

DOUBLE BARREL 10'-0" X 5'-0" PRECAST CONCRETE BOX CULVERT

STA 87+25 HAPPY JACK ROAD CHEYENNE WEST SECTION

0107023

LARAMIE COUNTY

PRELIMINARY

DESIGN DATA

SPECIFICATIONS: AASHTO LRFD Bridge Design Specifications, 8th Edition.

ADT: 3470 (Year 2019)

LOADING:

- Live Load: HL93
 - Lateral live load surcharge: 3 ft earth or 108 psf
- Dead Load: Design fill: 7.5 ft
 - (1) Vertical earth pressure: 120 pcf
 - Lateral earth pressure: 36 pcf
 - (2) Vertical earth pressure: 120 pcf
 - Lateral earth pressure: 72 pcf

REINFORCED CONCRETE: Load and Resistance Factor Design -
 Class A Concrete $f'_c = 4000$ psi
 Reinforcing Steel $f_y = 60,000$ psi (Grade 60)

PRECAST CONCRETE: Load and Resistance Factor Design -
 Concrete $f'_c = 5000$ psi
 Reinforcing Steel $f_y = 60,000$ psi (Grade 60)

APPROACH ROADWAY WIDTH: 40'-0"

ESTIMATED QUANTITIES - CODE 08				
ITEM NO.	ITEM	UNIT	TOTAL QUANTITY	ESTIMATE
202.03100	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	LUMP SUM	EA
206.03300	CULVERT SUBEXCAVATION	CY		
212.03900	PERVIOUS BACKFILL MATERIAL	CY		
217.01010	GEOTEXTILE, EROSION CONTROL	SY		
217.01020	GEOTEXTILE, MATERIAL SEPARATION (WOVEN)	SY		
502.11005	PRECAST BOX CULVERTS 10 X 5 ft	FT		
511.06000	MACHINE-PLACED RIPRAP	CY		CY
513.00005	CLASS A CONCRETE	LS	LUMP SUM	
514.00015	REINFORCING STEEL	LS	LUMP SUM	

STRUCTURE NO. LMQ
ML107B, RM 4.32 SEC 5, T13N, R67W

WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
REVISIONS			
REVIEW _____	DESIGN _____	Design Section L M Nop	
APPROVAL _____	DETAIL <u>CCC</u> <u>AAA</u>	Drwg No. P-0009 Sheet 1 of 3	

GENERAL NOTES

SPECIFICATIONS: WYDOT Standard Specifications for Road and Bridge Construction, 2010 Edition

DIMENSIONS: Longitudinal dimensions are along flow line. Slopes are vertical : horizontal.

CONSTRUCTION SEQUENCE: Work on the structure in multiple stages. Submit a detailed schedule of operations to the engineer before beginning any work.

CONCRETE AGGREGATE: Ensure all concrete mix designs employed in the project meet the following alkali -silica reactivity (ASR) screening.

Conduct the AASHTO T 303 (ASTM C 1260) test using a combined sample of fine aggregate and coarse aggregate, in the same proportions that will be used in the concrete mix design. If the test results indicate an expansion at 16 days from casting of 0.10 percent or less, the aggregate is considered non-reactive and mitigation measures are not required.

If the test results indicate an expansion at 16 days from casting of greater than 0.10 percent, mitigate the aggregate reactivity through the use of class F fly ash as approved for ASR mitigation in accordance with the Materials Testing Manual, silica fume, and/or lithium nitrate additive. Demonstrate adequate mitigation by conducting the ASTM C 1567 test and ensuring the test results indicate an expansion at 16 days from casting of 0.10 percent or less. When conducting the ASTM C 1567 test, use a combined sample of fine aggregate and coarse aggregate, in the same proportions that will be used in the concrete mix design and use the cementitious material that is to be used in the mix design.

Ensure the AASHTO T 303 (ASTM C 1260), and ASTM C 1567 tests have been performed within 12 months of the submittal date.

Submit qualifying AASHTO T 303 (ASTM C 1260) and ASTM C 1567 test results to the engineer a minimum of 14 calendar days before concrete production. Submit test results to the Materials Program along with each mix design request.

REINFORCING STEEL: Ensure reinforcing steel conforms to ASTM A 615 (Grade 60) for all bars, including ties and stirrups. Concrete cover to face of reinforcing steel is 2" unless noted. Dimensions for bent bars are out to out. Ensure bars marked with an asterisk (*) are coated.

BAR MARKS



CUTWATER ANGLE: Ensure steel for the cutwater angle conforms to ASTM A 709 (Grade 36) minimum and is galvanized after fabrication. Work necessary for the cutwater angle is incidental to the contract pay item Class A Concrete.

EYEBOLTS: Use galvanized bar conforming to ASTM A 709 (Grade 36). Work necessary for the eyebolts is incidental to the contract pay item Class A Concrete.

PRECAST BOX CULVERTS: The estimated quantity of precast box culverts is based on the precast culvert length for each barrel.

Two single barrel culvert sections may be used instead of the double barrel culvert section. If two single barrel culvert sections are used, maintain a 1" minimum gap between the two culvert sections. Place a sand slurry, as approved by the engineer, to completely fill the gap. Use of two single barrel culvert sections is considered an alternate design.

Design precast boxes for the loading specified. Ensure the title pages of the design computations and shop plans bear the seal and signature of a professional engineer.

The minimum concrete cover to the face of the main reinforcing steel is 1 1/2" and 1" to other reinforcing steel unless noted.

JOINT SEALANT: Use joint sealant conforming to AASHTO M 198. Work necessary for the joint sealant is incidental to the contract pay item Precast Box Culverts 10 x 5 ft.

REMOVAL OF STRUCTURES AND OBSTRUCTIONS: Remove the existing 72"Ø x 74'-0"± reinforced concrete pipe.

CULVERT EXCAVATION: The estimated quantity of culvert excavation, including removal of the existing pipe and excavation for the new culvert, is 680 CY and is incidental to the contract pay item Removal of Structures and Obstructions.

CULVERT SUBEXCAVATION: The bottom limits of culvert subexcavation is 3'-0" below the bottom of the bottom slab. Line the bottom of the culvert subexcavation with geotextile material separation. Backfill with pervious backfill material. The estimated quantity of culvert subexcavation is calculated in accordance with Standard Plan 206-1A, Culvert and Trench Excavation.

EPOXY RESIN BONDING COMPOUND: Clean the exposed ends of the precast culvert end sections and coat with epoxy resin bonding compound. If the bonding compound gels before concrete placement, remove by sandblasting and reapply. Use bonding compound conforming to Subsection 810.6, Epoxy Resin. Mix and apply in accordance with the manufacturer's recommendations. Work necessary for the epoxy resin bonding compound is incidental to the contract pay item Class A Concrete.

BRIDGE OFFICE NOTIFICATION: The engineer will notify the State Bridge Engineer in writing within 14 calendar days after work has been completed at this structure.

