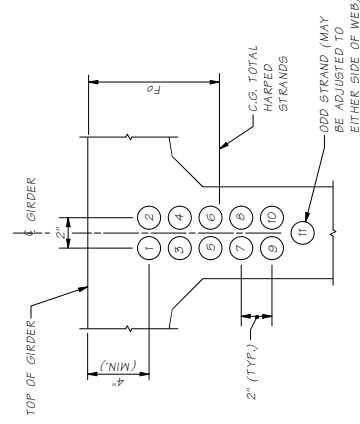
STATE: WASH
 JOB NO: 10
 SHEET NO: _____

FED. AID PROJ. NO. _____

TOTAL SHEETS: _____

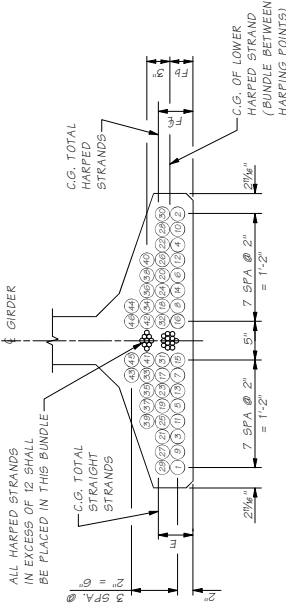
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5.6-A10-1



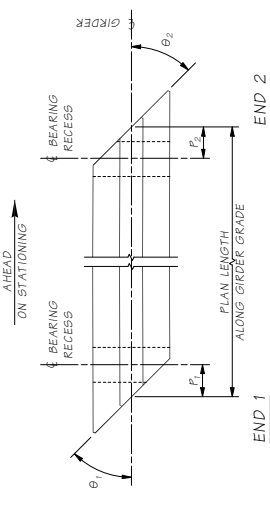
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



STRAND PATTERN AT ξ SPAN

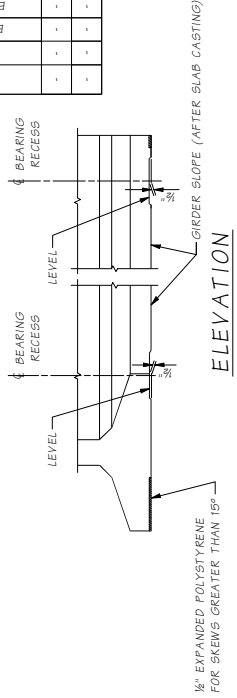
STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



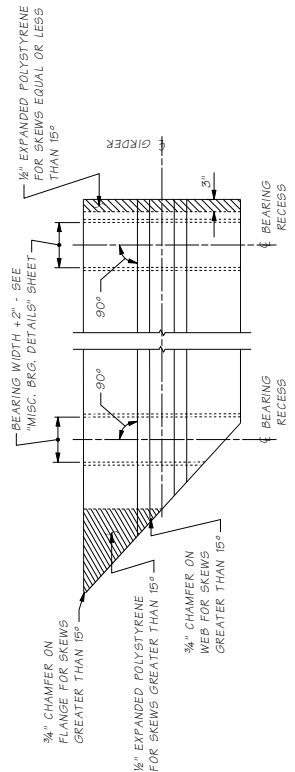
GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

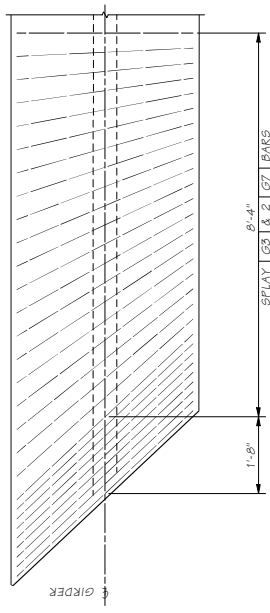
SPAN	GIRDER	END 1 TYPE	END 2 TYPE	L	θ_1	θ_2	F ₁	F ₂	PLAN LENGTH (ACING GIRDER GRADE)	MIN. CONC. COMP. STRENGTH		HARPED	STRAIGHT	TEMPORARY	LOCATION OF C.G. STRANDS (IN.)			LD (IN.)	
										F.C. (KSI) @ FINAL	F.C.I (KSI) @ RELEASE				NO. OF STRANDS	JACKING FORCE (RIPS)	NO. OF STRANDS		JACKING FORCE (RIPS)



ELEVATION



PLAN - BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION DETAIL



TRANSVERSE REINFORCING SKEWED ENDS

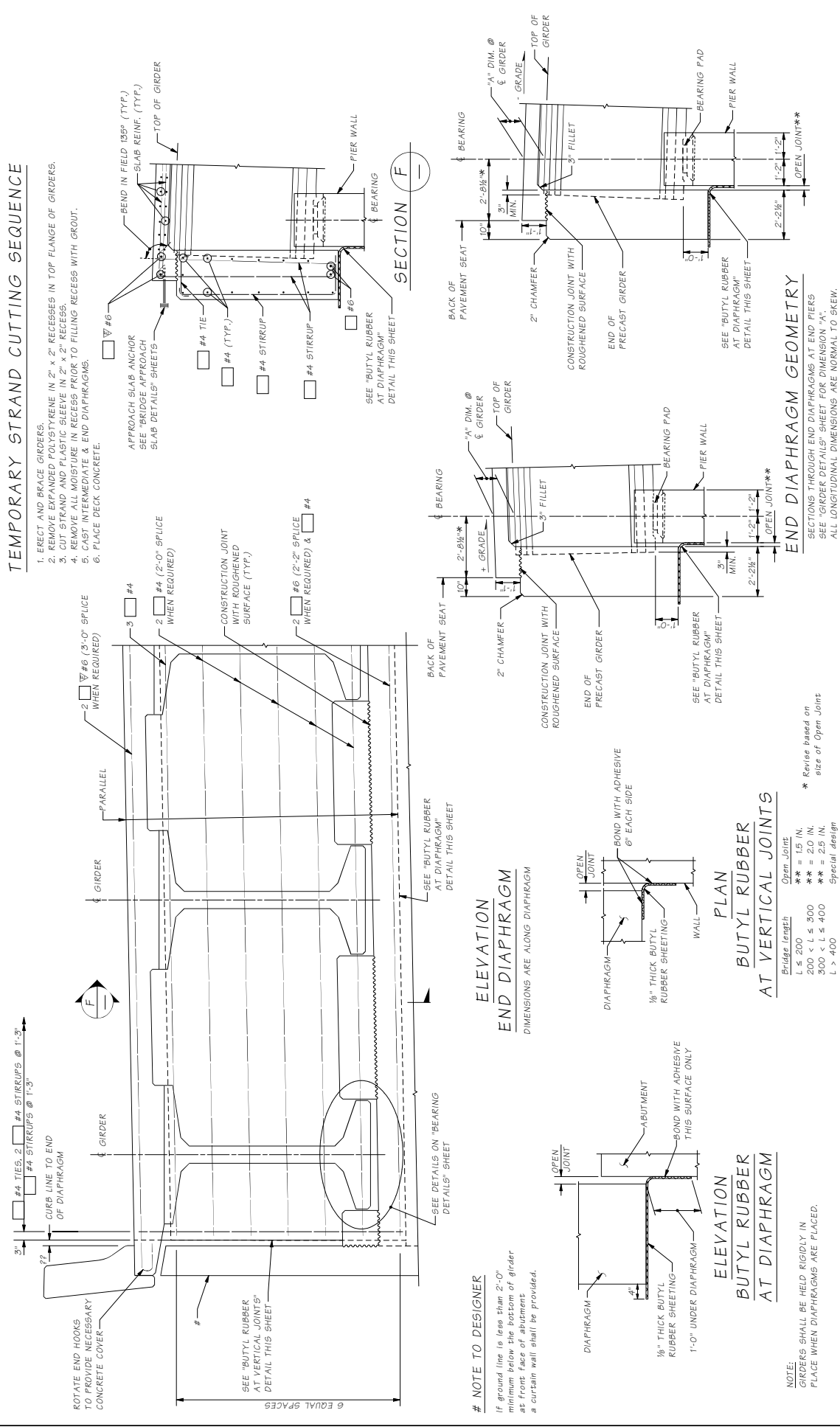
ONLY TRANSVERSE REINF. SHOWN

SAWTOOTH DETAILS

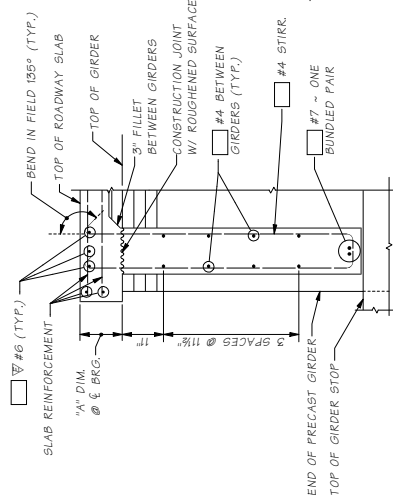
SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - WF74G GIRDER DETAILS 1 OF 3

Bridge Design Eng.	MJLSTANDARDS\Girders\WF 74G\WF74G2.mxd	DATE	REVISION	BY	APPD
Supervisor					
Designed By					
Checked By					
Detailled By					
Bridge Projects Eng.					
Printed Plan By					
Architect/Specifier					

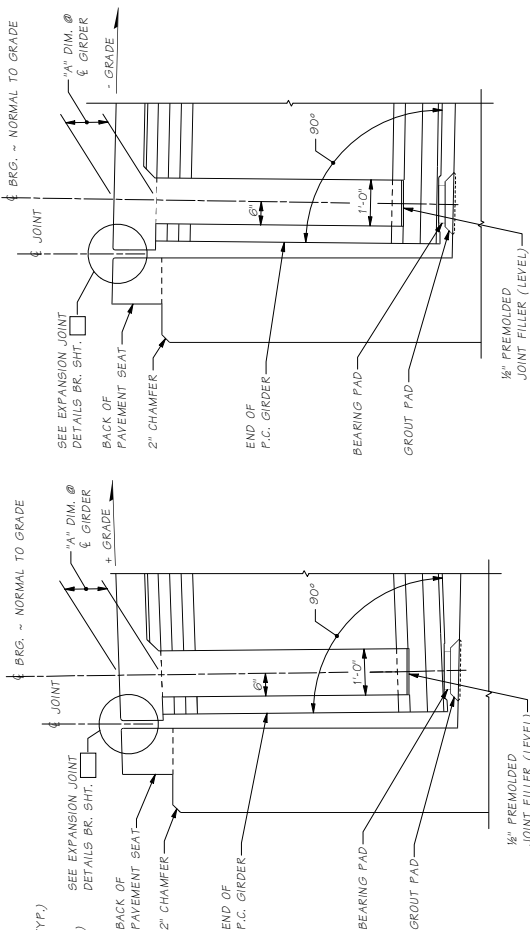
BRIDGE AND STRUCTURES OFFICE		Washington State Department of Transportation		STANDARD PRESTRESSED CONCRETE GIRDERS	
JOB NO.		SHEET		OF SHEETS	
5.6-A10-2		WF74G GIRDER		DETAILS 2 OF 3	



Subproject: WA181-AND-RD251-Girders/WF74G/WF74G	END DIA. ON GIR.MAN	SHEET NO.	TOTAL SHEETS
Checked By: []	DATE: []	REVISION: []	BY: []
Drawn By: []	DATE: []	REVISION: []	BY: []
Bridge Projects Eng. []	DATE: []	REVISION: []	BY: []
Architect/Specifier []	DATE: []	REVISION: []	BY: []
JOB NO. []	SHEET []	BRIDGE AND STRUCTURES OFFICE	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
STANDARD PRESTRESSED CONCRETE GIRDERS			WF74G END DIAPHRAGM ON GIRDER DETAILS

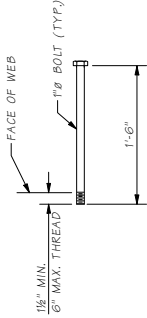


SECTION A



ELEVATION END DIAPHRAGM
DIMENSIONS ARE ALONG DIAPHRAGM

ANCHOR DETAIL
ASTM A-307



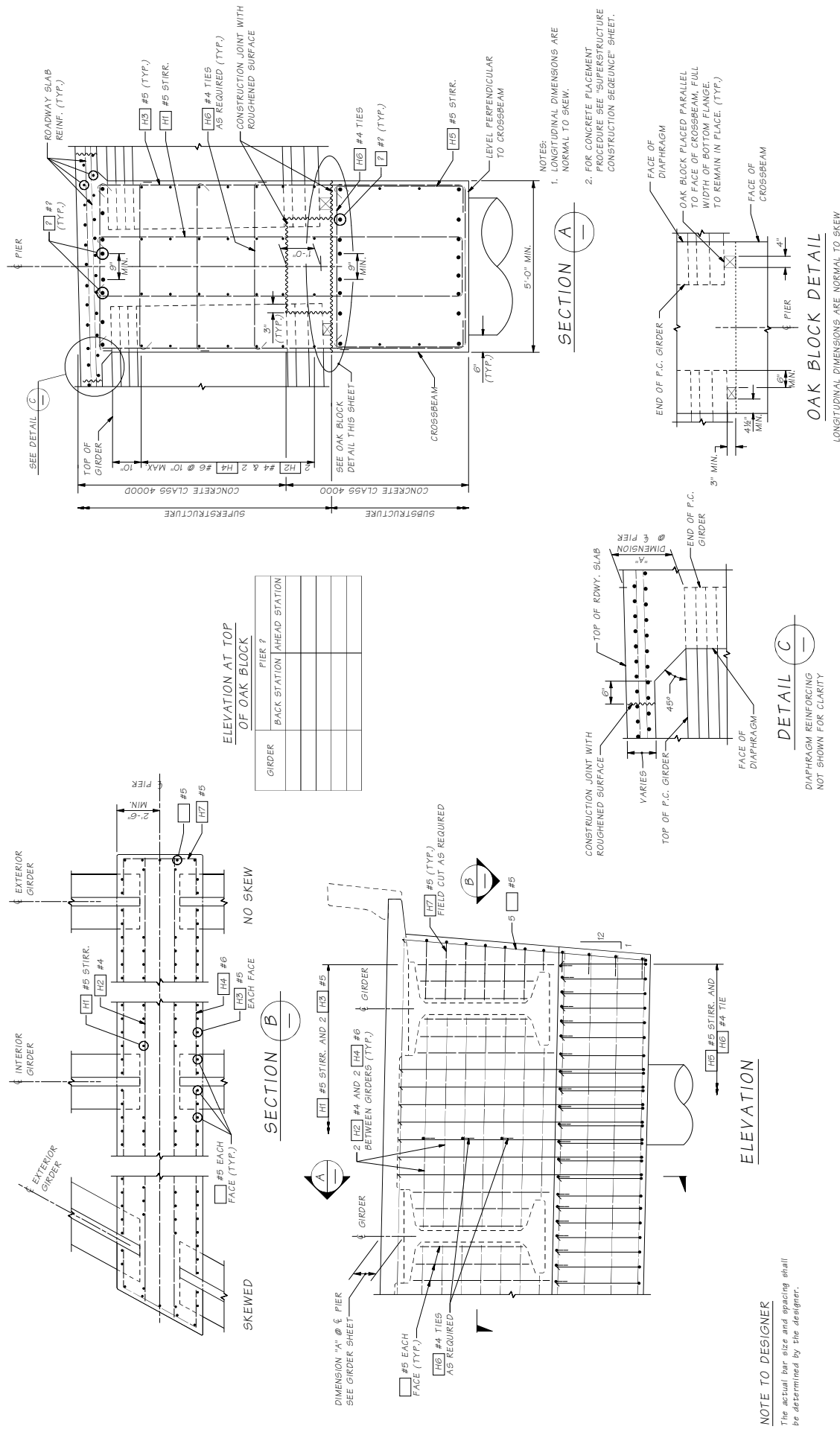
TEMPORARY STRAND CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESS.
4. REMOVE ALL MOISTURE IN RECESS PRIOR TO FILLING RECESS WITH GROUT.
5. CAST INTERMEDIATE & END DIAPHRAGMS.
6. PLACE DECK CONCRETE.

ROADWAY EXPANSION JOINT AT END PIERS

LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.
GIRDER STOP NOT SHOWN FOR CLARITY.

BRIDGE DESIGN ENGR.	MALSTANDARDS\Girders\WF74G-ABUT_PIER_DIAPH_DET.MAN	DATE	REVISION	BY	APPD
SUPERVISOR					
DESIGNED BY					
CHECKED BY					
DETAILED BY					
BRIDGE PROJECTS ENGR.					
PREP. PLAN BY					
ARCHITECT/SPECIEST					
JOB NO.	10	WASH			
SHEET					
OF					
SHEETS					
STANDARD PRESTRESSED CONCRETE GIRDERS		WASHINGTON STATE DEPARTMENT OF TRANSPORTATION			
WF74G ABUTMENT TYPE PIER DIAPHRAGM DETAILS					



ELEVATION AT TOP OF OAK BLOCK

GIRDER	PIER 7	
	BACK STATION	AHEAD STATION

BRIDGE DESIGN MANUAL
FEBRUARY 2007

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS
WF74C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

DATE: _____ BY: APFD
REVISION: _____

DESIGNED BY: _____
CHECKED BY: _____
BRIDGE PROJECTS ENGR: _____
ARCHITECT/SPECIALECT: _____

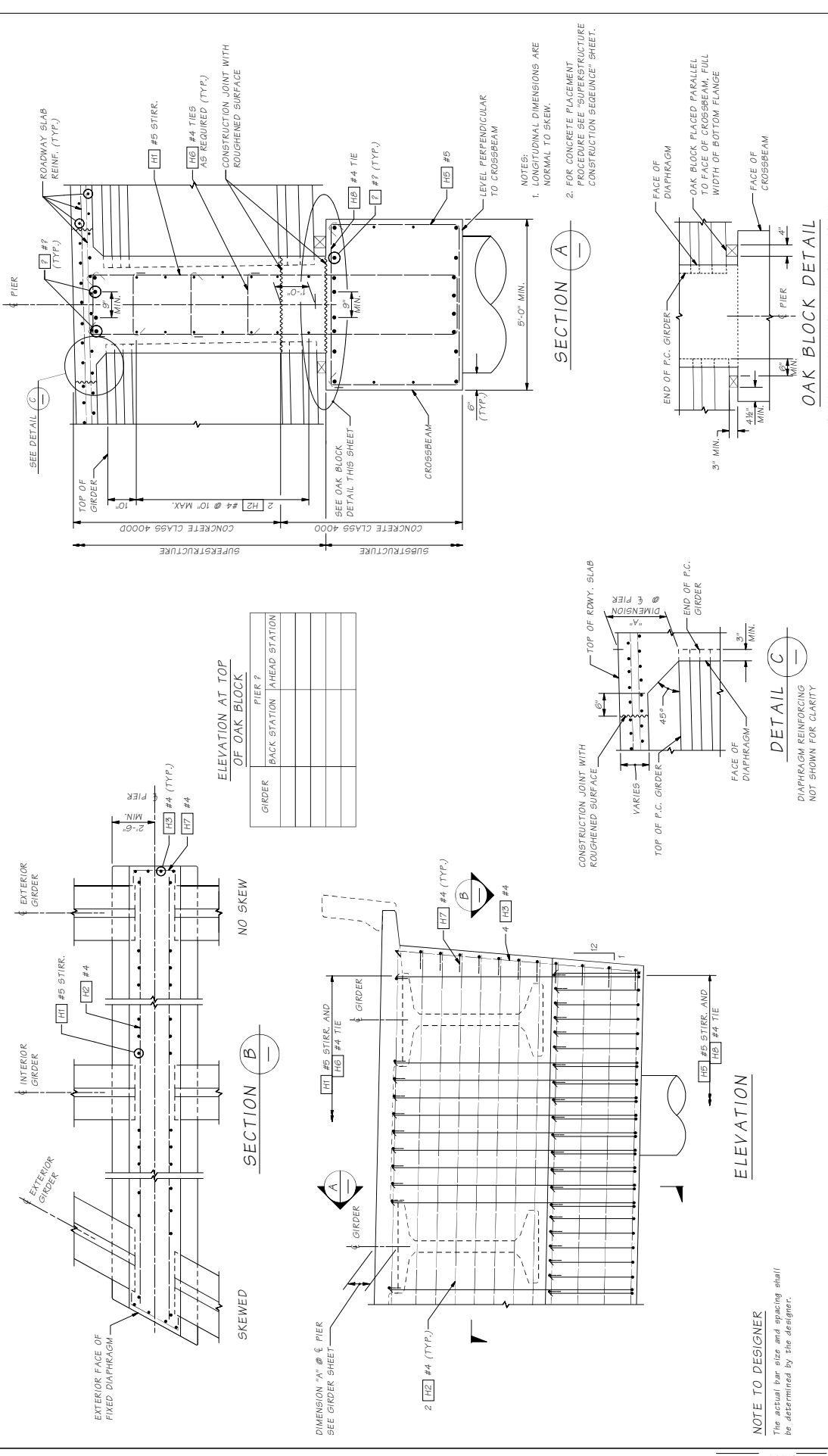
FED. AID PROJ. NO. _____ STATE _____ WASH _____
JOB NUMBER _____

TOTAL SHEETS _____ SHEET NO. _____

SR JOB NO. _____ SHEET _____

5.6-A10-5

Feb 15 13:22:24 2007



NOTE TO DESIGNER
 The actual bar size and spacing shall be determined by the designer.

