

DECK REPLACEMENT ON PC CONCRETE BULB-T GIRDERS WITH SACRIFICIAL FLANGE TECHNIQUE LOWER PERRY BRIDGE

Tanarat Potisuk, PhD, PE, SE

Prestressed Concrete Standards Engineer



PRESENTATION OUTLINES



Background – Motivation

Project Information

Construction Cost – Schedule

Lessons Learned

BACKGROUND – MOTIVATION



COPCO CANAL - BR# 16019 - HWY 22 - MP: 44.09

TYP. DECK CONDITION

IM16019_A3

BACKGROUND – MOTIVATION



BACKGROUND – MOTIVATION



BACKGROUND – MOTIVATION



BACKGROUND – MOTIVATION



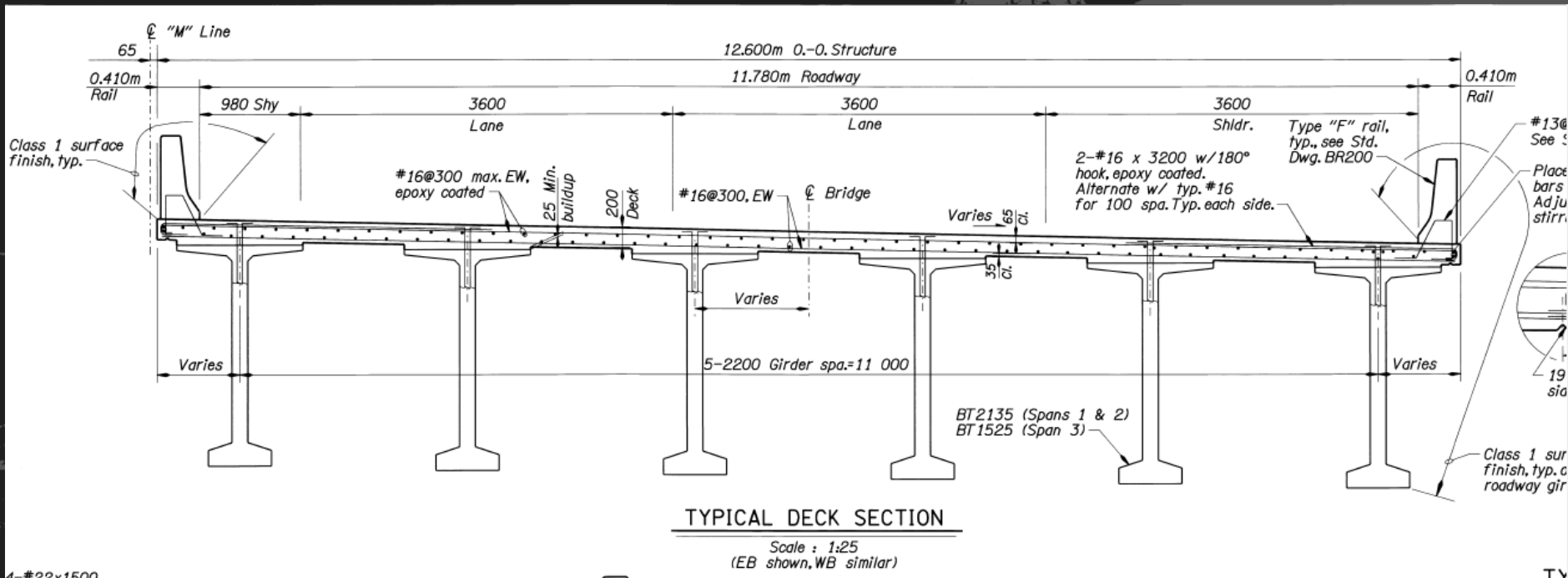
BACKGROUND – MOTIVATION



BACKGROUND – MOTIVATION



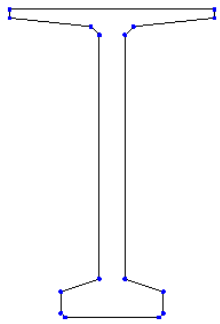
BACKGROUND – MOTIVATION



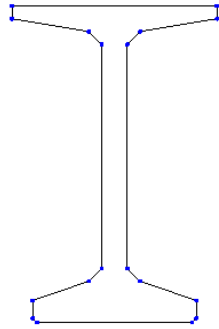
4-#22x1500

TY

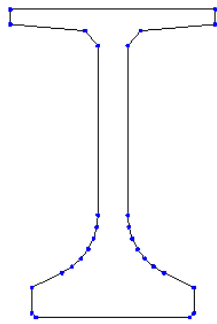
BACKGROUND – MOTIVATION



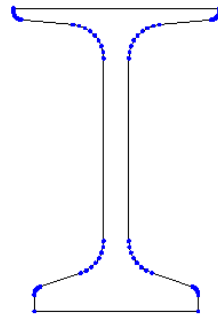
ODOT-BT72



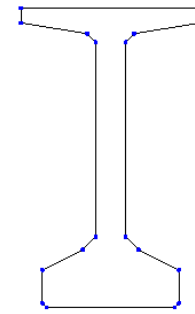
WSDOT-WF74G



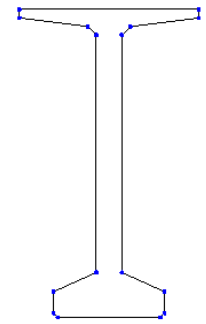
FLORIDA-I72



NDOR-NU1800

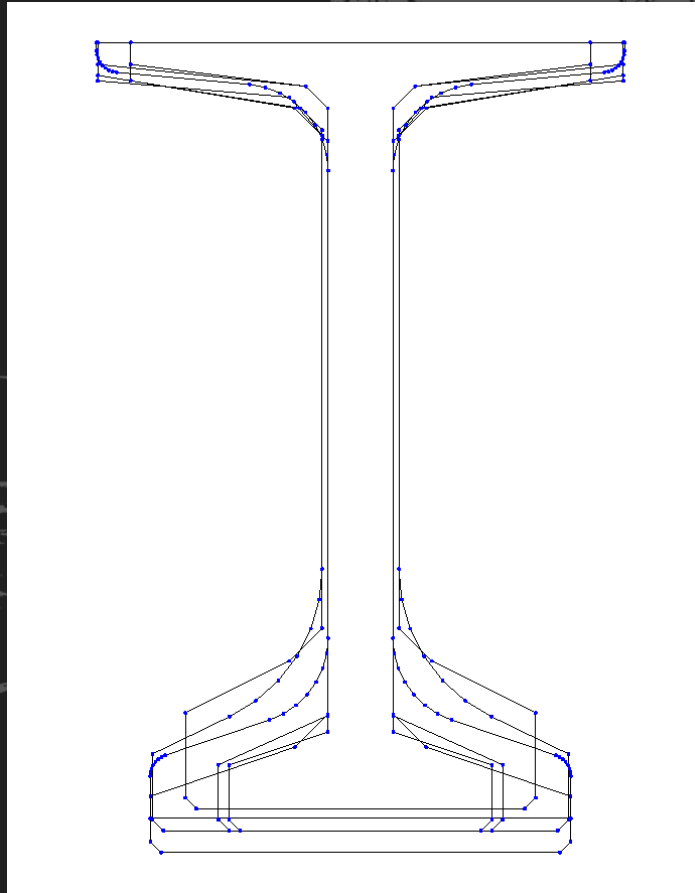


TxDOT-Tx70

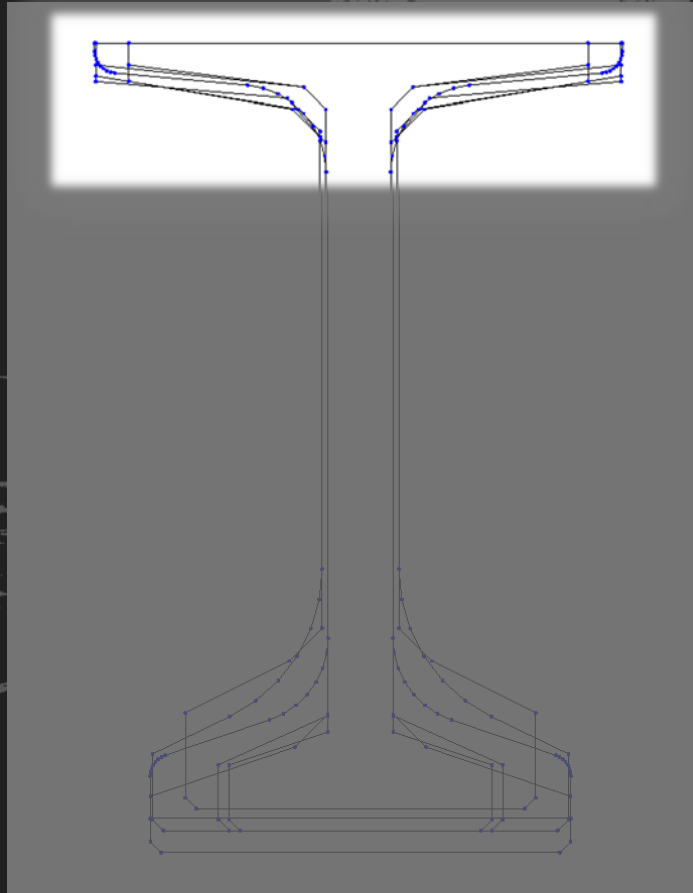


AASHTO-PCI-BT72

BACKGROUND – MOTIVATION



BACKGROUND – MOTIVATION



PROJECT LOCATION

46V-018

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

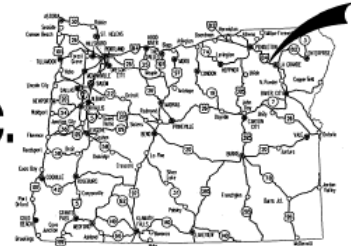
Grading, Drainage, Structures, Paving, Signing, & Illumination

FFO I-84 KAMELA INTCHG - 2ND ST U'XING (LA GRANDE) SEC.

OLD OREGON TRAIL HIGHWAY

UNION COUNTY

MARCH 2013



Overall Length Of Project - 14.50 Miles

| INDEX OF SHEETS | |
|-----------------|-----------------------|
| SHEET NO. | DESCRIPTION |
| I | Title Sheet |
| IA | Index Of Sheets Cont. |

BEGINNING OF CONTRACT PROJECT

IM-STP-S006(126)

STA. 255+95 (M.P. 245.85)

PROSPECTIVE MATERIAL SOURCE
(HWY. 006 M.P. 237.98)

BEGINNING OF PROJECT
IM-STP-S006(126)

STA. 261+12 (M.P. 245.95)

END OF PROJECT
IM-STP-S006(126)

STA. "EB2" 101+71 (M.P. 260.45)

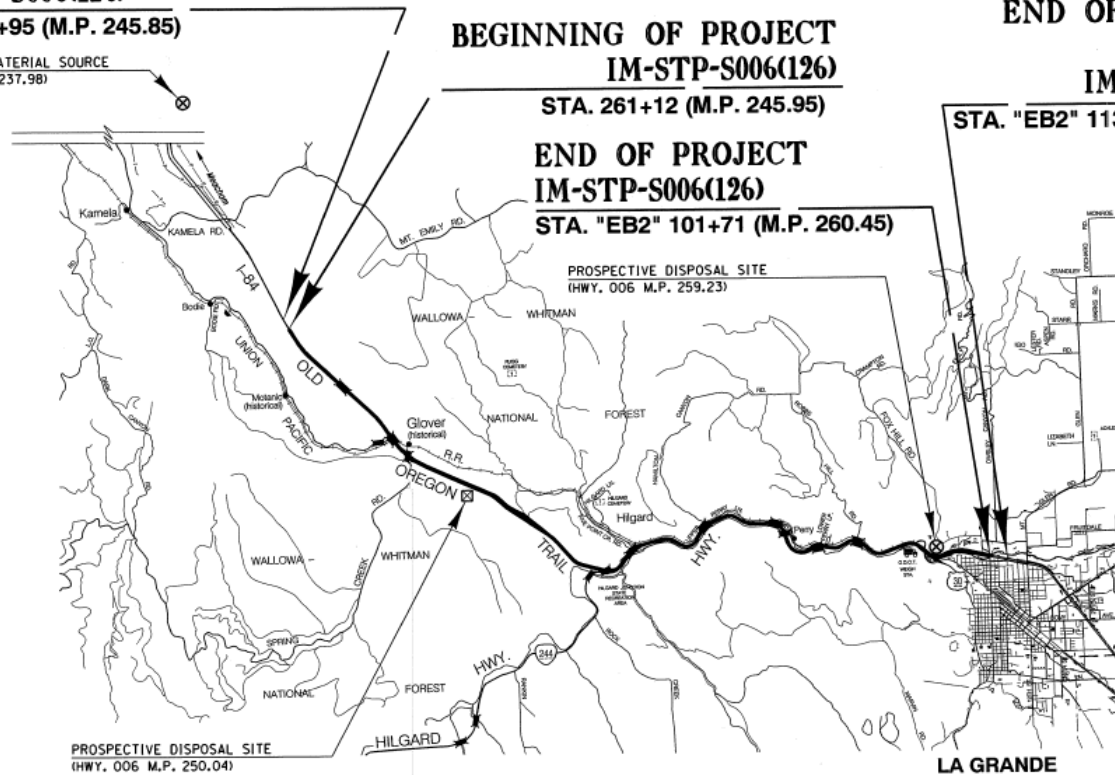
END OF CONTRACT PROJECT

IM-STP-S006(126)

STA. "EB2" 113+31 (M.P. 260.67)

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center is (503) 232-1987.)

LET'S ALL
WORK TOGETHER
TO MAKE THIS
JOB SAFE



T. 2 S., R. 36E., 37E., & 38E., W.M.

OREGON TRANSPORTATION COMMISSION

- Pat Egan, CHAIR
- David Lehman, COMMISSIONER
- Mary F. Olson, COMMISSIONER
- Mark Frohnmayer, COMMISSIONER
- Tammy Boney, COMMISSIONER
- Matthew L. Corbett, DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, if any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: *Steven A. Davis*
Steven A. Davis, Reg 5 Tech Center Mgr.

Matthew L. Corbett
Concurrence by ODOT Chief Engineer

FFO I-84 KAMELA INTCHG - 2ND ST U'XING (LA GRANDE) SEC.
OLD OREGON TRAIL HIGHWAY
UNION COUNTY

| FEDERAL HIGHWAY ADMINISTRATION | PROJECT NUMBER | SHEET NO. |
|--------------------------------|------------------|-----------|
| OREGON DIVISION | IM-STP-S006(126) | 1 |

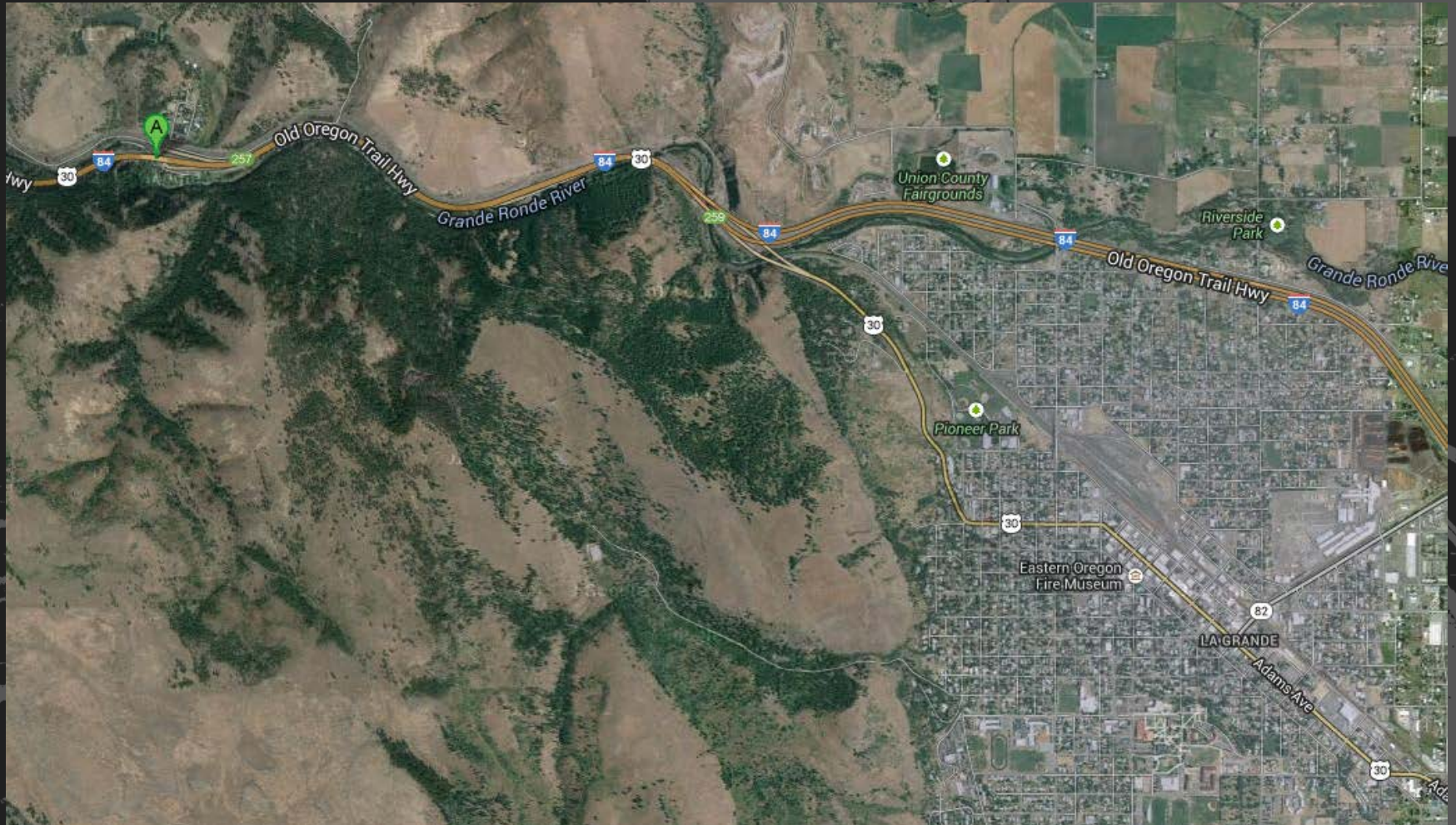


PE001750

Total Construction Contract Cost = \$40.2 Million

PROJECT LOCATION

Lower Perry Bridge in Region 5 – STR No. 19230



PROJECT LOCATION

Lower Perry Bridge in Region 5 – STR No. 19230



Lower Perry Bridge in Region 5 – STR No. 19230



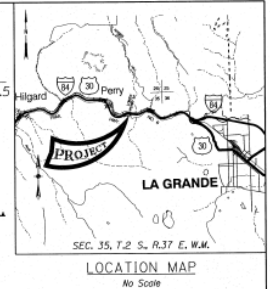
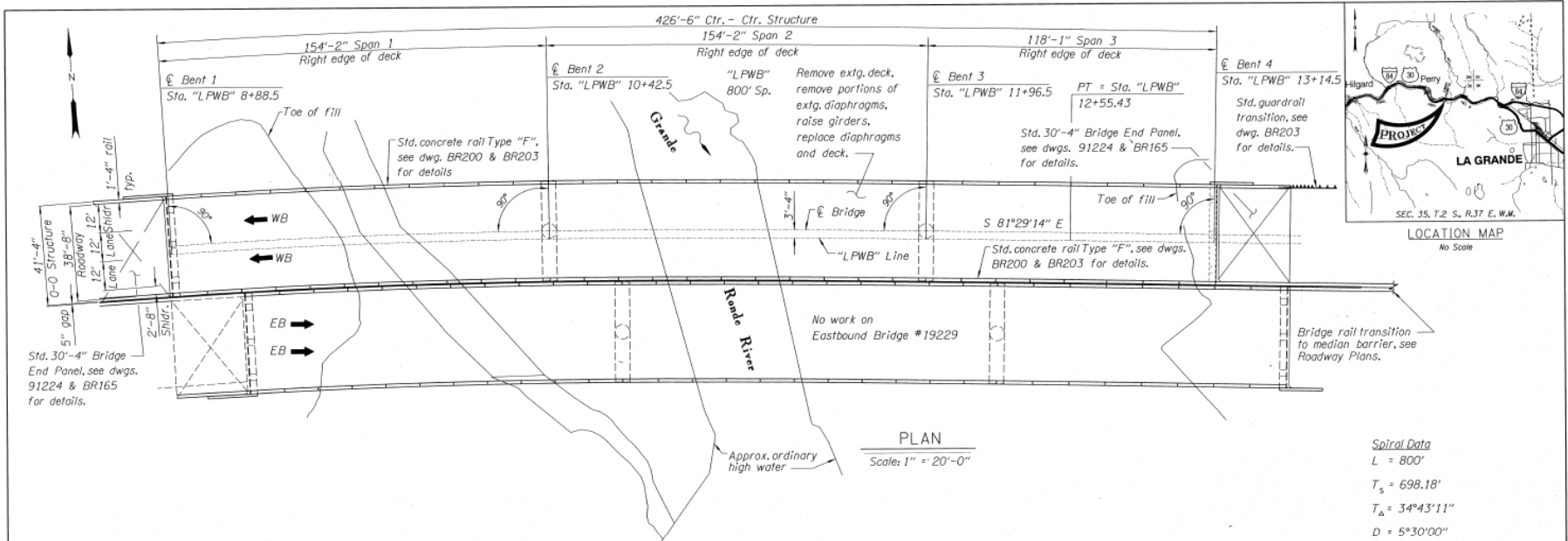


