Arizona Department of Transportation

Emergency Rehabilitation of I-10 Mescal Road TI UP

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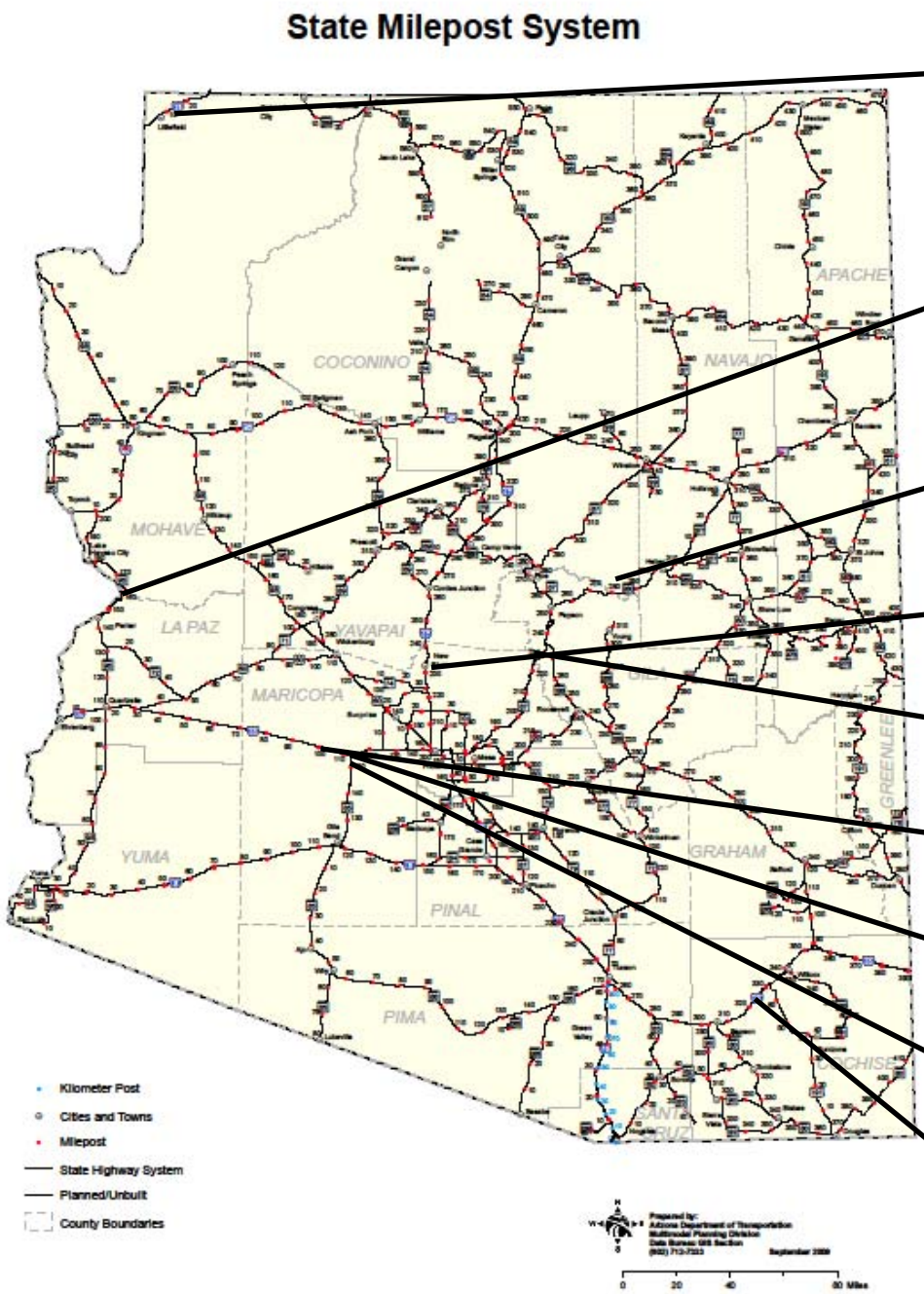
ADOT Bridge Group Design Section Leader

Arizona Fire Damaged Bridges in the last 15 years

- I-10 Oglesby Road Ramp C UP in 1998
- SR 260 Gordon Canyon Bridge in 1998
- I-15 Virgin River BR #7 in 2001
- SR 87 Slate Creek RCB in 2003 and 2007
- I-10 335th Ave UP in 2006
- I-17 Union Hills Drive TI OP in 2006
- I-10 Hassayampa River Bridge EB in 2008
- SR 95 Bill Williams River Bridge in 2006
- I-10 Mescal Road TI UP in 2011



- I-15 Virgin River BR # 7
- SR 95 Bill Williams River Bridge
- SR 260 Gordon Canyon Bridge
- I-17 Union Hills Drive TI OP
- SR 87 Slate Creek RCB
- I-10 355th Ave UP
- I-10 Hassayampa River Bridge EB
- I-10 Oglessby Road Ramp
- I-10 Mescal Road TI UP MP 297.17

Mescal Road TI UP Background

- Built 1959
  - 5- Span Steel Girder
- Barrier Replacement 1993
- Sidewalk Widening 2003
  - 6 ft. Sidewalk on the east side
- Heat Straightening Jan 2011