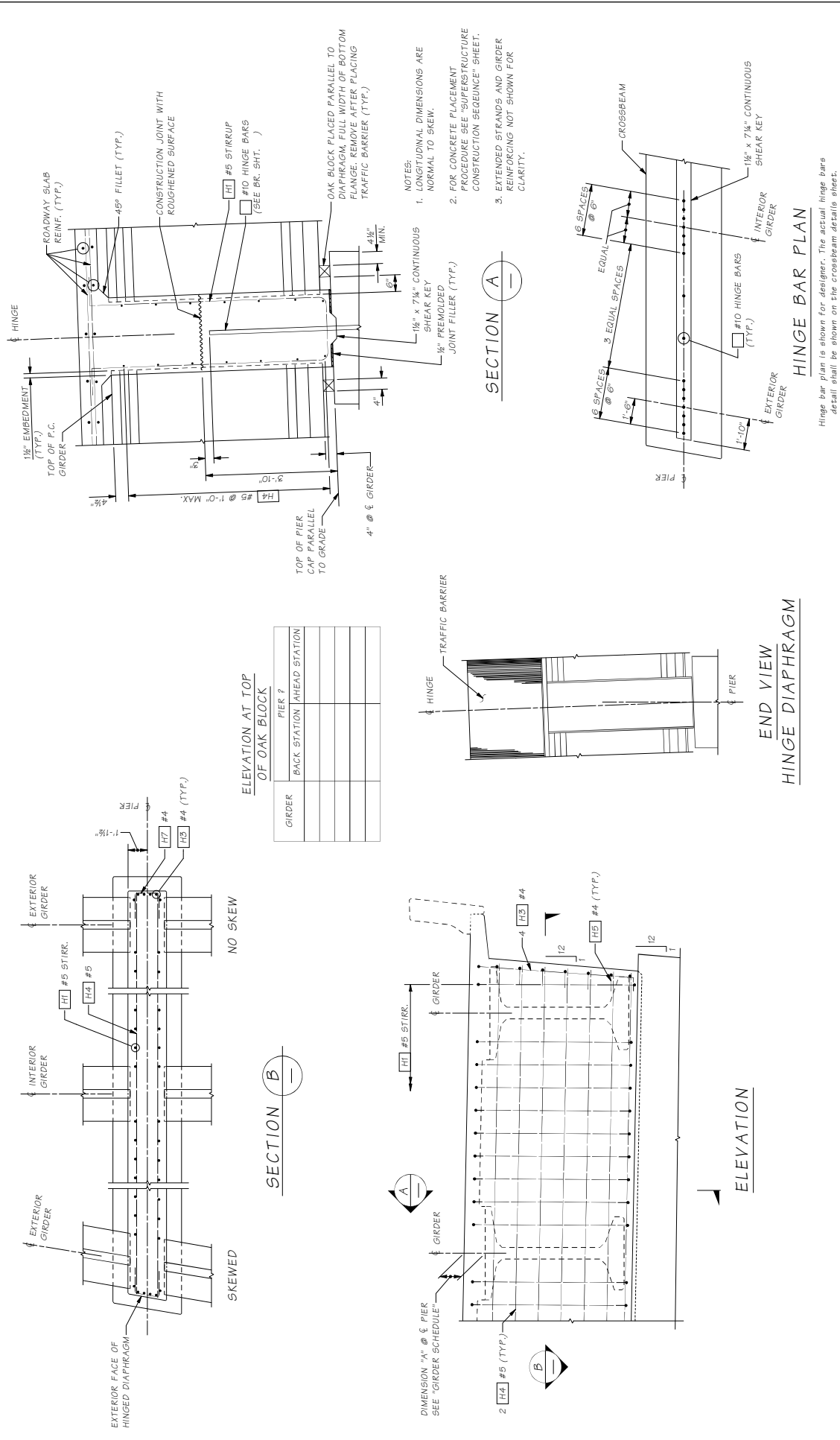
Bridge Design Eng.	DATE	REVISION	BY	APPD.
Checked By	DATE	REVISION	BY	APPD.
Scale	DATE	REVISION	BY	APPD.
Job No.	DATE	REVISION	BY	APPD.
Project No.	DATE	REVISION	BY	APPD.
State	DATE	REVISION	BY	APPD.
FED. AID PROJ. NO.	DATE	REVISION	BY	APPD.
Sheet No.	DATE	REVISION	BY	APPD.
Total Sheets	DATE	REVISION	BY	APPD.

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS

WF74C FIXED RECESSED-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS



BRIDGE DESIGN MANUAL FEBRUARY 2007

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS WF74G HINGE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

MAINT AND REPAIRS Girders WF 7 Girders WF 7 Girders WF 7 Girders WF 7 Girders WF 7 Girders WF 7

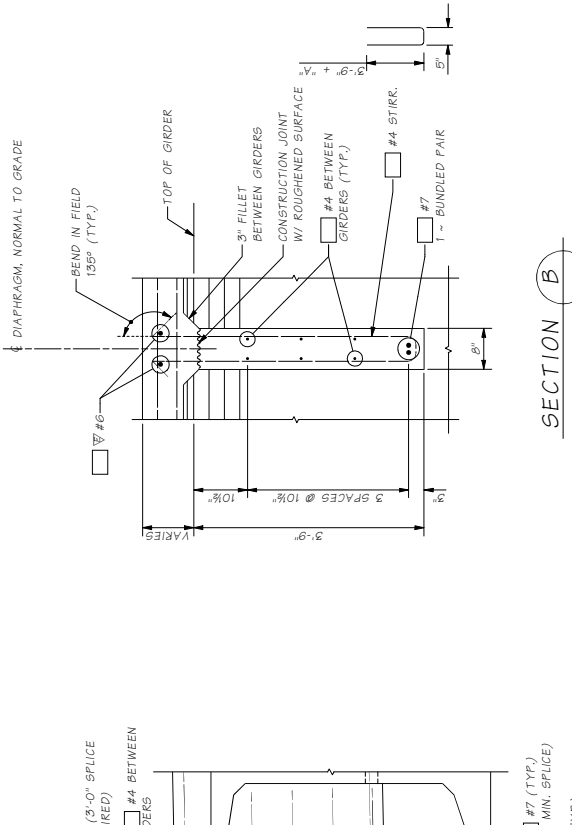
NO. STATE PROJ. NO. SHEET NO. SHEETS

10 WASH JOB NUMBER

DATE REVISION BY APPR

Architect/Inspector

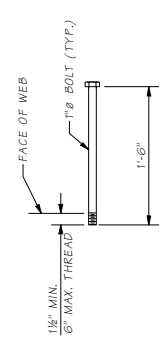
THE DATE 15 13,22:14 2007



ELEVATION
INTERMEDIATE DIAPHRAGM
DIMENSIONS ARE ALONG DIAPHRAGM

SEE FRAMING PLAN

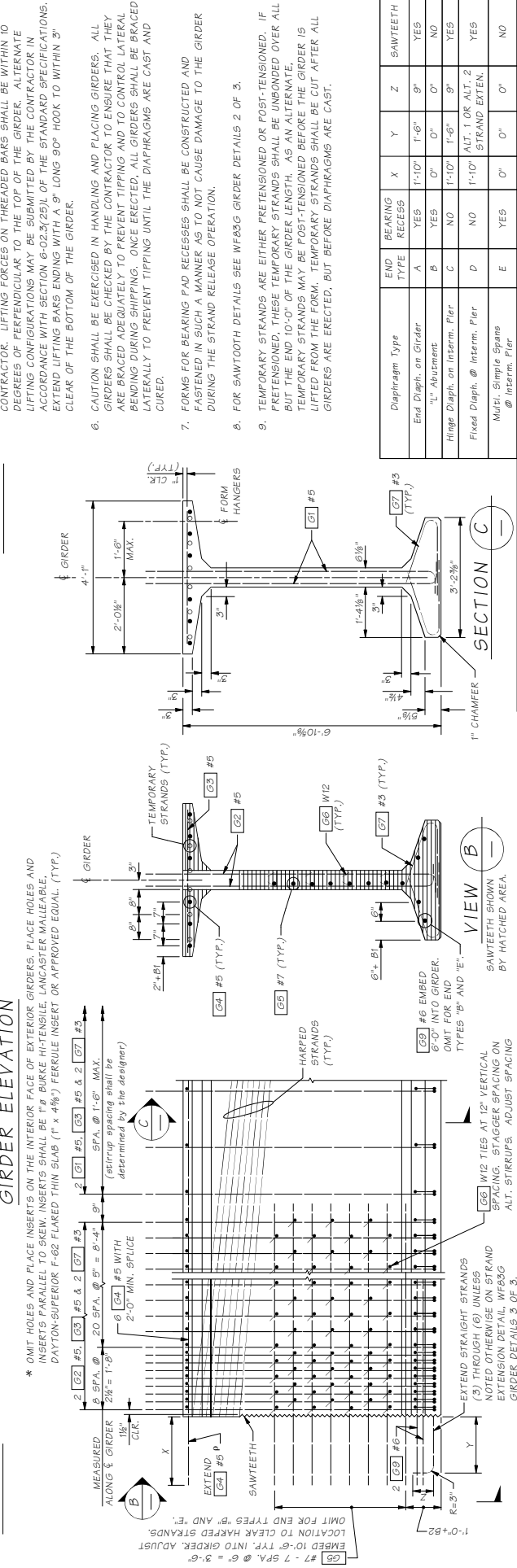
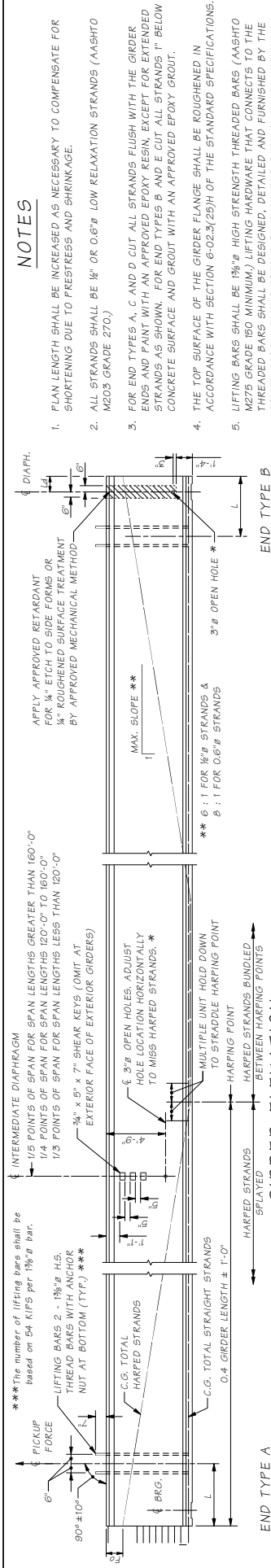
SEE "ANCHOR DETAIL" THIS SHEET



ANCHOR DETAIL
ASTM A-307

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.
REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

SR	JOB NO.	SHEET	DATE		REVISION	BY	APPD
Bridge Design Eng: Jerome A. Meigel Supervisor: Allen, T.M. Designed By: Checked By: Bridge Project Eng: Pretn. Plan by: Architect/Engineer:			REGION: STATE: WASH. DISTRICT: 10 JOB NUMBER:		MAINT AND ARDS (Girders) WF I-Girders WF74G INTER. DIAPHRAGM, DET. MAN FED. AID PROJ. NO.: WEST SURVEY NO.:		
Washington State Department of Transportation			BRIDGE AND STRUCTURES OFFICE			STANDARD PRESTRESSED CONCRETE GIRDERS WF74G INTERMEDIATE DIAPHRAGM DETAILS	
			SCALE: 1/4" = 1'-0" NO.		SHEET OF SETS		



NOTES

- PLAN LENGTH SHALL BE INCREASED AS NECESSARY TO COMPENSATE FOR SHORTENING DUE TO PRESTRESS AND SHRINKAGE.
- ALL STRANDS SHALL BE 1/2" OR 0.6" LOW RELAXATION STRANDS (AASHTO M203 GRADE 270).
- FOR END TYPES A, C AND D CUT ALL STRANDS FLUSH WITH THE GIRDER ENDS AND PAINT WITH AN APPROVED EPOXY RESIN, EXCEPT FOR EXTENDED STRANDS AS SHOWN. FOR END TYPES B AND E CUT ALL STRANDS 1" BELOW CONCRETE SURFACE AND GROUT WITH AN APPROVED EPOXY GROUT.
- THE TOP SURFACE OF THE GIRDER FLANGE SHALL BE ROUGHENED IN ACCORDANCE WITH SECTION 6-02.3(25)H OF THE STANDARD SPECIFICATIONS.
- LIFTING BARS SHALL BE 1/2" HIGH STRENGTH THREADED BARS (AASHTO M275 GRADE 60 MINIMUM) LIFTING HARDWARE THAT CONNECTS TO THE THREADED BARS SHALL BE DESIGNED, DETAILED AND FURNISHED BY THE CONTRACTOR. LIFTING FORCES ON THREADED BARS SHALL BE WITHIN 10 DEGREES OF PERPENDICULAR TO THE TOP OF THE GIRDER. ALTERNATE LIFTING CONFIGURATIONS MAY BE SUBMITTED BY THE CONTRACTOR IN ACCORDANCE WITH SECTION 6-02.3(25)H OF THE STANDARD SPECIFICATIONS. EXTEND LIFTING BARS ENDING WITH A 9" LONG 90° HOOK TO WITHIN 3" CLEAR OF THE BOTTOM OF THE GIRDER.
- CAUTION SHALL BE EXERCISED IN HANDLING AND PLACING GIRDERS. ALL GIRDERS SHALL BE CHECKED BY THE CONTRACTOR TO ENSURE THAT THEY ARE BRACED ADEQUATELY TO PREVENT TIPPING AND TO CONTROL LATERAL BENDING DURING SHIPPING. ONCE ERECTED, ALL GIRDERS SHALL BE BRACED LATERALLY TO PREVENT TIPPING UNTIL THE DIAPHRAGMS ARE CAST AND CURED.
- FORMS FOR BEARING PAD RECESSES SHALL BE CONSTRUCTED AND FASTENED IN SUCH A MANNER AS TO NOT CAUSE DAMAGE TO THE GIRDER DURING THE STRAND RELEASE OPERATION.
- FOR SAWTOOTH DETAILS SEE WF83G GIRDER DETAILS 2 OF 3.
- TEMPORARY STRANDS ARE EITHER PRETENSIONED OR POST-TENSIONED. IF PRETENSIONED, THESE TEMPORARY STRANDS SHALL BE UNBONDED OVER ALL BUT THE END 10'-0" OF THE GIRDER LENGTH. AS AN ALTERNATE, TEMPORARY STRANDS MAY BE POST-TENSIONED BEFORE THE GIRDER IS LIFTED FROM THE FORM. TEMPORARY STRANDS SHALL BE CUT AFTER ALL GIRDERS ARE ERECTED, BUT BEFORE DIAPHRAGMS ARE CAST.

MARKS

MARK	LOCATION	SIZE
G1	GIRDER STRIKES	5
G2	GIRDER END STRIKES	6
G3	GIRDER FLANGE STR.	6
G4	GIRDER LONGIT. STR.	7
G5	GIRDER END TIES.	W(28)
G6	GIRDER ROT. FLANGE TIES	3
G7	GIRDER END LONGIT.	6
G8	GIRDER END LONGIT.	6

BENDING DIAGRAM (ALL DIMENSIONS ARE OUT TO OUT).

NOTE: FOR DIMENSION "A", SEE "GIRDER SCHEDULE"

ENDS AHEAD ON STATION

G5 BARS LEFT OF §

B1 = 0' (G4) (G9)

B2 = 0' (G5)

ENDS BACK ON STATION

G5 BARS RIGHT OF §

B1 = 1/2' (G4) (G9)

B2 = 3' (G5)

FOR END TYPE "C"

G6 BARS LEFT OF §

B1 = 0' (G4) (G9)

B2 = 0' (G5)

ENDS BACK ON STATION

G6 BARS RIGHT OF §

B1 = 1/2' (G4) (G9)

B2 = 3' (G5)

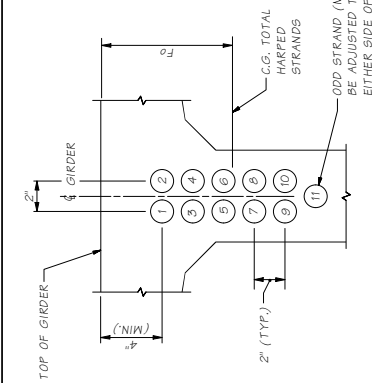
BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

STANDARD PRESTRESSED CONCRETE GIRDERS

WF83G GIRDER DETAILS 1 OF 3

Prestressed Concrete Superstructure

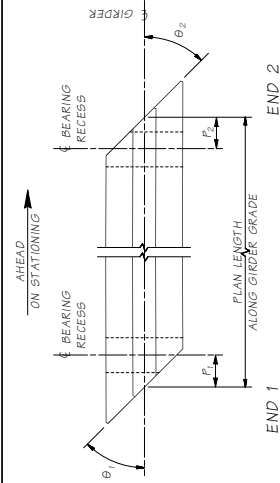
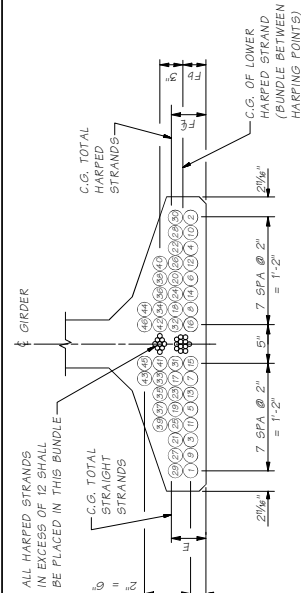


STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.

STRAND PATTERN AT 1/4 SPAN

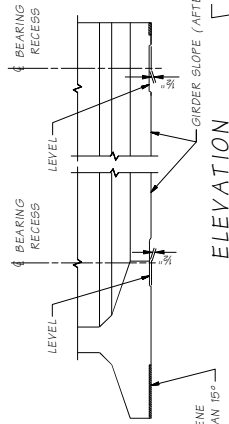
STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

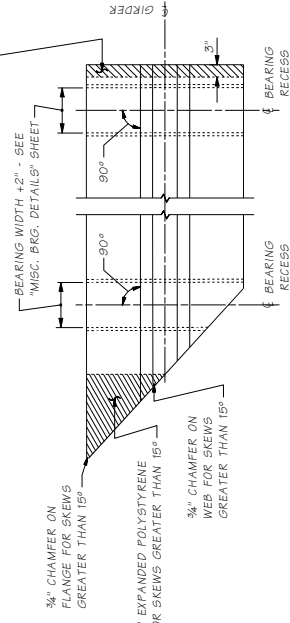
Table with columns for SPAN, GIRDER, END 1 TYPE, END 2 TYPE, L, theta 1, theta 2, F1, F2, PLAN LENGTH (ALONG GIRDER GRADE), MIN. CONC. COMP. STRENGTH (F.C. (KSI) @ FINAL, F.C.I (KSI) @ RELEASE), HARPED (NO. OF STRANDS, JACKING FORCE (KIPS)), STRAIGHT (NO. OF STRANDS, JACKING FORCE (KIPS)), TEMPORARY (NO. OF STRANDS, JACKING FORCE (KIPS)), LOCATION OF C.G. STRANDS (F, E, Fb, Fc), D @ 40 DAYS (IN), D @ 120 DAYS (IN), and Ld (IN).