Lower Perry Interchange
BR# 19230
HWY 6 - I-84 - MP 257.22 WB

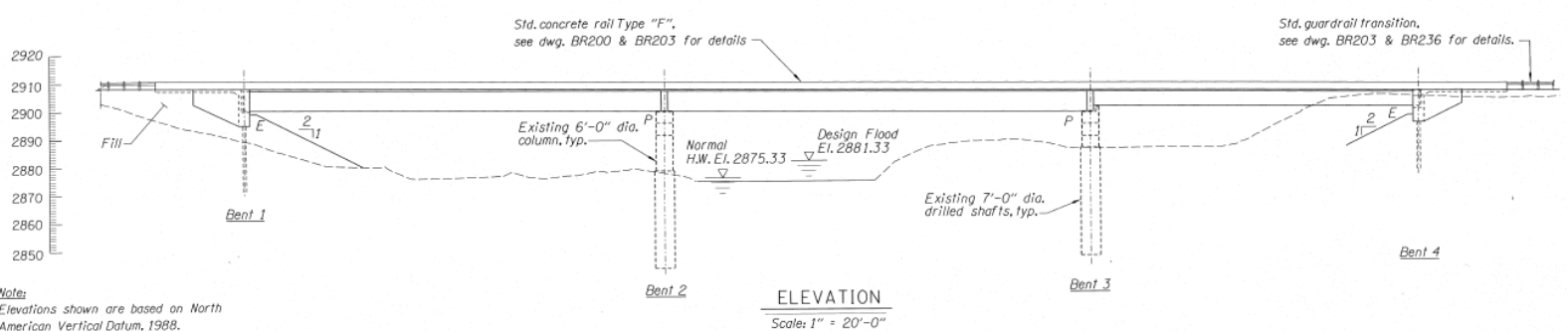
Rt. Side Profile
12/17/03



Constructed in 2003 – Reverse superelevation



Spiral Data
 L = 800'
 T_s = 698.18'
 T_a = 34°43'11"
 D = 5°30'00"

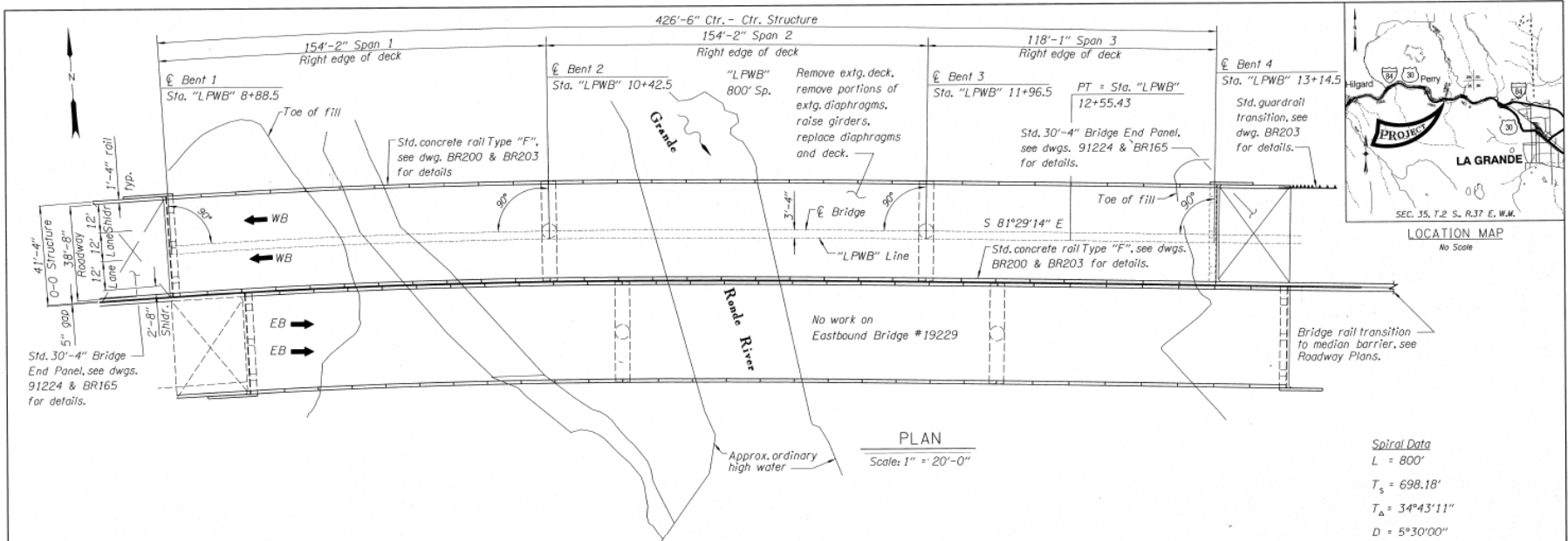


Notes:
 Elevations shown are based on North American Vertical Datum, 1988.

| | | | | | | | |
|--|------------------------------|-----------|---------------------------------|--|------------------------|--|------------------------|
| DATE 03/12/2013 | REVISION Replaced drawing | BY RBS | DRAFTER Rick B. Stanton | | STRUCTURE NO. 19230 | Lower Perry Intchg, Grande Ronde River WB FFO I-84 KAMELA INTCH-2ND ST UXING (LA GRANDE) SEC. OLD OREGON TRAIL HIGHWAY UNION COUNTY | SHEET 1 OF 20 |
| | | | DESIGNER Scott W. Hayes | | DATE March 2013 | | DRAWING NO. 91205 |
| ACCOMPANIED BY DWGS. See dwgs 91206 thru 91224, BR145, BR165, BR200, BR203 & BR236 | | | CHECKER Robert V. Kaspari | | CALC. BOOK 0000 | PLAN AND ELEVATION | |
| | | | REVIEWER George F. Bornstedt | | | | |

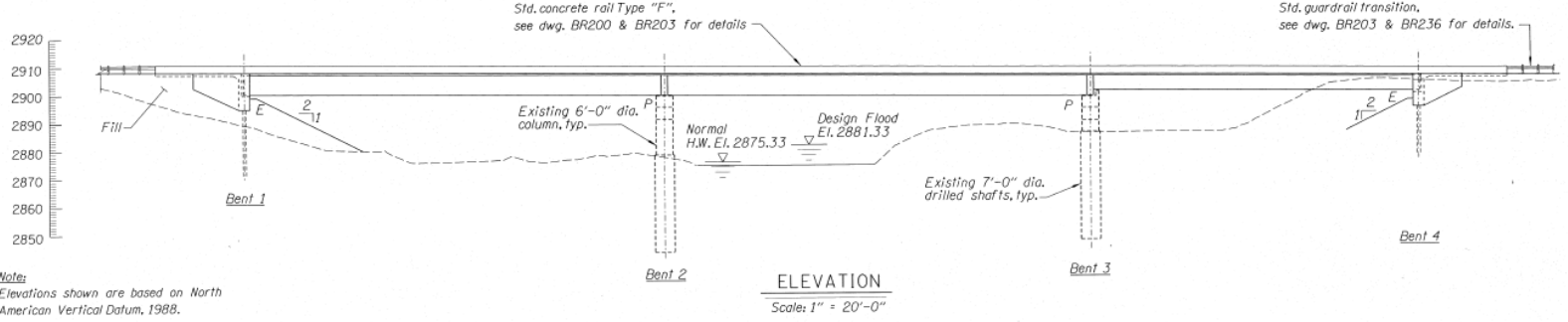
G:\184_Glover_0roDel\Bridges\19230 Lower perry\plan_sheets\rbs-19230.dgn :: 01_Plan.Elevation 3/12/2013 3:22:11 PM hwyr501

2013 – Full deck replacement after 10 years



PLAN
Scale: 1" = 20'-0"

Spiral Data
 L = 800'
 T_s = 698.18'
 T_a = 34°43'11"
 D = 5°30'00"

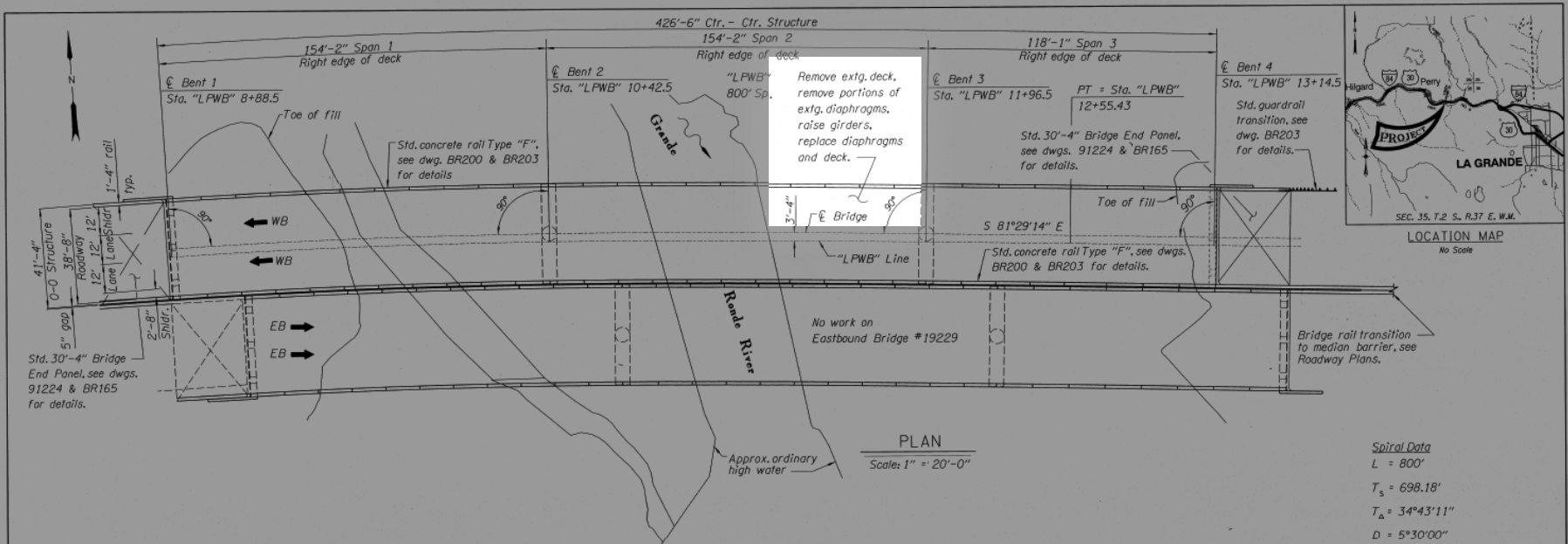


ELEVATION
Scale: 1" = 20'-0"

| | | | | | | | | |
|--|------------------------------|-----------|------------------------------|--------------------------------|--|------------------------|--|------------------------|
| DATE 03/12/2013 | REVISION Replaced drawing | BY RBS | DRAFTER Rick B. Stanton | | | STRUCTURE NO. 19230 | Lower Perry Intchg, Grande Ronde River WB FFO 1-84 KAMELA INTCH-2ND ST UXING (LA GRANDE) SEC. OLD OREGON TRAIL HIGHWAY UNION COUNTY | SHEET 1 OF 20 |
| | | | DESIGNER Scott W. Hayes | | | DATE March 2013 | | DRAWING NO. 91205 |
| ACCOMPANIED BY DWGS. See dwgs 91206 thru 91224, BR145, BR165, BR200, BR203 & BR236 | | | CHECKER Robert V. Kaspari | REVISOR George F. Bornstedt | | CALC. BOOK 0000 | PLAN AND ELEVATION | |

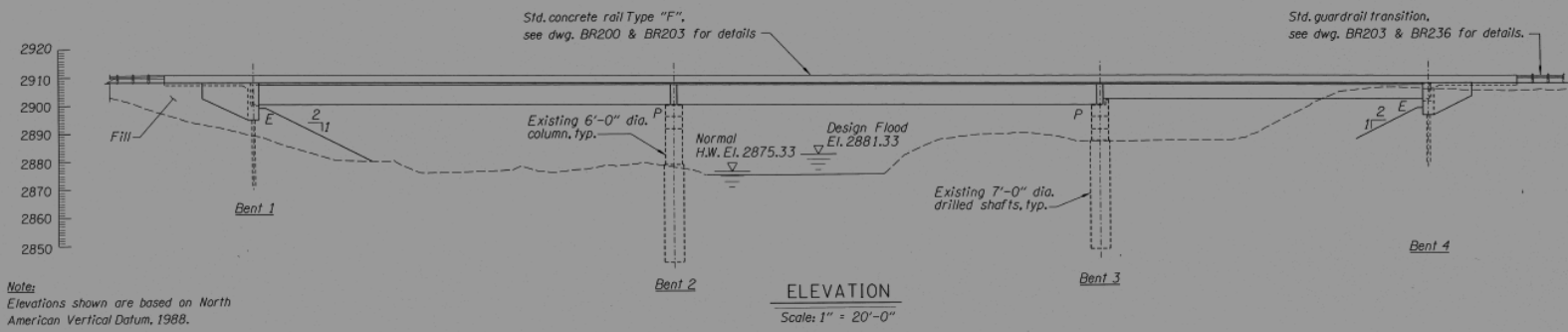
G:\184_Glover_0roDel\Bridges\19230 Lower perry\plan_sheets\rbs-19230.dgn :: 01_Plan.Elevation 3/12/2013 3:22:11 PM hwyr501

**Original Plans –
Remove deck, preserve and jack girders**



PLAN
Scale: 1" = 20'-0"

Spiral Data
 L = 800'
 T_s = 698.18'
 T_a = 34°43'11"
 D = 5°30'00"



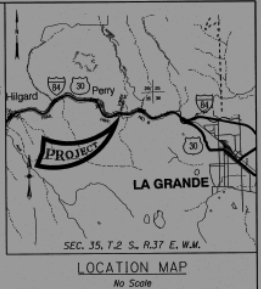
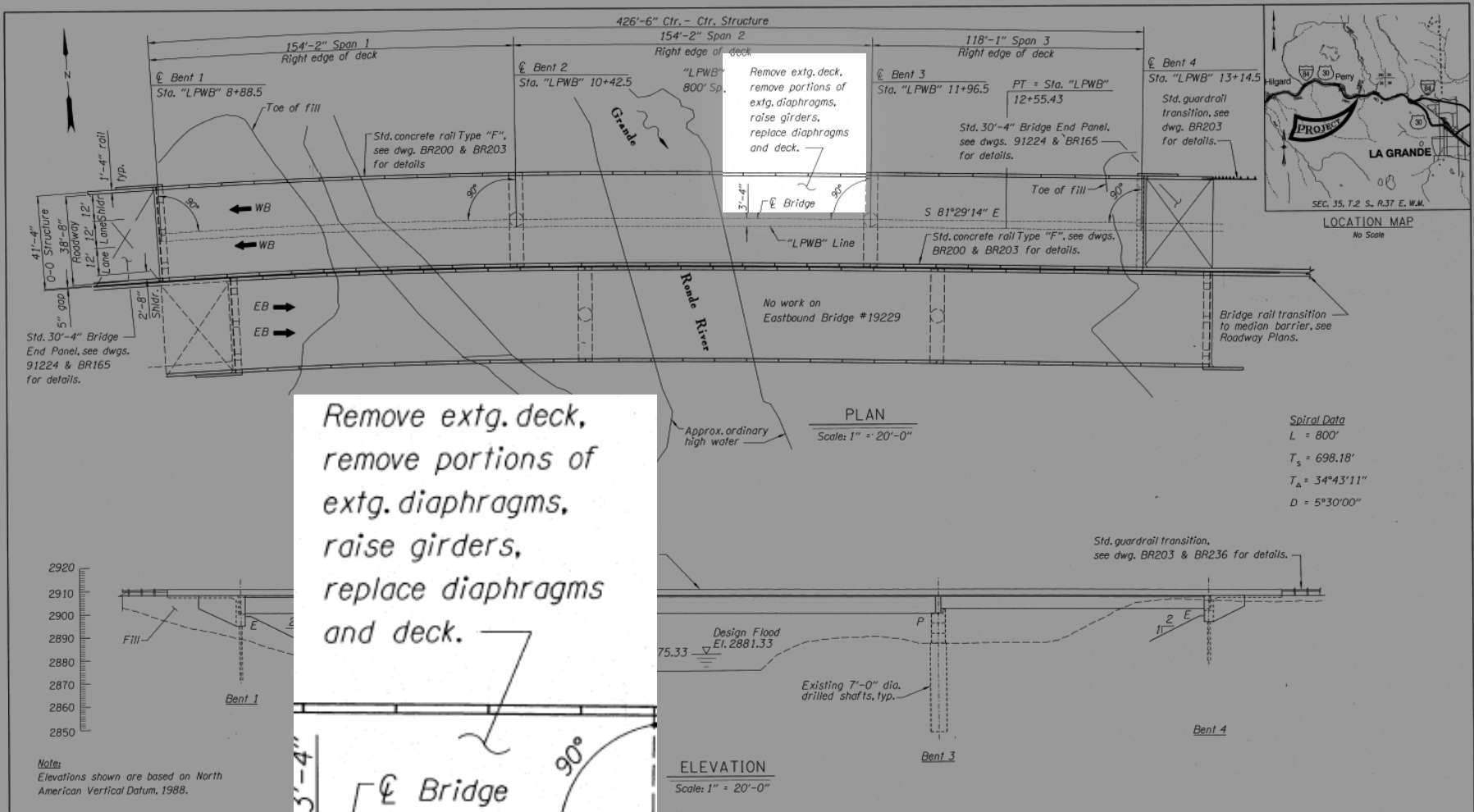
ELEVATION
Scale: 1" = 20'-0"