Presentation Overview

- Damage Assessments
- Emergency Repairs
- Project Schedule
- Design
- Construction

Fire Incident

- March 15, Approximate 11:00 pm
- Two semi-trucks collided under the bridge
- Magnesium fire lasted approximately 6 hours

Special Damage Inspection

- Approximately 6” upward deflection at pier 1
- Approximately 2” Lateral deflection
- Concrete spalls from columns and pier cap

Damage Assessments

- Material Properties
- Effects of heat residuals

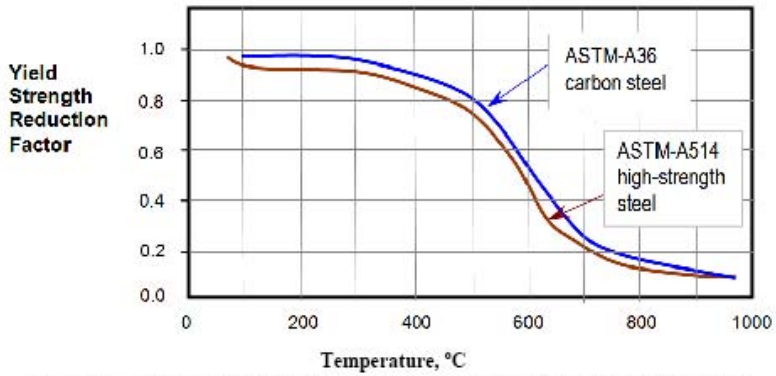


Figure 2.1. Reduction of steel yield strength with temperature (Astaneh-Asl et al. 2009)

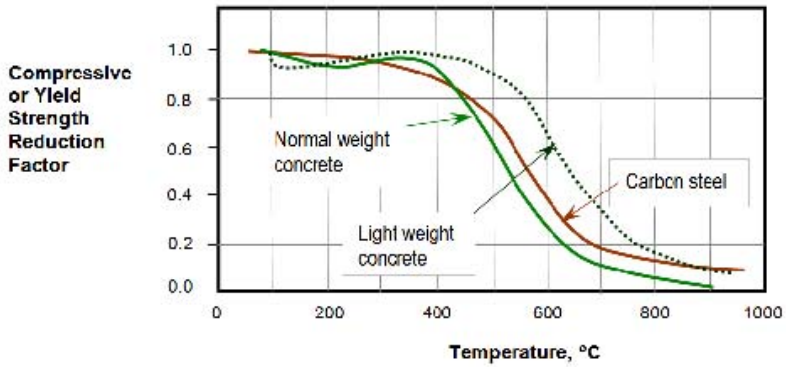


Figure 2.2. Reduction in concrete compressive strength with temperature (Astaneh-Asl et al. 2009)

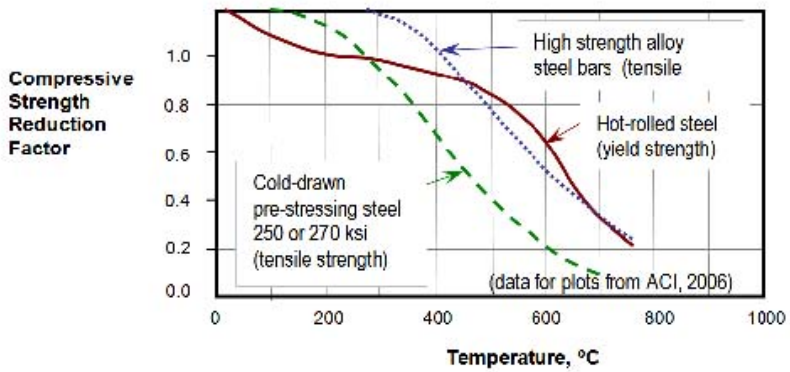


Figure 2.3. Reduction in strength of prestressing steel and high strength alloy bars with temperature (Astaneh-Asl et al. 2009)