STREAM DATA

Drainage Area -----	7.5 Sq Mi
Structure Slope -----	1.02%
Description of Channel Material -----	Clayey sand with gravel
Drift Potential -----	Trees
Ordinary High Water Elevation -----	6258.1 ft
Headwater Elevation Q ₂₅ -----	6263.4 ft
Q ₁₀₀ -----	6265.8 ft
Outlet Velocity -----	14.5 fps
Design Frequency -----	25 Year
Design Discharge Q ₂₅ -----	875 cfs
Review Discharge Q ₁₀₀ -----	1710 cfs
Source of Discharge -----	Floodflow Characteristics of Wyoming Streams
Method of Analysis -----	HEC-RAS and CDS
Flood History -----	Unknown

REFERENCES

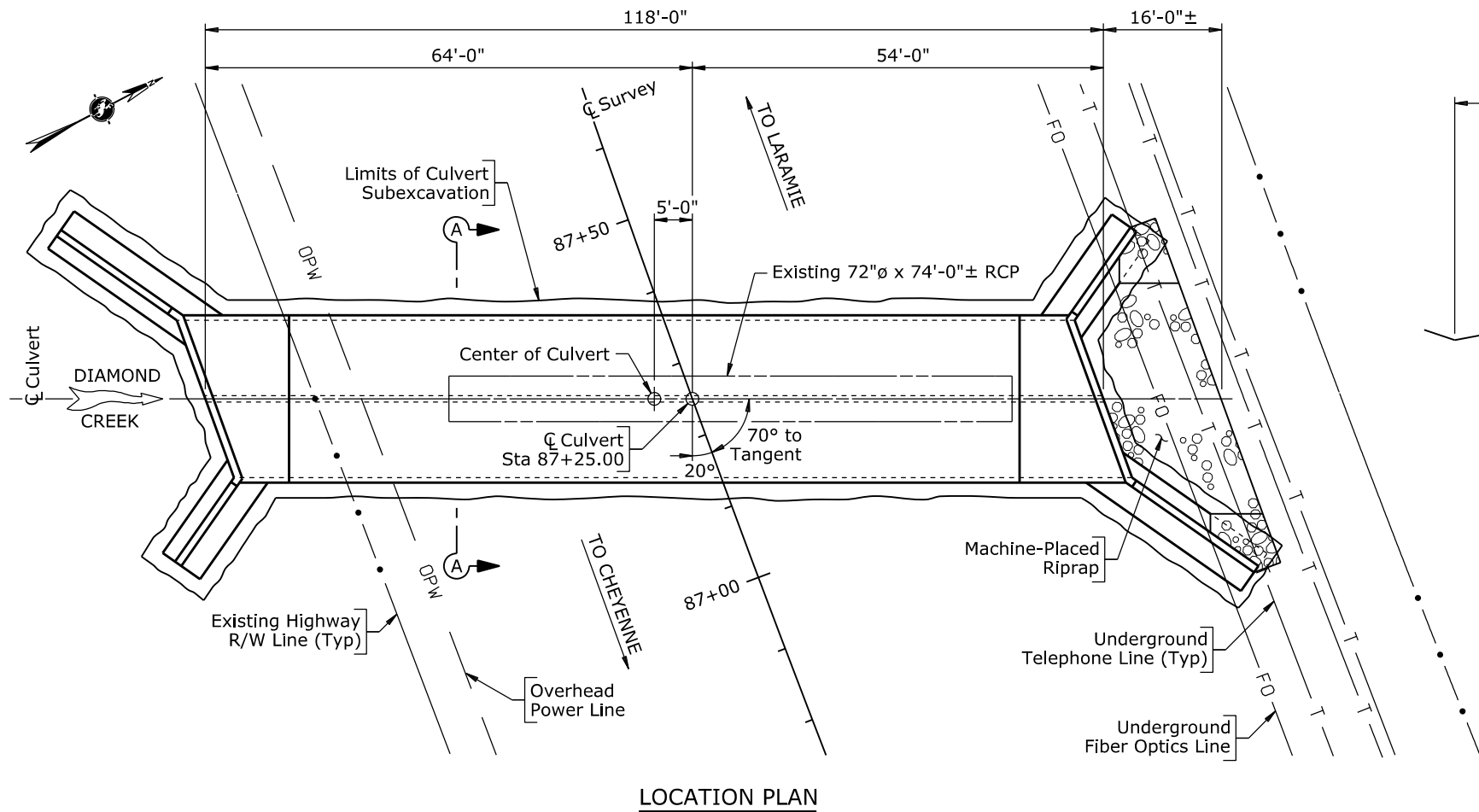
- Supplementary Specifications:
SS-100K Adjustment for Structural Steel
- Standard Plans:
206-1A Culvert and Trench Excavation

WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
REVISIONS	PRELIMINARY GENERAL NOTES		
	DOUBLE BARREL 10'-0" X 5'-0" PRECAST CONCRETE BOX CULVERT STA 87+25 Happy Jack Road Cheyenne West Section		
	0107023 La		
REVIEW _____	DESIGN _____ DETAIL <u>CCC</u> <u>AAA</u> QTY'S _____	Design Section L M Nop	Drwg No. P-0009 Sheet 2 of 3
APPROVAL _____			