Notes:
 Elevations shown are based on North American Vertical Datum, 1988.

| | | | | | | | | | |
|--|------------|------------------|-----|---|--|--|---------------|--|-------------|
| | DATE | REVISION | BY | DRAFTER: Rick B. Stanton DESIGNER: Scott W. Hayes CHECKER: Robert V. Kaspari REVIEWER: George F. Bornstedt | | | STRUCTURE NO. | Lower Perry Intchg, Grande Ronde River WB FFO 1-84 KAMELA INTCH-2ND ST UXING (LA GRANDE) SEC. OLD OREGON TRAIL HIGHWAY UNION COUNTY | SHEET |
| | 03/12/2013 | Replaced drawing | RBS | | | | 19230 | | 1 |
| ACCOMPANIED BY DWGS. See dwgs 91206 thru 91224, BR145, BR165, BR200, BR203 & BR236 | | | | | | | | DATE | OF |
| | | | | | | | | March 2013 | 20 |
| | | | | | | | | CALC. BOOK | DRAWING NO. |
| | | | | | | | | 0000 | 91205 |

G:\184_Glover_0roDel\Bridges\19230 Lower perry\plan_sheets\rbs_19230.dgn :: 01_Plan.Elevation 3/12/2013 3:22:11 PM hwyr501

**Original Plans –
 Remove deck, preserve and jack girders**



Remove extg. deck,
 remove portions of
 extg. diaphragms,
 raise girders,
 replace diaphragms
 and deck.

| DATE | REVISION | BY |
|------------|------------------|-----|
| 03/12/2013 | Replaced drawing | RBS |

ACCOMPANIED BY DWGS. See dwgs 91206 thru 91224, BR145, BR165, BR200, BR203 & BR236

| | |
|---|--|
| DRAFTER: Rick B. Stanton DESIGNER: Scott W. Hayes CHECKER: Robert V. Kaspari REVIEWER: George F. Bornstedt | |
|---|--|

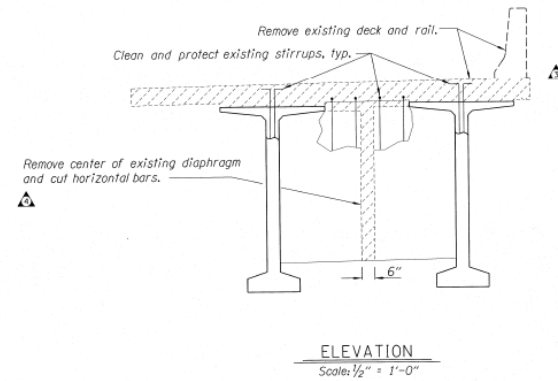
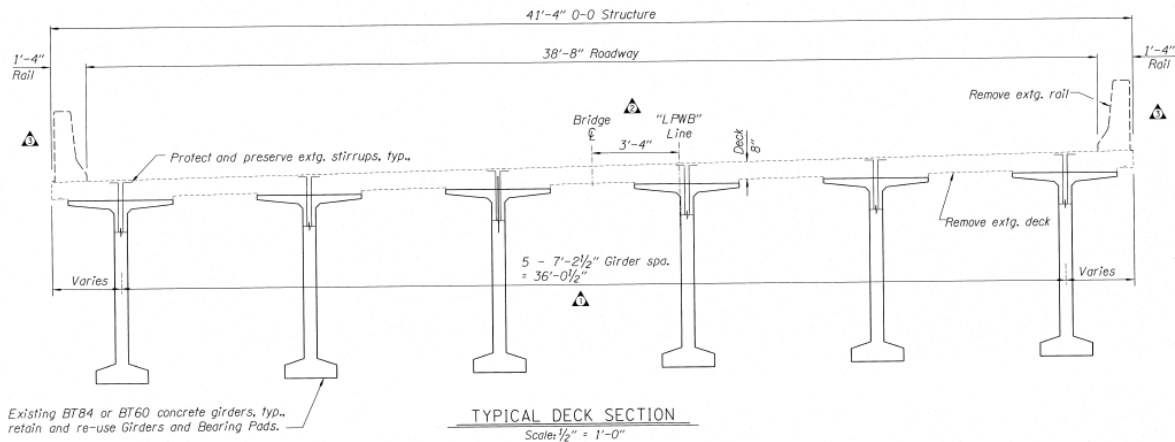
OREGON DEPARTMENT OF TRANSPORTATION

Region 5 Tech Center
 BRIDGE ENGINEERING
 1702 10TH AVE S.E.
 TULSA, OK 74104-1177

| | | |
|------------------------|--|------------------------|
| STRUCTURE NO. 19230 | Lower Perry Intchg, Grande Ronde River WB FFO 1-84 KAMELA INTCH-2ND ST UXING (LA GRANDE) SEC. OLD OREGON TRAIL HIGHWAY UNION COUNTY | SHEET 1 OF 20 |
| DATE March 2013 | PLAN AND ELEVATION | DRAWING NO. 91205 |
| CALC. BOOK 0000 | | |

G:\184_Glover_0roDel\Bridges\19230 Lower perry\plan_sheets\rbs_19230.dgn :: 01_Plan.Elevation 3/12/2013 3:22:11 PM hwyr501

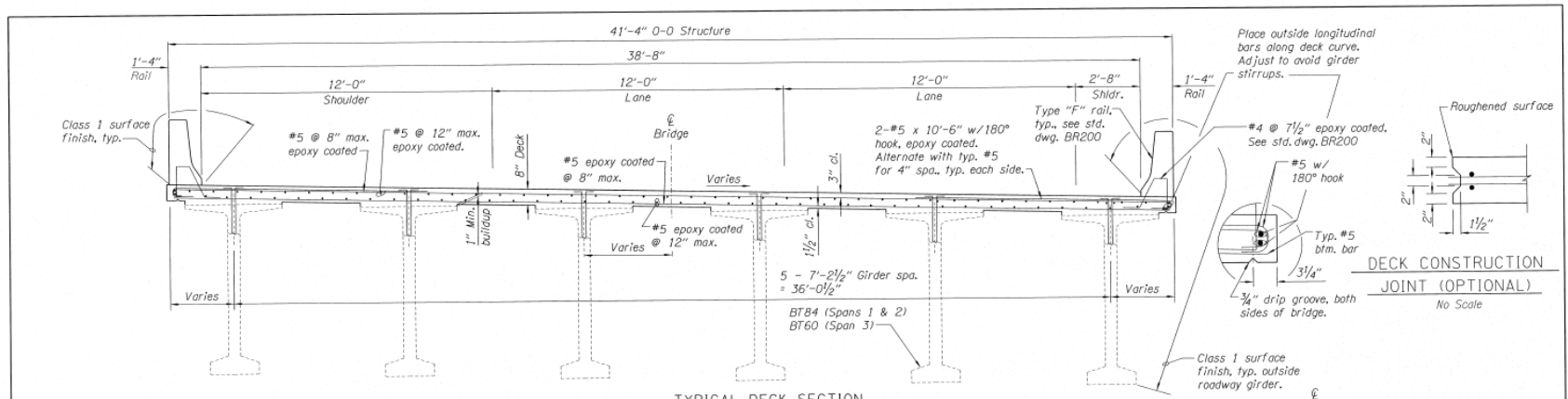
**Original Plans –
 Remove deck, preserve and jack girders**



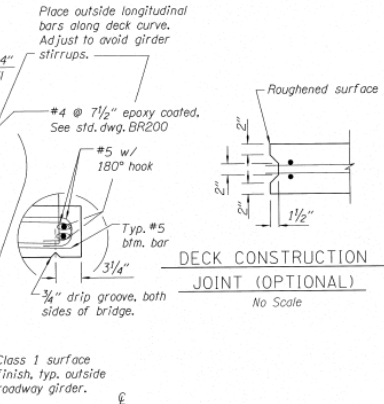
| DATE | REVISION | BY | STRUCTURE NO. | LOWER PERRY INTCHG, GRANDE RONDE RIVER WB | SHEET |
|--|--|-----|---------------|---|-------------|
| 2-25-2013 | Changed dimension | RBS | 19230 | FFO I-84 KAMELA INTCH-2ND ST UXING (LA GRANDE) SEC. | 6 |
| 2-25-2013 | Added dimension | RBS | DATE | OLD OREGON TRAIL HIGHWAY | OF |
| 2-25-2013 | Changed line style to show existing rail | RBS | March 2013 | UNION COUNTY | 20 |
| 03/12/2013 | Changed note | RBS | CALC. BOOK | DECK AND DIAPHRAGM REMOVAL DETAIL | DRAWING NO. |
| ACCOMPANIED BY DWGS. See sheet 1 for this structure. | | | 0000 | | 91210 |

G:\184_Glover_OroDel\Bridges\19230 Lower perry\plan_sheets\rbs_19230.dgn :: 06_Deck_Dia.Rmv1 3/12/2013 3:22:16 PM hwyr501

Original Plans –
Remove deck, preserve and jack girders

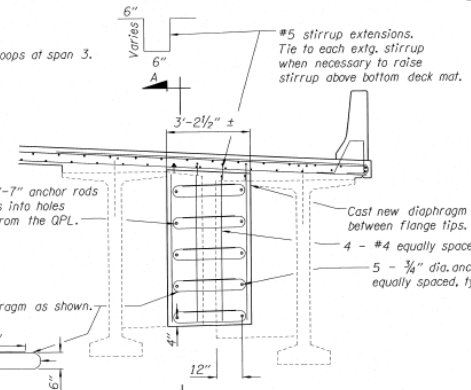


TYPICAL DECK SECTION
Scale: 1/2" = 1'-0"

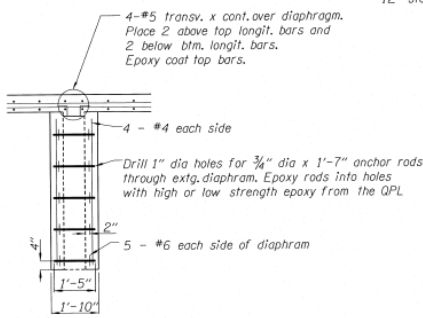


DECK CONSTRUCTION
JOINT (OPTIONAL)
No Scale

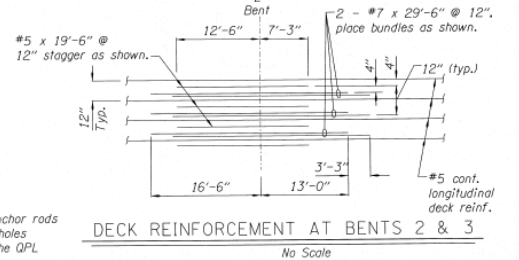
Notes:
Omit 1 set of anchors and #6 hoops at span 3.



ELEVATION
NOT TO SCALE



SECTION A
NOT TO SCALE



DECK REINFORCEMENT AT BENTS 2 & 3
No Scale

TYPICAL DECK STEEL

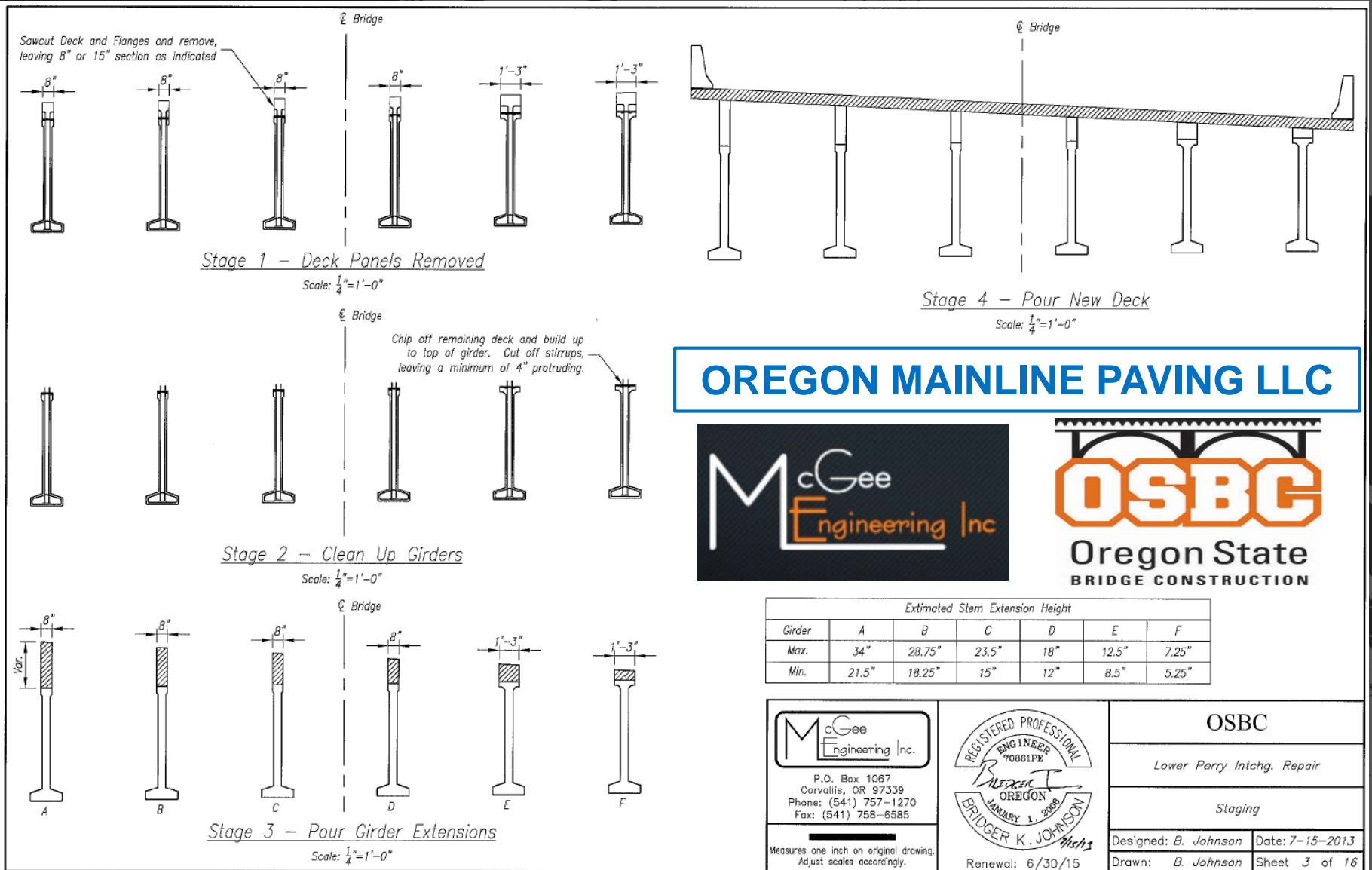
- Longitudinal Bars:
- #5 @ 12" max. ctr. in top deck, epoxy coated.
 - Additional top bars at interior bents. See detail this sheet.
 - #5 @ 12" max. ctr. in bottom deck, staggered with top bars.
 - Place longitudinal bars parallel to girders except as noted.
- Transverse Bars:
- #5 x full length, @ 8" max. ctr. top deck, epoxy coated.
 - #5 x full length, @ 8" max. ctr. bottom deck, staggered with top bars.
 - 2 - #5 x 10'-6" with 180° hook, epoxy coated. Alternate with typ. #5 for 4" spa. typ. each side at edge of deck.
 - Provide 180° hook in top bars at back edge of deck at abutment, at edge of deck, typ..

| | | | | | | | |
|--|---|--|--|--|--|--|---------------------------------------|
| | DATE: 03/12/2013 REVISION: Replaced drawing BY: Rick B. Stanton RBS: Scott W. Hayes | | | | STRUCTURE NO.: 19230 DATE: March 2013 CALC. BOOK: 0000 | Lower Perry Intchg, Grande Ronde River WB FFO 1-84 KAMELA INTCH-2ND ST UXING (LA GRANDE) SEC. OLD OREGON TRAIL HIGHWAY UNION COUNTY | SHEET 7 OF 20 DRAWING NO. 91211 |
| | ACCOMPANIED BY DWGS. See sheet 1 for this structure. CHECKER: Robert V. Kaspari REVIEWER: George F. Bornstedt | | | | | | DECK AND DIAPHRAGM REPLACEMENT DETAIL |

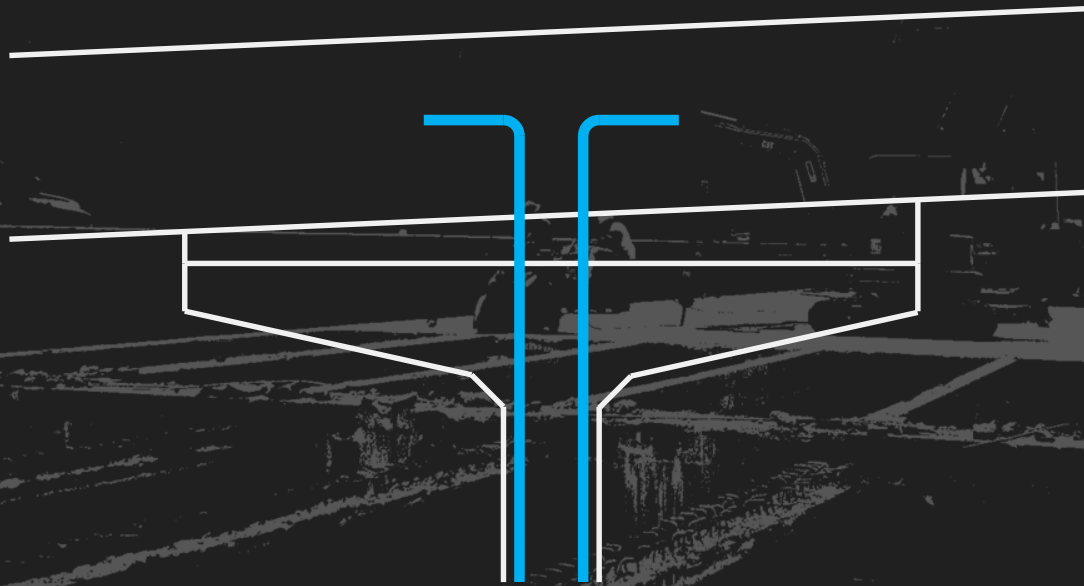
G:\1B4_Glover_OroDel\Bridge\19230 Lower perry\plan.sheets\vrbs_19230.dgn :: 07_Deck_Dia_Rep1 3/12/2013 3:22:16 PM hwyr501

Original Plans –
Remove deck, preserve and jack girders

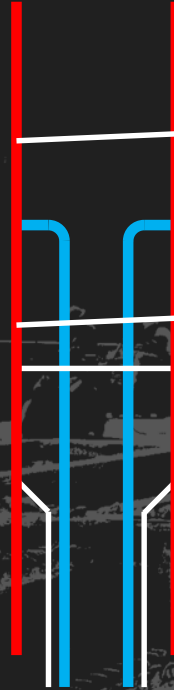
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