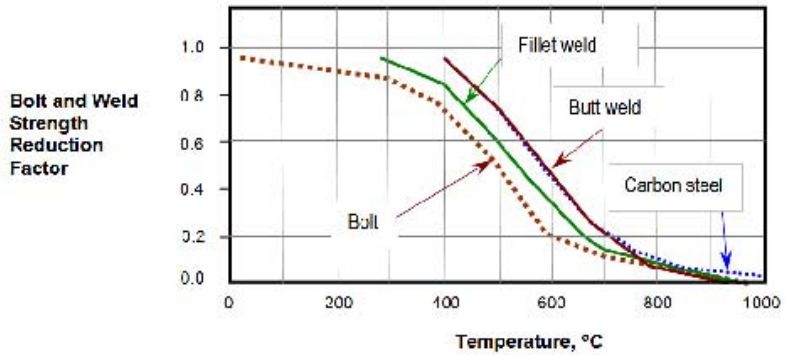


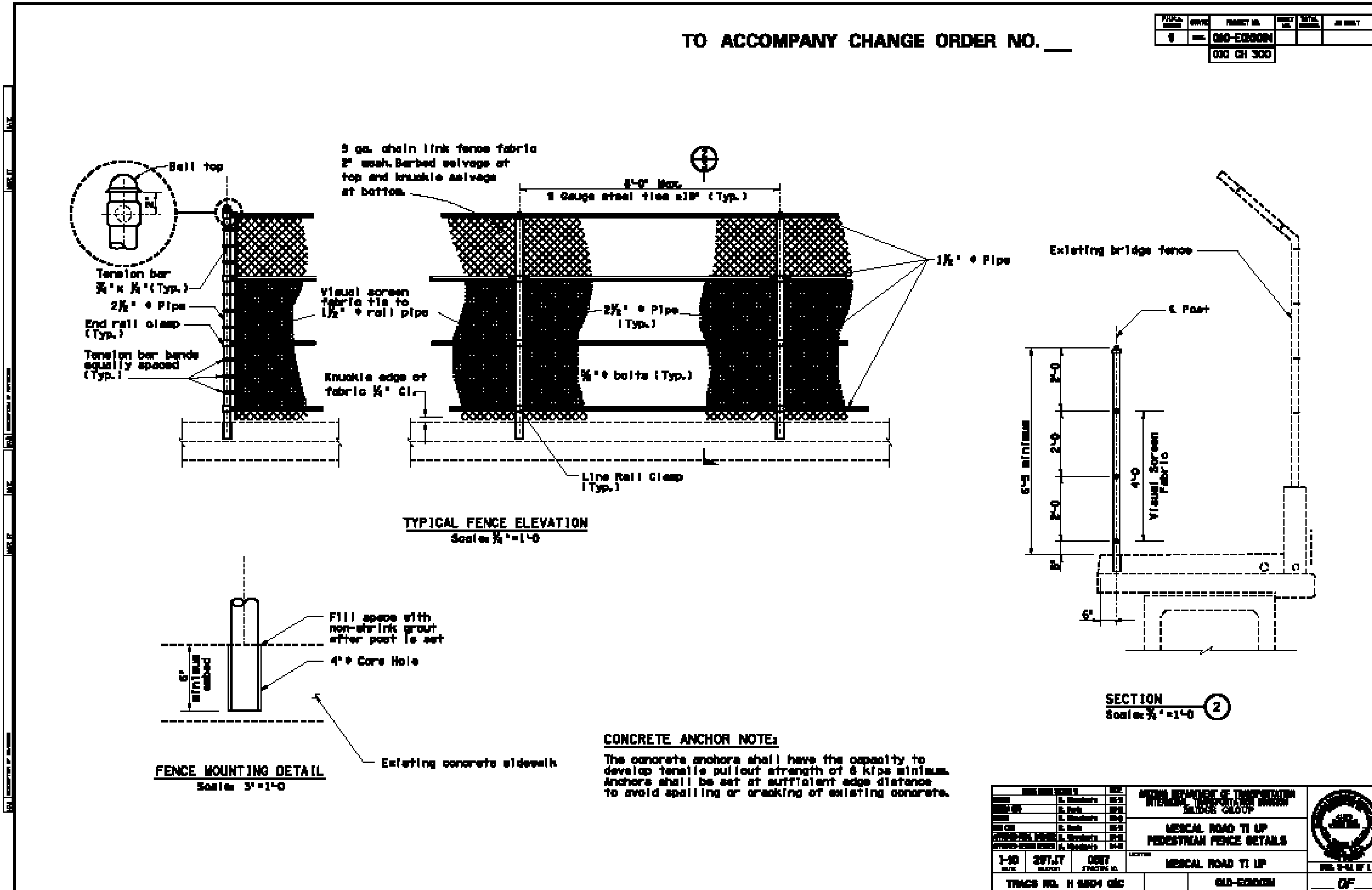
Figure 2.4. Reduction in strength of bolts, welds, reinforcing bars with temperature (Astaneh-Asl et al. 2009)