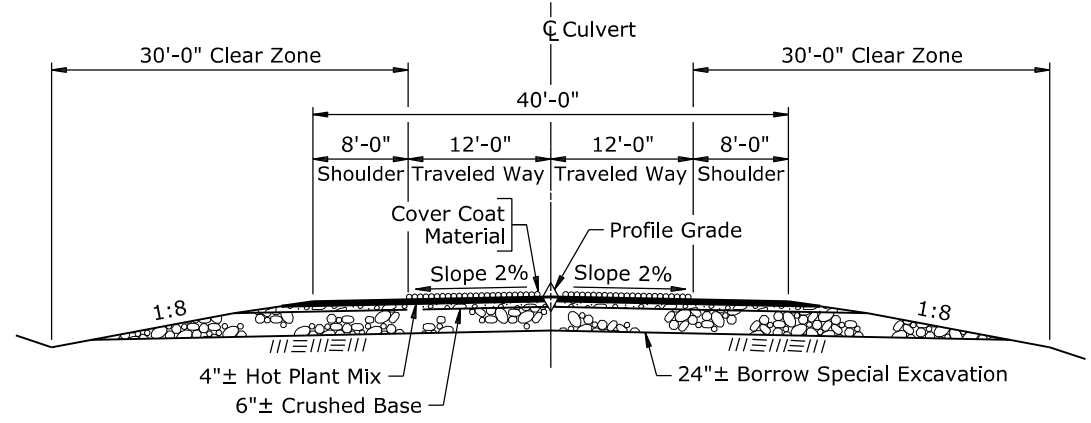
Nov 2019

4.01 - Example

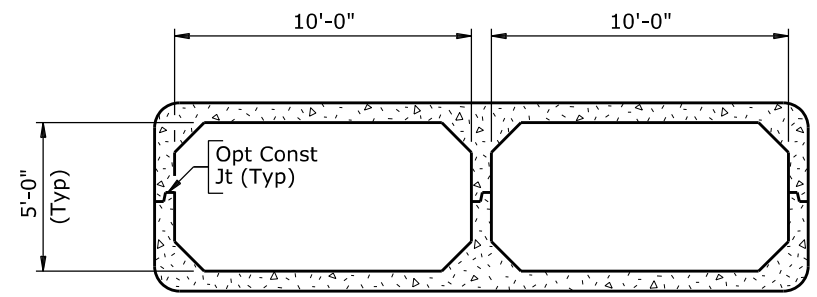
Wyo. Proj. 0107023
 Sheet of Sheets



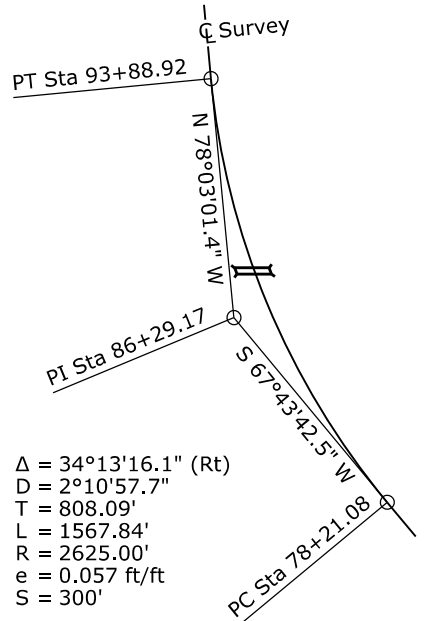
LOCATION PLAN



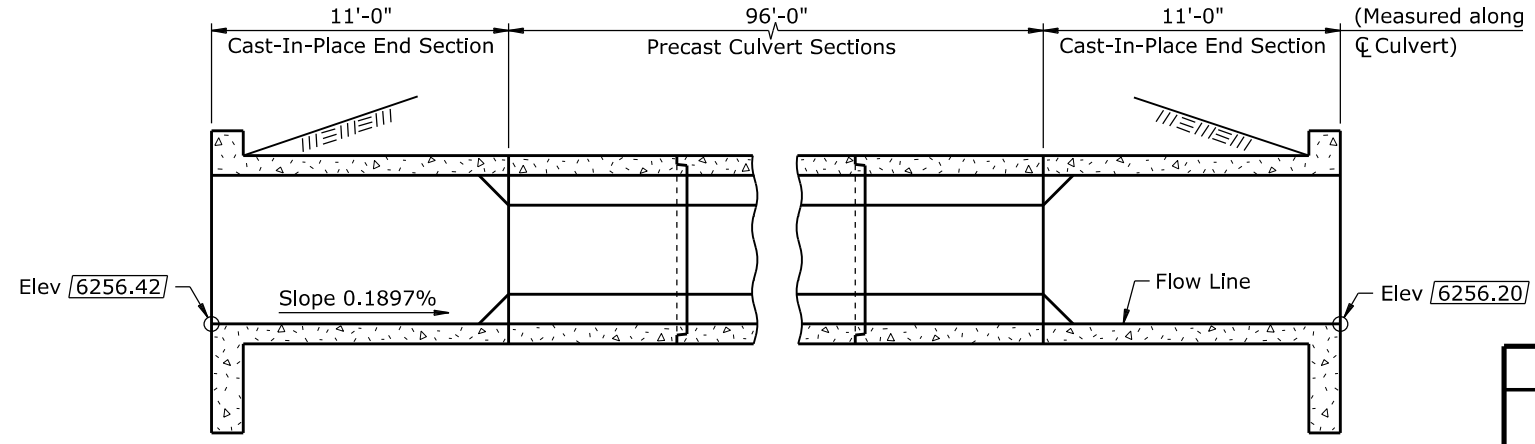
TYPICAL ROADWAY SECTION



SECTION A-A



HORIZONTAL CURVE DATA



LONGITUDINAL SECTION

Note: Elevations shown as 6256.42 are at \bar{C} Culvert.

WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
PRELIMINARY LAYOUT			
DOUBLE BARREL 10'-0" X 5'-0" PRECAST CONCRETE BOX CULVERT			
STA 87+25 Happy Jack Road Cheyenne West Section			
0107023		La	
DESIGN	CCC	AAA	Design Section L M Nop
DETAIL	CCC	AAA	Drwg No. P-0009 Sheet 3 of 3
QTY'S			

Section 4.01 - Preliminary

DOUBLE BARREL 10'-0" X 5'-0" PRECAST CONCRETE BOX CULVERT STA 87+25 HAPPY JACK ROAD CHEYENNE WEST SECTION

0107023

LARAMIE COUNTY

DESIGN DATA

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ADT: 3470 (Year 2019)

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212.03900	PERVIOUS BACKFILL MATERIAL	CY	350	
217.01010	GEOTEXTILE, EROSION CONTROL	SY	60	
217.01020	GEOTEXTILE, MATERIAL SEPARATION (WOVEN)	SY	440	
502.11005	PRECAST BOX CULVERTS 10 X 5 ft	FT	192	
511.06000	MACHINE-PLACED RIPRAP	CY	40	75.7 CY
513.00005	CLASS A CONCRETE	LS	LUMP SUM	
514.00015	REINFORCING STEEL	LS	LUMP SUM	

STRUCTURE NO. LMQ
ML107B, RM 4.32 SEC 5, T13N, R67W

WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
REVISIONS			
<small>REVIEW</small>	<small>DESIGN</small>	<small>Design Section</small>	<small>L M Nop</small>
<small>APPROVAL</small>	<small>DETAIL</small> CCC ✓ AAA	<small>Drwg No. 0009</small>	<small>Sheet 1 of 6</small>
	<small>QTY'S</small>		

GENERAL NOTES

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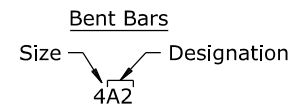
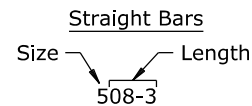
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BAR MARKS



CUTWATER ANGLE: Ensure steel for the cutwater angle conforms to ASTM A 709 (Grade 36) minimum and is galvanized after fabrication. Work necessary for the cutwater angle is incidental to the contract pay item Class A Concrete.

EYEBOLTS: Use galvanized bar conforming to ASTM A 709 (Grade 36). Work necessary for the eyebolts is incidental to the contract pay item Class A Concrete.

PRECAST BOX CULVERTS: The estimated quantity of precast box culverts is based on the precast culvert length for each barrel.

Two single barrel culvert sections may be used instead of the double barrel culvert section. If two single barrel culvert sections are used, maintain a 1" minimum gap between the two culvert sections. Place a sand slurry, as approved by the engineer, to completely fill the gap. Use of two single barrel culvert sections is considered an alternate design.

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BRIDGE OFFICE NOTIFICATION: The engineer will notify the State Bridge Engineer in writing within 14 calendar days after work has been completed at this structure.