Contractor's Proposal – Remove deck cutting girder flanges and extended stems



Contractor's Proposal – Remove deck cutting girder flanges and extended stems



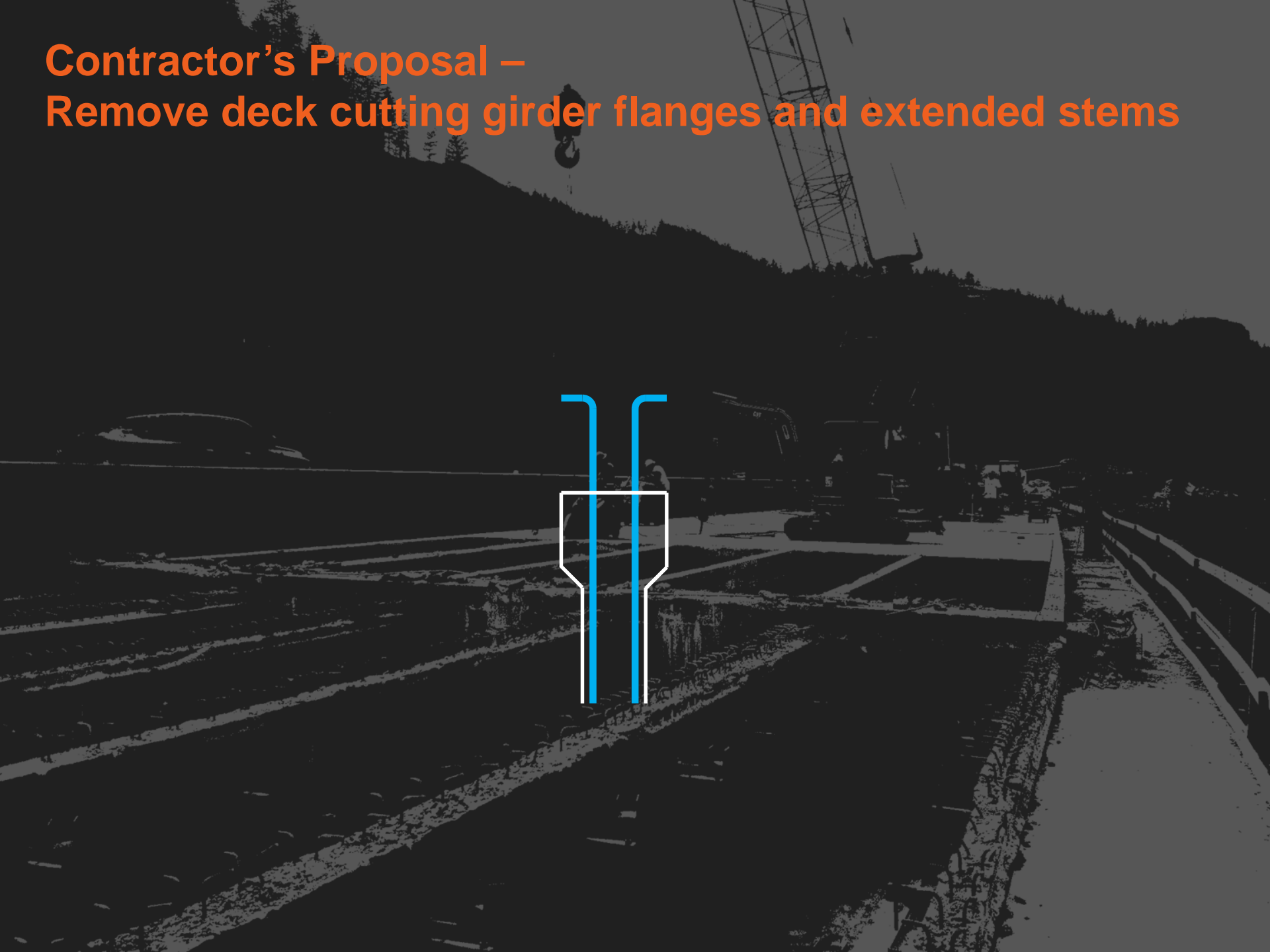
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



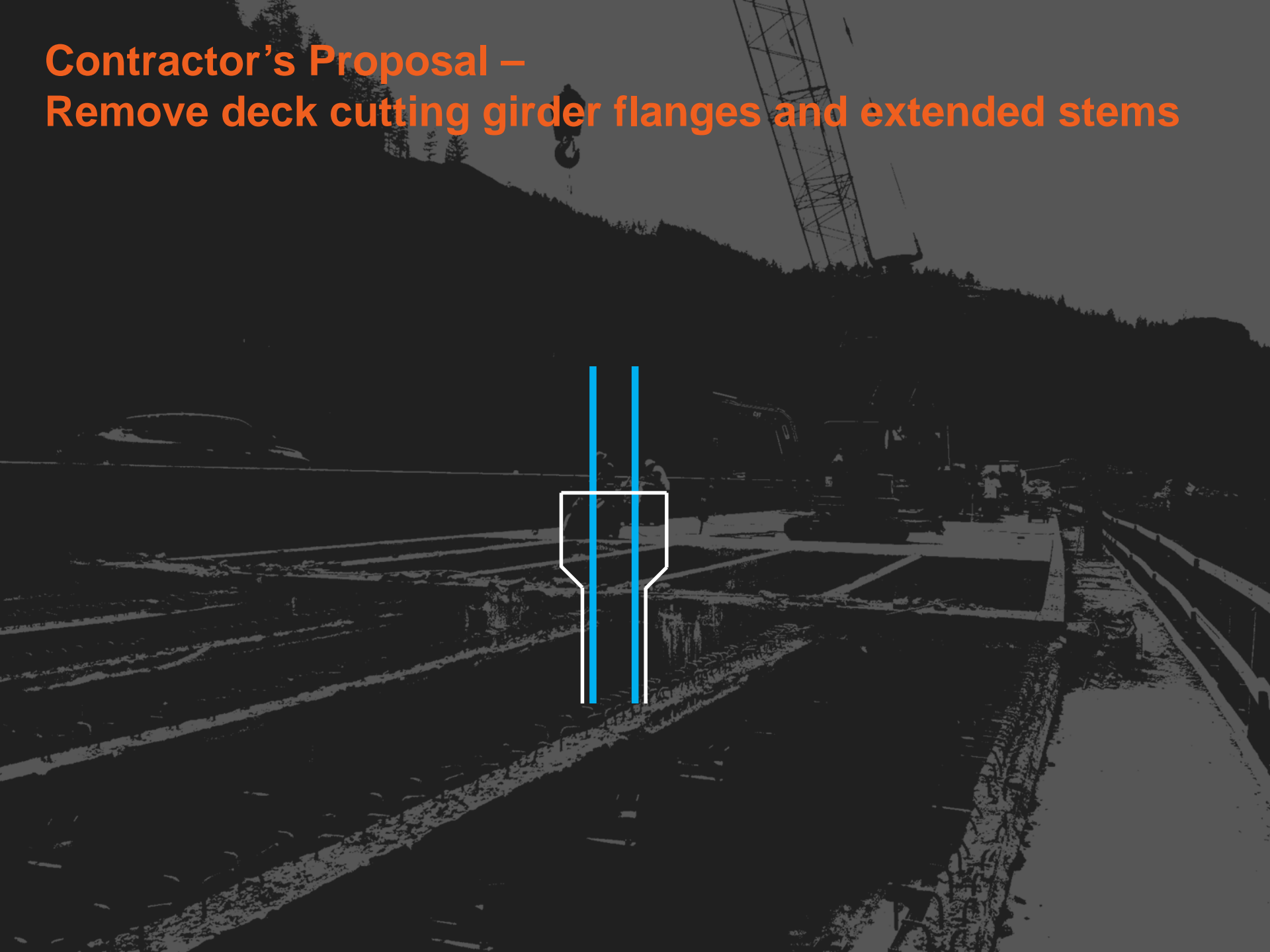
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



Contractor's Proposal – Remove deck cutting girder flanges and extended stems



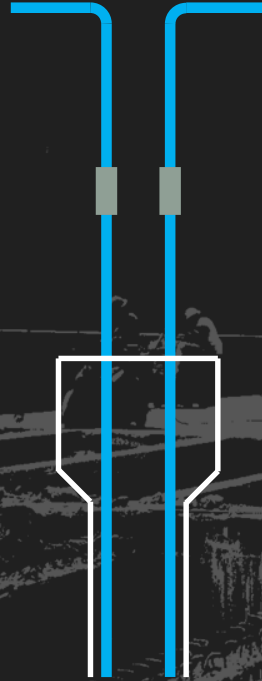
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



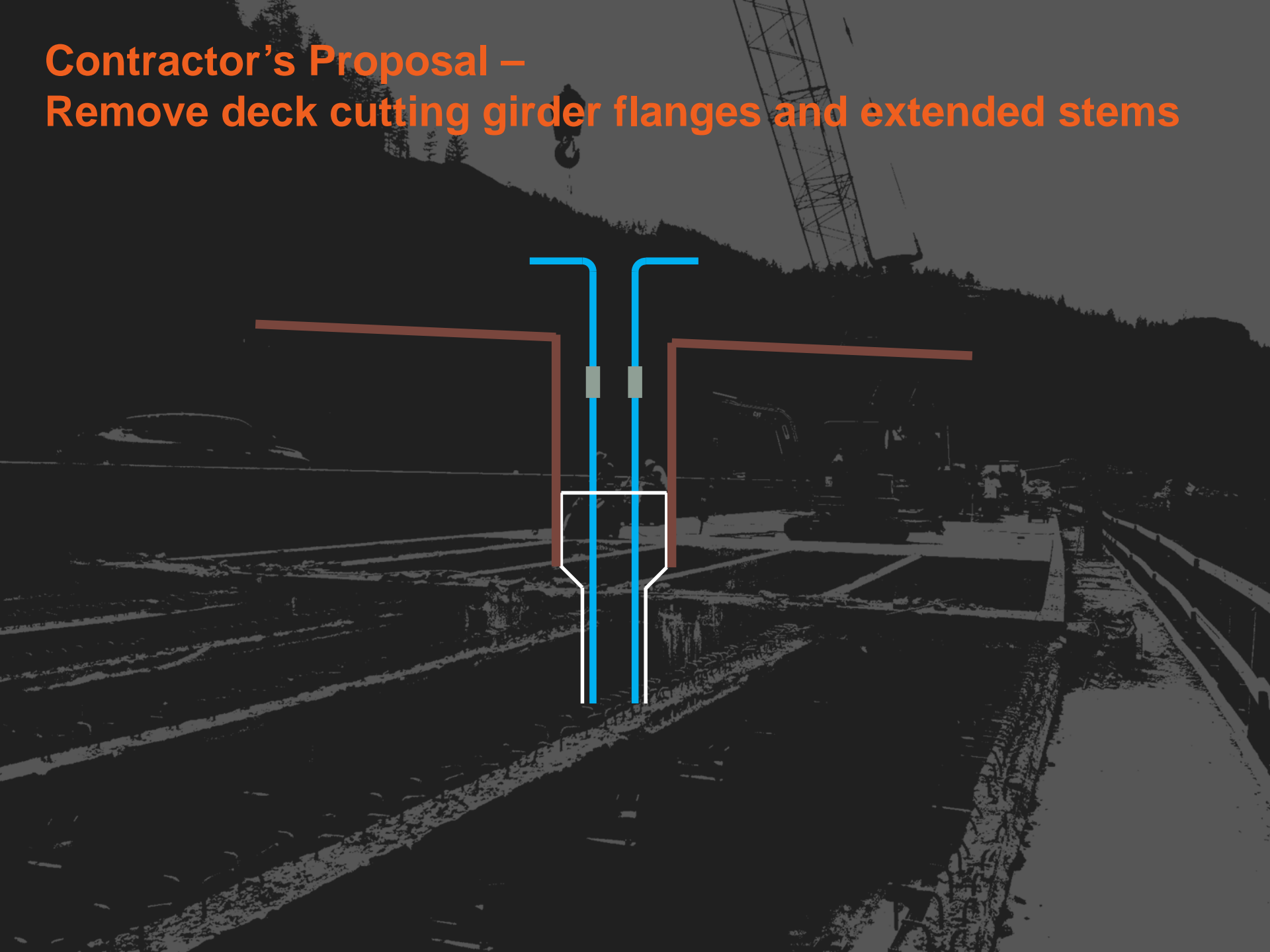
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



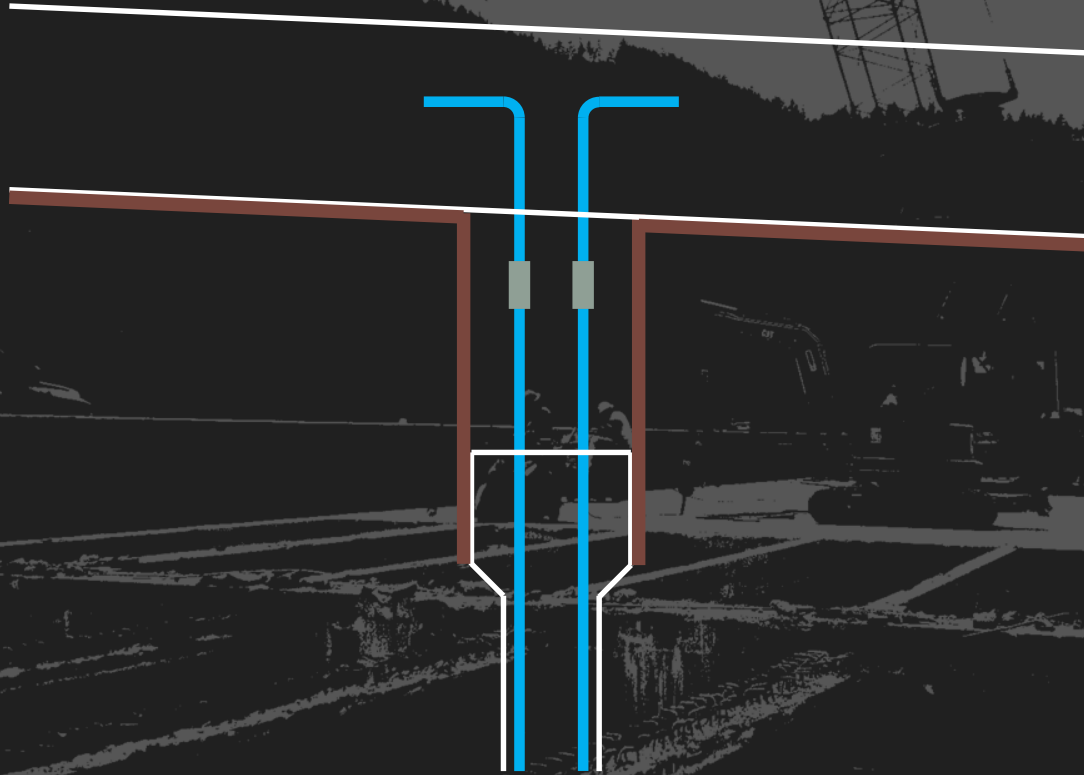
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



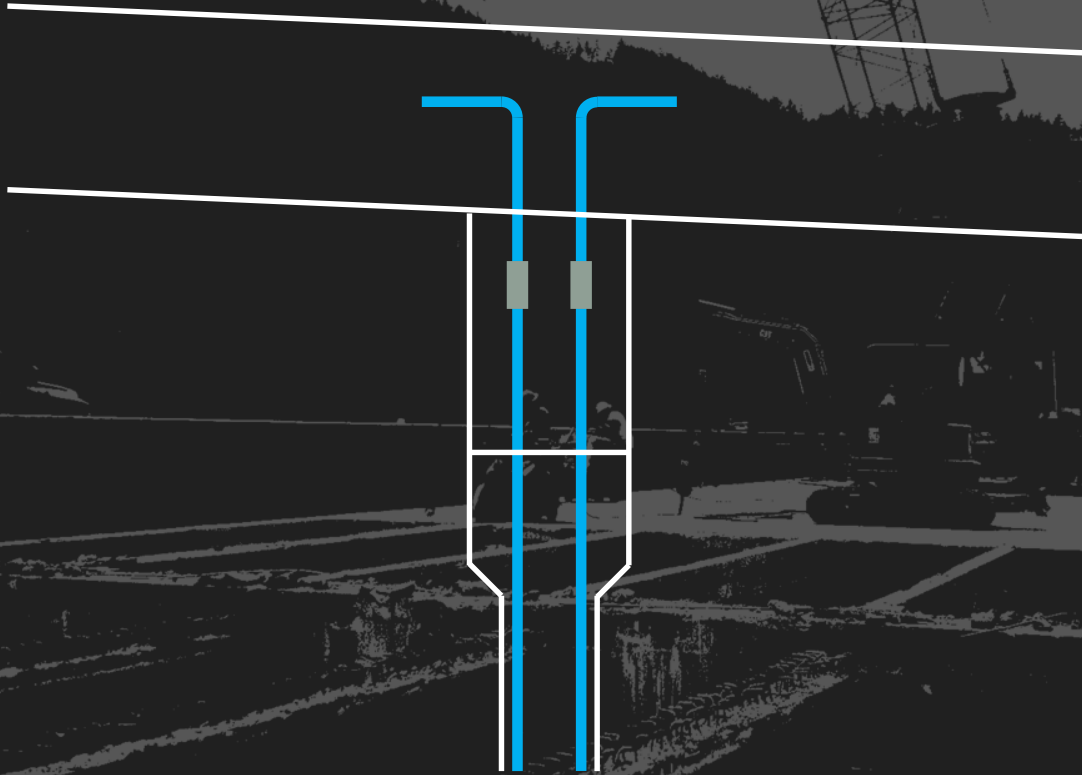
Contractor's Proposal – Remove deck cutting girder flanges and extended stems



