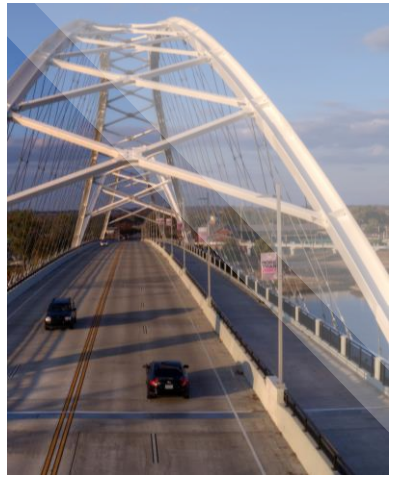
Iowa Pilot Project
IA 210 over I-35



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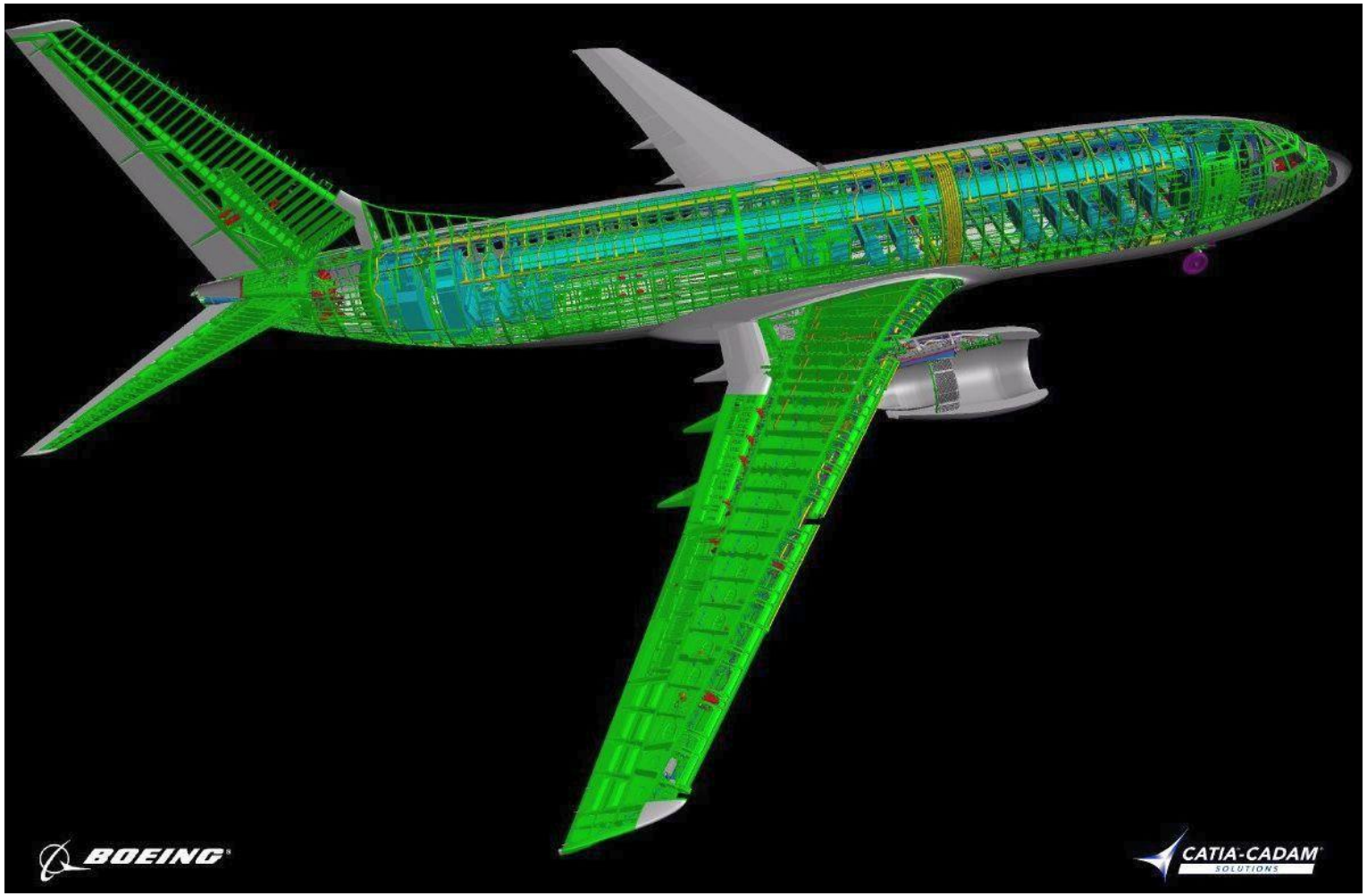