STREAM DATA

Drainage Area	7.5 Sq Mi
Structure Slope	1.02%
Description of Channel Material	Clayey sand with gravel
Drift Potential	Trees
Ordinary High Water Elevation	6258.1 ft
Headwater Elevation Q ₂₅	6263.4 ft
Q ₁₀₀	6265.8 ft
Outlet Velocity	14.5 fps
Design Frequency	25 Year
Design Discharge Q ₂₅	875 cfs
Review Discharge Q ₁₀₀	1710 cfs
Source of Discharge	Floodflow Characteristics of Wyoming Streams
Method of Analysis	HEC-RAS and CDS
Flood History	Unknown

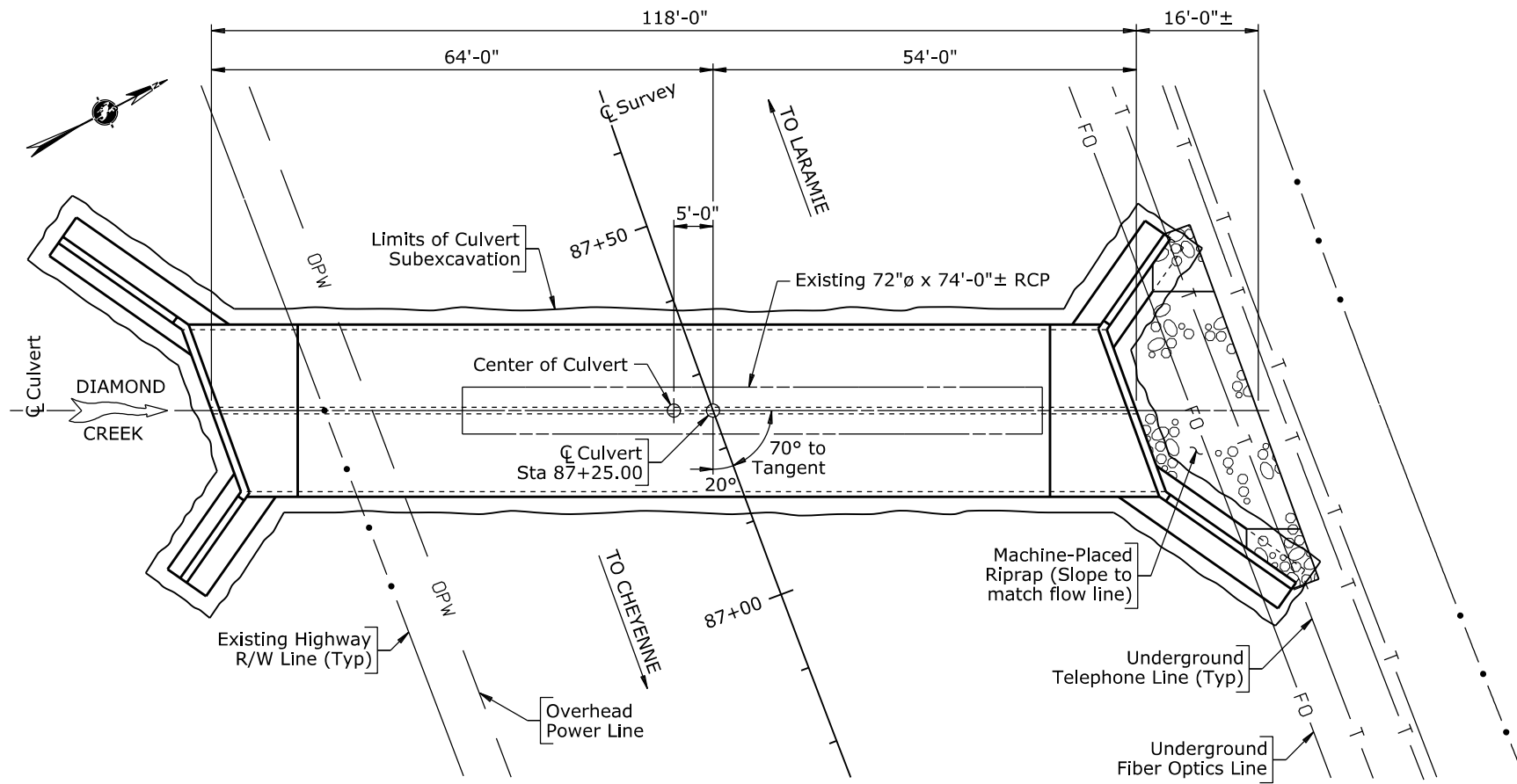
REFERENCES

- Supplementary Specifications:
 - SS-100K Adjustment for Structural Steel
- Standard Plans:
 - 206-1A Culvert and Trench Excavation

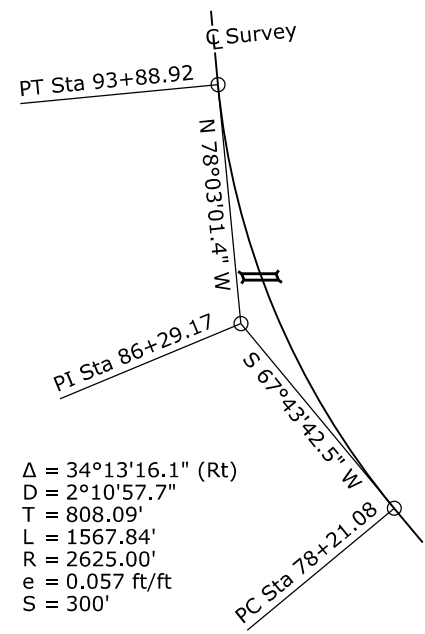
WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
REVISIONS	GENERAL NOTES		
	DOUBLE BARREL 10'-0" X 5'-0" PRECAST CONCRETE BOX CULVERT STA 87+25 Happy Jack Road Cheyenne West Section		
	0107023 La		
DESIGN	_____	Design Section	L M Nop
DETAIL	CCC ✓ AAA	Drwg No. 0009	Sheet 2 of 6
QTY'S	_____		