Contractor's Proposal – Remove deck cutting girder flanges and extended stems



Contractor's Proposal – Remove deck cutting girder flanges and extended stems











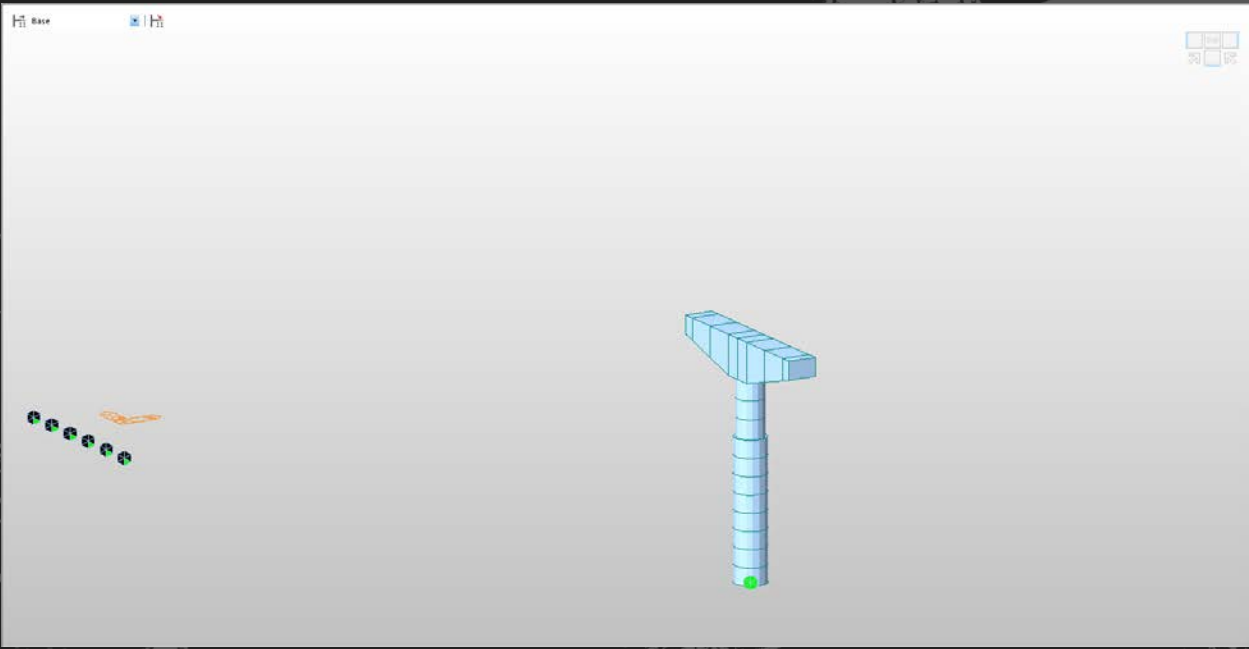
Up to 1"
Girder Sweep



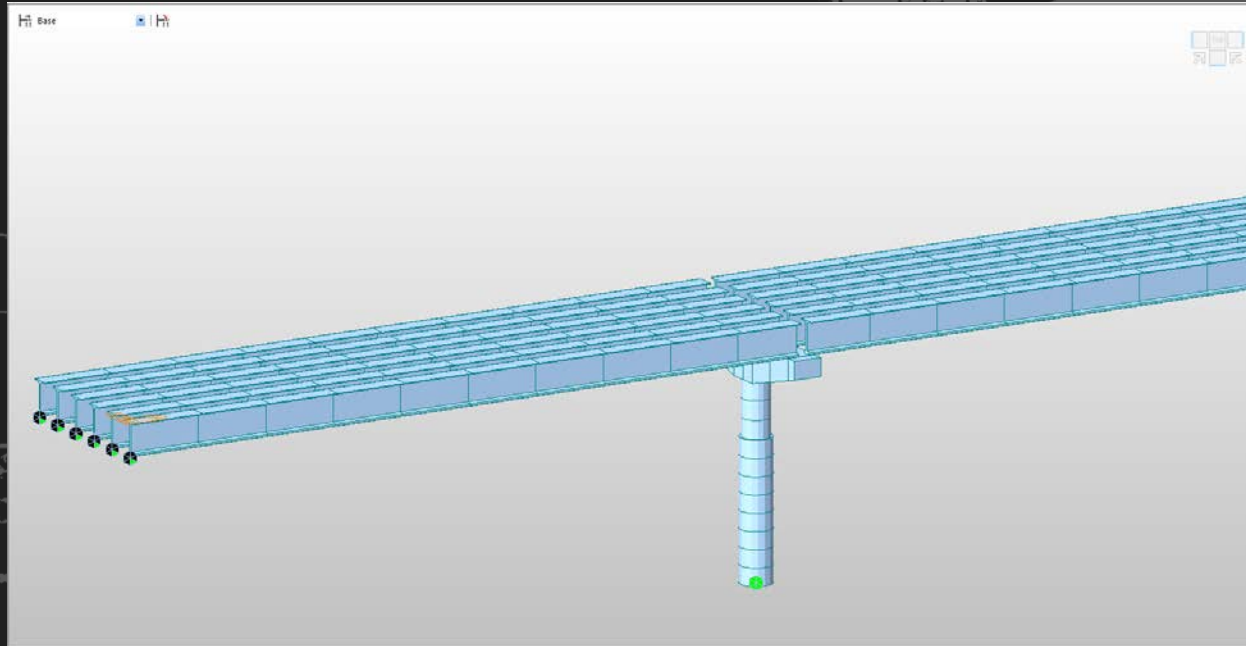
Positive Bending Moment at Bents



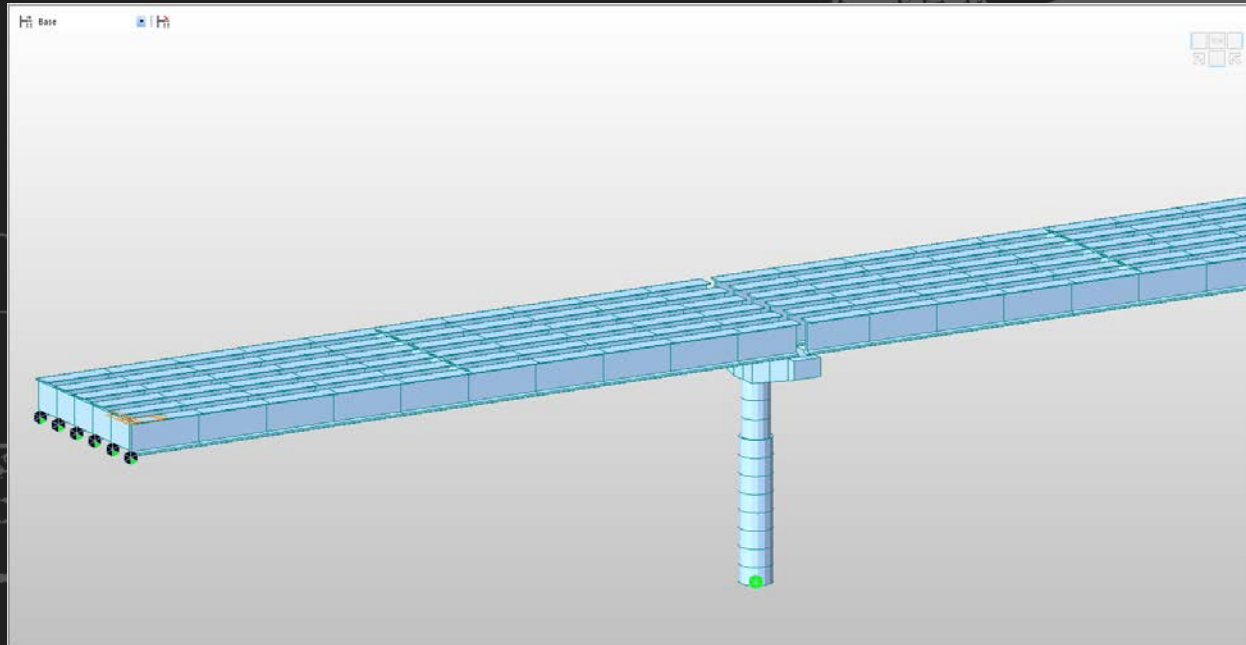
Original Construction Sequence



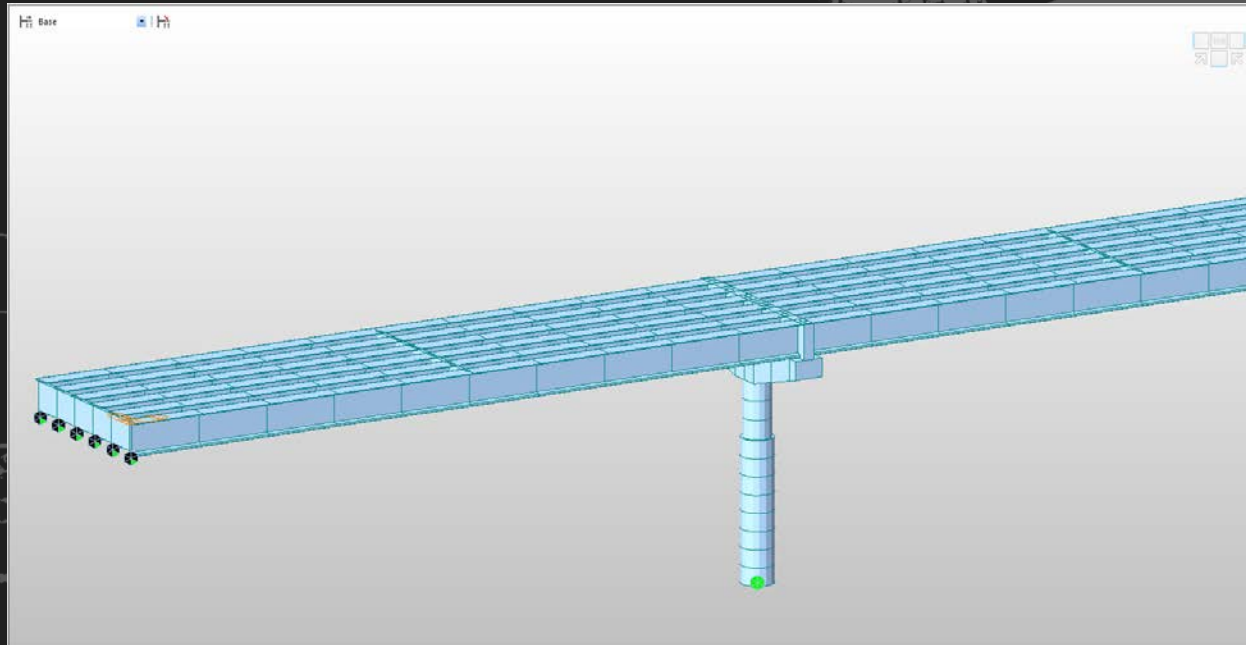
Original Construction Sequence



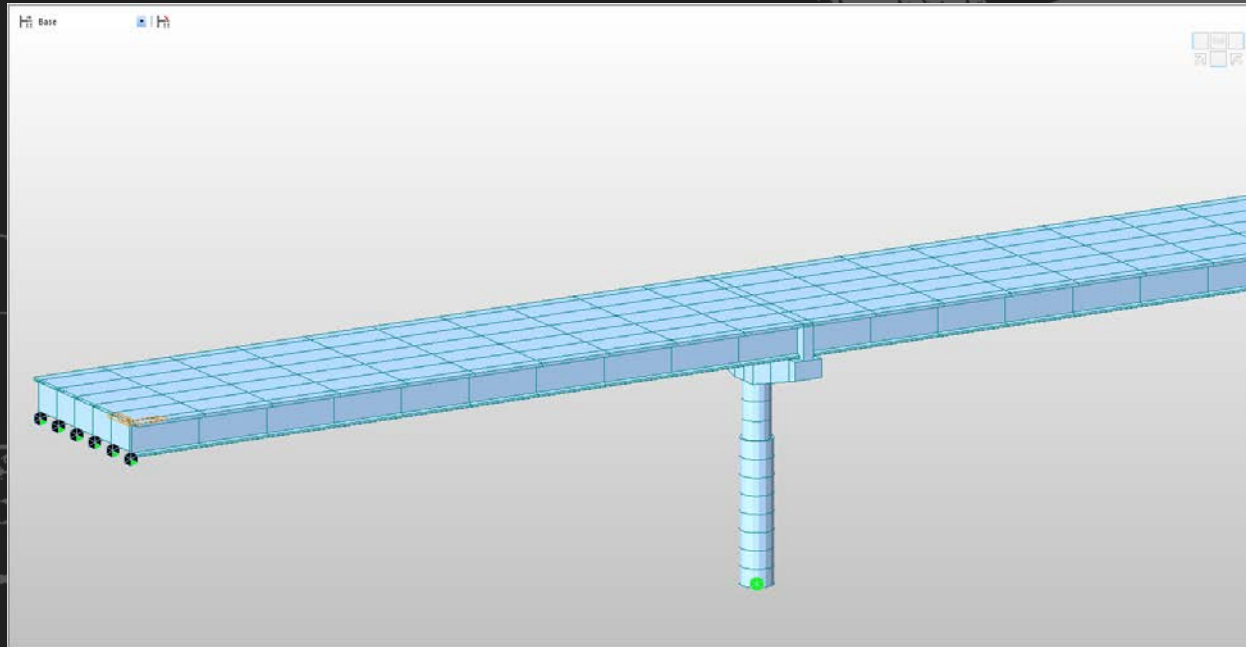
Original Construction Sequence



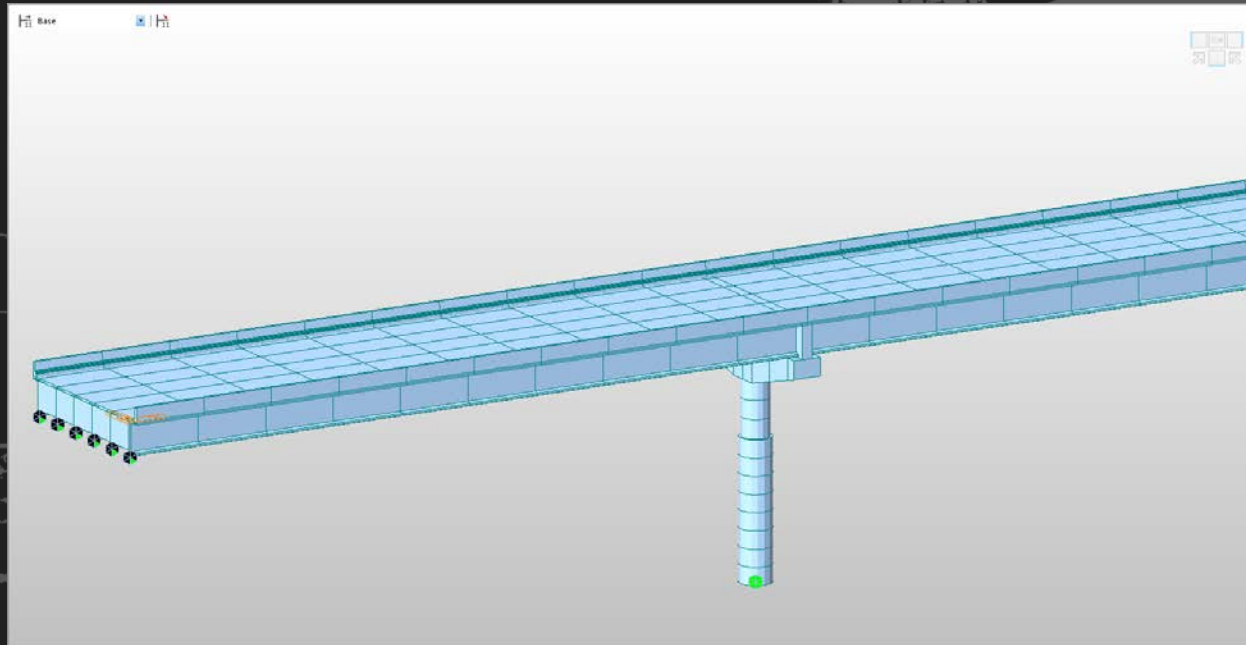
Original Construction Sequence



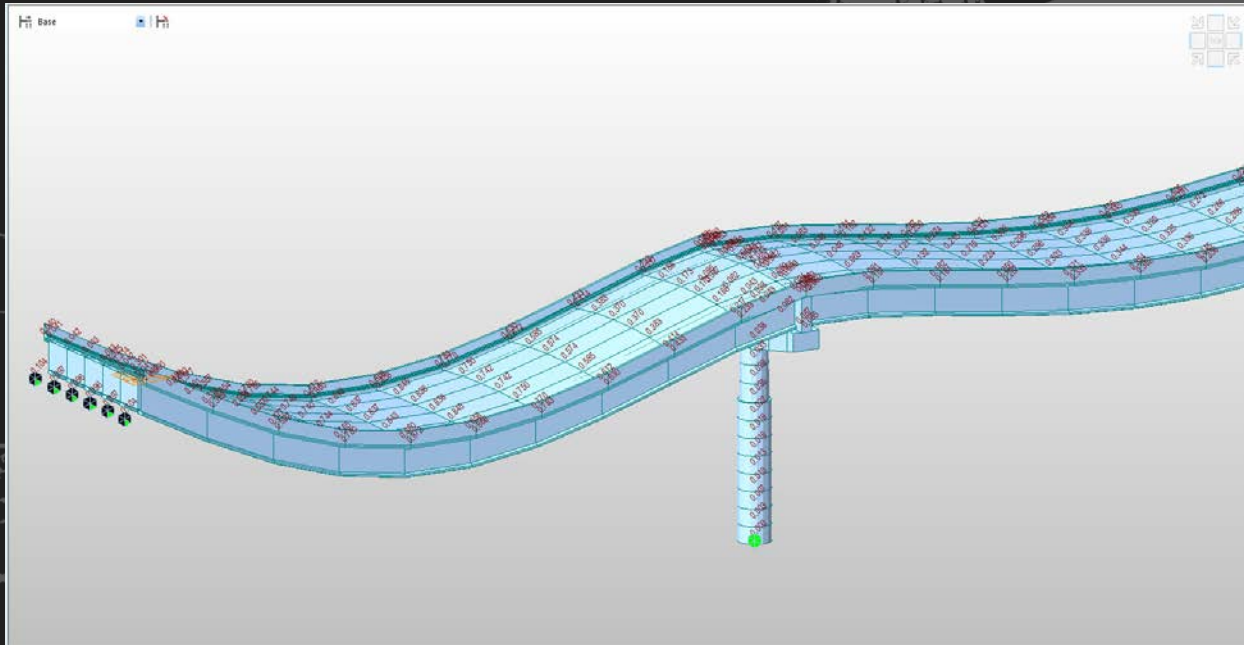
Original Construction Sequence



Original Construction Sequence

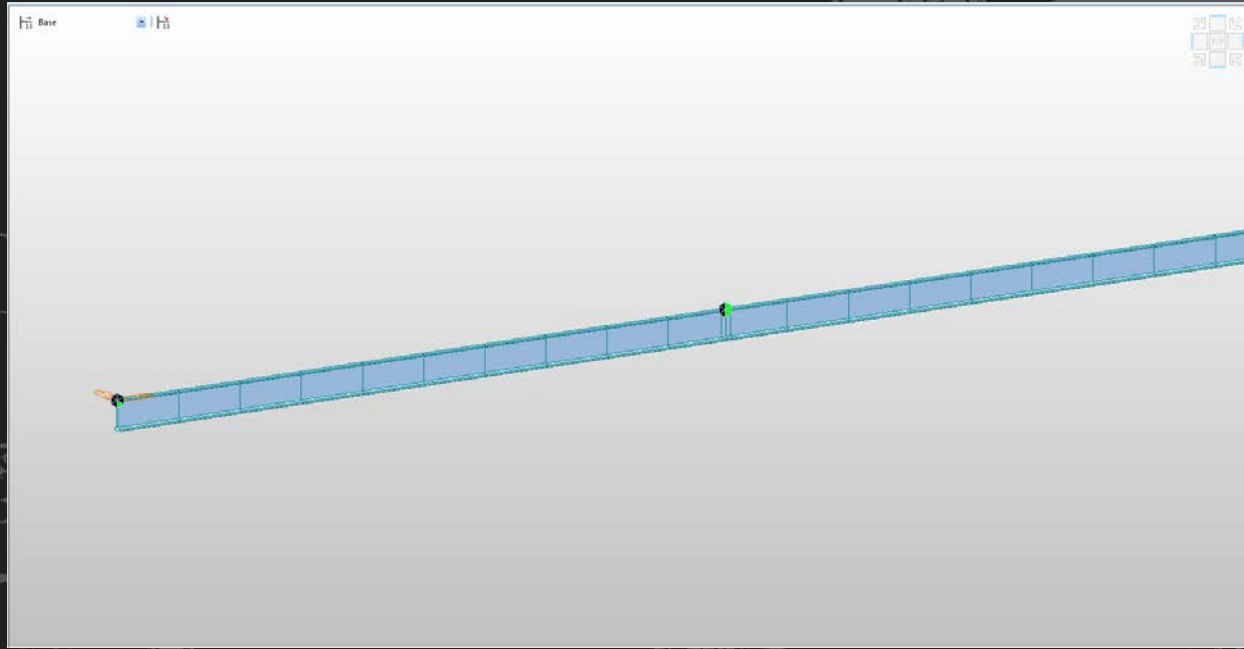


Original Construction Sequence

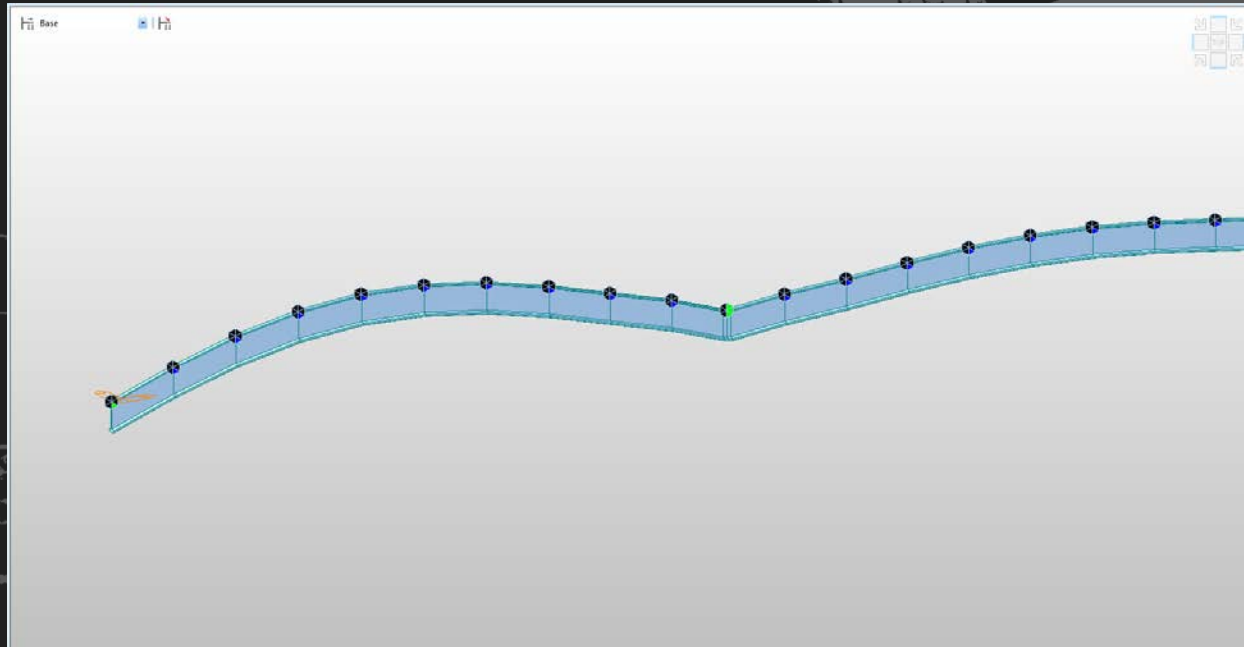