ELEVATION

1/2" EXPANDED POLYSTYRENE FOR SKEWS EQUAL OR LESS THAN 15°

1/2" EXPANDED POLYSTYRENE FOR SKEWS GREATER THAN 15°

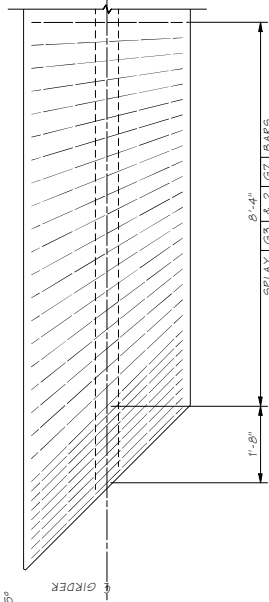


3/4" CHAMFER ON FLANGE FOR SKEWS GREATER THAN 15°

1/2" EXPANDED POLYSTYRENE FOR SKEWS GREATER THAN 15°

3/4" CHAMFER ON WEB FOR SKEWS GREATER THAN 15°

PLAN - BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION DETAIL



TRANSVERSE REINFORCING SKEWED ENDS

ONLY TRANSVERSE REINF. SHOWN

SAWTOOTH DETAILS

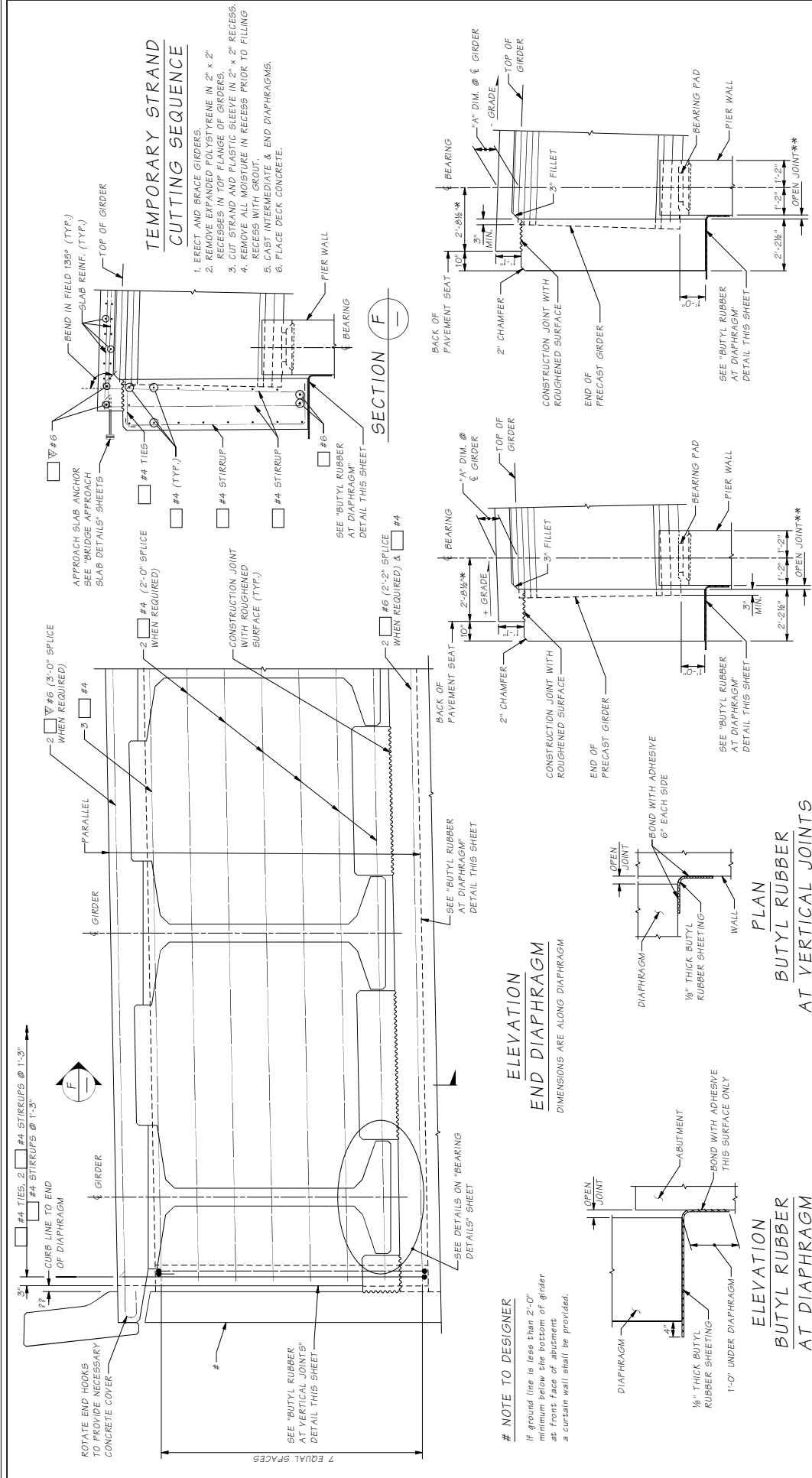
SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - WF83G GIRDER DETAILS 1 OF 3

Metadata table with fields for Bridge Design Eng., Supervisor, Described By, Checked By, Bridge Projects Eng., Prelim. Plan By, Architect/Specifier, DATE, REVISION, and I/BY /APPD.

Table with fields for MAIN STATE, FED. AID PROJ. NO., SHEET NO., and SHEET TOTAL.

Washington State Department of Transportation logo and text: BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS, WF83G GIRDER DETAILS 2 OF 3



END DIAPHRAGM GEOMETRY

SECTIONS THROUGH END DIAPHRAGMS AT END PIERS
SEE "PIERS THROUGH ENDS OF GIRDERS" SECTION FOR DETAILS
ALL LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.

**ELEVATION
END DIAPHRAGM**

DIMENSIONS ARE ALONG DIAPHRAGM

NOTE TO DESIGNER
If ground line is less than 2'-0"
minimum below the bottom of girder
at front face of abutment
a curtain wall shall be provided.

**PLAN
BUTYL RUBBER
AT VERTICAL JOINTS**

Bridge Length
L ≤ 200 ** = 1.5 IN.
200 < L ≤ 300 ** = 2.0 IN.
300 < L ≤ 400 ** = 2.5 IN.
L > 400 Special design

NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN
PLACE WHEN DIAPHRAGMS ARE PLACED.

Supervisor	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Designed By	10	WASH		
Checked By		JOB NUMBER		
Printed On By		DATE	BY	APPD
Architect/Consultant		REVISION		

MA15T AND ARD51 Girders/WF 1-Girders/WF83G/WF83G END DIA. ON GIR. MAIN

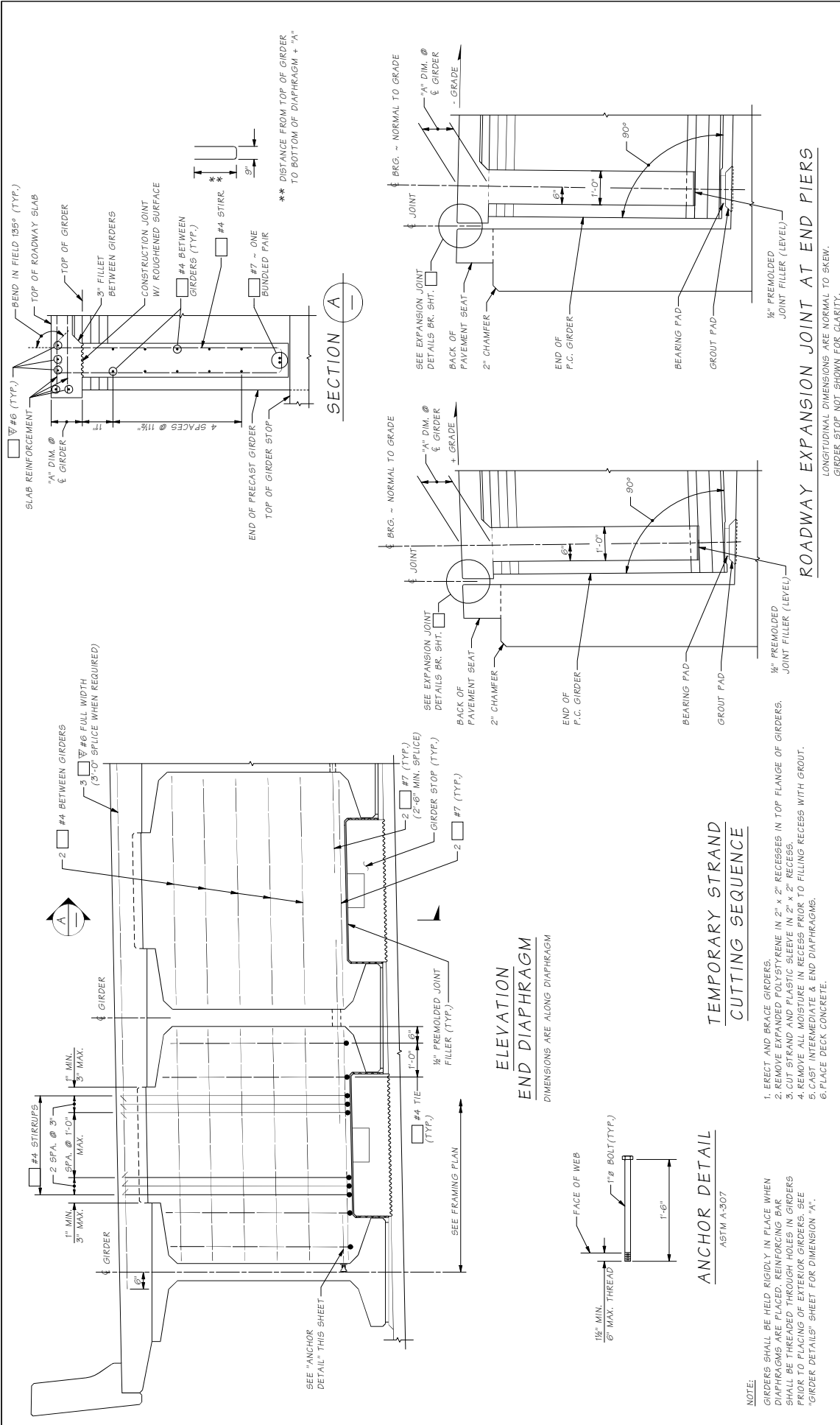
BRIDGE DESIGN ENGINEER

BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

STANDARD PRESTRESSED CONCRETE GIRDERS

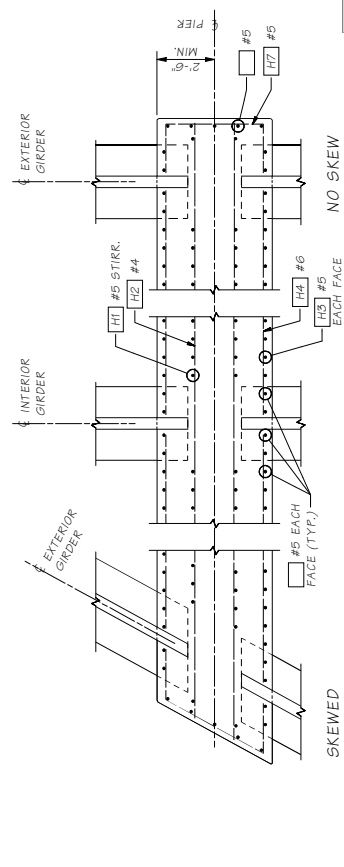
WF83G END DIAPHRAGM ON GIRDER DETAILS



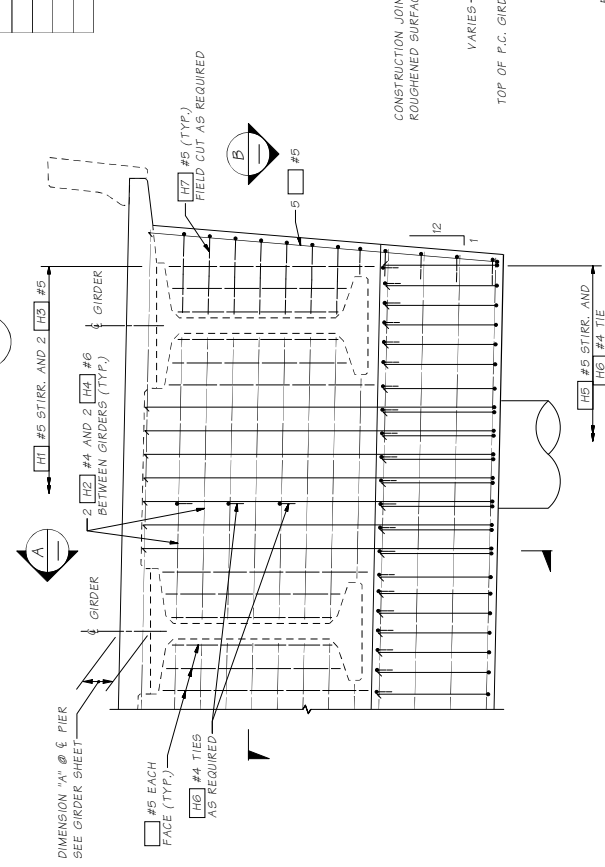
Bridge Design Engr:	W1STANDARD2Girder/WF I-Girder/WB3GAWB3G ABUT-PIER DIAPHR DET.MAN	DATE	REVISION	BY	APPD
Supervisor					
Designed By:					
Checked By:					
Detailed By:					
Bridge Projects Engr:					
Printed By:					
Architect/Engineer:					

WASH STATE	FED. AID PROJ. NO.	SHEET	NO.
10			
WASHA			
JOB NUMBER			

BRIDGE AND STRUCTURES OFFICE		Washington State Department of Transportation		STANDARD PRESTRESSED CONCRETE GIRDERS		WF83G ABUTMENT TYPE PIER DIAPHRAGM DETAILS	
------------------------------	--	---	--	---------------------------------------	--	--	--

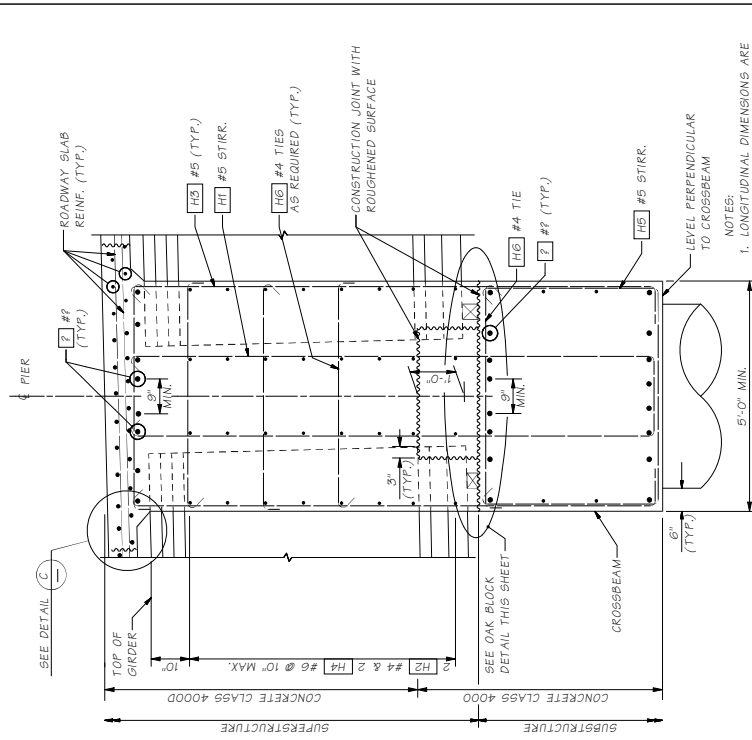


SECTION B



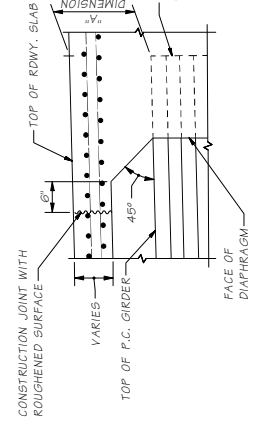
ELEVATION

NOTE TO DESIGNER
The actual bar size and spacing shall be determined by the designer.



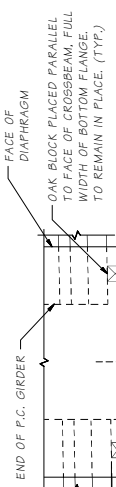
SECTION A

NOTES:
1. LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.
2. FOR CONCRETE PLACEMENT PROCEDURE SEE "SUPERSTRUCTURE CONSTRUCTION SEQUENCE" SHEET.



DETAIL C

DIAPHRAGM REINFORCING NOT SHOWN FOR CLARITY



OAK BLOCK DETAIL

LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW

ELEVATION AT TOP OF OAK BLOCK

GIRDER	PIER 7
	BACK STATION AHEAD STATION

Washington State Department of Transportation

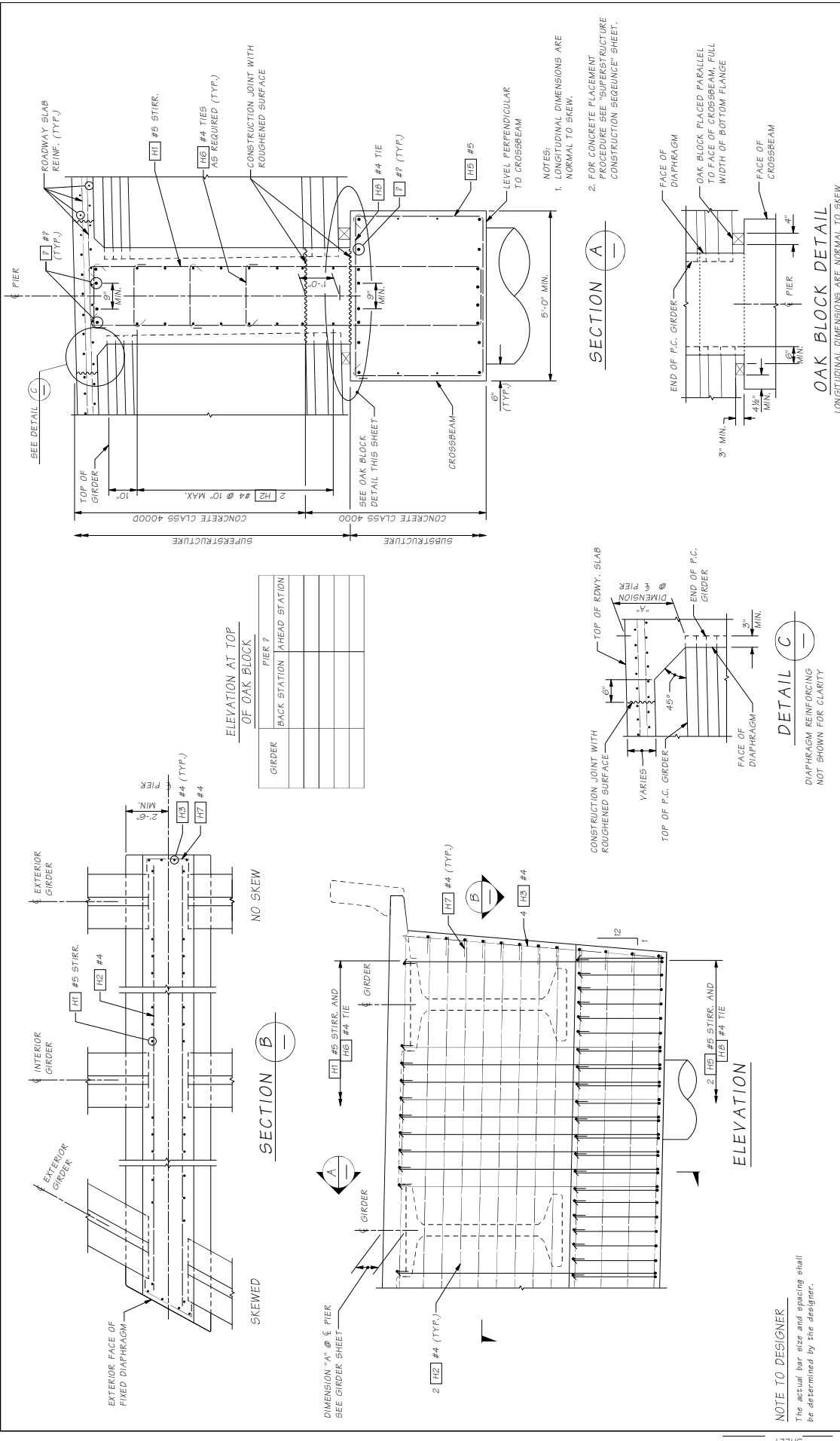
BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS
WF83C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

DATE: _____ BY: APFD
REVISION: _____

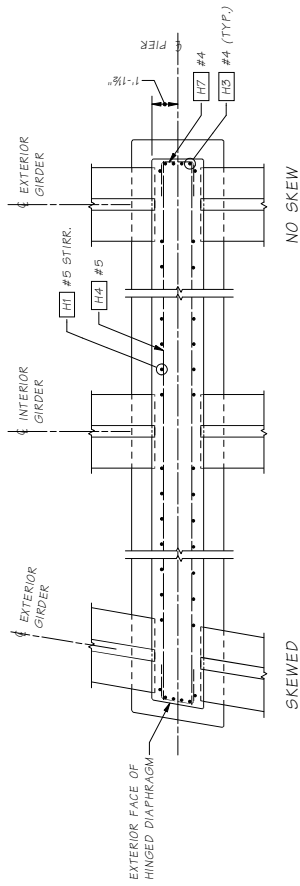
JOB NO. _____ SHEET _____ OF _____ SHEETS

9.6-A11-5



Bridge Design Exp. Checked By Drawn By		WASHINGTON STATE FEDERAL PROJECT NO.		SHEET NO. TOTAL SHEETS	
Date Revision		STATE WASH		JOB NUMBER	
By ARPD		DATE		REVISION	

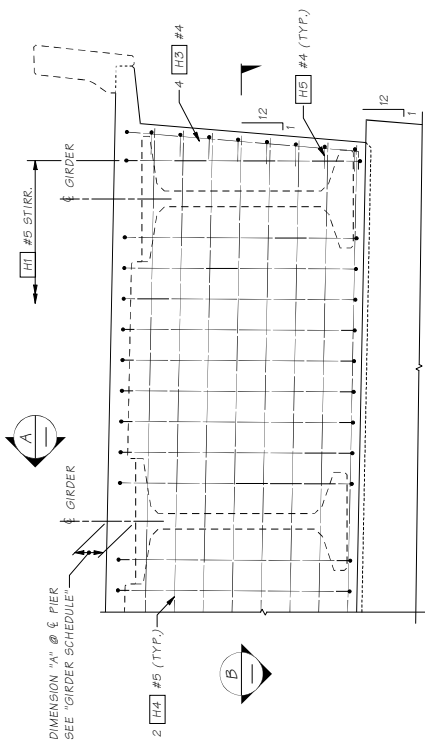
WASHINGTON STATE
 Department of Transportation
 STANDARD
 PRESTRESSED CONCRETE GIRDERS
 WF83G FIXED RECESSED-FACE DIAPHRAGM
 AT INTERMEDIATE PIER DETAILS