Nov 2019

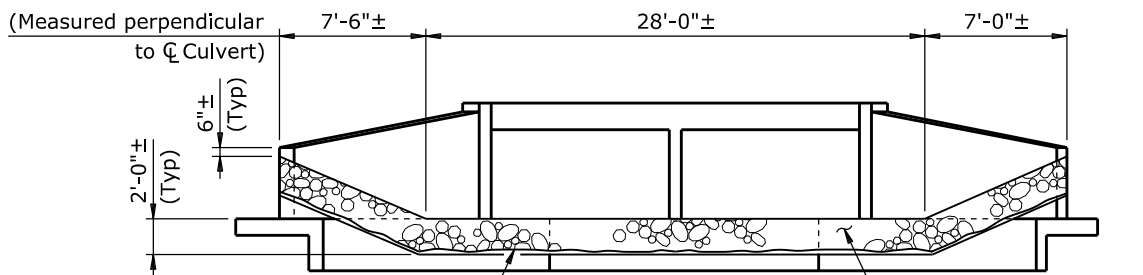
4.17 - Example



LOCATION PLAN



HORIZONTAL CURVE DATA



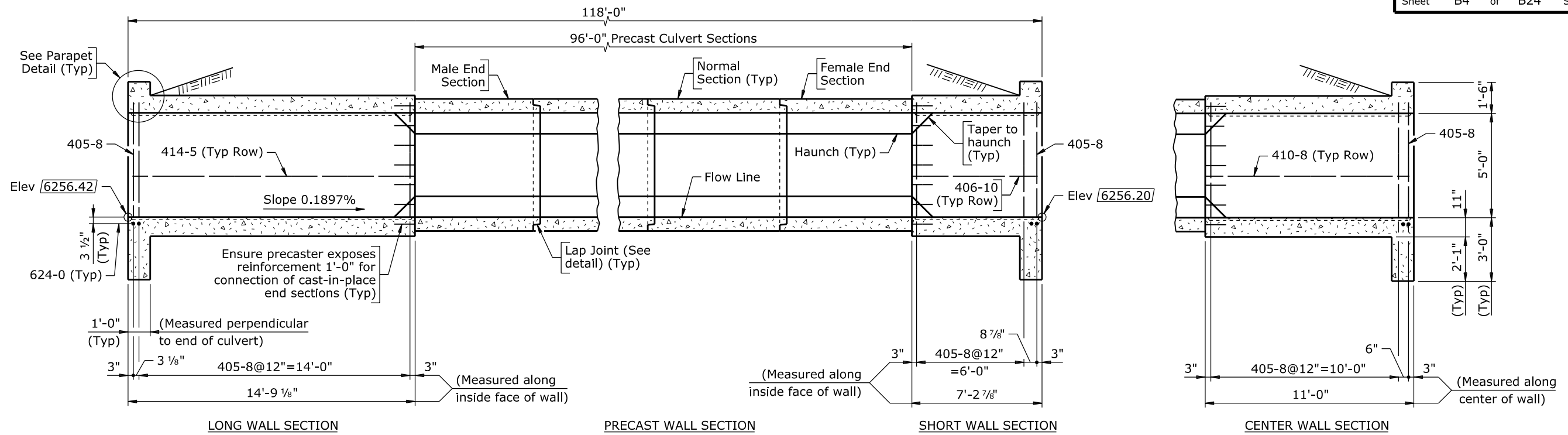
RIPRAP ELEVATION

BILL OF REINFORCEMENT				
Location	Mark	Number Required	Bending Diagrams	Set Diagrams
Bott Slabs & Footings	4C1	66		
	4C3	64		
	415-6	14		
	421-8	28		
	424-0	14		
	Set 1 Bars	2		
	Set 4 Bars	4		
	521-8	28		
	Set 2 Bars	2		
	605-8	70		
624-0	4			
Weight		3436 LB		
Walls	4C4	10		
	4C5	10		
	405-8	72		
	406-4	6		
	406-10	10		
	410-8	10		
	414-5	10		
	Weight			
Top Slabs & Parapets	4C2	44		
	Set 4 Bars	4		
	521-8	28		
	Set 2 Bars	2		
	621-8	28		
	622-7	2		
	623-0	2		
	624-0	4		
	Set 3 Bars	2		
	Weight			
Wingwalls	403-3	2		
	404-9	2		
	407-3	2		
	410-5	2		
	411-8	8		
	416-8	8		
	Set 5 Bars	2		
	Set 6 Bars	2		
	611-9	4		
	616-9	4		
Weight		545 LB		

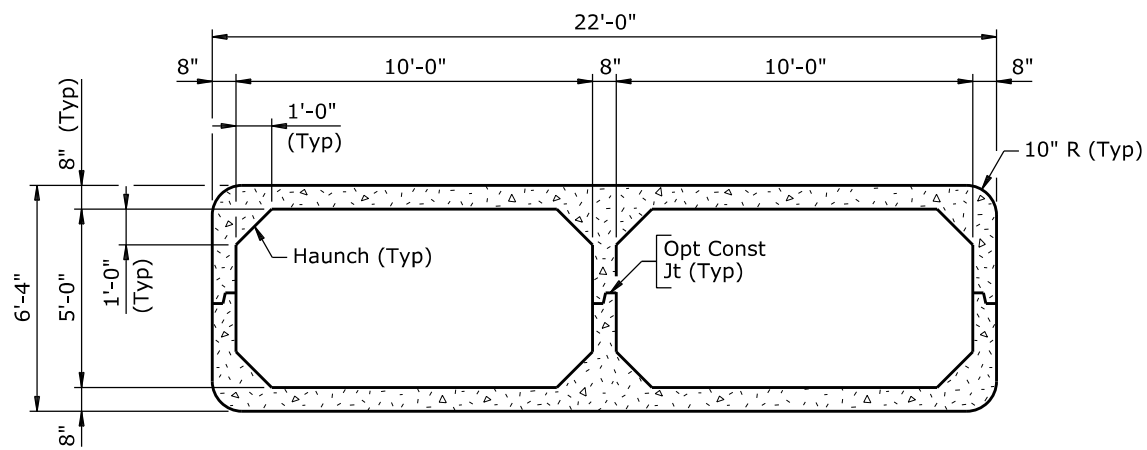
WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
CULVERT DETAILS			
DOUBLE BARREL 10'-0" X 5'-0" PRECAST CONCRETE BOX CULVERT STA 87+25 Happy Jack Road Cheyenne West Section			
0107023		La	
DESIGN	DDD ✓ FFF	Design Section	L M Nop
DETAIL	CCC ✓ AAA	Drwg No. 0009	Sheet 3 of 6
QTY'S	CCC ✓ AAA		

Section 4.17 - Culverts

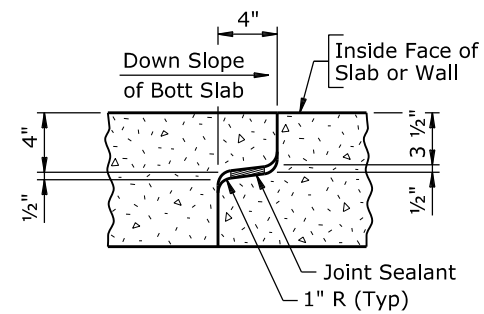
Nov 2018



LONGITUDINAL SECTIONS
 (Showing reinforcing steel placed in walls)



PRECAST CULVERT SECTION



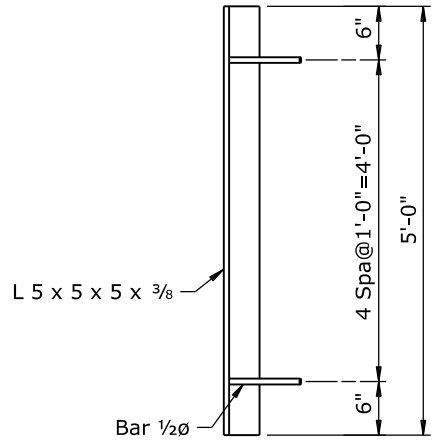
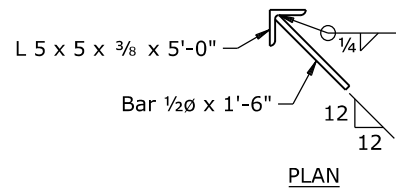
TYPICAL LAP JOINT DETAIL

- Note:**
- 1) Elevations shown as $\sqrt{6256.42}$ are at $\text{\textcircled{C}}$ Culvert.
 - 2) Fill lifting holes with grout.
 - 3) The weight of each precast concrete barrel section is approximately 6450 lb/ft.
 - 4) For Parapet Detail, see Sheet No. 5.