Deflection due to super-imposed dead loads with continuous span configuration

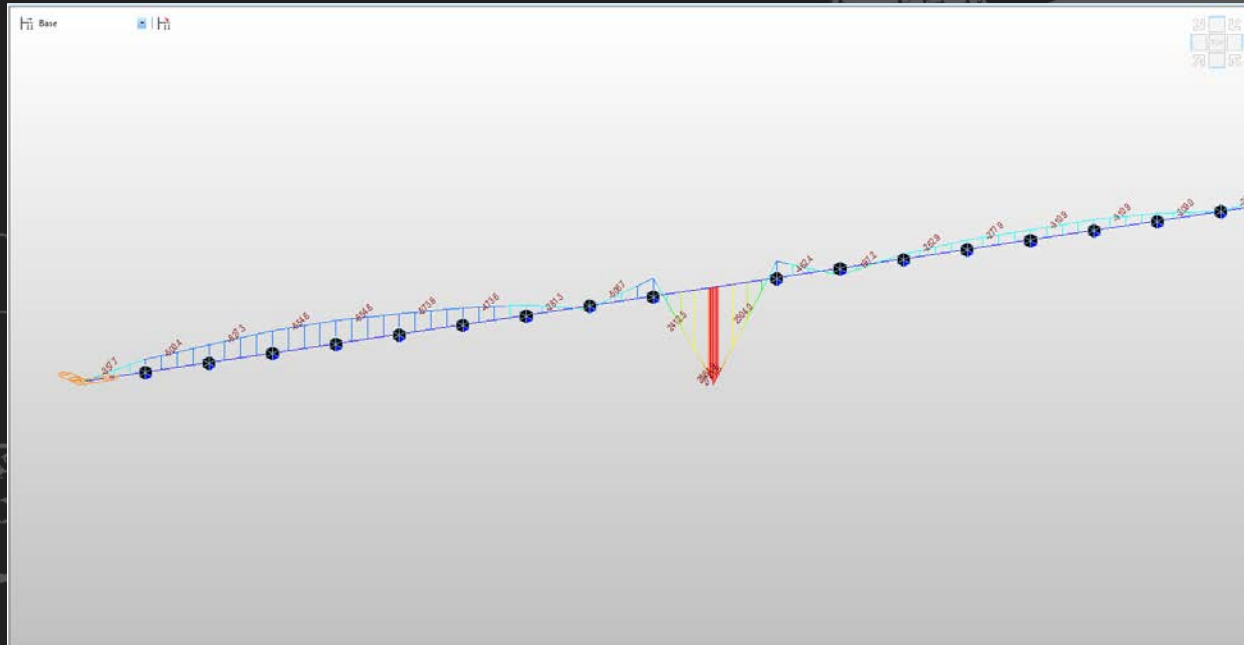
Positive Bending Moment at Bents – Dead load removal



Positive Bending Moment at Bents – Dead load removal



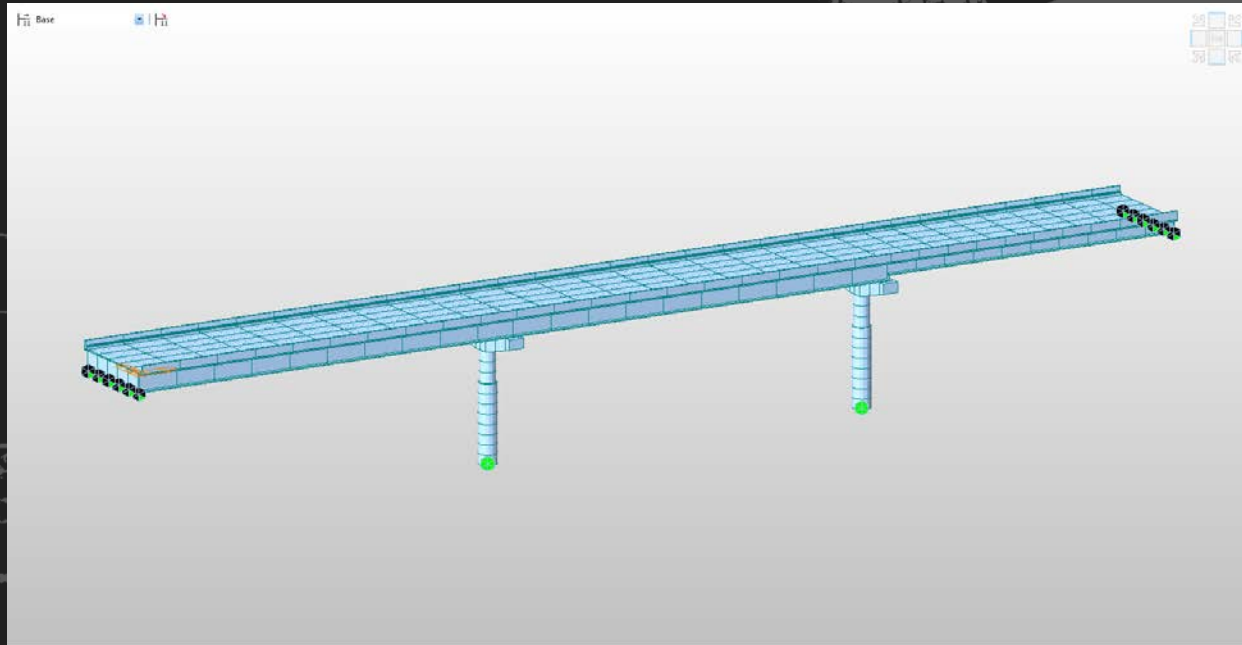
Positive Bending Moment at Bents – Dead load removal



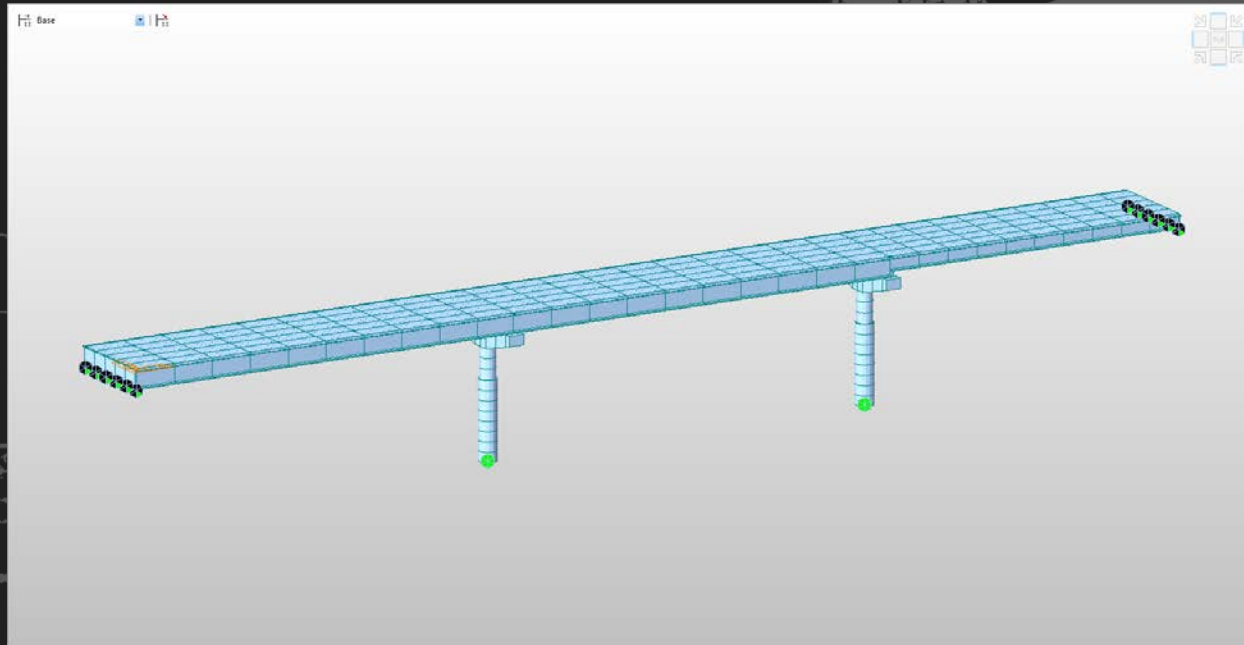
Positive Bending Moment at Bents – Dead load removal



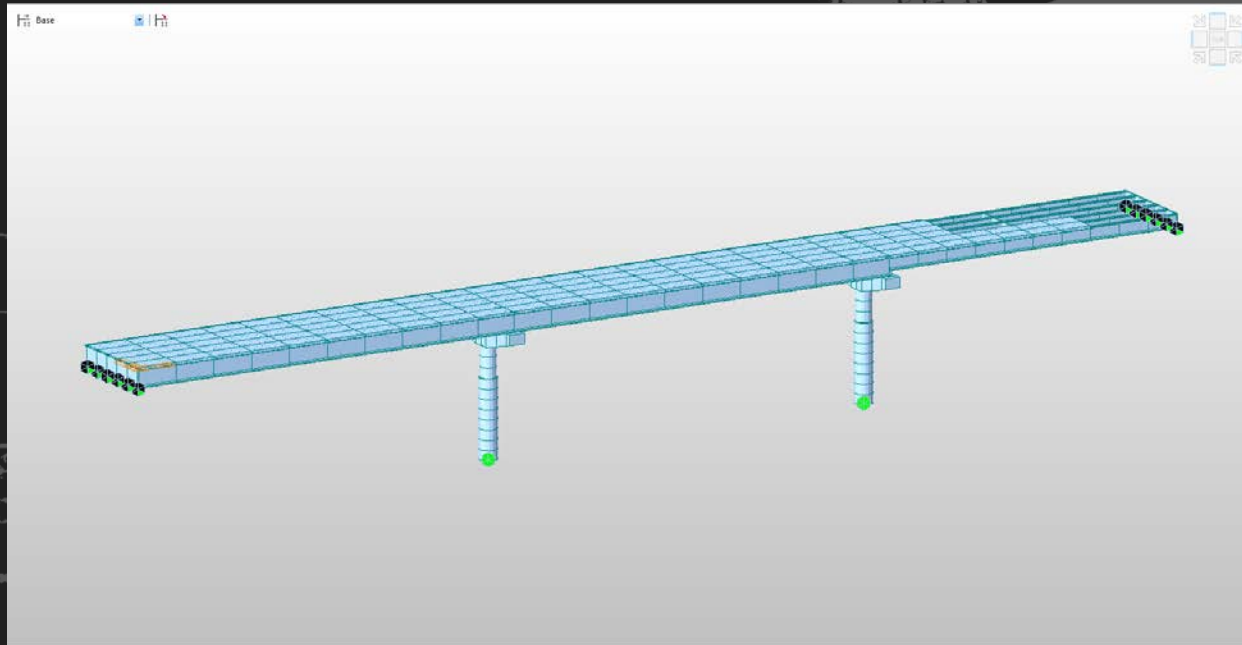
Construction Sequence Analysis



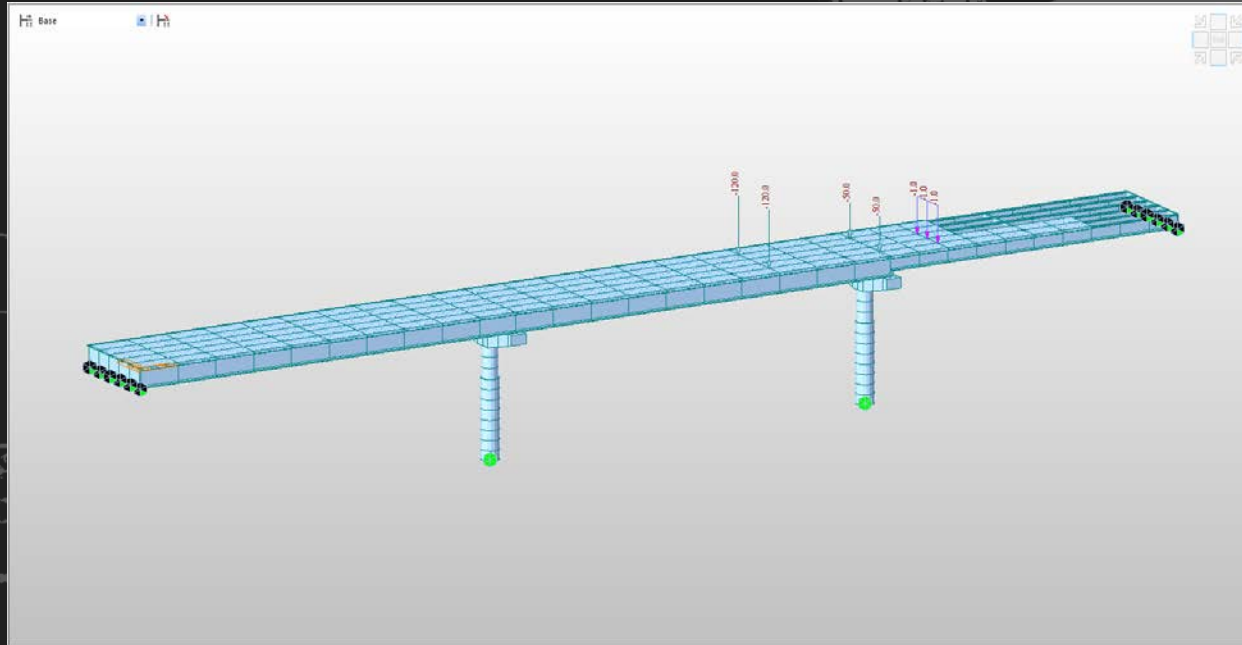
Construction Sequence Analysis



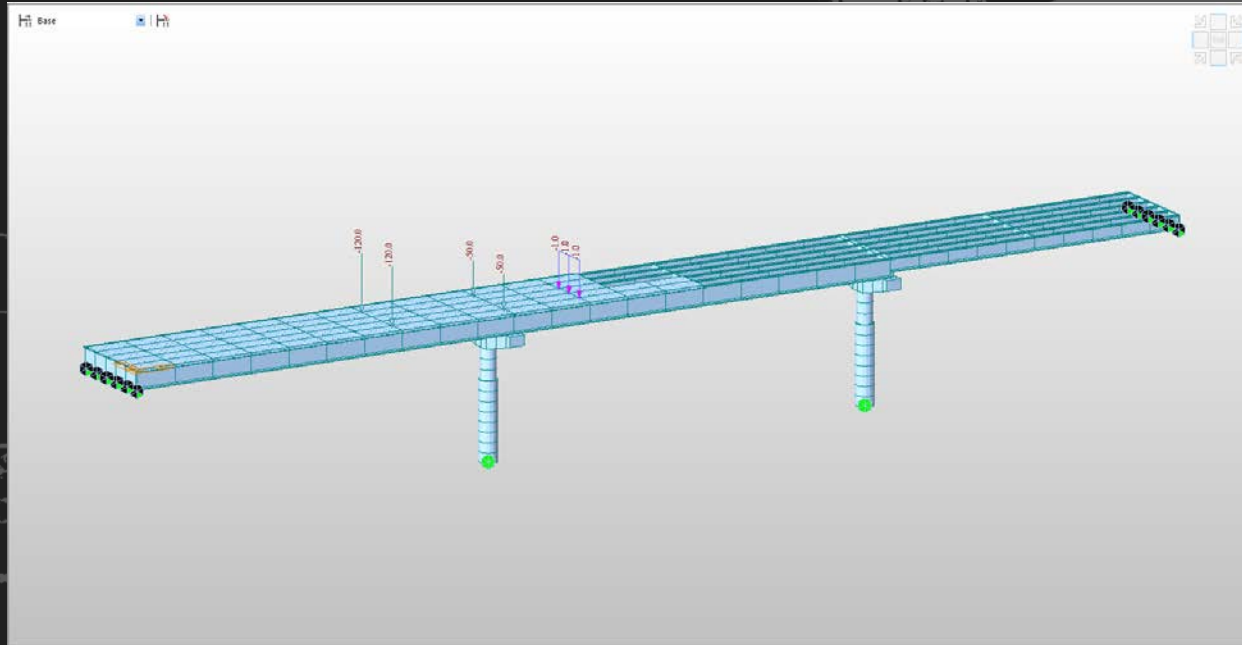
Construction Sequence Analysis



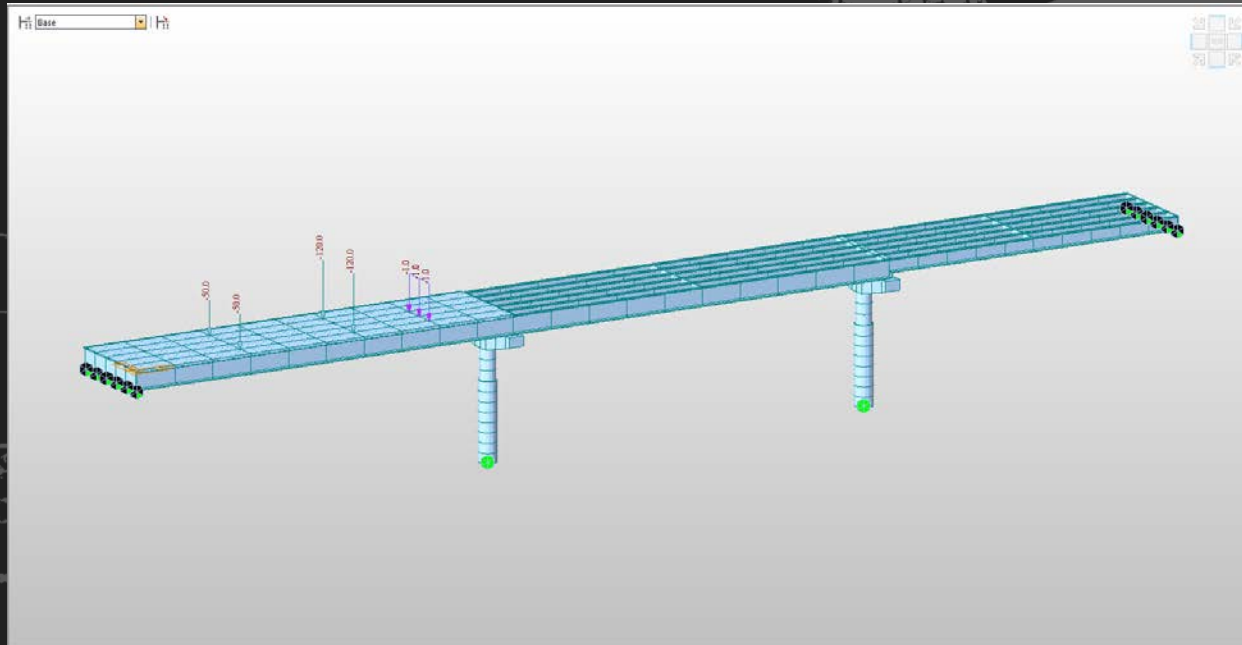
Construction Sequence Analysis



Construction Sequence Analysis



Construction Sequence Analysis



Section Capacity

PSBeam - [PSBeam_cut.psb]