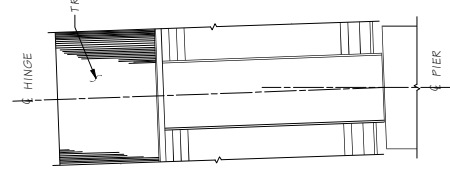
SECTION B

ELEVATION AT TOP OF OAK BLOCK

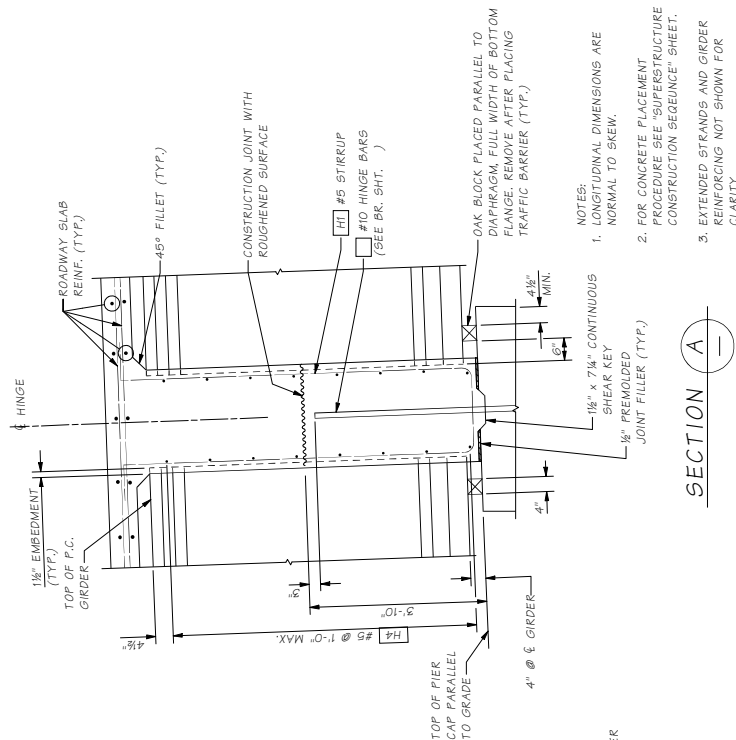
GIRDER	PIER ?	BACK STATION (AHEAD STATION)



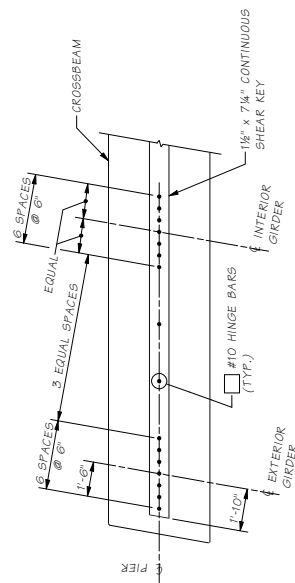
ELEVATION



END VIEW HINGE DIAPHRAGM



SECTION A

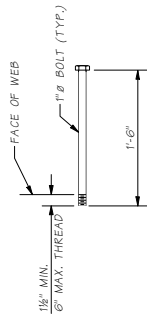
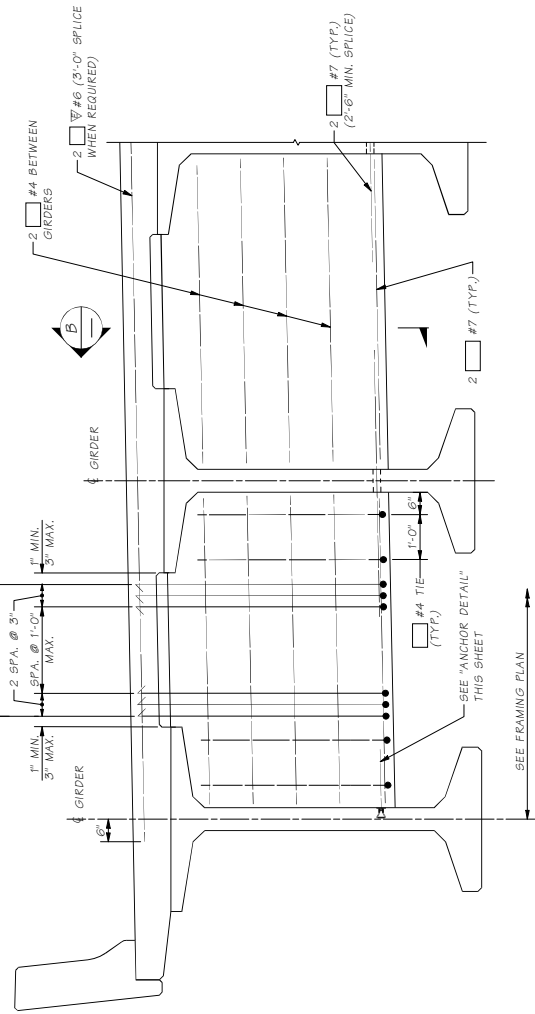


HINGE BAR PLAN

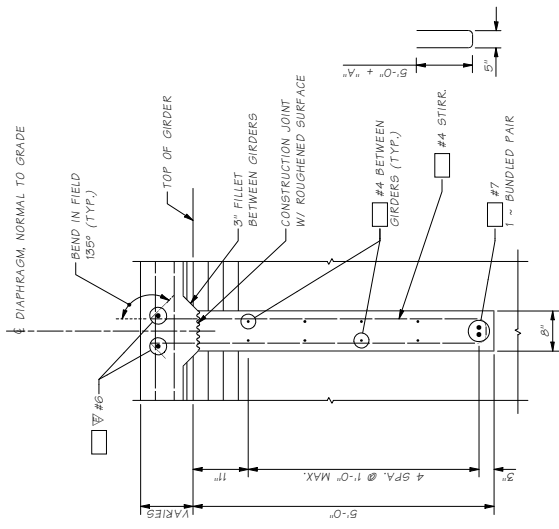
- NOTES:
1. LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.
 2. FOR CONCRETE PLACEMENT PROCEDURE SEE "SUPERSTRUCTURE CONSTRUCTION SEQUENCE" SHEET.
 3. EXTENDED STRANDS AND GIRDER CLARITY.

Hinge bar plan is shown for designer. The actual hinge bars detail shall be shown on the crossbeam details sheet.

Bridge Design Engr.	MA15TANDARDS/Girders/WF1-Girders/W83G/W85G	HINGE_DIAPHRAGM_INTER_PIER_DEF.MAN	NO.	STATE	FEEL	PROD. NO.	NO.	SHEETS	TOTAL
Supervisor			10	WASH					
Designed By									
Checked By									
Bridge Projects Engr.									
Proj. Plan By									
Architect/Specifier									
DATE		REVISION		BY	APPD				



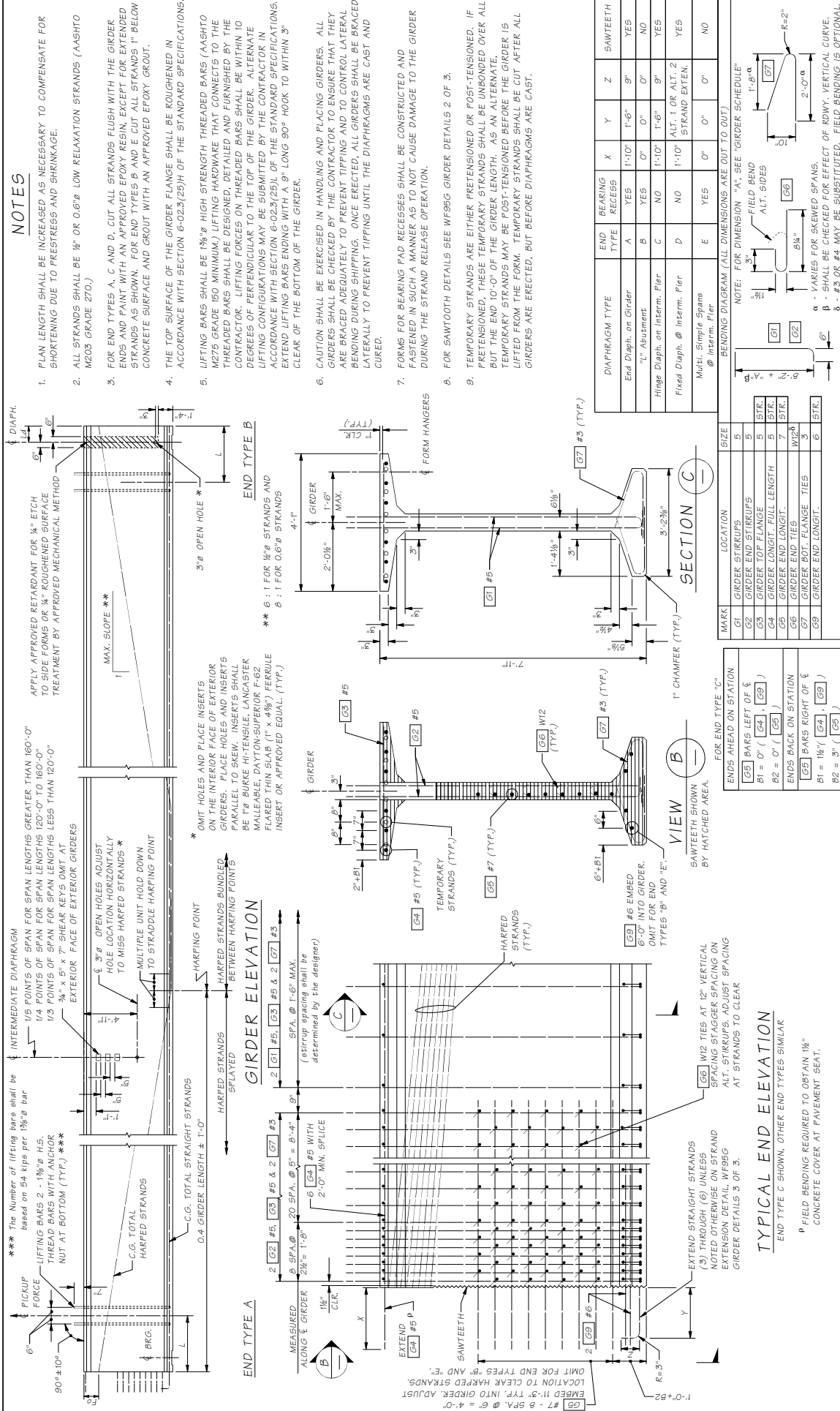
NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED.
REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR
TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".



ELEVATION
INTERMEDIATE DIAPHRAGM
DIMENSIONS ARE ALONG DIAPHRAGM

SECTION B-B

BRIDGE SHEET NO.	STANDARD SHEET	
	SHEET	OF SHEETS
PRESTRESSED CONCRETE GIRDERS		
WF83G - INTERMEDIATE DIAPHRAGM DETAILS		
Washington State Department of Transportation		
BRIDGE AND STRUCTURES OFFICE		
Project No.	DATE	BY / APP'D
Job Number	REVISION	
State	WASH	
FED. AID PROJ. NO.		
DESIGNER	INTERMEDIATE DIAPHRAGM DET./MAN	SHEET NO.
TOTAL SHEETS		



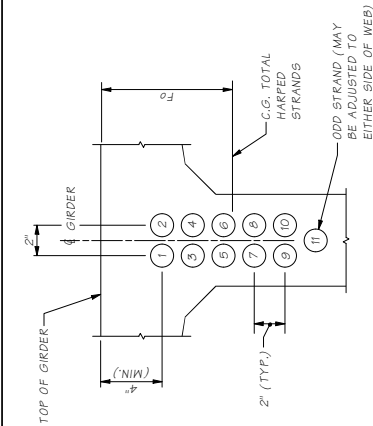
DIAPHRAGM TYPE	END TYPE	BEARING RECESS	X	Y	Z	SAWTEETH
End Diaph. on Girder	A	YES	1'-10"	1'-6"	9"	YES
"L" Abutment	B	YES	0"	0"	0"	NO
Hinge Diaph. on Interm. Pier	C	NO	1'-10"	1'-6"	9"	YES
Fixed Diaph. @ Interm. Pier	D	NO	1'-10"	1'-6"	9"	YES
Multi. Simple Spans @ Interm. Pier	E	YES	0"	0"	0"	NO

MARK	LOCATION	SIZE
G1	GIRDER STIRRUPS	5
G2	GIRDER END STIRRUPS	5
G3	GIRDER TOP FLANGE	5 STR.
G4	GIRDER LONGIT. FULL LENGTH	5 STR.
G5	GIRDER END LONGIT.	7 STR.
G6	GIRDER END TIES	W12b
G7	GIRDER POT. FLANGE TIES	3
G9	GIRDER END LONGIT.	6 STR.

FOR END TYPE "C"
G3 BARS LEFT OF §
B1 = 0" (G4 , G9)
B2 = 0" (G5)
ENDS BACK ON STATION
G5 BARS RIGHT OF §
B1 = 1/8" (G4 , G9)
B2 = 3" (G5)

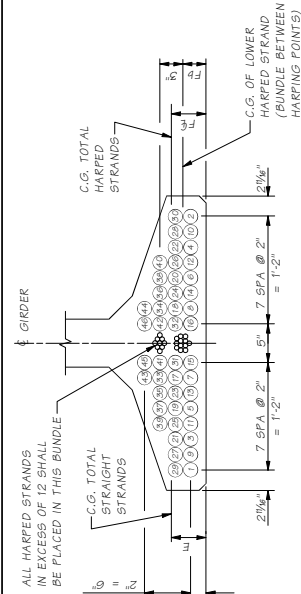
BRIDGE AND STRUCTURES OFFICE	STANDARD PRESTRESSED CONCRETE GIRDERS
Washington State Department of Transportation	WF95G GIRDER DETAILS 1 OF 3

BRIDGE DESIGN ENGINEER: M.L. ST. ANDREAS
 SUPERVISOR: Girders/WF 1-Girders/W95G/W 95G/1
 DESIGNED BY: WASH
 CHECKED BY: JOB NUMBER
 PROJECT PLAN BY: ARCHITECT/SCALE
 DATE: REVISION: BY: APPD.
 SHEET NO. 10 TOTAL SHEETS 10



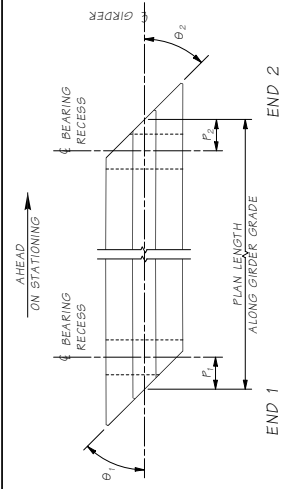
STRAND PATTERN AT GIRDER END

HARPED STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



STRAND PATTERN AT $\frac{1}{4}$ SPAN

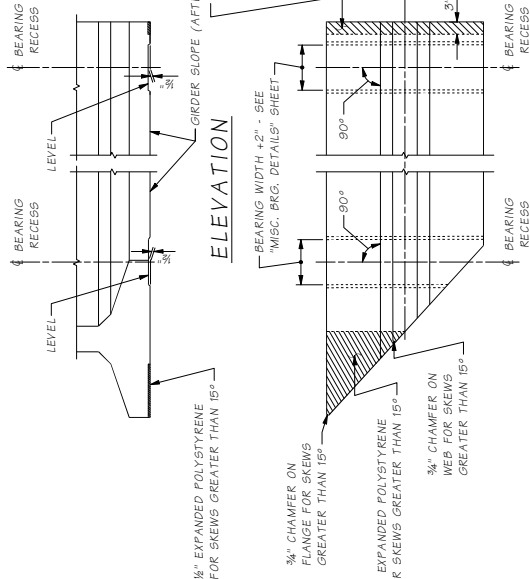
STRAIGHT STRAND LOCATION SEQUENCE SHALL BE AS SHOWN (1), (2) ETC.



GIRDER SCHEDULE

BASED ON GIRDER DEFLECTION = "D" AT TIME OF SLAB PLACEMENT (120 DAYS)

SPAN	GIRDER	END 1 TYPE	END 2 TYPE	L	θ_1	θ_2	F ₁	F ₂	PLAN LENGTH (ALONG GIRDER GRADE)	MIN. CONC. COMP. STRENGTH	HARPED		STRAIGHT		TEMPORARY		LOCATION OF C.G. STRANDS (IN.)			LD (IN.)	
											NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	NO. OF STRANDS	JACKING FORCE (KIPS)	E	F _E	F _P		F _O
										F.C. (KSI) @ FINAL	F.C. (KSI) @ RELEASE										



ELEVATION

1/8" EXPANDED POLYSTYRENE FOR SKEWS GREATER THAN 15°

3/4" CHAMFER ON FLANGE FOR SKEWS GREATER THAN 15°

1/2" EXPANDED POLYSTYRENE FOR SKEWS GREATER THAN 15°

3/4" CHAMFER ON WEB FOR SKEWS GREATER THAN 15°

BEARING WIDTH +2" - SEE "MISC. BRG. DETAILS" SHEET

90°

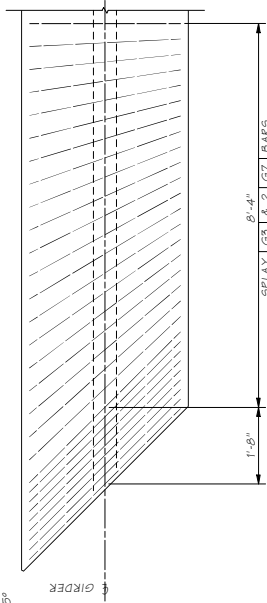
90°

BEARING RECESS

BEARING RECESS

9"

GIRDER



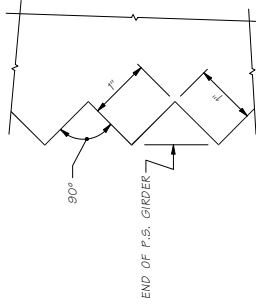
PLAN - BEARING RECESS AND BOTTOM FLANGE SPALL PROTECTION DETAIL

TRANSVERSE REINFORCING SKEWED ENDS

ONLY TRANSVERSE REINF. SHOWN

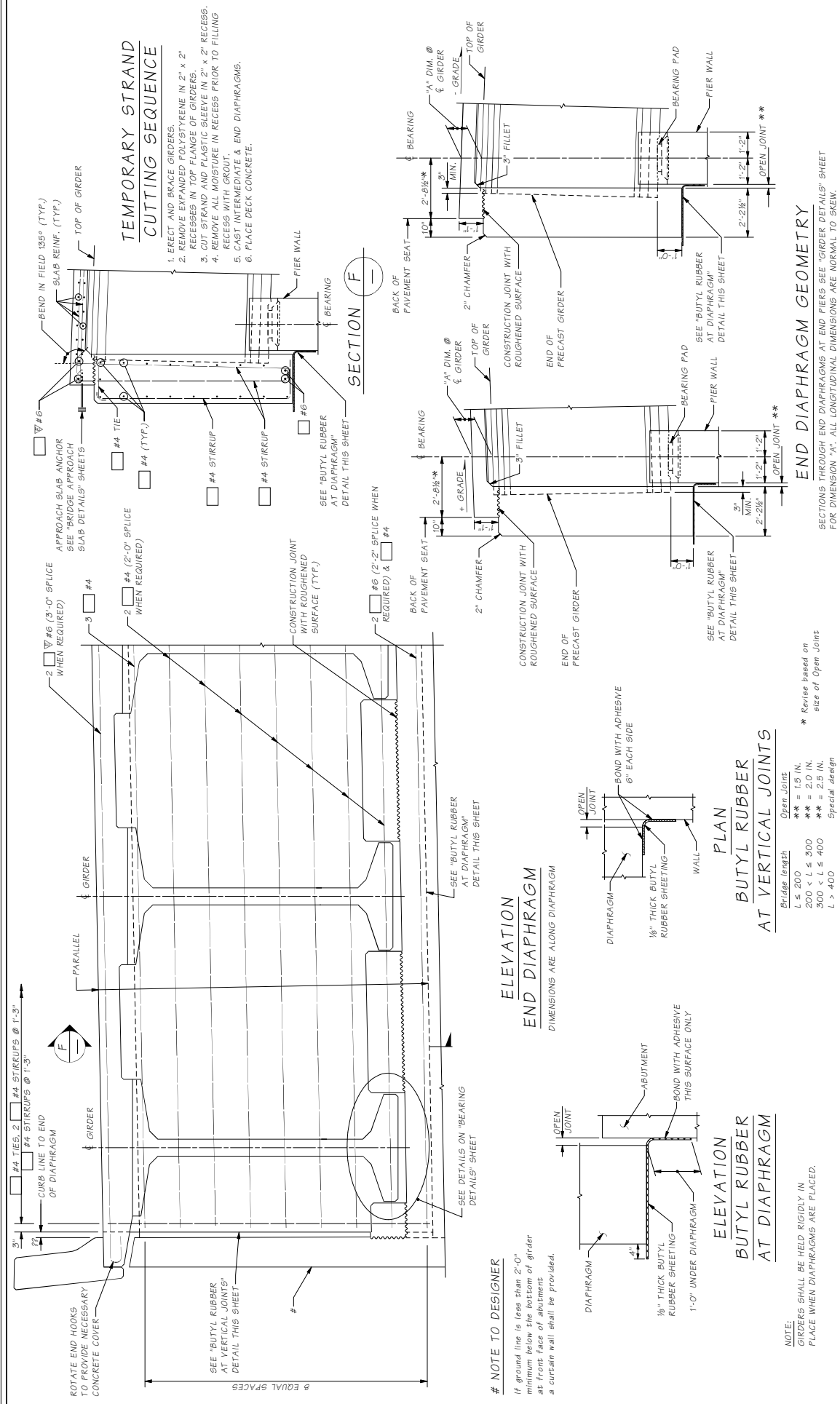
SAWTOOTH DETAILS

SAWTEETH ARE FULL WIDTH - USE SAWTOOTH KEYS FROM BOTTOM OF BOTTOM FLANGE TO BOTTOM OF LOWEST HARPED STRAND AS WELL AS TOP FLANGE ADJACENT TO HARPED STRANDS AS SHOWN IN VIEW B - WF95G GIRDER DETAILS 1 OF 3