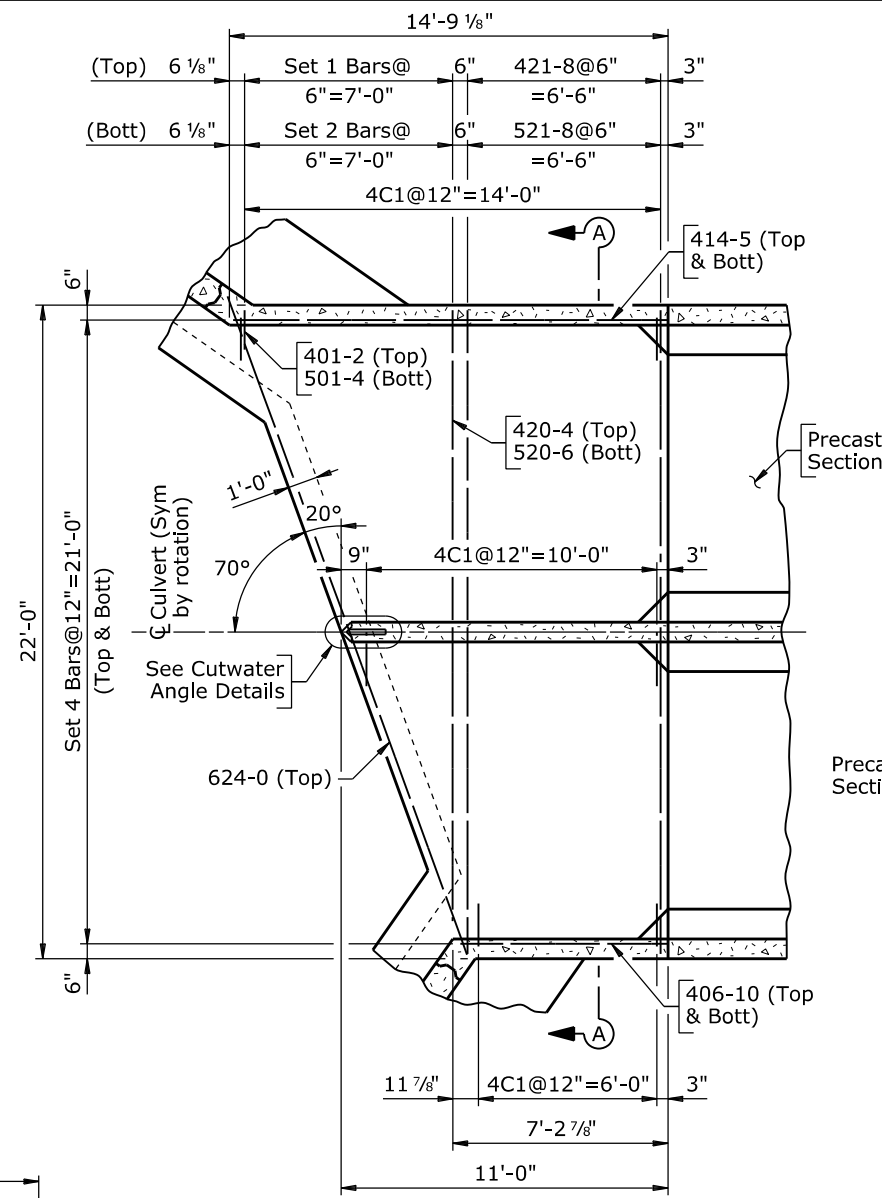
WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
CULVERT DETAILS			
DOUBLE BARREL 10'-0" X 5'-0"			
PRECAST CONCRETE BOX CULVERT			
STA 87+25			
Happy Jack Road			
Cheyenne West Section			
		0107023	La
REVISIONS	DESIGN <u>DDD</u> ✓ <u>FFF</u>	Design Section L M Nop	
	DETAIL <u>CCC</u> ✓ <u>AAA</u>		
APPROVAL	QTY'S <u>CCC</u> ✓ <u>AAA</u>	Drwg No. 0009	Sheet 4 of 6

4.17 - Example

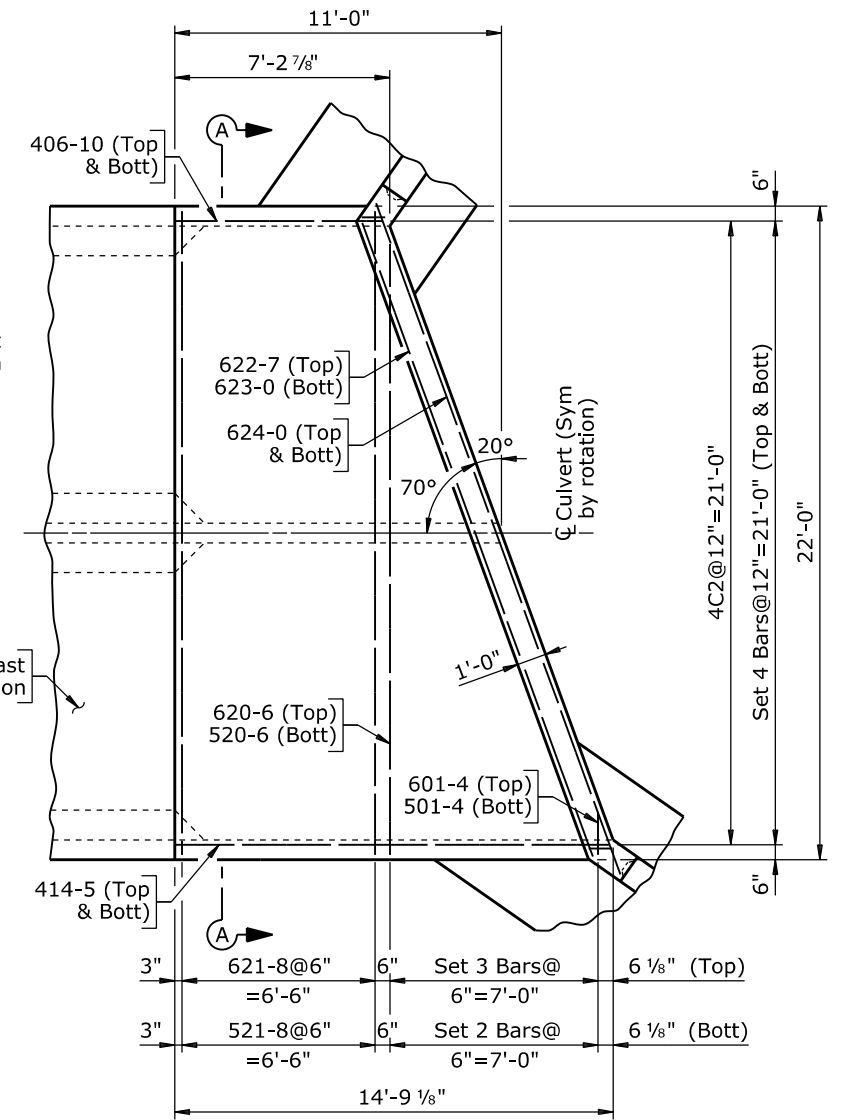
Section 4.17 - Culverts



CUTWATER ANGLE DETAILS
(1 req'd)