Conclusions

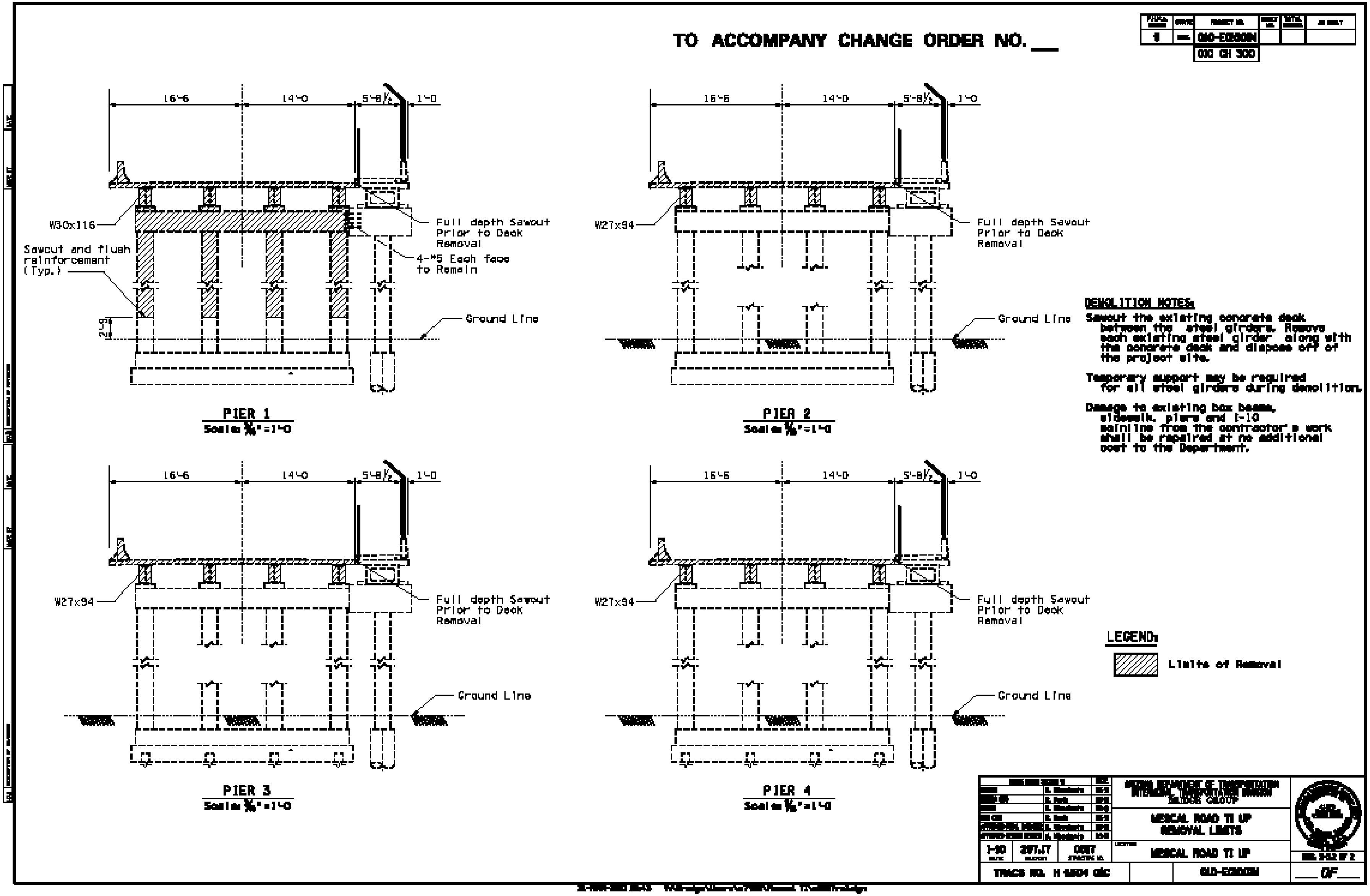
- Steel Girders have to be replaced
- Replace all pier caps
- Replace columns at pier 1

Emergency Repairs

- Install Temporary Concrete Barrier around the area
- Install Pedestrian Fence
- Set up a detour for locals
- Deck demolition
- Remove steel girders
- Remove south pier cap and columns



TO ACCOMPANY CHANGE ORDER NO. __
9 ga. chain link fence fabric 2" mesh. Barbed selvage at top and knuckle selvage at bottom.
Ball top
Tension bar
2½" Φ Pipe
End rail clamp (Typ.)
Tension bar bands equally spaced (Typ.)
Visual screen fabric tie to 1½" Φ rail pipe
9 Gauge steel ties x18" (Typ.)
1½" Φ Pipe
2½" Φ Pipe (Typ.)
Knuckle edge of fabric ½" Cl.
Line Rail Clamp (Typ.)
TYPICAL FENCE ELEVATION
Existing bridge fence
℄ Post
6'-0" minimum
4'-0" Visual Screen Fabric
SECTION
2
Fill space with non-shrink grout after post is set
4" Φ Core Hole
6" minimum embed
Existing concrete sidewalk
FENCE MOUNTING DETAIL
Scale: 3"=1'-0
CONCRETE ANCHOR NOTE:
The concrete anchors shall have the capacity to develop tensile pullout strength of 6 kips minimum. Anchors shall be set at sufficient edge distance to avoid spalling or cracking of existing concrete.
ARIZONA DEPARTMENT OF TRANSPORTATION
MESCAL ROAD TI UP
PEDESTRIAN FENCE DETAILS
MESCAL ROAD TI UP
I-10



TO ACCOMPANY CHANGE ORDER NO. ___
010-E(200)N
000 CH 300
16'-6
14'-0
5'-8½
1'-0
W30x116
Sawcut and flush reinforcement (Typ.)
Full depth Sawcut Prior to Deck Removal
4-#5 Each face to Remain
Ground Line
PIER 1
Scale: ⅜" = 1'-0
W27x94
PIER 2
Scale: ⅜" = 1'-0
PIER 3
Scale: ⅜" = 1'-0
PIER 4
Scale: ⅜" = 1'-0
DEMOLITION NOTES:
Sawcut the existing concrete deck between the steel girders. Remove each existing steel girder along with the concrete deck and dispose off of the project site.
Temporary support may be required for all steel girders during demolition.
Damage to existing box beams, sidewalk, piers and I-10 mainline from the contractor's work shall be repaired at no additional cost to the Department.
LEGEND:
Limits of Removal
BRIDGE GROUP
MESCAL ROAD TI UP
REMOVAL LIMITS
MESCAL ROAD TI UP
I-10
TRACS NO. H 4804 01C
010-E(200)N
___ OF ___