Bridge Design Engr.	MA1ST AND AR251/Girder/WF I-Girder/W95G2 main	STATE	WASH	FED. AID PROJ. NO.	SHEET NO.	SUBT SHEET
Supervisor		DATE				
Designed By		BY				
Checked By		FOR NUMBER				
Detailled By		REVISION				
Bridge Projects Engr.		DATE				
Prelim Plan By						
Architect/Specifier						

Thu, Feb 15 13:21:19 2007



Bridge Design Eng:	W:\S\F\A\RD\S\Girders\WF 9-Girders\WF95G\WF95G	END DIA ON GIR.MAN	NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
Supervisor:			10	WASH			
Checked By:							
Drawn By:							
Bridge Project Eng:							
Print Plan By:							
Architect/Specifier:							
DATE		REVISION		BY	APPD		
Thu Feb 15 15:21:09 2007							

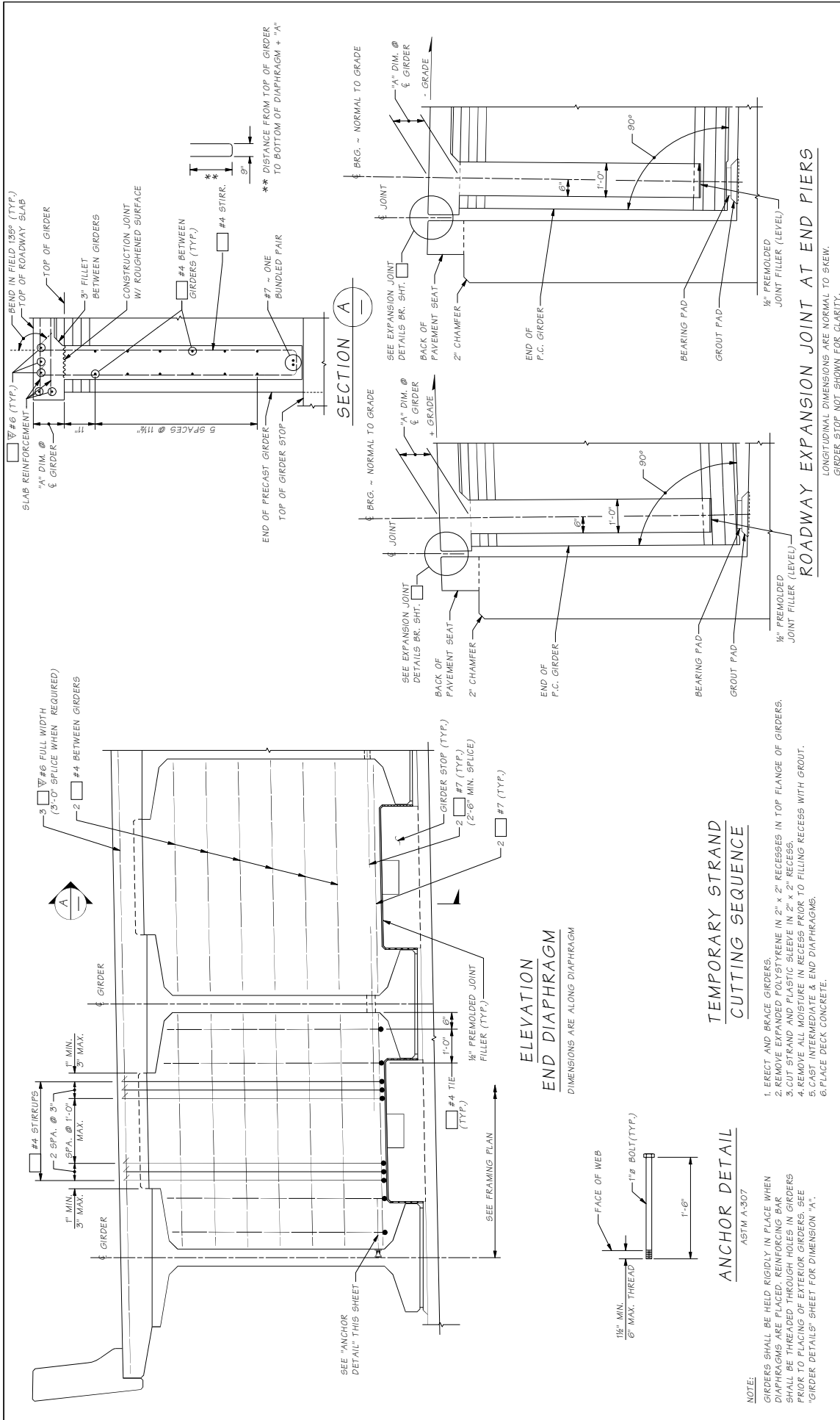
BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

STANDARD PRESTRESSED CONCRETE GIRDERS

WF95G END DIAPHRAGM ON GIRDER DETAILS

5.6-A12-3

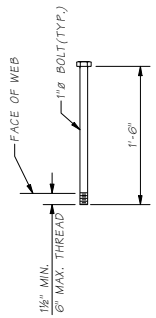


TEMPORARY STRAND CUTTING SEQUENCE

1. ERECT AND BRACE GIRDERS.
2. REMOVE EXPANDED POLYSTYRENE IN 2" x 2" RECESSES IN TOP FLANGE OF GIRDERS.
3. CUT STRAND AND PLASTIC SLEEVE IN 2" x 2" RECESS.
4. REMOVE ALL MOISTURE IN RECESS PRIOR TO FILLING RECESS WITH GROUT.
5. CAST INTERMEDIATE & END DIAPHRAGMS.
6. PLACE DECK CONCRETE.

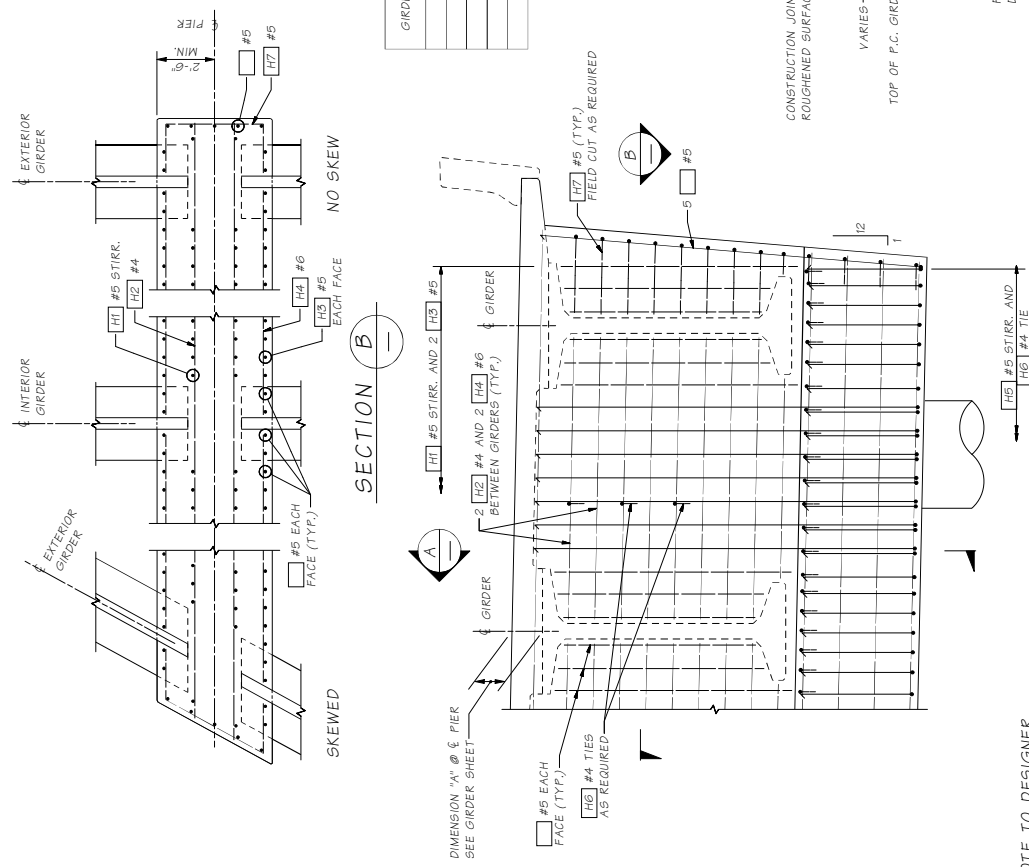
ANCHOR DETAIL

ASTM A-307

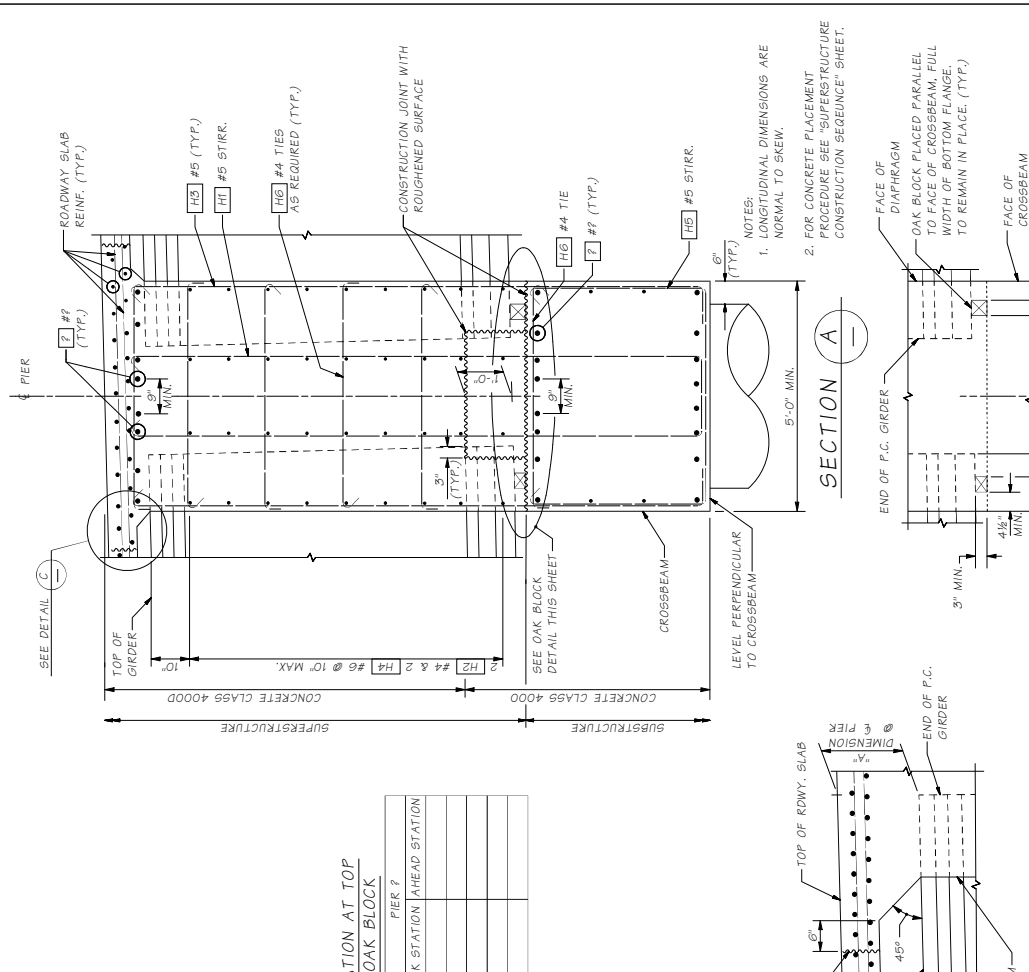


NOTE:
GIRDERS SHALL BE HELD RIGIDLY IN PLACE WHEN DIAPHRAGMS ARE PLACED. REINFORCING BAR SHALL BE THREADED THROUGH HOLES IN GIRDERS PRIOR TO PLACING OF EXTERIOR GIRDERS. SEE "GIRDER DETAILS" SHEET FOR DIMENSION "A".

Bridge Design Eng:	MALSTANDAKD&S/girders/wf	ABUT. PIER, DIAPH. DET. MAN	SCALE	SHEET
Supervisor:			MA	OF
Designed By:				
Checked By:				
Drawn By:				
Bridge Projects Eng:				
Project Mgr:				
Architect/Engineer:				
DATE	REVISION	BY	APPD	
		STANDARD PRESTRESSED CONCRETE GIRDERS WF95G ABUTMENT TYPE PIER DIAPHRAGM DETAILS		



NOTE TO DESIGNER
The actual bar size and spacing shall be determined by the designer.



NOTES:
1. LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW.
2. FOR CONCRETE PLACEMENT PROCEDURE SEE "SUPERSTRUCTURE CONSTRUCTION SEQUENCE" SHEET.

LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW

ELEVATION AT TOP OF OAK BLOCK

GIRDER	PIER T	BACK STATION AHEAD STATION

BRIDGE DESIGN MANUAL
FEBRUARY 2007

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS
WF95C FIXED FLUSH-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

MUST AND AS PER	DATE	REVISION	BY	APPD

DATE: Feb 15 13:21:05 2007

JOB NO. SR 5.6-A12-5

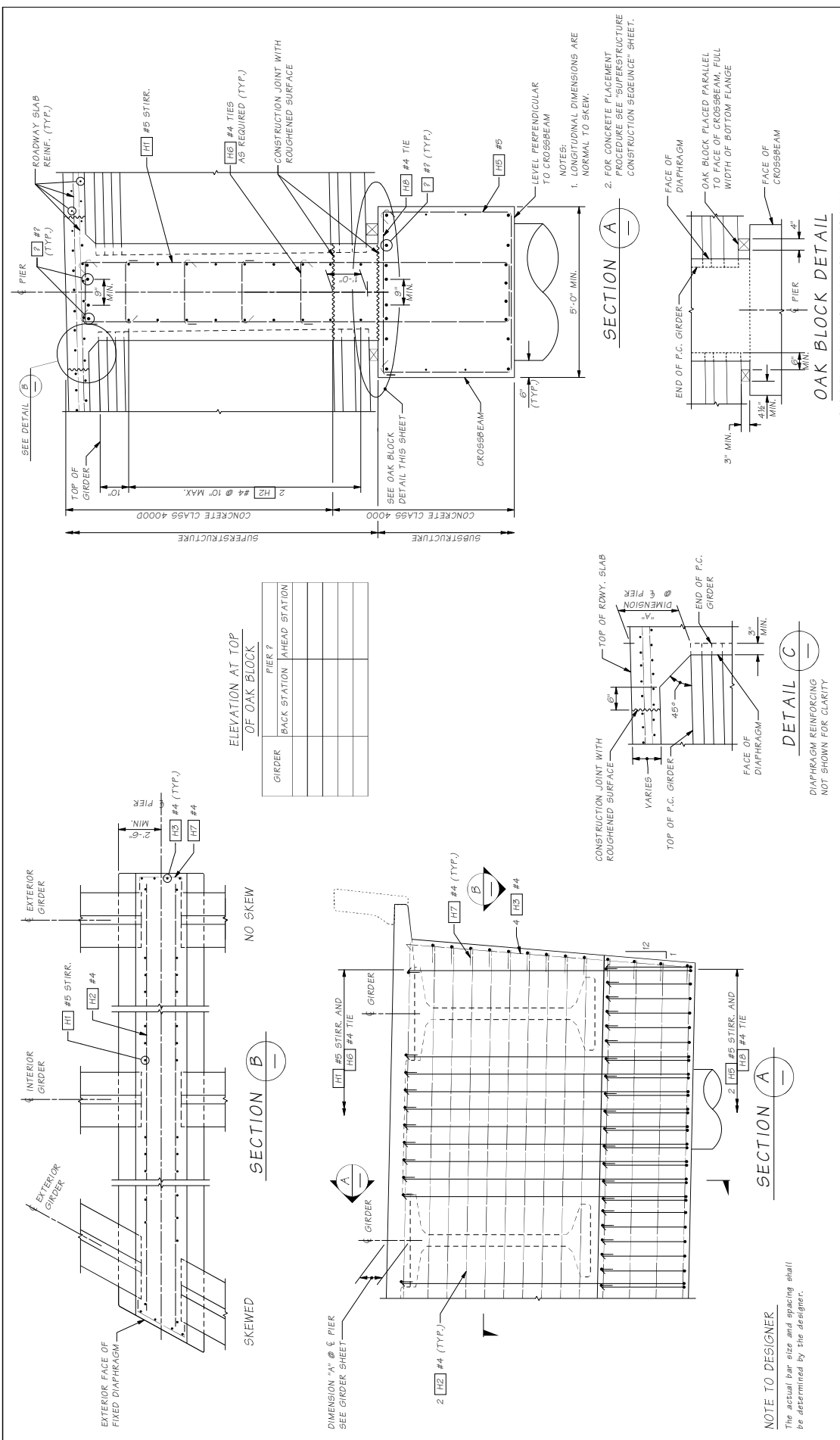
SHEET 10

TOTAL SHEETS 10

FED. AID PROJ. NO. 10 WASH

STATE PROJECT NO. 10 WASH

JOB NUMBER



BRIDGE DESIGN ENG.	DATE	REVISION	BY	APPD.
CHECKED BY	DATE	REVISION	BY	APPD.
DRAWN BY	DATE	REVISION	BY	APPD.
BRIDGE PROJECTS EXP.	DATE	REVISION	BY	APPD.
PREPARED BY	DATE	REVISION	BY	APPD.
ARCHITECT/SPECIALIST	DATE	REVISION	BY	APPD.
WASH STATE	DATE	REVISION	BY	APPD.
FED. AID PROJ. NO.	DATE	REVISION	BY	APPD.
SHEET NO.	DATE	REVISION	BY	APPD.
TOTAL SHEETS	DATE	REVISION	BY	APPD.

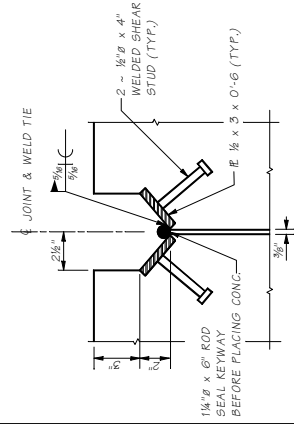
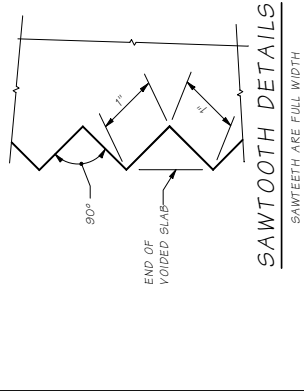
BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

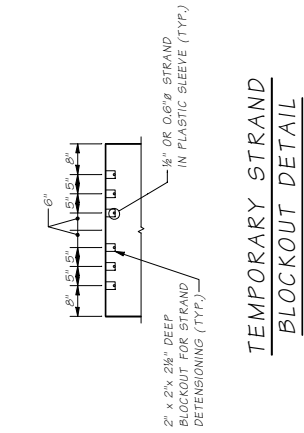
STANDARD PRESTRESSED CONCRETE GIRDERS

WF95C FIXED RECESSED-FACE DIAPHRAGM AT INTERMEDIATE PIER DETAILS

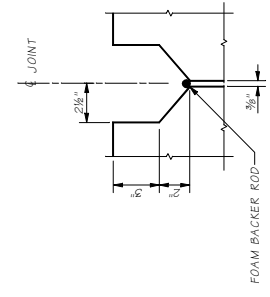
LONGITUDINAL DIMENSIONS ARE NORMAL TO SKEW



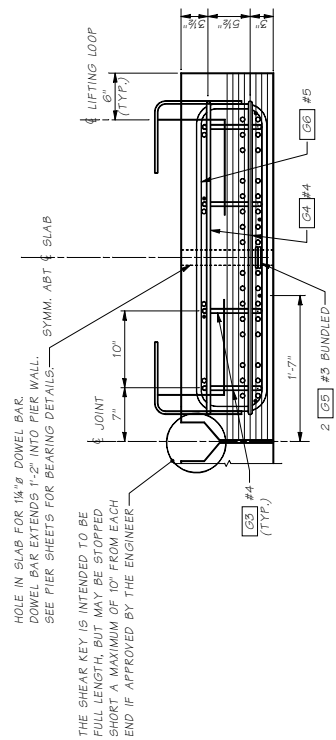
SECTION C
WELD TIE
ALTERNATE #1



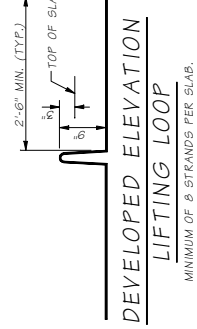
TEMPORARY STRAND
BLOCKOUT DETAIL



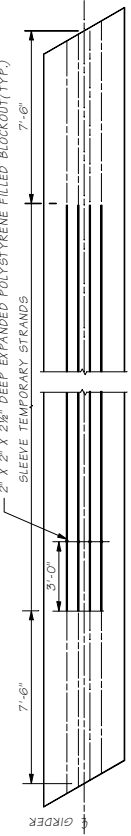
SECTION B
WELD TIE
ALTERNATE #2



END VIEW
EXTERIOR SLAB



DEVELOPED ELEVATION
LIFTING LOOP
MINIMUM OF 6 STRANDS PER SLAB.