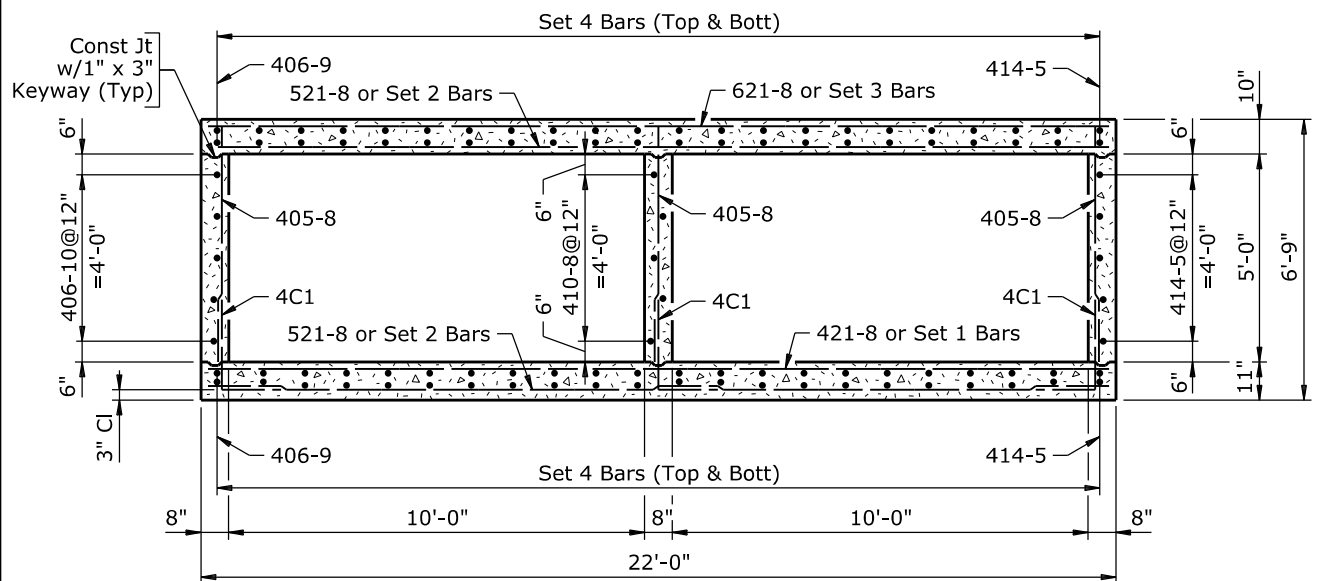


HORIZONTAL SECTION
(Showing cast-in-place bottom slab)

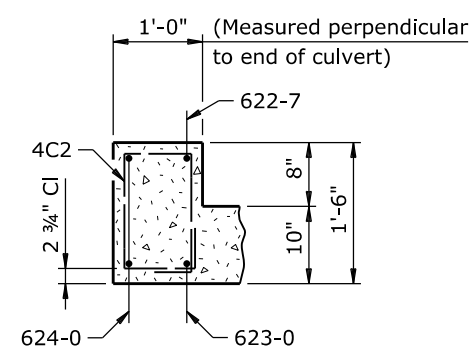


PLAN
(Showing cast-in-place top slab)

- Note:**
- 1) Place short leg of 4C1 bars in slab. Skew short leg as required to fit acute corners. Place 4C1 bars in center of interior wall and alternate direction of short leg at interior wall.
 - 2) Place 405-8 bars with 4C1 bars.
 - 3) Place 624-0 bars in bottom slab symmetrical about \bar{C} Culvert.
 - 4) For location of Parapet Detail, see Sheet No. 4.