File View Input Results Libraries Tools Window Help

Specification: LRFD

Bridge Geometry:
 LRFD(k) I-Beam comp
 Bridge Width 41.330 ft
 Curb-to-Curb 38.670 ft
 Beam Spacing 7.217 ft
 No. Beams 6
 No. Lanes 3
 Skew Angle 0.000 deg
 Overhang 2.623 ft
 de 1.293 ft

Span Data:
 Span/Girder 1 / 2
 Girder Length 157.310 ft
 Brng Pad Length 12.00 in
 Pad Offsets(L/R)
 left end 0.500 ft
 right end 0.500 ft
 CL Brng to Brng 158.310 ft

Cast-In-Place Deck:
 Slab Width 88.60 in
 Slab Thickness 8.00 in
 Haunch Width 15.00 in
 Haunch Thickness 0.00 in
 Suppl. Thickness 0.00 in
 Wearing Thickness 0.00 in

Material Properties:
Beam Concrete
 f_c 8.000 ksi
 f_{ci} 6.700 ksi
 density 0.155 kcf
Deck Concrete
 f_c 4.000 ksi
 density 0.150 kcf
Pretensioning Steel
 Diameter 0.50 in
 Area 0.153 in²
 f_{pu} 270 ksi
 Grade Low-Relaxation
 Strand pull fraction 0.750

Diagram 1: Framing Plan

Diagram 2: Bridge Cross Section

Diagram 3: Girder Cross Section

Section name: BT84-cut

| | Flanges: | | | No. webs 1 | Web width,in 6.00 | bwo,in 6.00 |
|--------|----------|----------|--|------------|-------------------|-------------|
| | Width,in | Thick,in | | | | |
| top | 15.00 | 6.00 | | | | |
| bottom | 24.00 | 7.50 | | | | |

Loads:

Dead (Non-Composite)
 Beam wt. 0.734 klf
 Deck wt. 0.722 klf
 Overlay wt. 0.000 klf
 Diaphragm wt. 2.450 kip
 Std. diaph. locations L/2
 Other uniform: 0.000 klf

Dead (Composite)
 Barriers 0.125 klf
 FWS 0.174 klf
 Other 0.000 klf

Live Load
 Vehicle HL-93
 Pedestrian Load 0.000 klf

| | Gross Properties | | | Transformed | |
|-----------------------|------------------|-----------|-----------|-------------|-----------|
| | Beam | Beam+Deck | Bm+Dk+Ov | Beam@fin | Bm+Dk+Ov |
| Height, in | 84.0 | 92.0 | 92.0 | 84.0 | 92.0 |
| Area, in ² | 682.0 | 1171.9 | 1171.9 | 719.8 | 1209.65 |
| cg, in | 36.9 | 58.2 | 58.2 | 35.2 | 56.6 |
| MI, in ⁴ | 538720.0 | 1287240.7 | 1287240.7 | 574213.7 | 1389535.6 |
| Sb, in ³ | 14619.3 | 22105.3 | 22105.3 | 16314.1 | 24558.1 |
| St, in ³ | 11425.7 | 49955.7 | 49955.7 | 11766.1 | 50678.7 |
| Sdck, in ³ | | 53910.6 | 53910.6 | | 55482.3 |

Section Capacity

PSBeam - [PSBeam_rebuilt1.psb]

File View Input Results Libraries Tools Window Help

Specification: LRFD

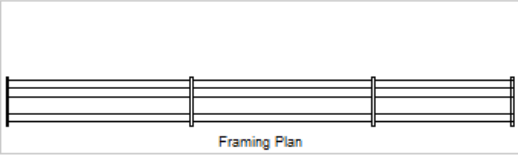
Bridge Geometry:
 LRFD(k) I-Beam comp
 Bridge Width 41.330 ft
 Curb-to-Curb 38.870 ft
 Beam Spacing 7.217 ft
 No. Beams 6
 No. Lanes 3
 Skew Angle 0.000 deg
 Overhang 2.823 ft
 de 1.293 ft

Span Data:
 Span/Girder 1 / 2
 CL Pier to Pier 156.310 ft
 Girder Length 157.310 ft
 Girder Offset -0.738 ft
 Brng Pad Length 12.00 in
 Pad Offsets(L/R)
 left end 0.738 ft
 right end 0.738 ft
 CL Brng to Brng 156.310 ft

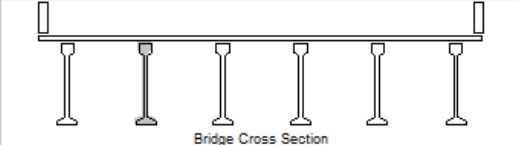
Cast-In-Place Deck:
 Slab Width 86.60 in
 Slab Thickness 8.00 in
 Haunch Width 15.00 in
 Haunch Thickness 0.00 in
 Suppl. Thickness 0.00 in
 Wearing Thickness 0.00 in

Material Properties:
 Beam Concrete
 f_c 8.000 ksi
 f_{ci} 8.000 ksi
 density 0.155 kcf
 Deck Concrete
 f_c 4.000 ksi
 density 0.150 kcf
 Pretensioning Steel
 Diameter 0.50 in
 Area 0.153 in²
 f_{pu} 270 ksi
 Grade Low-Relaxation
 Strand pull fraction 0.750

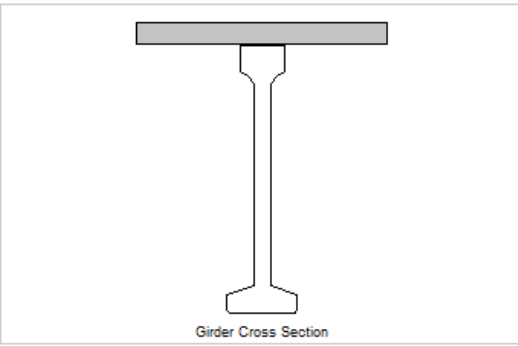
Loads:
 Dead (Non-Composite)
 Beam wt. 0.823 klf
 Deck wt. 0.722 klf
 Overlay wt. 0.000 klf
 Diaphragm wt. 2.450 kip
 Std. diaph. locations L/2
 Other uniform: 0.000 klf
 Dead (Composite)
 Barriers 0.134 klf
 FWS 0.174 klf
 Other 0.000 klf
 Live Load
 Vehicle HL-93
 Pedestrian Load 0.000 klf



Framing Plan



Bridge Cross Section



Girder Cross Section

Section name: BT84-cut

| | Gross Properties | | | Transformed | |
|-----------------------|------------------|-----------|-----------|-------------|-----------|
| | Beam | Beam+Deck | Bm+Dk+Ov | Beam@fin | Bm+Dk+Ov |
| Height, in | 91.0 | 99.0 | 99.0 | 91.0 | 99.0 |
| Area, in ² | 765.0 | 1254.9 | 1254.9 | 802.8 | 1292.65 |
| cg, in | 42.3 | 82.9 | 82.9 | 40.6 | 61.2 |
| MI, in ⁴ | 728907.0 | 1559490.2 | 1559490.2 | 778150.0 | 1680898.4 |
| Sb, in ³ | 17213.1 | 24792.7 | 24792.7 | 19163.5 | 27456.7 |
| St, in ³ | 14981.4 | 55500.3 | 55500.3 | 15441.3 | 56443.8 |
| Sdck, in ³ | | 61094.9 | 61094.9 | | 62920.7 |

Flanges: Width,in Thiek,in No. webs 1
 top 15.00 6.00 Web width,in 6.00
 bottom 24.00 7.50 bwo,in 6.00

Section Capacity

PSBeam - [PSBeam_rebuilt6.psb]

File View Input Results Libraries Tools Window Help

Specification: LRFD


Bridge Geometry:
 LRFD(k) I-Beam comp
 Bridge Width 41.330 ft
 Curb-to-Curb 38.670 ft
 Beam Spacing 7.217 ft
 No. Beams 6
 No. Lanes 3
 Skew Angle 0.000 deg
 Overhang 2.623 ft
 de 1.293 ft

Span Data:
 Span/Girder 1 / 2
 CL Pier to Pier 156.310 ft
 Girder Length 157.310 ft
 Girder Offset -0.738 ft
 Brng Pad Length 12.00 in
 Pad Offsets(L/R)
 left end 0.738 ft
 right end 0.738 ft
 CL Brng to Brng 156.310 ft

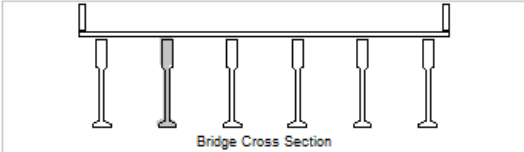
Cast-In-Place Deck:
 Slab Width 86.60 in
 Slab Thickness 8.00 in
 Haunch Width 15.00 in
 Haunch Thickness 0.00 in
 Suppl. Thickness 0.00 in
 Wearing Thickness 0.00 in

Material Properties:
 Beam Concrete
 f'c 8.000 ksi
 f'ci 8.000 ksi
 density 0.155 kcf
 Deck Concrete
 f'c 4.000 ksi
 density 0.150 kcf
 Pretensioning Steel
 Diameter 0.50 in
 Area 0.153 in²
 fpu 270 ksi
 Grade Low-Relaxation
 Strand pull fraction 0.750

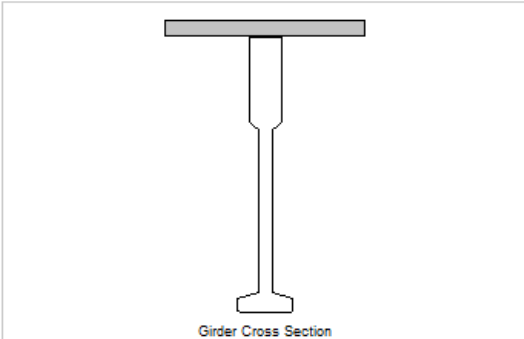
Loads:
 Dead (Non-Composite)
 Beam wt. 0.935 klf
 Deck wt. 0.722 klf
 Overlay wt. 0.000 klf
 Diaphragm wt. 2.450 klf
 Std. diaph. locations L/2
 Other uniform: 0.000 klf
 Dead (Composite)
 Barriers 0.134 klf
 FWS 0.174 klf
 Other 0.000 klf
 Live Load
 Vehicle HL-93
 Pedestrian Load 0.000 klf



Framing Plan



Bridge Cross Section



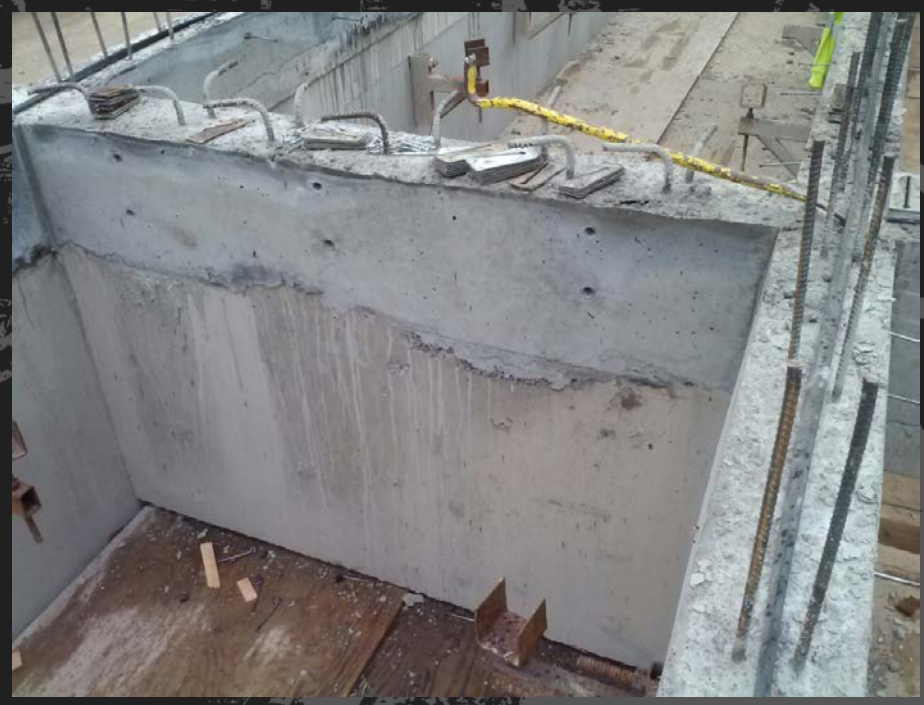
Girder Cross Section

Section name: BT84-out

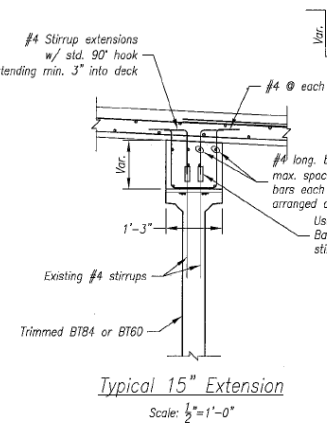
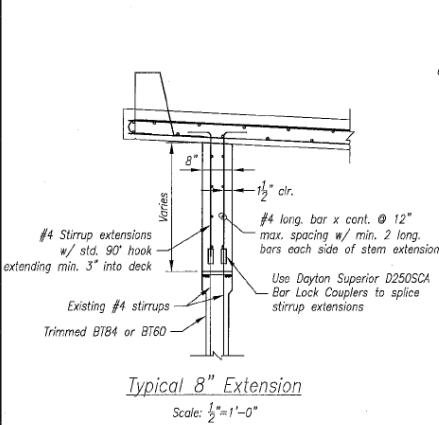
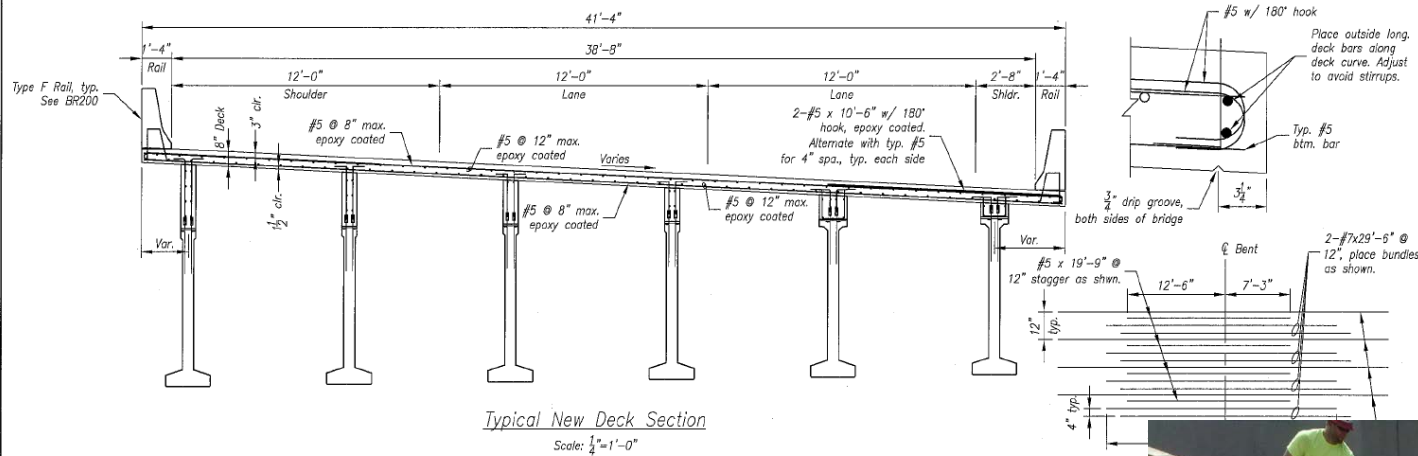
| | Gross Properties | | | Transformed | |
|-----------------------|------------------|-----------|-----------|-------------|-----------|
| | Beam | Beam+Deck | Bm+Dk+Ov | Beam@fin | Bm+Dk+Ov |
| Height, in | 118.0 | 126.0 | 126.0 | 118.0 | 126.0 |
| Area, in ² | 868.2 | 1358.1 | 1358.1 | 906.0 | 1395.85 |
| cg, in | 51.3 | 76.8 | 76.8 | 49.4 | 74.8 |
| MI, in ⁴ | 1340000.0 | 2909477.8 | 2909477.8 | 1416288.4 | 3096936.1 |
| Sb, in ³ | 26137.7 | 37892.9 | 37892.9 | 28897.0 | 41375.7 |
| St, in ³ | 20080.0 | 70587.0 | 70587.0 | 20631.5 | 71770.0 |
| Sdck, in ³ | | 83599.4 | 83599.4 | | 85623.7 |

| Flanges: | Width,in | Thick,in | No. webs |
|----------|----------|----------|----------|
| top | 8.00 | 6.00 | 1 |
| bottom | 24.00 | 7.50 | |

| | Web width,in | bwo,in |
|--|--------------|--------|
| | 6.00 | 6.00 |







Typical Deck Steel

Longitudinal Bars:
 - #5 @ 12" max. ctr. in top deck, epoxy coated.
 - Additional top bars at interior bents.
 - #5 @ 12" max. ctr. in bottom deck, epoxy coated.
 - Place longitudinal bars parallel to girders.