PLAN VIEW OF TEMPORARY STRANDS
DESIGN TABLE

MARK	LOCATION	NO.	SIZE	REQ'D
G1	SLAB LONGIT. - TOP	4	#4	STR.
G2	SLAB LONGIT. - BOT.	4	#4	STR.
G3	END OF SLAB - TIE	4	#4	STR.
G4	END OF SLAB - TIE	4	#4	STR.
G5	END OF SLAB - TIE	4	#4	STR.
G6	END OF SLAB - TIE	4	#4	STR.
G7	SLAB FRANK - STRIPUP	4	#4	STR.
G8	SLAB FRANK - STRIPUP	4	#4	STR.
G9	SLAB VERTICAL - TOP	4	#4	STR.

ALL REINFORCING SHALL BE ASTM A 706

ACUTE \angle BETWEEN ξ PIER AND PERPENDICULAR TO ξ ROADWAY

8 2 BARS BUNDLED
 β ADDITIONAL BARS WILL BE REQUIRED ON VOIDED SLABS
 W/BARRIERS, IF OPTION 1 ANCHOR PLATE DETAIL IS SELECTED. * VARIES FOR SKEW END

Bridge Design Engr.	Supervisor	Checked By	Drawn By	Bridge Project Engr.	Plan By	Architect/Specifier
DATE	REVISION	BY	APPD	NO.	DATE	REVISION

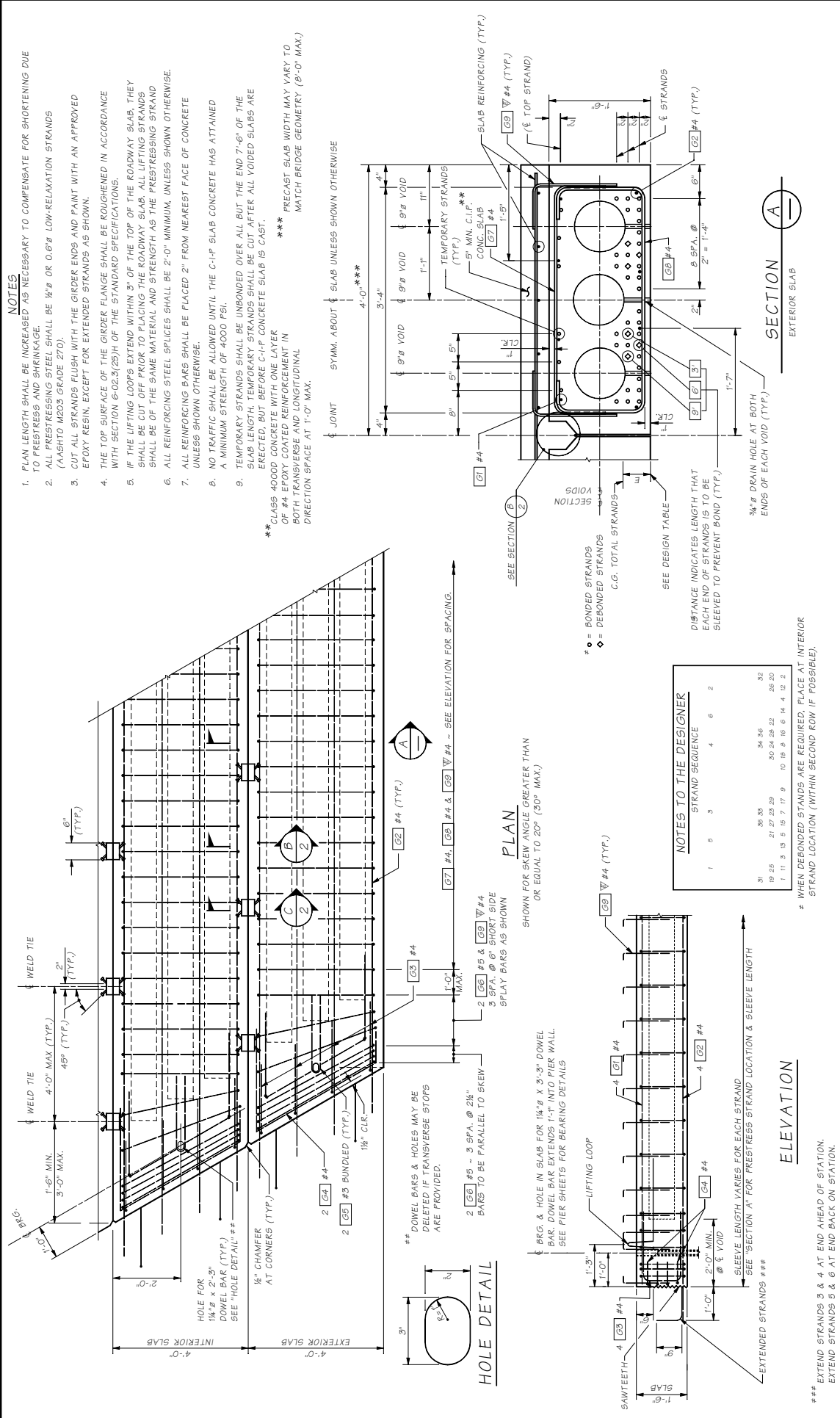
Washington State
Department of Transportation

BRIDGE AND STRUCTURES OFFICE

PRESTRESSED CONCRETE GIRDERS

1'-0" SOLID SLAB
DETAILS 2 OF 2

SPAN NUMBER	SPAN LENGTH	SPAN TYPE	SLAB NO.	STRENGTH OF CONCRETE	BOTTOM STRANDS	TOP TEMP STRANDS	LOCATION OF C.G. OF BOTTOM OF STRAND "E"	CAMBER (IN.)



- NOTES**
1. PLAN LENGTH SHALL BE INCREASED AS NECESSARY TO COMPENSATE FOR SHORTENING DUE TO PRESTRESS AND SHRINKAGE
 2. ALL PRESTRESSING STEEL SHALL BE 1/2" OR 0.6% LOW-RELAXATION STRANDS (ASTM A 2283 GRADE 270).
 3. CUT ALL STRANDS FLUSH WITH THE GIRDER ENDS AND PAINT WITH AN APPROVED EPOXY RESIN, EXCEPT FOR EXTENDED STRANDS AS SHOWN.
 4. THE TOP SURFACE OF THE GIRDER FLANGE SHALL BE ROUGHENED IN ACCORDANCE WITH SECTION 6-02.3(25)H OF THE STANDARD SPECIFICATIONS.
 5. IF THE LIFTING LOOPS EXTEND WITHIN 3" OF THE TOP OF THE ROADWAY SLAB, THEY SHALL BE CUT OFF PRIOR TO PLACING THE ROADWAY SLAB. ALL LIFTING STRANDS SHALL BE OF THE SAME MATERIAL AND STRENGTH AS THE PRESTRESSING STRANDS.
 6. ALL REINFORCING STEEL SPICES SHALL BE 2'-0" MINIMUM, UNLESS SHOWN OTHERWISE UNLESS SHOWN OTHERWISE.
 7. ALL REINFORCING BARS SHALL BE PLACED 2" FROM NEAREST FACE OF CONCRETE UNLESS SHOWN OTHERWISE.
 8. NO TRAFFIC SHALL BE ALLOWED UNTIL THE C-I-P SLAB CONCRETE HAS ATTAINED A MINIMUM STRENGTH OF 4000 PSI.
 9. TEMPORARY STRANDS SHALL BE UNBONDED OVER ALL BUT THE END 7'-6" OF THE SLAB LENGTH. TEMPORARY STRANDS SHALL BE CUT AFTER ALL VOIDED SLABS ARE ERECTED, BUT BEFORE C-I-P CONCRETE SLAB IS CAST.

*** CLASS 4000 CONCRETE WITH ONE LAYER OF #4 EPOXY COATED REINFORCEMENT IN BOTH TRANSVERSE AND LONGITUDINAL DIRECTION SPACE AT 1'-0" MAX.

*** PRECAST SLAB WIDTH MAY VARY TO MATCH BRIDGE GEOMETRY (8'-0" MAX.)

PLAN

SHOWN FOR SKEW ANGLE GREATER THAN OR EQUAL TO 20° (20° MAX.)

SEE SECTION A FOR BEARING DETAILS

ELEVATION

SEE "SECTION A" FOR PRESTRESS STRAND LOCATION & SLEEVE LENGTH

SLEEVE LENGTH VARIES FOR EACH STRAND

HOLE DETAIL

HOLE FOR 1 1/2" x 2" x 3" DOWEL BAR (TYP.)

SEE "HOLE DETAIL" # 1

SECTION A

EXTERIOR SLAB

3/4" Ø DRAIN HOLE AT BOTH ENDS OF EACH VOID (TYP.)

NOTES TO THE DESIGNER

STRAND SEQUENCE	1	2	3	4	5	6	7
31	30	33	34	36	32		
19	25	21	27	23	29	30	24
1	11	3	15	5	17	7	9
						10	19
						16	6
						14	4
						12	2

WHEN DEBONDED STRANDS ARE REQUIRED PLACE AT INTERIOR STRAND LOCATION (WITHIN SECOND ROW IF POSSIBLE).

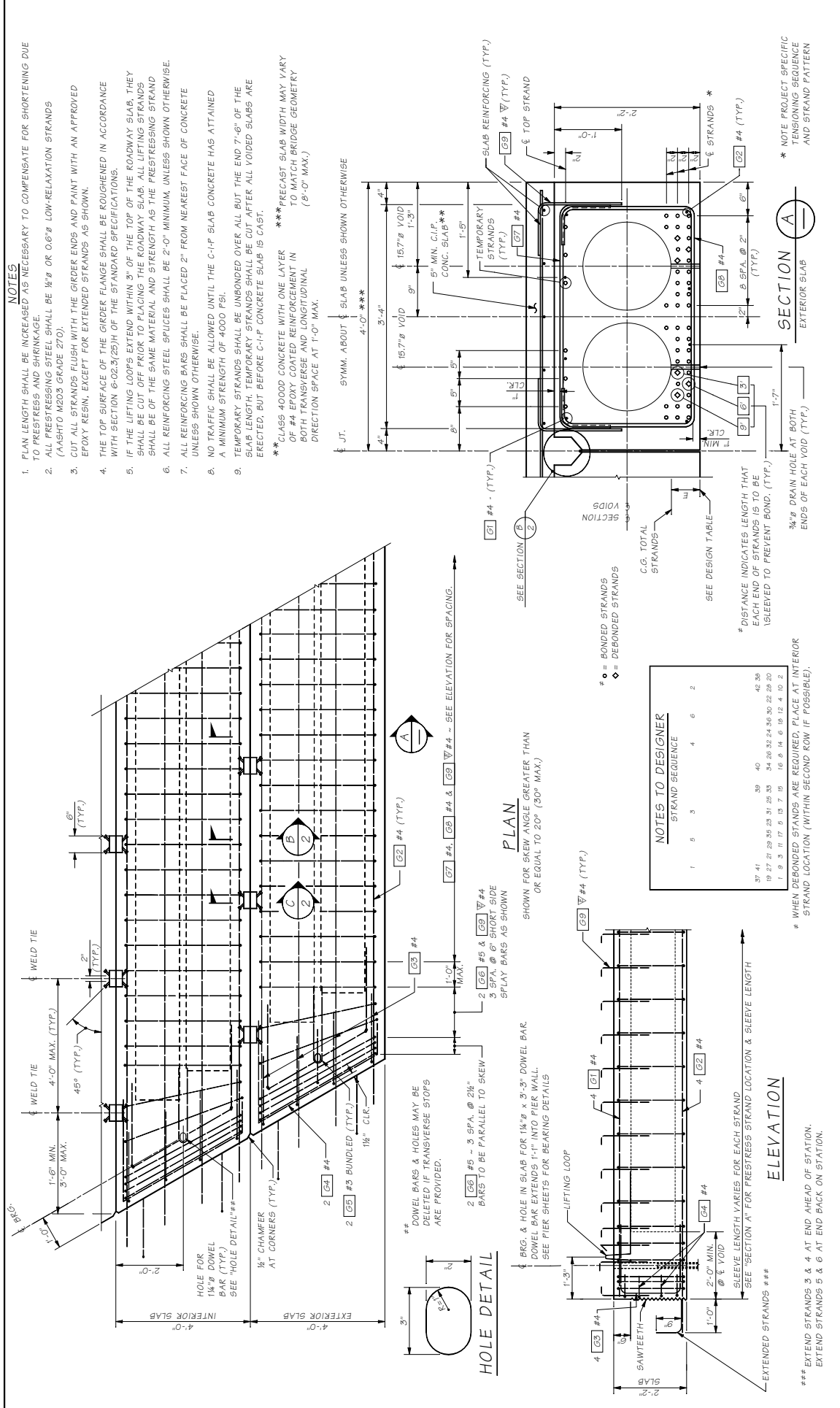
Bridge Design Eng.	DATE	REVISION	BY	APPRO
Supervisor				
Checked By				
Drawn By				
Architect/Engineer				
Project No.				
Job Number				
State	10	WASHA		
FED. AID PROJ. NO.				
SHEET NO.				
TOTAL SHEETS				

PRESTRESSED CONCRETE GIRDERS

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

1'-6" VOIDED SLAB
DETAILS 1 OF 2



BRIDGE DESIGN MANUAL FEBRUARY 2007

Washington State Department of Transportation

BRIDGE AND STRUCTURES OFFICE

STANDARD PRESTRESSED CONCRETE GIRDERS

2'-2" VOIDED SLAB DETAILS 1 OF 2

JOB NO. _____ SHEET _____ OF _____

DATE _____ REVISION _____

DESIGNED BY _____ CHECKED BY _____

BRIDGE PROJECT NO. _____

PREPARED BY _____

ARCHITECT/SPECIALLIST _____

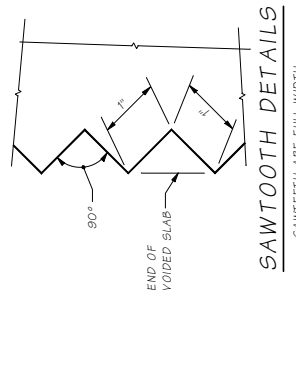
DATE _____

BY _____ APPR. _____

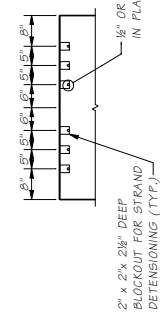
JOB NO. _____ SHEET _____ OF _____

STANDARD PRESTRESSED CONCRETE GIRDERS

2'-2" VOIDED SLAB DETAILS 1 OF 2



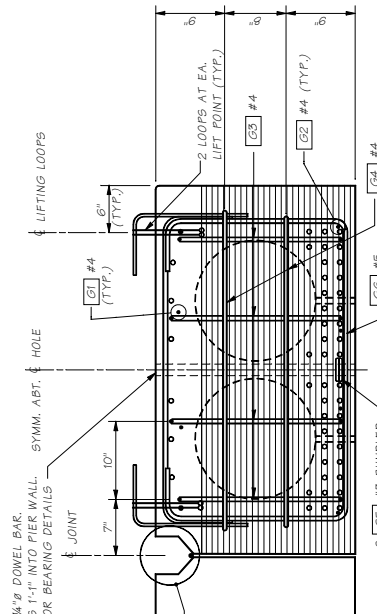
SAWTOOTH DETAILS
SAWTEETH ARE FULL WIDTH



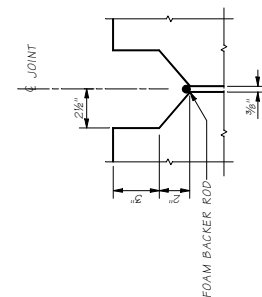
**TEMPORARY STRAND
BLOCKOUT DETAIL**

THE SHEAR KEY IS INTENDED TO BE FULL LENGTH, BUT MAY BE STOPPED SHORT A MAXIMUM OF 10" FROM EACH END IF APPROVED BY THE ENGINEER

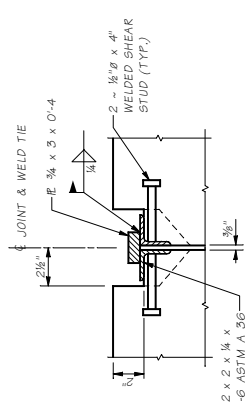
HOLE IN SLAB FOR 1/4" Ø DOWEL BAR. DOWEL BAR EXTENDS 1 FT INTO PIER WALL. SEE PIER SHEETS FOR BEARING DETAILS



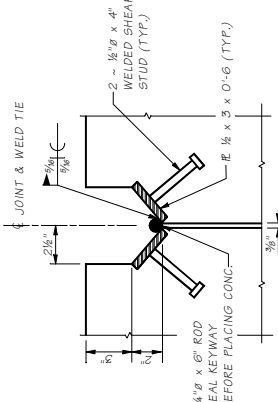
**END VIEW
EXTERIOR SLAB**



SECTION B

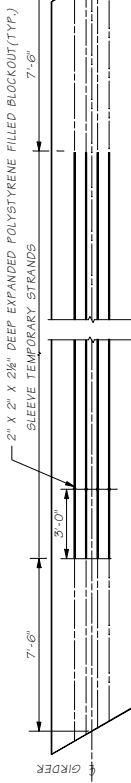


SECTION C
WELD TIE ALTERNATE #2

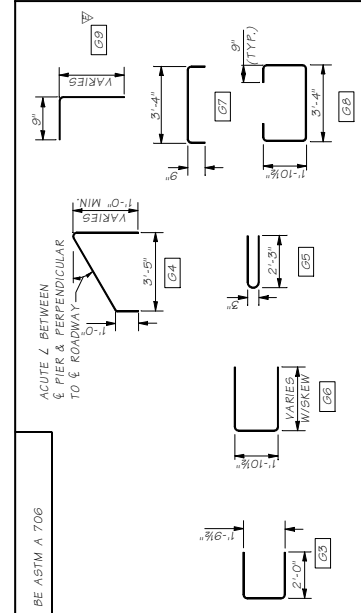


SECTION C
WELD TIE ALTERNATE #1

**DEVELOPED ELEVATION
LIFTING LOOP**
MINIMUM OF 8 STRANDS PER SLAB.



**PLAN VIEW OF TEMPORARY STRANDS
DESIGN TABLE**



ALL REINFORCING SHALL BE ASTM A 706

MARK	LOCATION	SIZE	NO. REQ'D
G1	LONGIT. - TOP	4	4
G2	LONGIT. - BOT.	4	4
G3	END TIE	4	8
G4	END TIE	4	4
G5	END TIE	3	4
G6	TRANSV. - TIE	5	AS REQ'D BY SKEW
G8	TRANSV. - STIRRUP	4	VARIES WITH SPAN
G9	VERTICAL	4	VARIES WITH SPAN

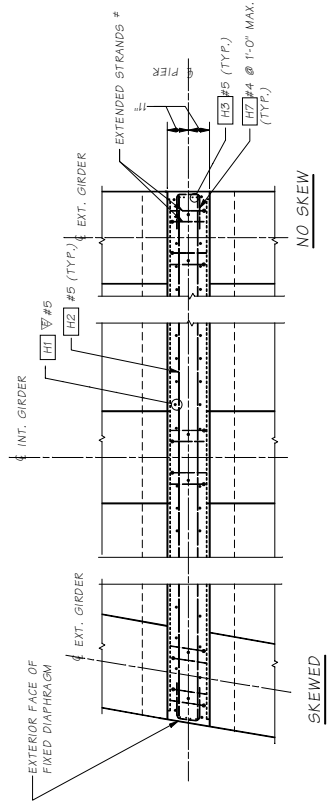
VARIABLE LENGTH TO ANCHOR PROVIDED BY VOIDED SLAB MANUFACTURER (BASED ON ANCHOR PLACEMENT).