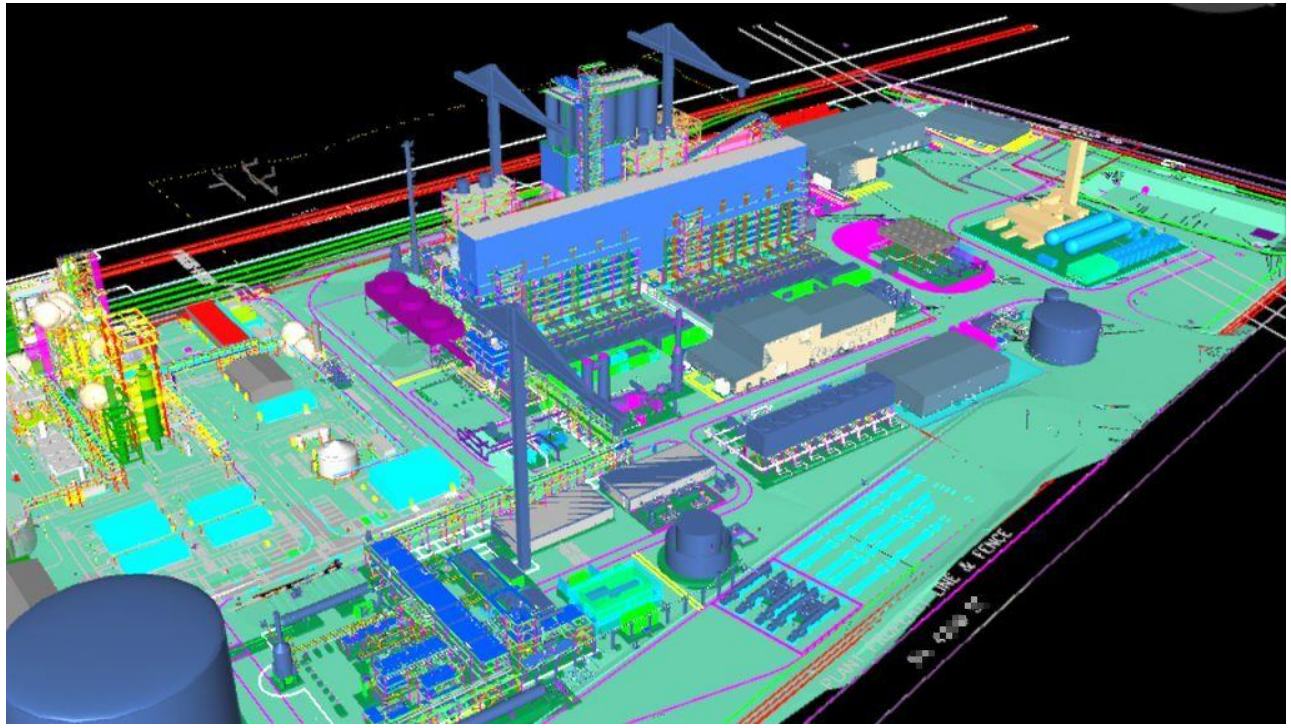
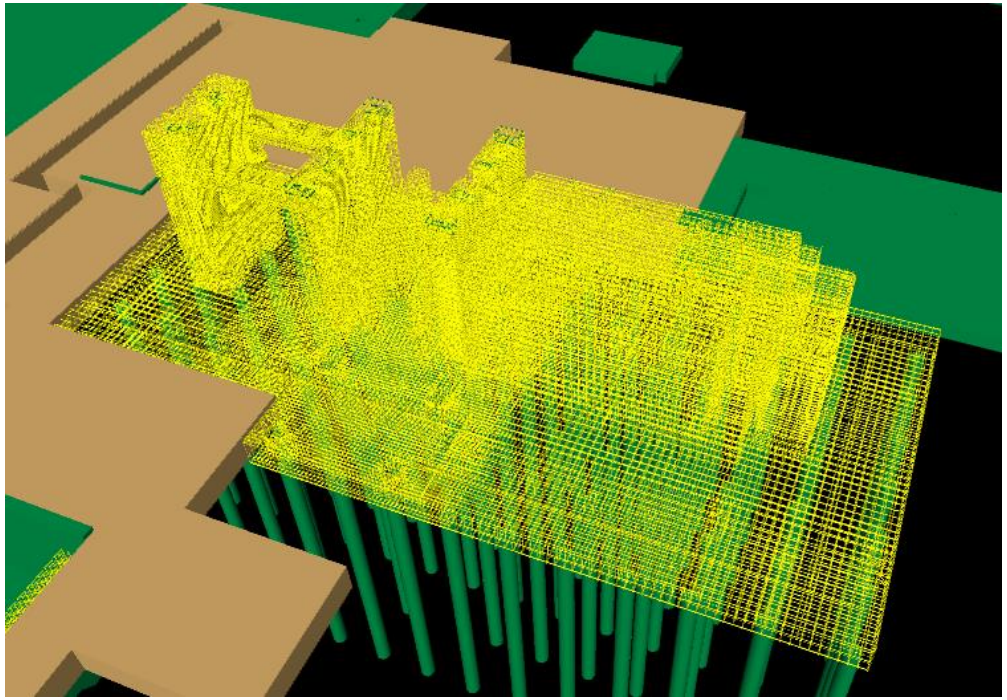
Iowa Pilot Project IA 210 over I-35



Iowa Pilot Project IA 210 over I-35



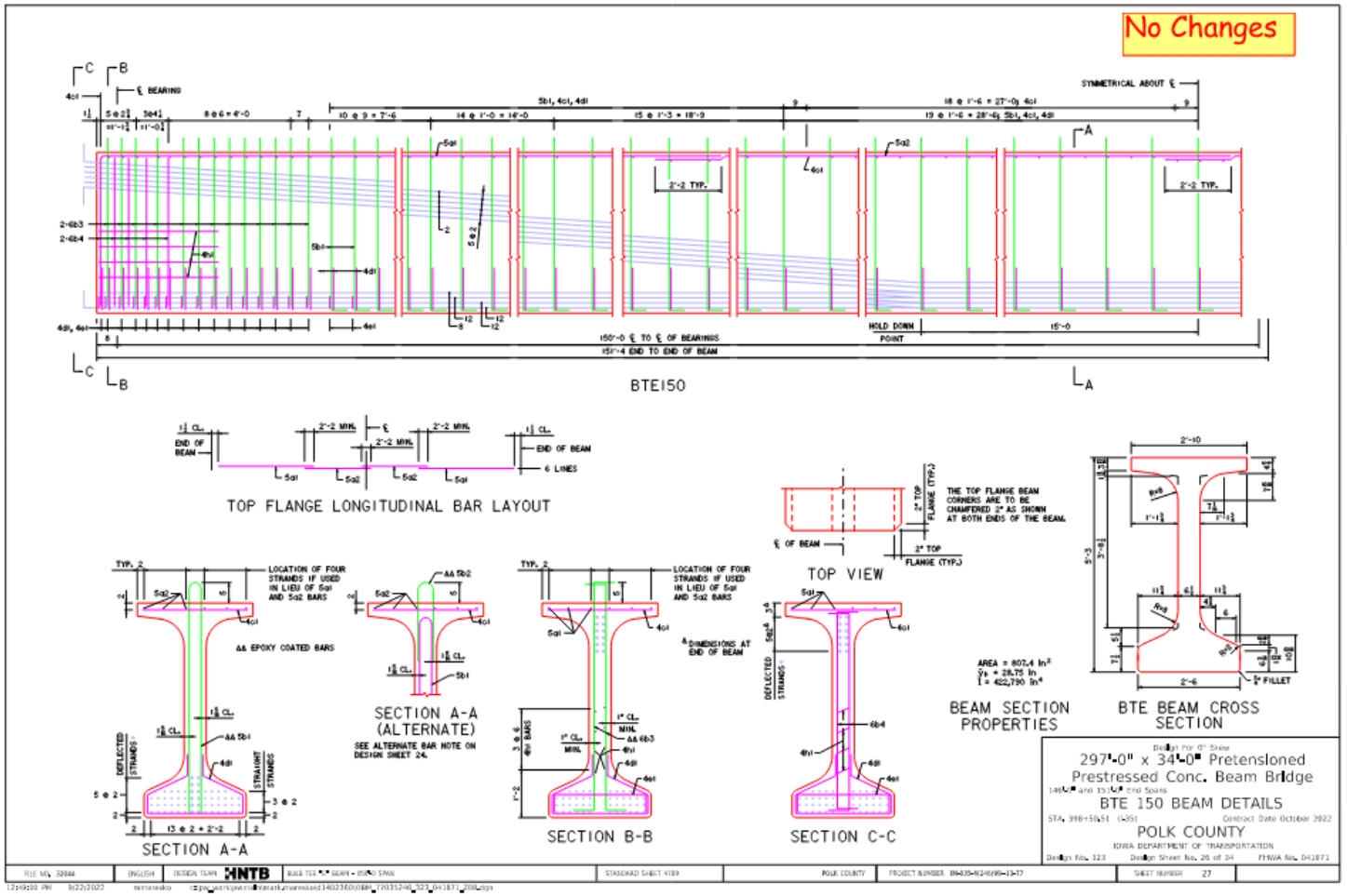