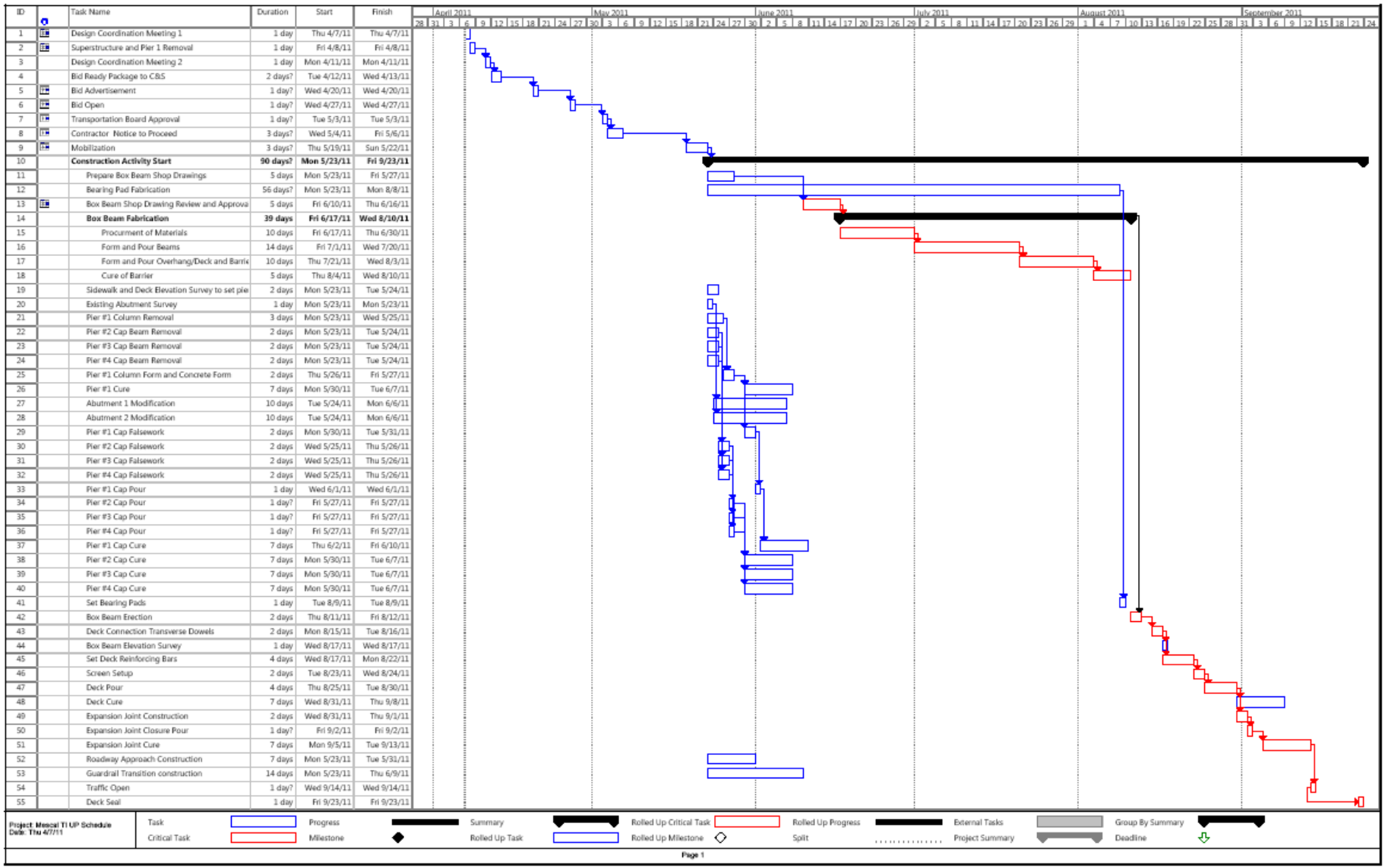
Friday April 8, 2011 (24 days after the incident)