SPAN NUMBER	SPAN LENGTH & BKG NUMBER (FT.)	STRENGTH OF CONCRETE		BOTTOM STRANDS	TOP TEMPORARY STRANDS	LOCATION OF C.G. OF BOTTOM STRAND 'E'	CAMBER (IN.)			
		f'c (KSI)	f'c (KSI)				C	D	D	

BRIDGE AND STRUCTURES OFFICE

Washington State Department of Transportation

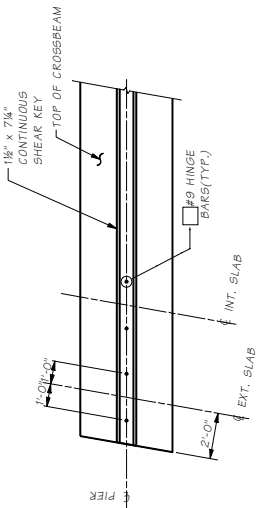
STANDARD PRESTRESSED CONCRETE GIRDERS
2'-2" VOIDED SLAB
DETAILS 2 OF 2



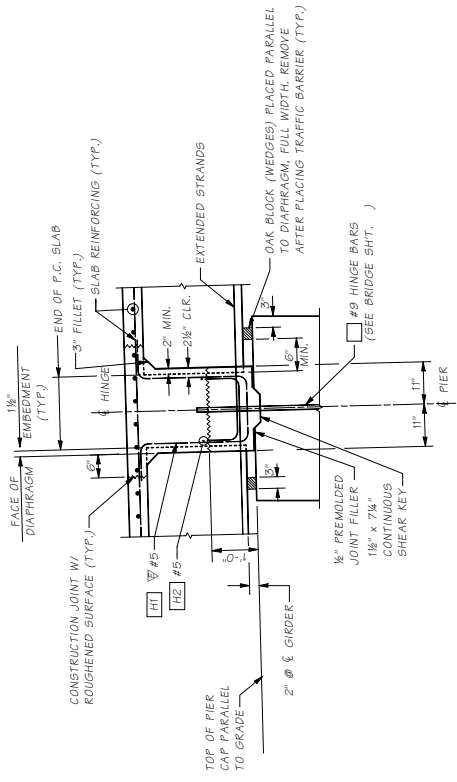
PLAN - HINGE DIAPHRAGM

10° MAX. SKEW FOR HINGE DIAPHRAGM

* FOR EXTENDED STRAND DETAIL SEE GIRDER SHEET

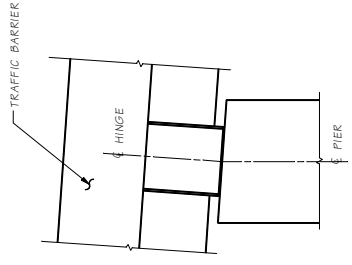


HINGE BAR PLAN



TYPICAL HINGE SECTION

** FOR SAWTOOTH SHEAR KEY DETAILS, SEE GIRDER SHEETS.



TYPICAL END VIEW
HINGE DIAPHRAGM

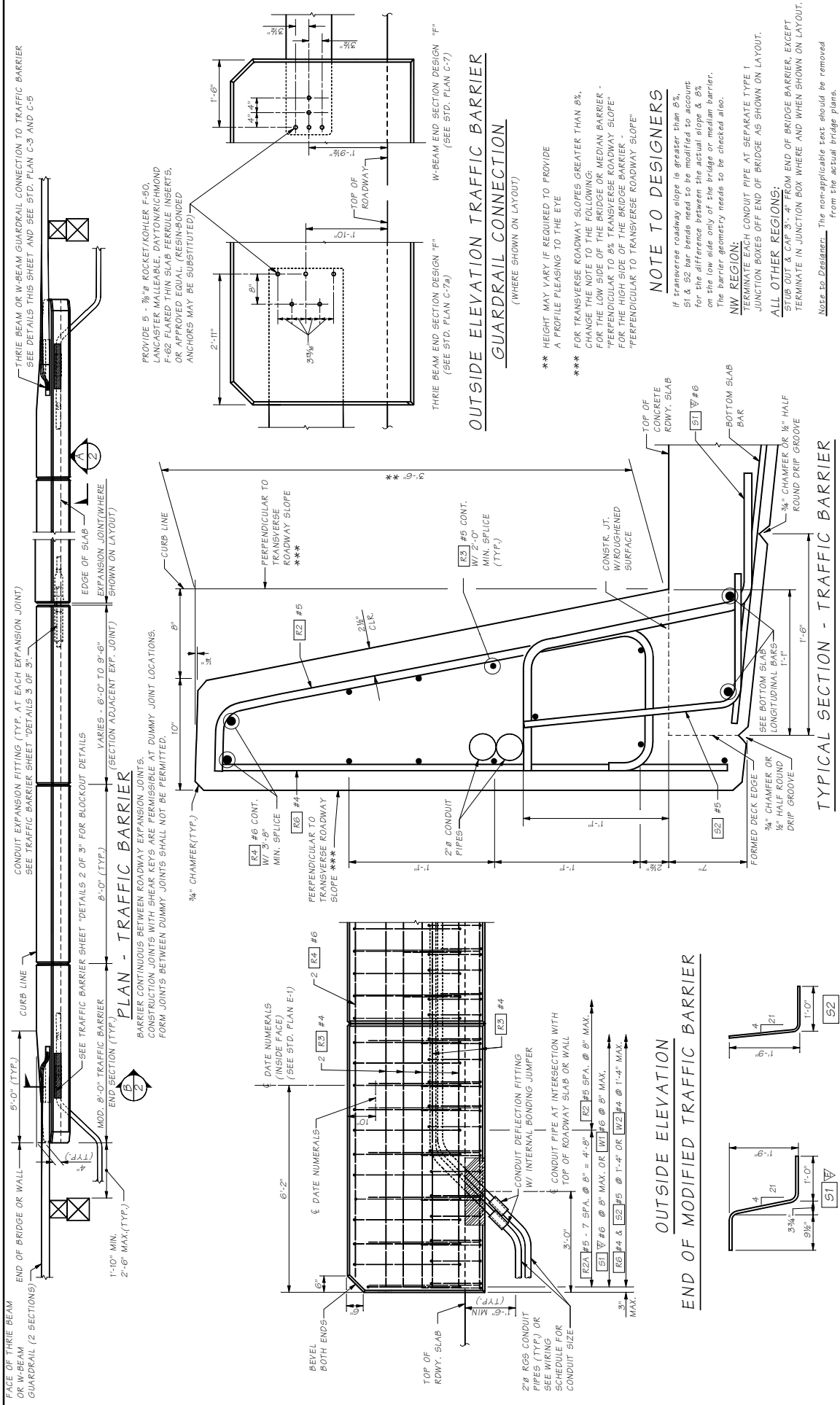
Bridge Design Engr. <i>Jayash Kapur</i> Supervisor <i>Sup</i> Designed By <i>Designer</i> Date Checked By <i>Checker</i> Date Detailed By <i>Detailer</i> Date Bridge Projects Engr. Prelim Plan By Architect/Specifier		WA STATE ID FOR NUMBER	FED. AID PROJ. NO. WASH FOR NUMBER	SHEET NO. SHEET OF SHEETS
BRIDGE AND STRUCTURES OFFICE		STANDARD PRESTRESSED CONCRETE GIRDER HINGE DIAPHRAGM AT INTERMEDIATE PIER DETAILS		
Washington State Department of Transportation				
DATE REVISION				

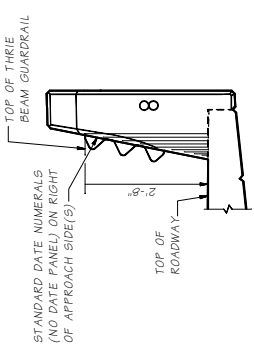
Chapter 10 Signs, Barriers, Approach Slabs & Utilities

10.1	Sign and Luminaire Supports	August 2006
10.1.1	Loads	
10.1.2	Bridge Mounted Signs	
10.1.3	Sign Bridges Mounted on Bridges	
10.1.4	Monotube Sign Structures	
10.1.5	Foundations	
10.1.6	Truss Sign Bridges: Foundation Sheet Design Guidelines	
10.2	Bridge Traffic Barriers	August 2006
10.2.1	General Guidelines	
10.2.2	Bridge Railing Test Levels	
10.2.3	Available WSDOT Designs	
10.2.4	Design Criteria	
10.3	At Grade Cast-in-Place Barriers	August 2006
10.3.1	Median Barriers	
10.3.2	Shoulder Barriers	
10.4	Bridge Traffic Barrier Rehabilitation	August 2006
10.4.1	Policy	
10.4.2	Guidelines	
10.4.3	Design Criteria	
10.4.4	WSDOT Bridge Inventory of Bridge Rails	
10.4.5	Available Retrofit Designs	
10.4.6	Available Replacement Designs	
10.5	Bridge Railing	August 2006
10.5.1	Design	
10.5.2	Railing Types	
10.6	Bridge Approach Slabs	August 2006
10.6.1	Notes to Region for Preliminary Plan	
10.6.2	Approach Slab Design and Detailing	
10.6.3	Approach Expansion Joints	
10.6.4	Skewed Approach Slabs	
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10.6.6	Pavement Seats on Existing Bridges	
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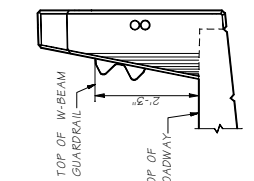
Appendix 10.1-A1-1	Monotube Sign Structures Sign Bridge Layout	June 2006
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Appendix 10.2-A6-1	Traffic Barrier – Single Slope 42” Details 1 of 3	February 2007
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Appendix 10.4-A1-1	Thrie Beam Retrofit Concrete Baluster	June 2006
Appendix 10.4-A1-2	Thrie Beam Retrofit Concrete Railbase	June 2006
Appendix 10.4-A1-3	Thrie Beam Retrofit Concrete Curb	June 2006
Appendix 10.4-A1-4	WP Thrie Beam Retrofit SL1 – Details 1 of 1	June 2006
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Appendix 10.4-A2-1	Traffic Barrier – Shape F Rehabilitation – Details 1 of 3	June 2006
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Appendix 10.8-A1-1	Utility Hanger Details for Prestressed Girders	June 2006
Appendix 10.8-A1-2	Utility Hanger Details for Concrete Box Structures	June 2006
Appendix 10.9-A1-1	Utility hanger Details	June 2006
Appendix 10.10-A1-1	Bridge Drain Modification	June 2006
Appendix 10.10-A1-2	Bridge Drain Types 2 thru 5 Modification for Overlay	June 2006

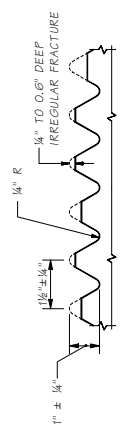




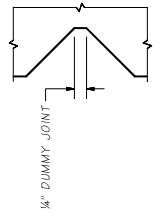
END VIEW WITH "D" CONNECTION



END VIEW WITH "D" CONNECTION



FRACTURED FIN FINISH



DUMMY JOINT DETAIL

JUNCTION BOX LOCATIONS	
STATION	STATION

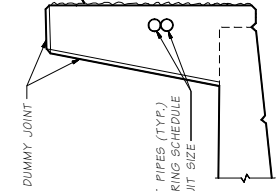
TRAFFIC BARRIER BAR LIST

MARK	SIZE	LENGTH	BENDING DIAGRAM (ALL DIMENSIONS ARE OUT TO OUT)	▽ DENOTES EPOXY COATED
R2	5	5'-1"		
R2a	5	(A)		
R3	4	(A)		
R4	6	(A)		
R6	4	3'-10"		
R9	5	5'-11"		

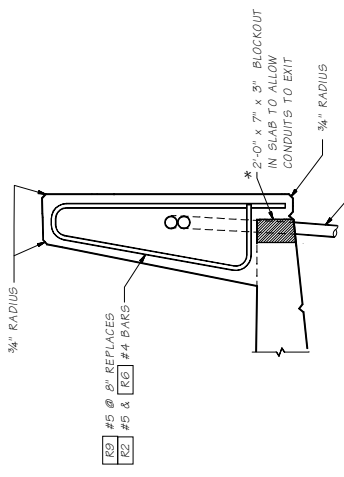
(A) DETERMINE FROM PLANS

FOR R2 & R2a BARS SEE WINGWALL OR RETAINING WALL PLANS. FOR R3 & R4 BARS SEE BARLIST.

± DIMENSIONS TO POINTS OF INTERSECTION.



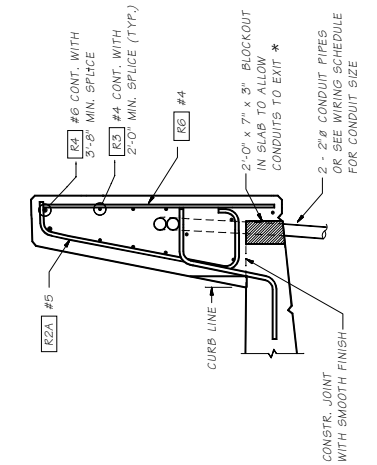
SECTION C



SLIPFORM ALTERNATE

SEE "TYPICAL SECTION - TRAFFIC BARRIER" FOR ADDITIONAL DETAILS.

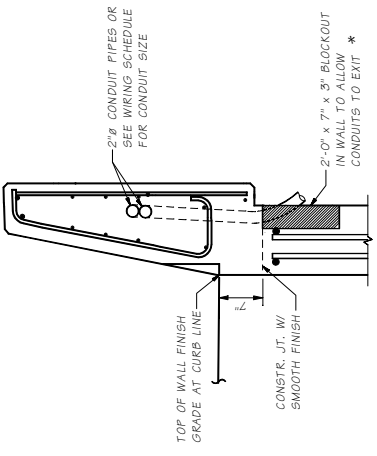
THE CONTRACTOR IS ADVISED THAT THE SLIPFORM CONSTRUCTION METHOD IS A PATENTED PROPRIETARY PROCESS FOR BARRIERS WITH A FRACTURED FIN FINISH.



SECTION B BRIDGE

DETAIL FOR BRIDGE FOR DETAILS NOT SHOWN SEE "OUTSIDE ELEVATION" AND "TYPICAL SECTION - TRAFFIC BARRIER"

* BLOCKOUT WIDTH MAY BE INCREASED TO 6" TO ALLOW CONDUITS OF A LARGER DIAMETER THAN 2" TO EXIT BARRIER OR WALL WITHOUT REPAIR STEEL CONFLICT



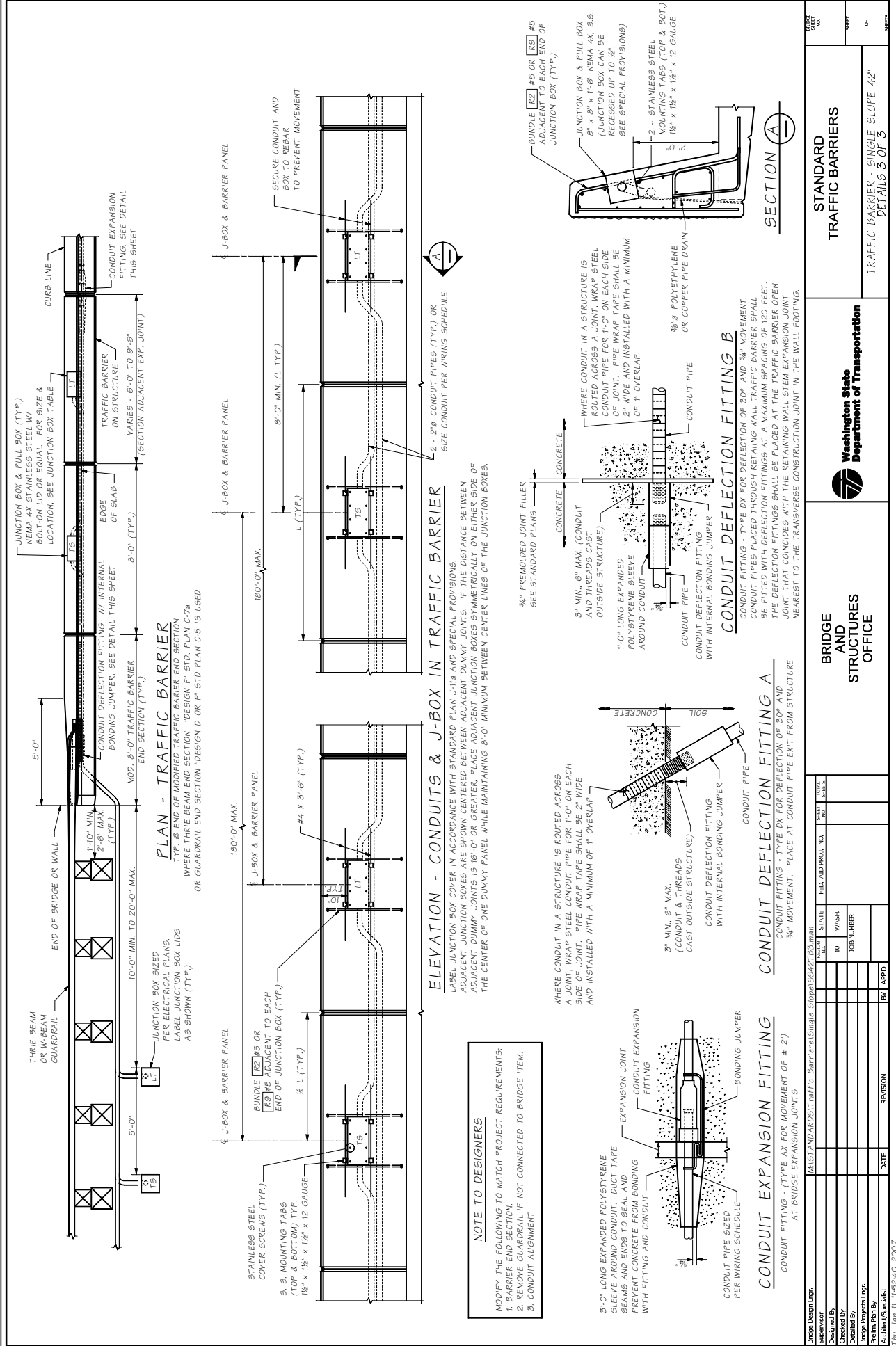
SECTION B WALL

DETAIL FOR RETAINING WALL OR WINGWALL FOR REINFORCING NOT SHOWN SEE STD. PLAN D-1a & D-1b OR WINGWALL PLAN. FOR DETAILS NOT SHOWN SEE SECTION C BRIDGE

Bridge Design Exp.	MAJSTANDARDSTraffic Barrier(Single Slope)42" B2.man	UNIV	STATE	FED. AID PROJ. NO.	SU	SRITS
Supervisor						
Designed By						
Checked By						
Bridge Projects Eng.						
Printed By						
Architect/Engineer						
DATE	REVISION	BY	APPD			

1/10/07 Jan 11 11:52:25 2007

 Washington State Department of Transportation	BRIDGE AND STRUCTURES OFFICE	STANDARD TRAFFIC BARRIERS
	TRAFFIC BARRIER - SINGLE SLOPE 42" DETAILS 2 OF 3	TRAFFIC BARRIER - SINGLE SLOPE 42" DETAILS 2 OF 3



Bridge Design Eng.	DATE	REVISION	BY	APPD	JOB NO.	SHEET	OF	SECTS.
Checked By								
Drawn By								
Bridge Projects Eng.								
Architect/Specifier								
MULT AND ACES Traffic Barrier Single Slope 42"					STANDARD TRAFFIC BARRIERS TRAFFIC BARRIER - SINGLE SLOPE 42" DETAILS 3 OF 3			
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION					BRIDGE AND STRUCTURES OFFICE			

Chapter 13 Bridge Load Rating

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	13.1.1 WSDOT Rating (LRFR)	
	13.1.2 NBI Rating (LFR)	
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	13.2.1 Dead Loads	(13.2-1 through 13.2-3 February 26, 2007)
	13.2.2 Live Load Distribution Factors	
	13.2.3 Reinforced Concrete Structures	
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	13.2.13 Timber Structures	
	13.2.14 Widened or Rehabilitated Structures	
13.3	Load Rating Software	August 2006
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Appendix 13.4-A1	Bridge Rating Summary	August 2006

13.1 General

Bridge Load Rating is a procedure to evaluate the adequacy of various structural components to carry predetermined live loads. The Bridge Load Rating Engineer in the WSDOT Bridge Preservation Office is responsible for the bridge inventory and load rating of existing and new bridges in accordance with the NBIS and the AASHTO Manual for Condition Evaluation of Bridges, latest edition. As presently required, only elements of the superstructure will be rated. Generally, the superstructure shall be defined as all structural elements above the column tops including drop crossbeams.

In order to provide a baseline rating for new bridges, load ratings are required for all new bridges, widened (one lane width or more throughout the length of the bridge), or rehabilitated bridges where the rehabilitation alters the load carrying capacity of the structure. The carrying capacity of a widened or rehabilitated structure shall equal or exceed the capacity of the existing structure.

The Bridge Design Section does not load rate new bridges during the design phase. However, copies of the computer models used in the design process shall be submitted to the Bridge Load Rating Engineer in the Bridge Preservation Section for the more complex structures where computer models were used in the design process.

The Bridge Preservation Office is responsible for maintaining an updated bridge load rating throughout the life of the bridge based on current bridge condition. Conditions of existing bridges change over time, resulting in the need for reevaluation of the load rating. Such changes may be caused by damage to structural elements, extensive maintenance or rehabilitative work, or any other deterioration identified by the Bridge Preservation Office through their regular inspection program.