Iowa Pilot Project IA 210 over I-35

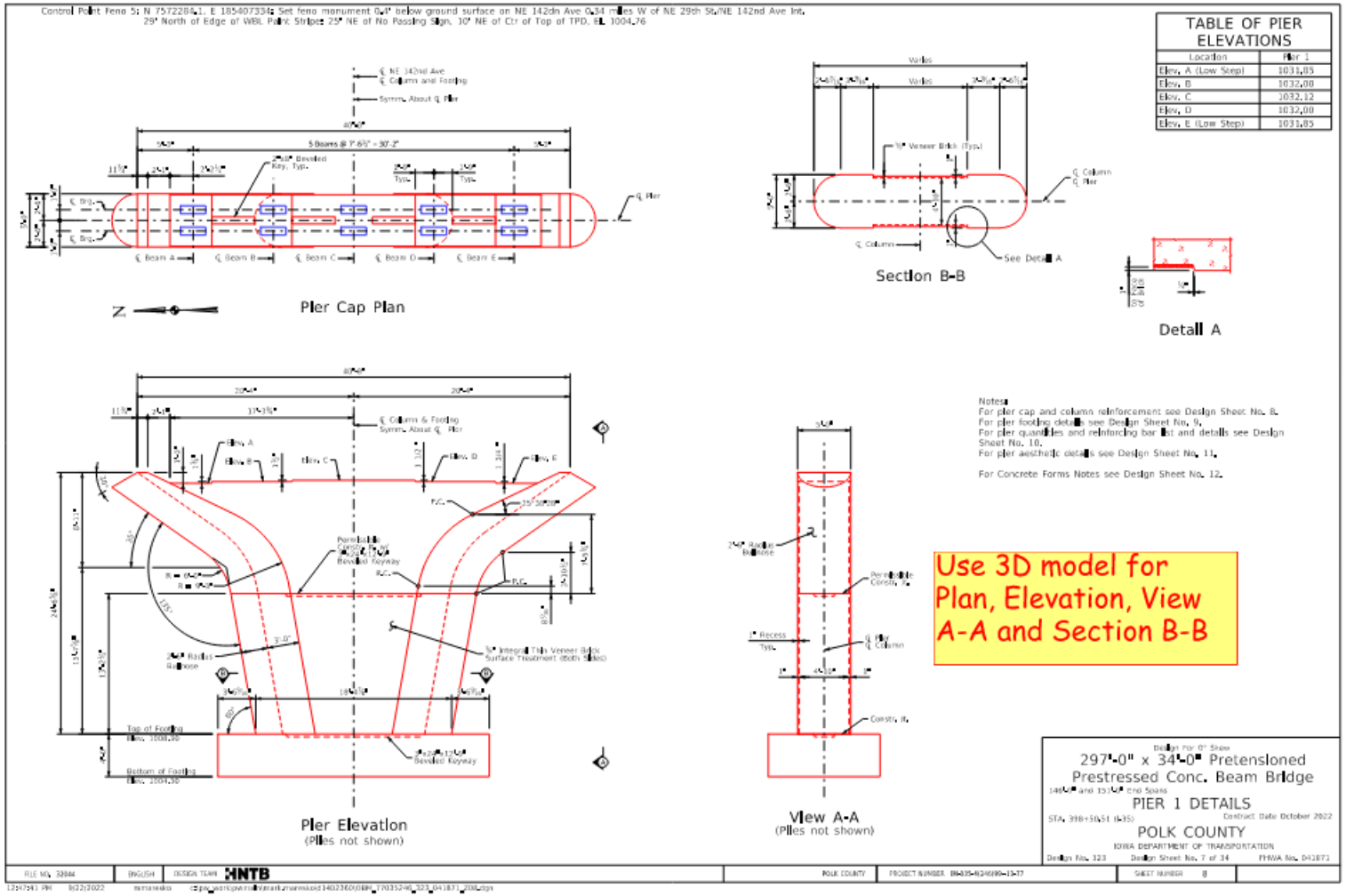
Iowa Pilot Project IA 210 over I-35

- Project Purpose and Scope
  - Model Bridge using Bentley OpenBridge Modeler (OBM)
  - Make Drawings from 3D Model
  - Model Pier and Abutment Rebar in 3D using ProStructures
  - Use ProStructures to Create Drawings and Schedules.