KOMATSU

Project Schedule

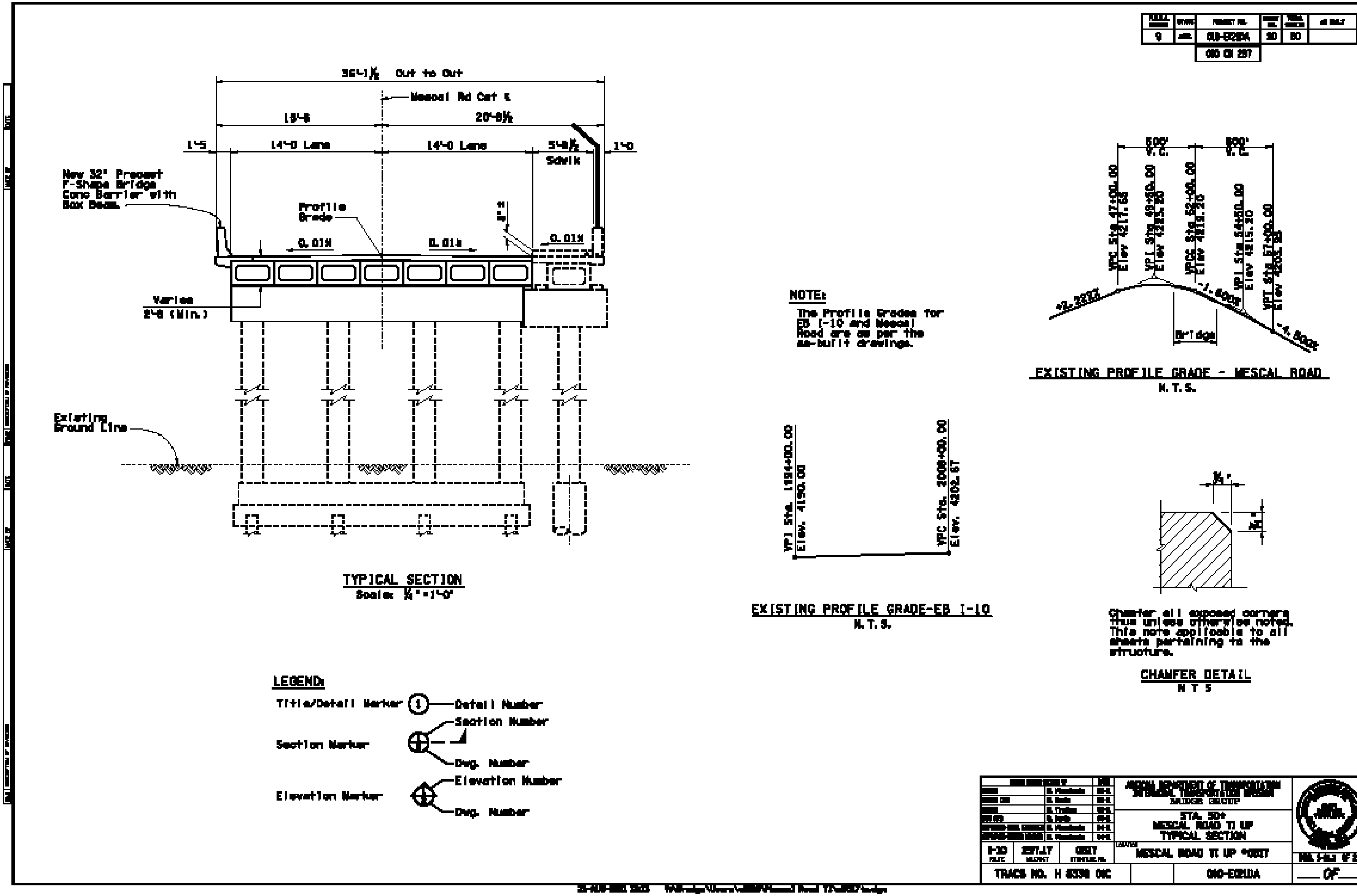
- Design 4 weeks
- Bid advertisement April 2011
- Finish Construction by September 10, 2011