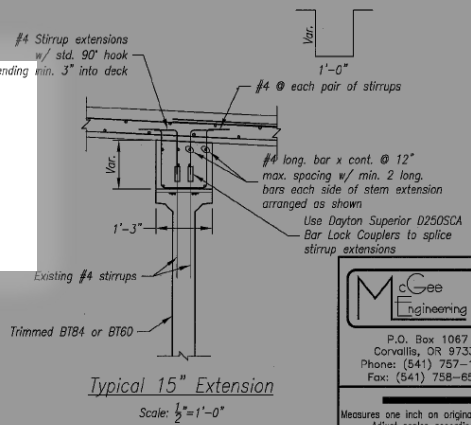
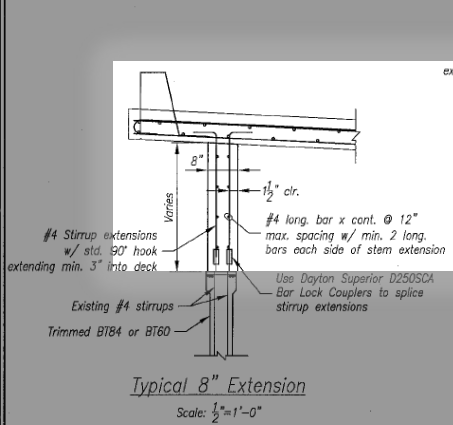
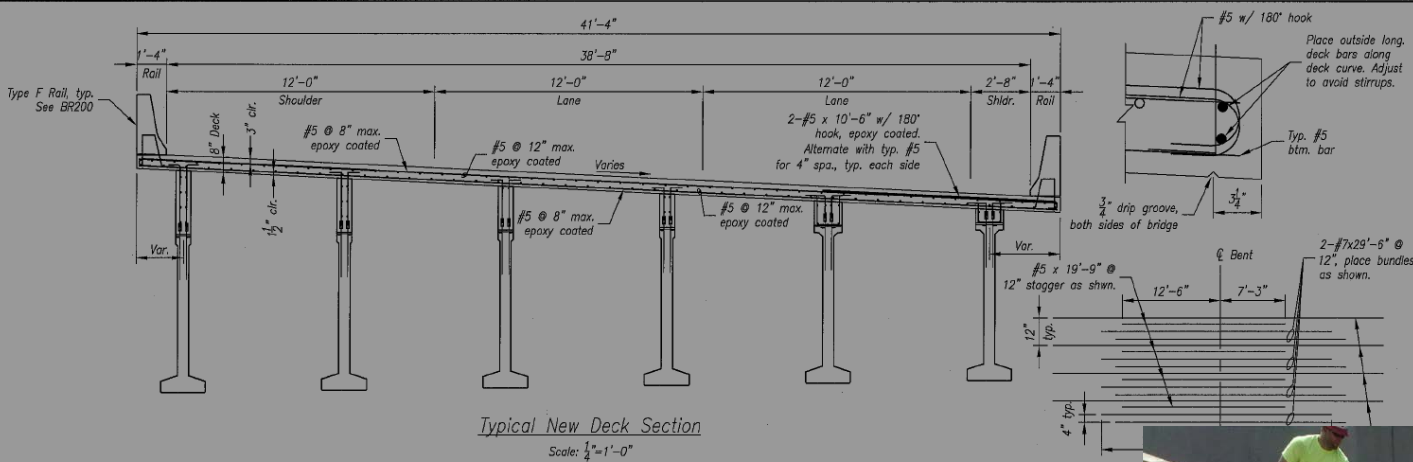
Transverse Bars:
 - #5 x full length, @ 8" max. ctr. top of deck.
 - #5 x full length, @ 8" max. ctr. bottom of deck.
 - 2-#5 x 10'-6" w/ 180' hook, epoxy coated.
 - 4" spa. typ. each side at edge of deck.
 - Provide 180° hook in top bars at back edge of deck, typ.

McGee Engineering Inc.
 P.O. Box 1067
 Corvallis, OR 97339
 Phone: (541) 757-1270
 Fax: (541) 758-8585

REGISTERED PROFESSIONAL ENGINEER
 70861PE
RESBEC
 OREGON
 JANUARY 1, 2008
BRIDGER K. JOHNSON P.E.
 Renewal: 6/30/15

Measures one inch on original drawing. Adjust scales accordingly.





Typical Deck Steel

Longitudinal Bars:

- #5 @ 12" max. ctr. in top deck, epoxy coated
- Additional top bars at interior bents. See detail.
- #5 @ 12" max. ctr. in bottom deck, epoxy coated
- Place longitudinal bars parallel to girders.

Transverse Bars:

- #5 x full length, @ 8" max ctr. top of deck
- #5 x full length, @ 8" max ctr. bottom of deck
- 2-#5 x 10'-6" w/ 180' hook, epoxy coated
- 4" spa, typ. each side at edge of deck
- Provide 180' hook in top bars at back edge of deck, typ.

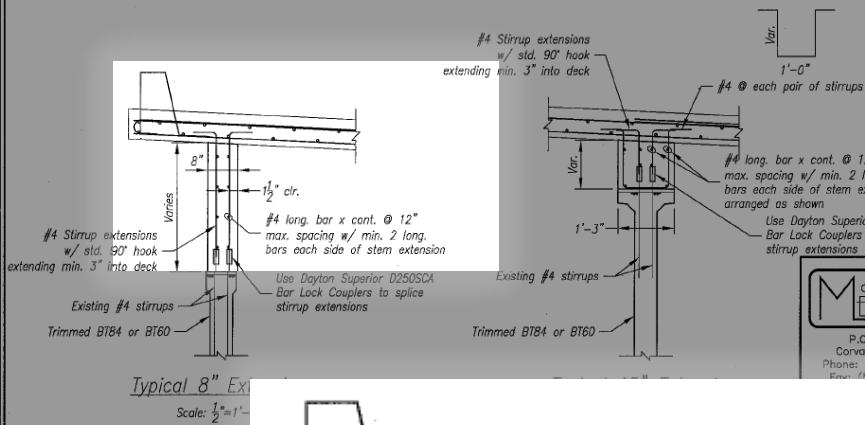
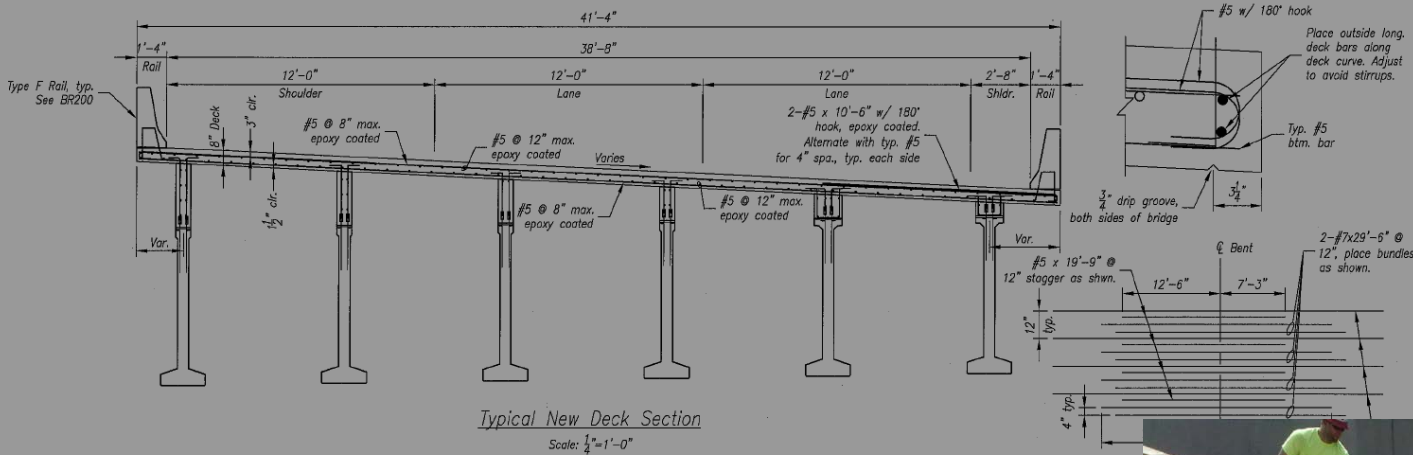
McGee Engineering Inc.
P.O. Box 1067
Corvallis, OR 97339
Phone: (541) 757-1270
Fax: (541) 758-8585

REGISTERED PROFESSIONAL ENGINEER
70881PPE
RESBAC
OREGON
JANUARY 1, 2008
BRIDGER K. JOHNSON

Measures one inch on original drawing. Adjust scales accordingly.

Renewal: 6/30/15



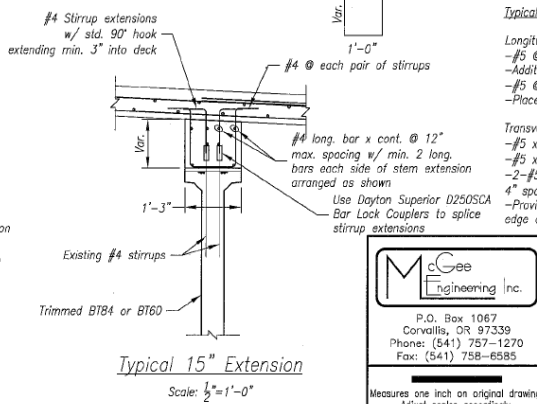
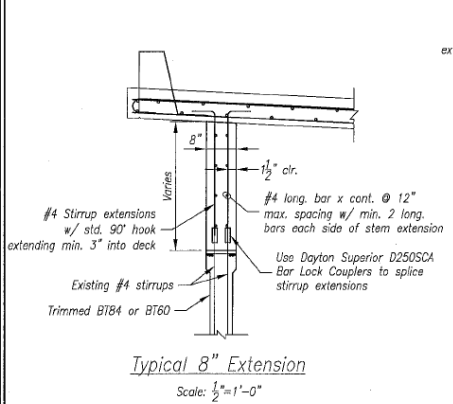
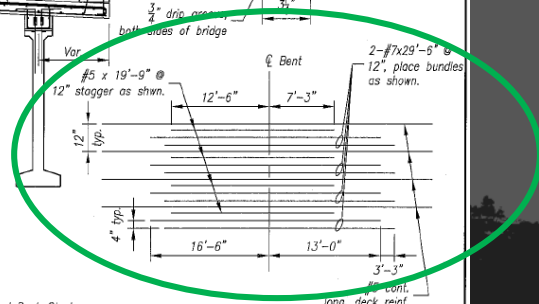
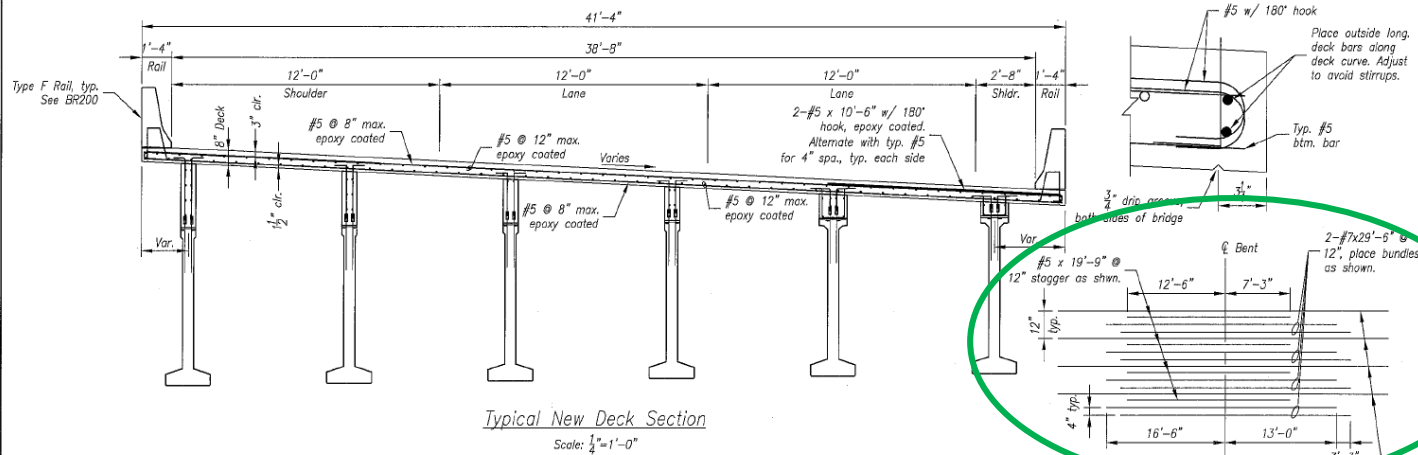


McGee Engineering Inc.
 P.O. Box 1067
 Corvallis, OR 97339
 Phone: (541) 757-1270
 Fax: (541) 758-8885

REGISTERED PROFESSIONAL ENGINEER
 70881PE
RESBAK
 OREGON
 JANUARY 1, 2008
BR K. JOHNSON
 License No. 71543
 Expires: 6/30/15







Typical Deck Steel

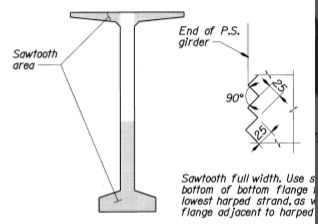
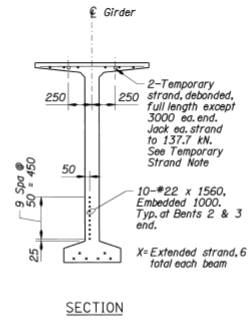
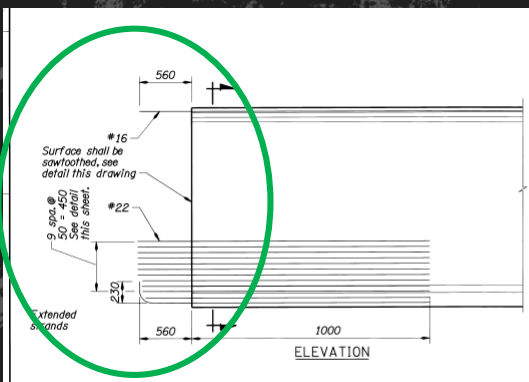
Longitudinal Bars:
 -#5 @ 12" max. ctr. in top deck, epoxy coated.
 -Additional top bars at interior bents. See detail this sheet.
 -#5 @ 12" max. ctr. in bottom deck, staggered w/ top bars.
 -Place longitudinal bars parallel to girders except as noted.

Transverse Bars:
 -#5 x full length, @ 8" max ctr. top deck, epoxy coated.
 -#5 x full length, @ 8" max ctr. bottom deck staggered w/ top bars.
 -2-#5 x 10'-6" w/ 180° hook, epoxy coated. Alternate w/ typ. #5 for 4" spa, typ. each side at edge of deck.
 -Provide 180° hook in top bars at back edge of deck at abutment, at edge of deck, typ.

M/Gee Engineering Inc.
 P.O. Box 1067
 Corvallis, OR 97339
 Phones: (541) 757-1270
 Fax: (541) 758-8585

REGISTERED PROFESSIONAL ENGINEER 70881PE
OSBC
 OREGON
 JANUARY 1, 2008
BRIDGER K. JOHNSON

| | |
|--------------------------------|-----------------|
| OSBC | |
| Lower Perry Intchg. Repair | |
| Deck Section & Stem Extensions | |
| Designed: B. Johnson | Date: 7-15-2013 |
| Drawn: B. Johnson | Sheet 4 of 16 |



GIRDER END DETAIL (AT INTERIOR BENT ONLY)

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

Temporary Strand Note:
 Detension temporary strands after erection. Strand access at mid span breakout void.

Note:
 All exposed exterior surfaces shall rec. All other surfaces other than top and

CONSTRUCTION SCHEDULE – 2013

The background image shows a construction site for a bridge. A large crane is visible in the upper right, with its hook hanging. In the center, several workers are on the bridge deck, which is being prepared with rebar. The bridge spans across a valley, and the surrounding area is hilly with some trees. The overall scene is in black and white, with the text overlaid in various colors.

Mid July –

Reviewed and approved repair calculations, plans

August –

Completed demolition and formed stems, diaphragms

September –

Cast stems, tied deck rebar, poured new RC deck

October –

Finished deck pour, end panels, deck surface texturing

November –

Opened to traffic

CONSTRUCTION COST – BID TAB

| Item Description | Unit | Quantity | Unit Price | Actual Unit Price | 1st | | 2nd | | 3rd | |
|--|---------|----------|-------------|-------------------|---------------|-------|---------------|-------|---------------|-------|
| | | | | | Amount | % | Amount | % | Amount | % |
| → Remove and replace girders | LS | 1.0 | \$408,750.0 | \$408,750.0 | \$408,750.0 | 19.7 | \$168,000.0 | 12.8 | \$175,000.0 | 13.3 |
| → Bridge removal work | LS/SQFT | 17600.0 | \$993,750.0 | \$56.5 | \$993,750.0 | 48.0 | \$460,000.0 | 35.0 | \$475,000.0 | 36.0 |
| Granular structure backfill | LS/CUYD | 4.0 | \$1,000.0 | \$250.0 | \$1,000.0 | 0.0 | \$7,500.0 | 0.6 | \$1,000.0 | 0.1 |
| Reinforcement | LS/LB | 8900.0 | \$15,000.0 | \$1.7 | \$15,000.0 | 0.7 | \$15,400.0 | 1.2 | \$15,000.0 | 1.1 |
| Coated reinforcement | LS/LB | 115060.0 | \$140,000.0 | \$1.2 | \$140,000.0 | 6.8 | \$143,000.0 | 10.9 | \$140,000.0 | 10.6 |
| Deck concrete, HPC5000 | LS/CUYD | 435.0 | \$270,000.0 | \$620.7 | \$270,000.0 | 13.0 | \$275,000.0 | 21.0 | \$270,000.0 | 20.5 |
| General structural concrete, Class3300 | LS/CUYD | 16.0 | \$20,000.0 | \$1,250.0 | \$20,000.0 | 1.0 | \$20,500.0 | 1.6 | \$20,000.0 | 1.5 |
| General structural concrete, Class5000 | LS/CUYD | 87.0 | \$60,000.0 | \$689.7 | \$60,000.0 | 2.9 | \$61,400.0 | 4.7 | \$60,000.0 | 4.5 |
| Saw cut texturing | SQYD | 1860.0 | \$4.5 | \$4.5 | \$8,370.0 | 0.4 | \$8,556.0 | 0.7 | \$8,370.0 | 0.6 |
| Reinforced concrete bridge end panels | LS/SQYD | 278.0 | \$250.3 | \$250.3 | \$69,569.5 | 3.4 | \$66,998.0 | 5.1 | \$69,500.0 | 5.3 |
| Asphaltic plug seals | LS/FT | 82.7 | \$10,000.0 | \$120.9 | \$10,000.0 | 0.5 | \$10,230.0 | 0.8 | \$10,000.0 | 0.8 |
| Type "F" concrete rail | LS/FT | 914.0 | \$75,000.0 | \$82.1 | \$75,000.0 | 3.6 | \$76,000.0 | 5.8 | \$75,000.0 | 5.7 |
| | | | | | \$2,071,439.5 | 100.0 | \$1,312,584.0 | 100.0 | \$1,318,870.0 | 100.0 |
| Bridge area | SQFT | 17627.25 | | | \$117.51 | | \$74.46 | | \$74.82 | |

LESSONS LEARNED



Complete deck replacement on PS/PC concrete girders is possible.

Deck removal by cutting through girder flanges can be done.

Girder sweep can occur where intermediate diaphragms do not exist.

Careful attention to behavior at girder ends is required.

Crack control reinforcement is needed to reduce cracking at interface between PC and CIP concrete near end diaphragms.







?

or

Comments