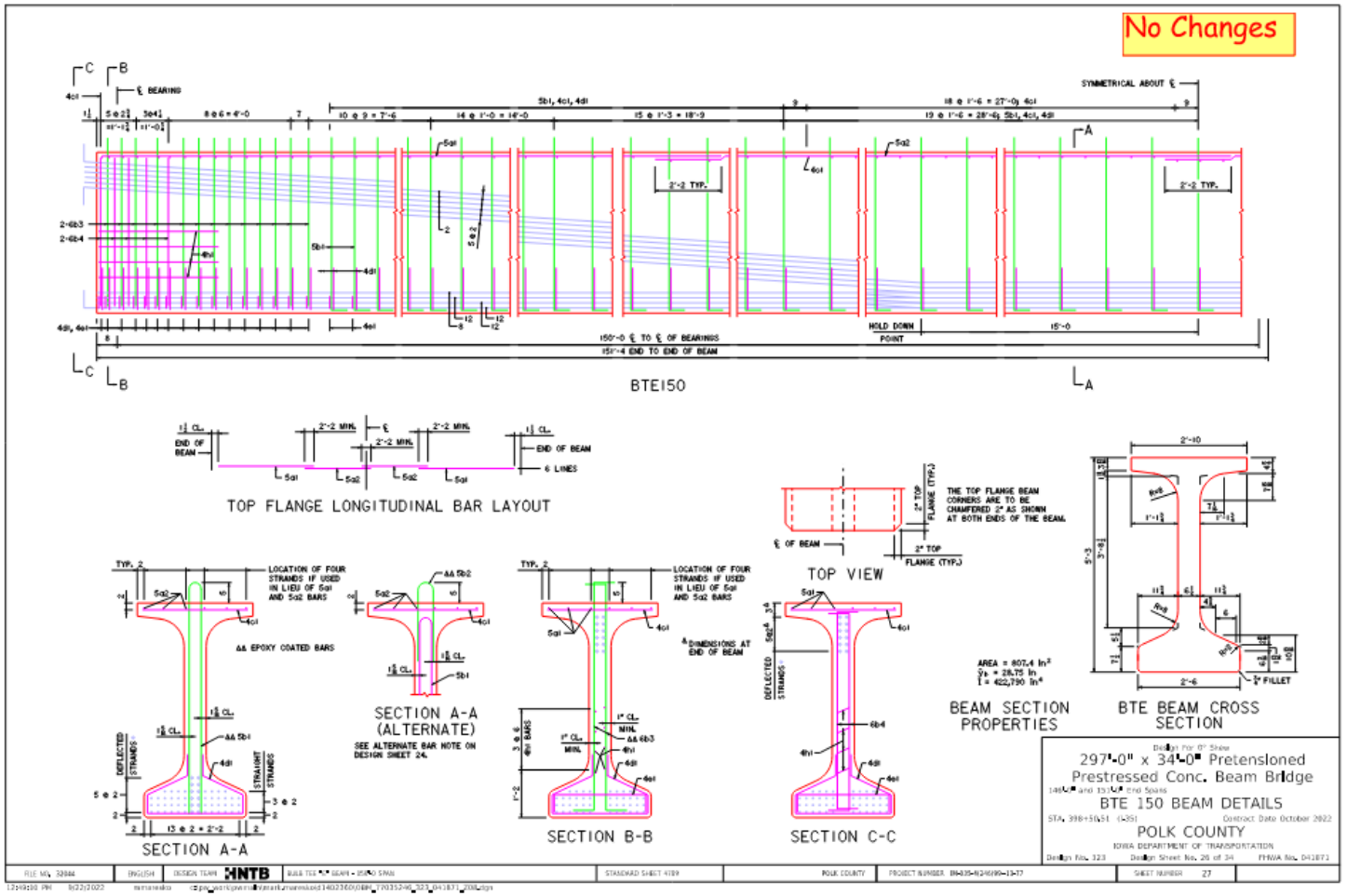
Iowa Pilot Project IA 210 over I-35



Iowa Pilot Project