Critical Path



ID	Task Name	Duration	Start	Finish
1	Design Coordination Meeting 1	1 day	Thu 4/7/11	Thu 4/7/11
2	Superstructure and Pier 1 Removal	1 day	Fri 4/8/11	Fri 4/8/11
3	Design Coordination Meeting 2	1 day	Mon 4/11/11	Mon 4/11/11
4	Bid Ready Package to CBS	2 days?	Tue 4/12/11	Wed 4/13/11
5	Bid Advertisement	1 day?	Wed 4/20/11	Wed 4/20/11
6	Bid Open	1 day?	Wed 4/27/11	Wed 4/27/11
7	Transportation Board Approval	1 day?	Tue 5/3/11	Tue 5/3/11
8	Contractor Notice to Proceed	3 days?	Wed 5/4/11	Fri 5/6/11
9	Mobilization	3 days?	Thu 5/19/11	Sun 5/22/11
10	**Construction Activity Start**	**90 days?**	**Mon 5/23/11**	**Fri 9/23/11**
11	Prepare Box Beam Shop Drawings	5 days	Mon 5/23/11	Fri 5/27/11
12	Bearing Pad Fabrication	56 days?	Mon 5/23/11	Mon 8/8/11
13	Box Beam Shop Drawing Review and Approva	5 days	Fri 6/10/11	Thu 6/16/11
14	**Box Beam Fabrication**	**39 days**	**Fri 6/17/11**	**Wed 8/10/11**
15	Procurment of Materials	10 days	Fri 6/17/11	Thu 6/30/11
16	Form and Pour Beams	14 days	Fri 7/1/11	Wed 7/20/11
17	Form and Pour Overhang/Deck and Barrie	10 days	Thu 7/21/11	Wed 8/3/11
18	Cure of Barrier	5 days	Thu 8/4/11	Wed 8/10/11
19	Sidewalk and Deck Elevation Survey to set pie	2 days	Mon 5/23/11	Tue 5/24/11
20	Existing Abutment Survey	1 day	Mon 5/23/11	Mon 5/23/11
21	Pier #1 Column Removal	3 days	Mon 5/23/11	Wed 5/25/11
22	Pier #2 Cap Beam Removal	2 days	Mon 5/23/11	Tue 5/24/11
23	Pier #3 Cap Beam Removal	2 days	Mon 5/23/11	Tue 5/24/11
24	Pier #4 Cap Beam Removal	2 days	Mon 5/23/11	Tue 5/24/11
25	Pier #1 Column Form and Concrete Form	2 days	Thu 5/26/11	Fri 5/27/11
26	Pier #1 Cure	7 days	Mon 5/30/11	Tue 6/7/11
27	Abutment 1 Modification	10 days	Tue 5/24/11	Mon 6/6/11
28	Abutment 2 Modification	10 days	Tue 5/24/11	Mon 6/6/11
29	Pier #1 Cap Falsework	2 days	Mon 5/30/11	Tue 5/31/11
30	Pier #2 Cap Falsework	2 days	Wed 5/25/11	Thu 5/26/11
31	Pier #3 Cap Falsework	2 days	Wed 5/25/11	Thu 5/26/11
32	Pier #4 Cap Falsework	2 days	Wed 5/25/11	Thu 5/26/11
33	Pier #1 Cap Pour	1 day	Wed 6/1/11	Wed 6/1/11
34	Pier #2 Cap Pour	1 day?	Fri 5/27/11	Fri 5/27/11
35	Pier #3 Cap Pour	1 day?	Fri 5/27/11	Fri 5/27/11
36	Pier #4 Cap Pour	1 day?	Fri 5/27/11	Fri 5/27/11
37	Pier #1 Cap Cure	7 days	Thu 6/2/11	Fri 6/10/11
38	Pier #2 Cap Cure	7 days	Mon 5/30/11	Tue 6/7/11
39	Pier #3 Cap Cure	7 days	Mon 5/30/11	Tue 6/7/11
40	Pier #4 Cap Cure	7 days	Mon 5/30/11	Tue 6/7/11
41	Set Bearing Pads	1 day	Tue 8/9/11	Tue 8/9/11
42	Box Beam Erection	2 days	Thu 8/11/11	Fri 8/12/11
43	Deck Connection Transverse Dowels	2 days	Mon 8/15/11	Tue 8/16/11
44	Box Beam Elevation Survey	1 day	Wed 8/17/11	Wed 8/17/11
45	Set Deck Reinforcing Bars	4 days	Wed 8/17/11	Mon 8/22/11
46	Screen Setup	2 days	Tue 8/23/11	Wed 8/24/11
47	Deck Pour	4 days	Thu 8/25/11	Tue 8/30/11
48	Deck Cure	7 days	Wed 8/31/11	Thu 9/8/11
49	Expansion Joint Construction	2 days	Wed 8/31/11	Thu 9/1/11
50	Expansion Joint Closure Pour	1 day?	Fri 9/2/11	Fri 9/2/11
51	Expansion Joint Cure	7 days	Mon 9/5/11	Tue 9/13/11
52	Roadway Approach Construction	7 days	Mon 5/23/11	Tue 5/31/11
53	Guardrail Transition construction	14 days	Mon 5/23/11	Thu 6/9/11
54	Traffic Open	1 day?	Wed 9/14/11	Wed 9/14/11
55	Deck Seal	1 day	Fri 9/23/11	Fri 9/23/11