SECTION A-A



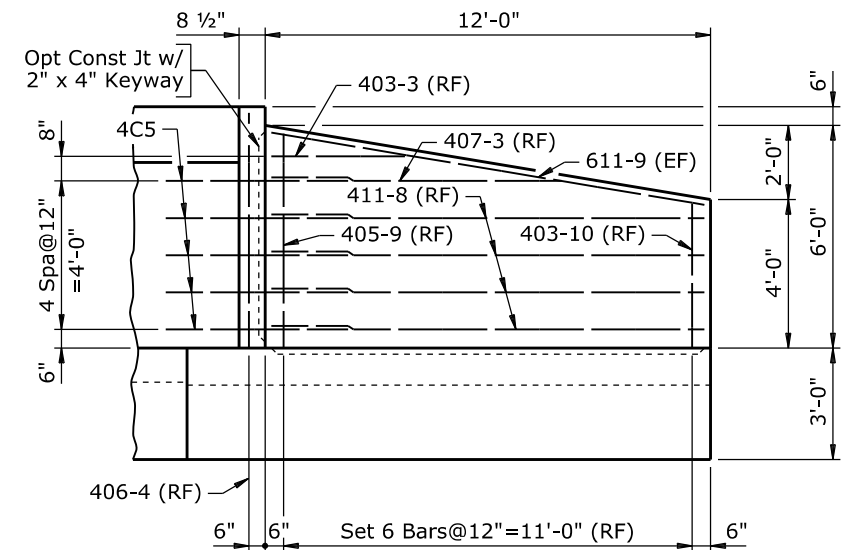
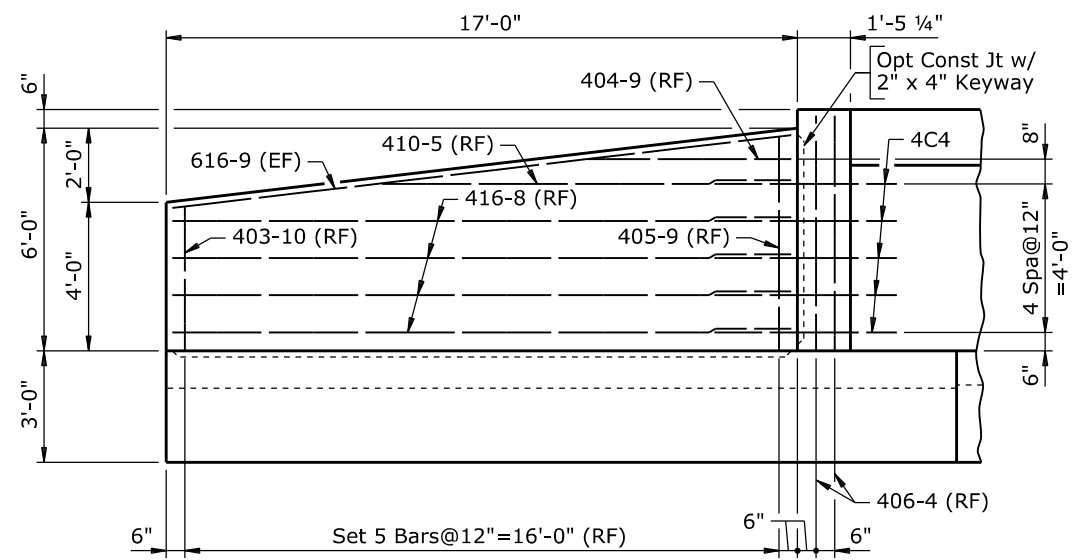
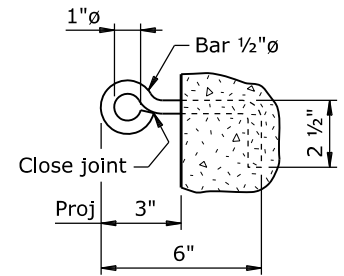
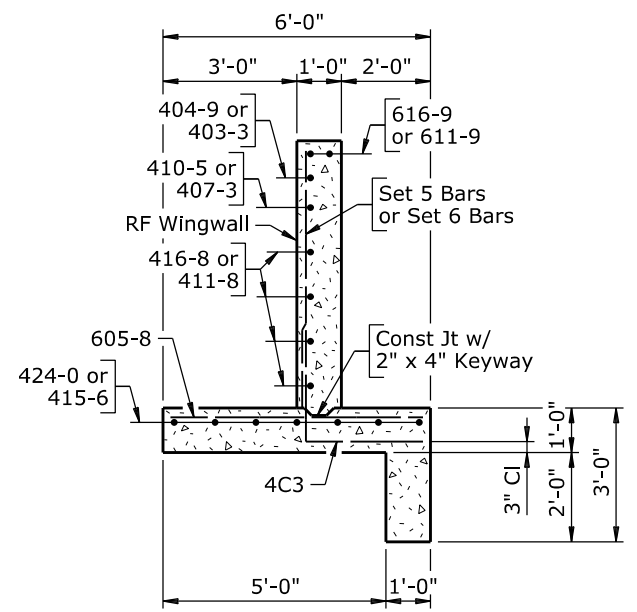
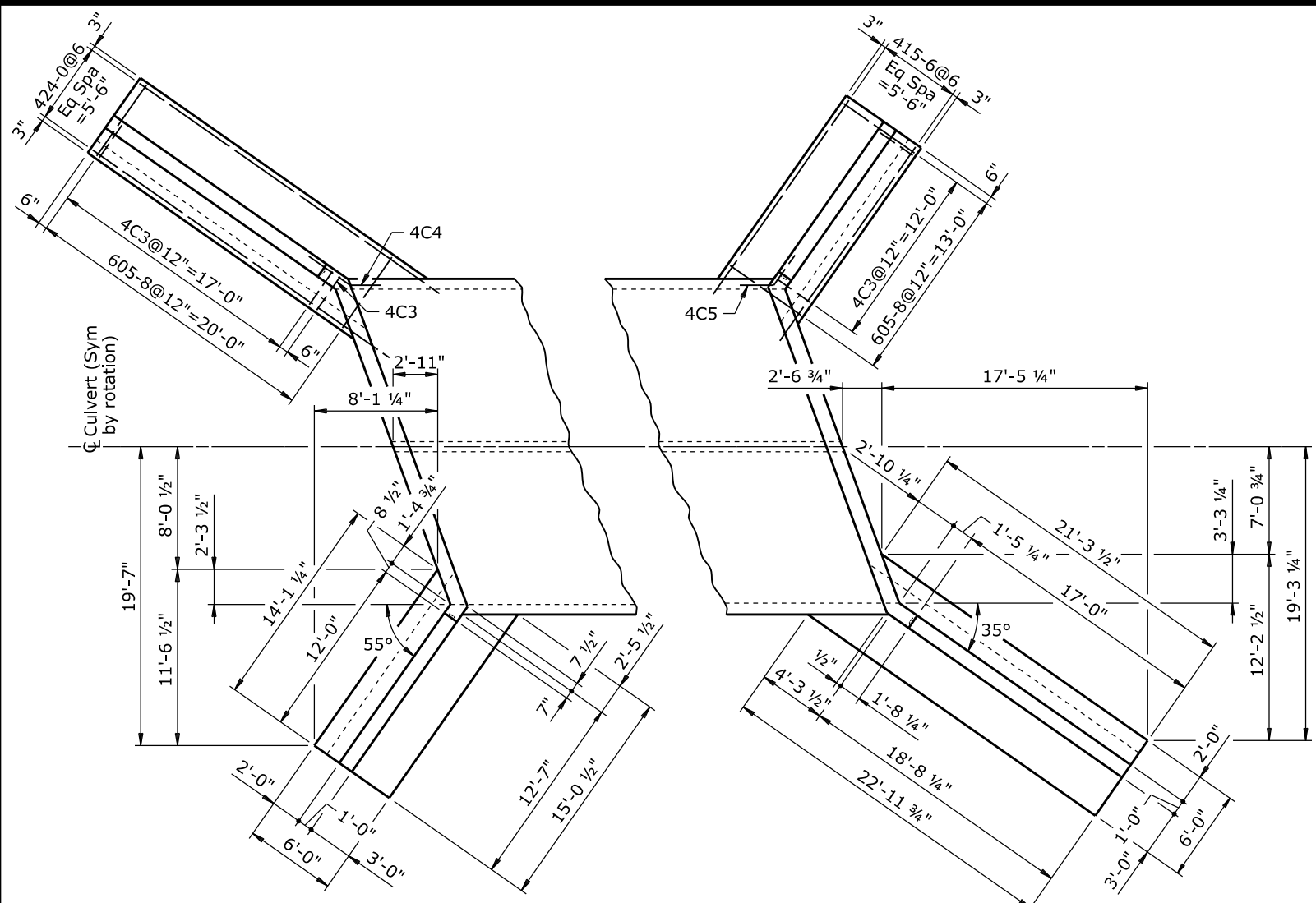
PARAPET DETAIL

WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
CULVERT DETAILS			
DOUBLE BARREL 10'-0" X 5'-0"			
PRECAST CONCRETE BOX CULVERT			
STA 87+25			
Happy Jack Road			
Cheyenne West Section			
0107023		La	
DESIGN	DDD ✓ FFF	Design Section	L M Nop
DETAIL	CCC ✓ AAA	Drwg No. 0009	Sheet 5 of 6
APPROVAL	CCC ✓ AAA		

Nov 2018

4.17 - Example

Wyo. Proj. 0107023
 Sheet B6 of B24 Sheets



- Note:
- 1) Place long leg of 4C3 bars in footing.
 - 2) Place Set 5 Bars, Set 6 Bars, and 406-4 bars with 4C3 bars.
 - 3) Place short leg of 4C4 bars with 414-5 bars at inside face of walls.
 - 4) Place short leg of 4C5 bars with 406-10 bars at inside face of walls.

WYOMING DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM			
CULVERT DETAILS			
DOUBLE BARREL 10'-0" X 5'-0"			
PRECAST CONCRETE BOX CULVERT			
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0107023		La	
DESIGN	DDD ✓	FFF	Design Section L M Nop
DETAIL	CCC ✓	AAA	
QTY'S	CCC ✓	AAA	
REVISIONS		Drwg No. 0009	Sheet 6 of 6

Section 4.17 - Culverts