This criteria applies only to concrete and steel bridges. For timber bridges, rating procedure shall be as per Chapters 6 and 7 of the 1994 AASHTO *Manual for Condition Evaluation of Bridges*.

Structural elements as defined above shall be evaluated for flexural, vertical shear, and torsional capacities based on Load Resistance Factor Design (LRFR) as outlined in the AASHTO 1989 *Guide Specifications for Strength Evaluation of Existing Steel and Concrete Bridges* and Load Factor Design (LFD) as outlined in the latest AASHTO *Manual for Condition Evaluation of Bridges*. Consider all reinforcing, including temperature/distribution reinforcement, in the rating analysis.

By definition, the adequacy or inadequacy of a structural element to carry a specified truck load will be indicated by the value of its rating factor (RF); that is, whether it is greater or smaller than 1.0. For a specific loading, the lowest RF value of the structural elements will be the overall rating of the bridge.

13.1.1 WSDOT Rating (LRFR)

Ratings shall be performed per the 1989 AASHTO *Guide Specifications for Strength Evaluation of Existing Steel and Concrete Bridges*. All bridges, except timber, shall be rated based on the Strength method.

A. Strength Method (LRFR)

The basic rating equations shall be:

$$RF = \frac{\Phi R_n - \gamma_{DL} D \pm S}{\gamma_L L(1 + I)}$$

When rating the full section of a bridge, like box girders, or crossbeams, which have two or more lanes, the following formulas apply for the overload trucks:

$$RF = \frac{\Phi R_n - \gamma_{DL} D \pm S - \gamma_L L_{Legal Load}(1 + I)}{\gamma_L L(1 + I)}$$

The formulas for the overloads assume that there is one overload truck in one lane, and legal trucks occupy the remaining lanes. Trucks shall be placed, in the lanes, in a manner that produces the maximum forces.

Where:

R.F.	=	Rating Factor (Ratio of Capacity to Demand)
R_n	=	Nominal <u>Capacity of Section</u>
D	=	Calculated Dead Load
S	=	Secondary Prestressing
L	=	Calculated Live Load
Φ	=	Resistance Factor (Capacity Reduction Factor)
γ_{DL}	=	Dead Load Factor.
γ_L	=	Live Load Factor
γ_P	=	Prestress Factor
I	=	Impact

*For continuous structures, a one-half support width moment increase is to be used.

B. Service Method (LRFR)

Prestressed and Post-tensioned Members

Prestressed and post-tensioned members in positive moment regions, and where post-tensioning is continuous over the supports, shall also be rated based on allowable stresses at service loads. The lowest rating factors between Service and Strength methods shall be the governing rating. The rating equations shall be:

Concrete Tension:

$$R.F. = \frac{F_A - (F_D + F_P + F_S)}{F_{L(1+I)}}$$

Concrete Compression:

$$R.F. = \frac{F_A - (F_D + F_P + F_S)}{F_{L(1+I)}}$$

$$R.F. = \frac{F_A^{-1/2} (F_D + F_P + F_S)}{F_{L(1+I)}}$$

Prestressing Steel:

$$R.F. = \frac{F_A - (F_D + F_P + F_S)}{F_{L(1+I)}}$$

R.F. = Rating Factor (Ratio of Capacity to Demand)

Allowable Concrete Tensile Stress:

$$\begin{aligned} F_A &= 6\sqrt{f'_c} \\ &= 3\sqrt{f'_c} \text{ for severe corrosive exposure} \\ &= 0 \text{ for members without bonded reinforcement} \end{aligned}$$

Allowable Concrete compressive Stress:

$$\begin{aligned} F_A &= 0.6 f'_c \\ &= 0.4 f'_c \text{ when checking live load plus one half of the} \\ &\quad \text{dead and prestress compressive stresses.} \end{aligned}$$

Allowable Prestressing Tensile Stress

$$\begin{aligned} F_A &= 0.80f_y^* \text{ (Allowable Prestressing Tensile Stress)} \\ &\quad \text{where } f_y^* \text{ is the yield stress of the prestressing.} \\ F_D &= \text{Dead Load Stress} \\ F_P &= \text{Stress due to Prestress Force after all losses} \\ F_S &= \text{Stress due to Secondary Prestress forces} \\ F_{L(1+I)} &= \text{Stress due to Live Load including Impact} \end{aligned}$$

For all loadings, prestress losses shall be per design or current Bridge Design Manual.

For the overload trucks, the allowable stresses shall be increased by 15 percent.

When the bending moment rating for the overload vehicles is less than 1.0 based on the Service Method, and greater than 1.0 based on the Strength Method, the moment rating shall be calculated by dividing the strength rating factor by 1.30, and the result cannot exceed 1.0.

Timber Members

$$R.F. = \frac{F_A - F_D}{F_L}$$

R.F. = Rating Factor (Ratio of Capacity to Demand)

F_A = Allowable bending stress

F_D = Dead Load Stress

F_L = Stress due to Live Load, does not include Impact

F_A is per AASHTO Standard Specs. with an increase of 33%.

C. Resistance Factors (LRFR)

The resistance factors shall be per Table 3b or Figure 4 of the 1989 AASHTO *Guide Specifications for Strength Evaluation of Existing Steel and Concrete Bridges*. The resistance factors can be increased up to a maximum of 0.95, or decreased, depending on the condition, redundancy, type of inspection, and type of maintenance. For state owned bridges, assume careful inspection and vigorous maintenance and for local agency bridges, consult with the agency’s Bridge Engineer.

Following are the NBI and BMS condition codes and their interpretation:

For NBI Codes > or = 6 (BMS States 1 and 2) — no deterioration

For NBI Codes = 5 (BMS State 3) — some deterioration

For NBI Codes < 5 (BMS State 4) — heavy deterioration

The BMS coding shall be used to identify the conditions of the elements being rated, and the appropriate resistance factors shall be applied.

When rating members that have section loss identified in the inspection report, the members should be modeled using the reduced section. Then, use the resistance factors for members in satisfactory condition.

D. Load Factors (LRFR)

Dead Load γ_D = 1.20

Prestress Load γ_P = 1.00

Live Load

1. Low volume roadways (ADTT less than 1,000), significant sources of over weight trucks without effective enforcement. γ_L = 1.65
2. Heavy volume roadways (ADTT equal to or greater than 1,000), significant sources of over weight trucks without effective enforcement. γ_L = 1.80
3. OL-1 and OL-2 (or other permit vehicles). γ_L = 1.30

If ADTT is unavailable from traffic data, it may be estimated as 20 percent of ADT. The listed factors are essentially the same as Table 2 of AASHTO *Guide Specifications* except that Live Load Category 1 and 2 have been eliminated based on the assumption that Washington State does not have effective enforcement or control of overloads.

E. Impact (LRFR)

For new bridge designs, impact shall be 10 percent (0.1).

For existing bridges, the impact factor shall be determined by the approach roadway and the deck condition. For approach roadway condition codes 6 or greater, assume 10 percent impact; for codes less than 6, assume 20 percent impact. If the bridge deck condition is 6 or greater or has 0 to 4 percent scaling, assume 10 percent impact; if the deck condition is 5 or has between 5 and 15 percent scaling, assume 20 percent impact; if the deck condition is 4 or less and has greater than 15 percent scaling, assumes 30 percent impact.

F. Live Load Reduction Factors (LRFR)

Number of Loaded Lanes	Reduction Factor
One or two lanes	1.0
Three lanes	0.8
Four lanes or more	0.7

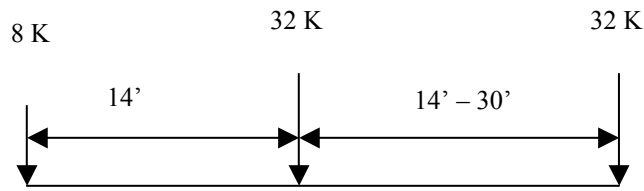
G. Live Loads (LRFR)

The moving loads for the rating shall be the HS-20 truck/lane loading (Figure [13.1-1](#)), three legal trucks/ lane load (Figure [13.1-2](#)), and two overload trucks. (Figure [13.1-3](#)). The legal lane load shall be used to rate structures with spans over 200 feet. For the two overload trucks (OL-1 and OL-2), use only one overload truck occupying one lane in combination with one of the AASHTO legal trucks in each of the remaining lanes, when modeling the full section of the bridge or cross-beams. The number of lanes used shall be the actual striped lanes at the time of rating.

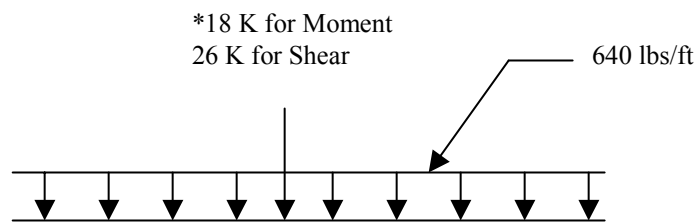
The three legal trucks and legal lane load, Type 3, Type 3S2, and Type 3-3, are to be used to determine posting limits. The two overload vehicles represent extremes in the limits of permitted vehicles in Washington State.

H. Rating Trucks

Design Trucks



HS-20 Truck

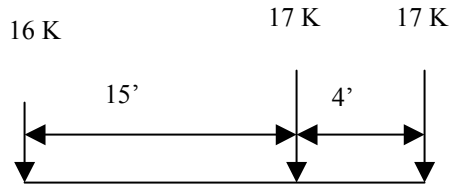


HS-20 Lane Load

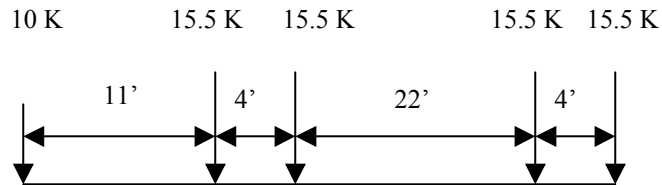
* In negative moment regions of continuous spans, place an equivalent load in the other span to produce the maximum effect.

Figure 13.1-1

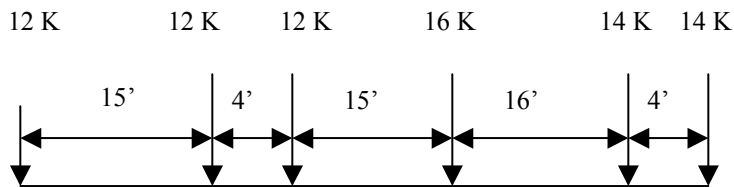
Legal Trucks



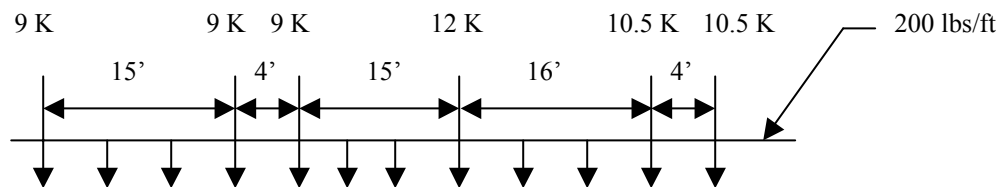
Type 3 Truck



Type 3S2 Truck

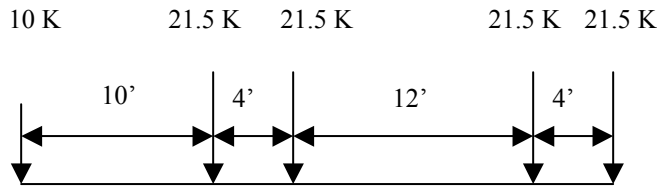


Type 3-3 Truck

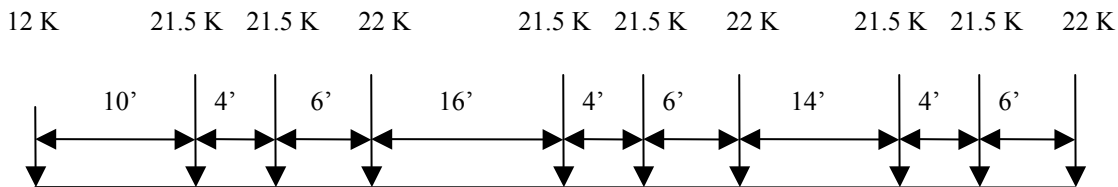


Legal Lane Load
Figure 13.1-2

Overload Trucks



Overload 1



Overload 2
Figure 13.1-3

13.1.2 NBI Rating (LFR)

Ratings shall be performed per the latest AASHTO *Manual for Condition Evaluation of Bridges*. All bridges, except timber, shall be rated based on the Load Factor method. The HS20 Truck/Lane shall be used to calculate the Inventory and Operating Ratings.

A. Strength Method (LFR)

The basic equation shall be:

$$R.F. = \frac{\Phi R_n - \gamma_{DL} D \pm S}{\gamma_L L(1 + I)}$$

Where:

R.F. = Rating Factor (Ratio of Capacity to Demand)

R_n = Nominal Capacity of the Member

Φ = Resistance Factor (Per AASHTO Standard Specs.)

D = Unfactored Dead Load

L = Unfactored Live Load

S = Unfactored Prestress Secondary Moment or Shear

I = Impact Factor, Span dependant (Per AASHTO Standard Specs.)

γ_{DL} = 1.3 (Dead Load Factor)

γ_L = 2.17 for Inventory (Live Load Factor)

= 1.30 for Operating

Truck/Lane shall be used to calculate the Inventory and Operating Ratings.

B. Service Method (LFR)

1. Prestressed and Post-tensioned Members

Prestressed and post-tensioned members in positive moment regions, and where post-tensioning is continuous over the supports, shall also be rated based on allowable stresses at service loads. The lowest rating factor between Service and Load Factor methods shall be the governing Inventory rating. The Operating rating shall be based on the load factor method using a Live Load factor of 1.30. Service ratings for the HS20 shall be the same as stated in Section 13.1.1.B, except the impact factor shall be span dependant.

2. Timber Members

$$R.F. = \frac{F_A - F_D}{F_L}$$

R.F. = Rating Factor (Ratio of Capacity to Demand)

F_A = Allowable bending stress

F_D = Dead Load Stress

F_L = Stress due to Live Load, does not include Impact

* F_A , for Inventory rating, shall be per AASHTO Standard Specifications. For Operating Ratings, F_A shall be per AASHTO Standard Specifications with a 33% increase in the allowable stress.

C. Resistance Factors (LFR)

The resistance factors for NBI ratings shall be per the latest AASHTO Standard Specifications. Following are the NBI resistance factors:

Steel Members:	1.00 (Flexure) 1.00 (Shear)
Prestressed Concrete	1.00 (Flexure, Positive moment) 0.90 (Shear)
Post-tensioned, Cast in place:	0.95 (Flexure, Positive moment) 0.90 (Shear)
Reinforced Concrete:	0.90 (Flexure) 0.85 (Shear)

For prestressed and post-tensioned members, where reinforcing steel is used to resist negative moment, the resistance factors for reinforced concrete section shall be used in the ratings.

D. Live Loads

The HS-20 truck or lane shall be used to load rate bridge members. The number of lanes shall be per AASHTO Standard Specifications, Section 3.6. When multiple lanes are considered, apply the appropriate multilane reduction factor given in Section 13.1.2.F. Load distribution methods are discussed under specific bridge types. Do not consider sidewalk live loads in rating analysis.

E. Impact (LFR)

Impact is expressed as a fraction of the live load stress, and shall be determined by the following formula:

$$I = \frac{50}{125 + L}$$

I = Rating Factor (Ratio of Capacity to Demand)

L = Length in feet of the portion of the span that is loaded to produce the maximum stress in the member.

*AASHTO Standard Specifications for Highway Bridges 3.8.2.1.

F. Live Load Reduction Factors (LFR)

Number of Loaded Lanes	Reduction Factor
One or two lanes	1.0
Three lanes	0.9
Four lanes or more	0.75

13.2 Special Rating Criteria

13.2.1 Dead Loads

Dead Loads shall be as defined in the AASHTO *Standard Specifications for Highway Bridges*, except concrete weight shall be 155 pcf.

13.2.2 Live Load Distribution Factors

Live Load distribution factors shall be per Chapter 3 of the AASHTO *Standard Specifications for Highway Bridges*. Distribution factors are selected assuming one traffic lane where the roadway is less than 20 feet wide or two or more traffic lanes where the roadway is 20 feet or wider.

13.2.3 Reinforced Concrete Structures

For conventional reinforced concrete members of existing bridges, checking of serviceability shall not be part of the rating evaluation.

Rating for shear in the longitudinal direction shall begin at a distance $h/2$ from the centerline of the bearing or face of integral cross beams (h = total depth).

13.2.4 Concrete Decks

For all concrete bridge decks, except flat slab bridges, that are designed per current AASHTO criteria for HS-20 loading or heavier, loading will be considered structurally sufficient and need not be rated. However, for existing bridge decks having any of the following conditions, rating of the deck is required:

1. Deck was designed for live loads lighter than HS-20.
2. Deck overhang is more than half the girder spacing.
3. Bridge Inspection Report Code is 4 or below.
4. When the original traffic barrier(s) or rail have been replaced by heavier barrier.

When rating of the deck is required, live load shall include all vehicular loads as specified in Section 13.1.1.H. Live load moments for the HS20 truck shall be per Section 3.24.3.1 of the AASHTO *Standard Specifications*. Live load moments for the legal and overload trucks shall be per the AASHTO *Manual for Maintenance Inspection of Bridges*.

13.2.5 Concrete Crossbeams

Live loads can be applied to the crossbeam as moving point loads at any location between curbs that produce the maximum effect.

When rating for shear in crossbeams, current AASHTO *Design Specifications* requires shear design to be at the face of support if there is a concentrated load within a distance “d” from the face of support. This requirement is new relative to earlier editions of AASHTO *Design Specifications* that allowed shear reinforcement design to be at a distance “d” from the face of support. When rating existing crossbeams that show no indication of distress on the latest inspection report, but have a rating factor of less than one (1.0), a more detailed/accurate shear analysis should be performed. One acceptable method is the “Strut and Tie” model analysis. For existing box girders and T-beams integral with the crossbeams, in lieu of this detailed analysis, dead and live loads can be assumed as uniformly distributed and the shear rating performed at a distance “d” from the face of support.

13.2.6 In-Span Hinges

For in-span hinges, rating for shear and bending moment should be performed based on the reduced cross-sections at the hinge seat. Diagonal hairpin bars are part of this rating as they provide primary reinforcement through the shear plane.

13.2.7 Concrete Box Girder Structures

Bridges with spread box girders shall be rated on a per box basis. Otherwise, the rating shall be on the per bridge basis for all applied loads.

13.2.8 Prestressed Concrete Girder Structures

Rate on a per member basis.

13.2.9 Concrete Slab Structures

Rate cast-in-place solid slabs on a per foot of width basis. Rate precast panels on a per panel basis. Rate cast-in-place voided slabs based on a width of slab equal to the predominant center-to-center spacing of voids.

When rating flat slabs on concrete piling, assume pin-supports at the slab/pile interface of interior piers and the slab continuous over the supports. If ratings using this assumption are less than 1.0, the piles should be modeled as columns with fixity assumed at 10 feet below the ground surface.

Pile caps are to be rated if deemed critical by the engineer.

13.2.10 Steel Structures

On existing bridges, checking of fatigue and serviceability shall not be part of the rating evaluation.

13.2.11 Steel Floor Systems

Floorbeams and stringers shall be rated as if they are simply supported. Assume the distance from outside face to outside face of end connections as the lengths for the analysis. Live loads can be applied to the floorbeam as moving point loads at any location between curbs, which produce the maximum effect.

Rating of connections is not required unless there is evidence of deterioration.

13.2.12 Steel Truss Structures

Rate on a per truss basis or perform a 3-D analysis or simplified distribution methods. Assume nonredundancy of truss members and pinned connections.

In general, rate chords, diagonals, verticals, end posts, stringers, and floorbeams. Do not rate connections unless there is evidence of deterioration, except connections with structural pins. For pin-connected trusses, analyze pins for shear, and the side plates for bearing capacity.

For truss members that have been heat-straightened three or more times, deduct 0.1 from $\phi(\Phi)$.

13.2.13 Timber Structures

Unless the species and grade is known, assume Douglas fir, select structural for members installed prior to 1955 and Douglas fir, No. 1 after 1955. The allowable stresses for beams and stringers shall be as listed in the AASHTO *Standard Specifications*.

The nominal dimensions should be used to calculate dead load, and the net dimensions to calculate section modulus. If the member is charred, it may be assumed that $\frac{1}{4}$ -inch of material is lost on all surfaces. Unless the member is notched or otherwise suspect, shear need not be calculated.

When calculating loads, no impact is assumed.

13.2.14 Widened or Rehabilitated Structures

For widened bridges, rate crossbeams in all cases.

For existing bridges, a load rating shall be performed if the load carrying capacity of the longitudinal members is altered, or the dead and live loads have increased due to the widening.

Longitudinal rating for the widened portion will be required only when the width of the widened portion on one side of the structure is greater than or equal to 10'-0" or more throughout the length of the structure.

For rehabilitated bridges, a load rating will be required if the load carrying capacity of the structure is altered by the rehabilitation.

13.3 Load Rating Software

Rating of State bridges shall be performed using the BRIDG for Windows software, latest version.

For more complex structures such as Steel Curved girders and Arches, different software may be used to analyze the loads after obtaining approval from the Load Rating Engineer.