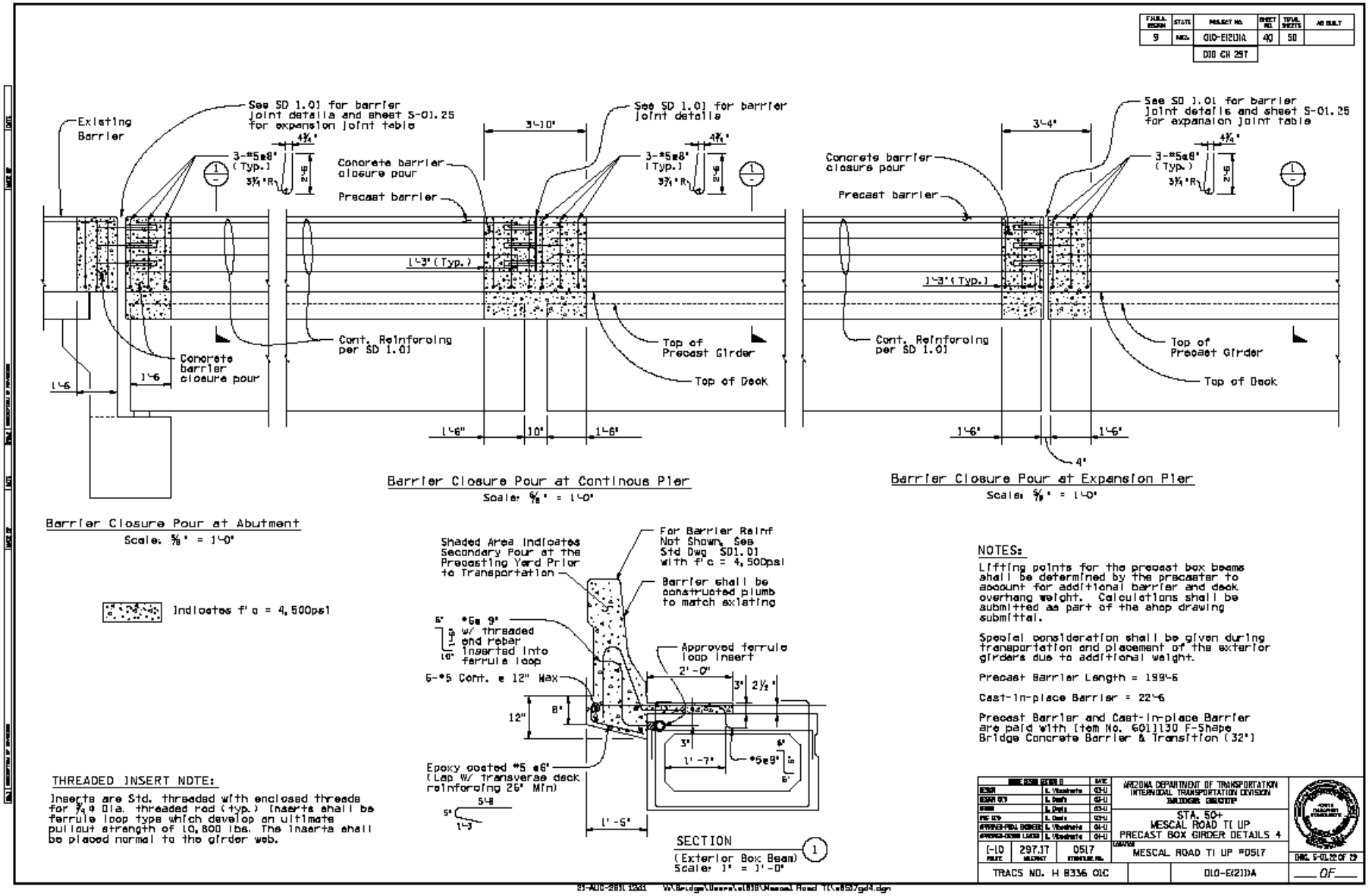
Design


36'-1½ Out to Out
Mescal Rd Const ℄
15'-6
20'-8½
1'-5
14'-0 Lane
14'-0 Lane
5'-8½ Sdwlk
1'-0
New 32" Precast F-Shape Bridge Conc Barrier with Box Beam.
Profile Grade
0.01%
0.01%
0.01%
Varies
2'-6 (Min.)
Existing Ground Line
TYPICAL SECTION
Scale: ¼"=1'-0"
LEGEND:
Title/Detail Marker
Detail Number
Section Number
Section Marker
Dwg. Number
Elevation Number
Elevation Marker
Dwg. Number
NOTE:
The Profile Grades for EB I-10 and Mescal Road are as per the as-built drawings.
EXISTING PROFILE GRADE-EB I-10
N.T.S.
EXISTING PROFILE GRADE - MESCAL ROAD
N.T.S.
Bridge
Chamfer all exposed corners thus unless otherwise noted. This note applicable to all sheets pertaining to the structure.
CHAMFER DETAIL
N T S
STA. 50+
MESCAL ROAD TI UP
TYPICAL SECTION

Design

- Precast-Prestressed Concrete Box Beam
  - Design spans 31’,55’,47’,55’, and 28’
  - Initial Concrete Strength 4,500 psi
  - 28-day Concrete Strength 5,500 psi
  - Minimum strands = 12
  - Maximum strand = 18
  - Precast overhang and barrier Strength 4,500 psi

Integral Overhang and Barrier



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	010-E(211)A	40	50	
		010 CH 297			

THREADED INSERT NOTE:

Inserts are Std. threaded with enclosed threads for ¾ ø Dia. threaded rod (typ.) Inserts shall be ferrule loop type which develop an ultimate pullout strength of 10,800 lbs. The inserts shall be placed normal to the girder web.

NOTES:

Lifting points for the precast box beams shall be determined by the precaster to account for additional barrier and deck overhang weight. Calculations shall be submitted as part of the shop drawing submittal.

Special consideration shall be given during transportation and placement of the exterior girders due to additional weight.

Precast Barrier Length = 198'-6

Cast-in-place Barrier = 22'-6

Precast Barrier and Cast-in-place Barrier are paid with Item No. 601.1130 F-Shape Bridge Concrete Barrier & Transition (32")

DESIGN	DRAWN	CHECKED	QUANTITIES	DATE
K. Vbeckmeta	K. Davis	K. Vbeckmeta	K. Vbeckmeta	03-11

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
BRIDGE GROUP

STA. 50+
MESCAL ROAD TI UP
PRECAST BOX GIRDER DETAILS 4

I-10	297.1T	0517
ROUTE	MILEPOST	STRUCTURE NO.

DRAWING: MESCAL ROAD TI UP #0517

DWG. S-01.32 OF 50

TRACS NO. H 8336 01C | 010-E(211)A | ___ OF ___

25-AUG-2011 12:11 W:\Bridge\Users\a0818\Mescal Road TI\a0517gd4.dgn

Results

- Project advertisement April 29
- Bid opening May 11, Design Bid process
- Contract time 130 days
- Vastco, INC Low bidder $956,000
- Royden Construction for Precastor Start June
- Construction Start July
- Construction Completed September

Construction

- Began July
- Finished September


HIGHWAY TECHNOLOGIES
HIGHWAY TECHNOLOGIES


CAT
305C
HIGHWAY


Volvo Rents
Construction Equipment
400S
Volvo Rents
Construction Equipment
888-899-
CAT


ATLAS
ATLAS


Mescal Rd TIUP #517 MP 297.17 9/7/11
Looking North


Mescal Rd TIUP #517 MP 297.17 9/7/11
Deck

End

Question?