IA 210 over I-35

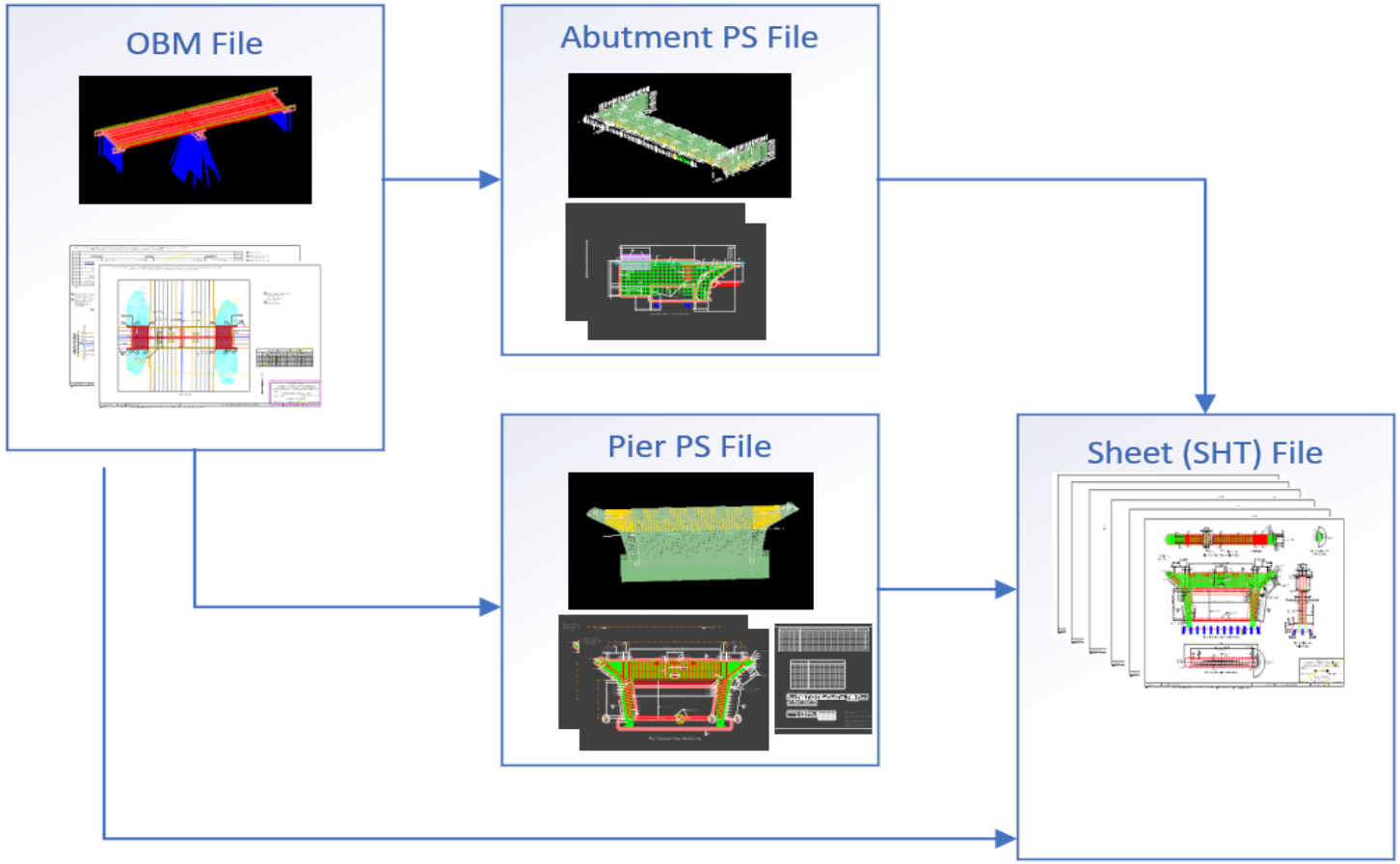


Iowa Pilot Project IA 210 over I-35



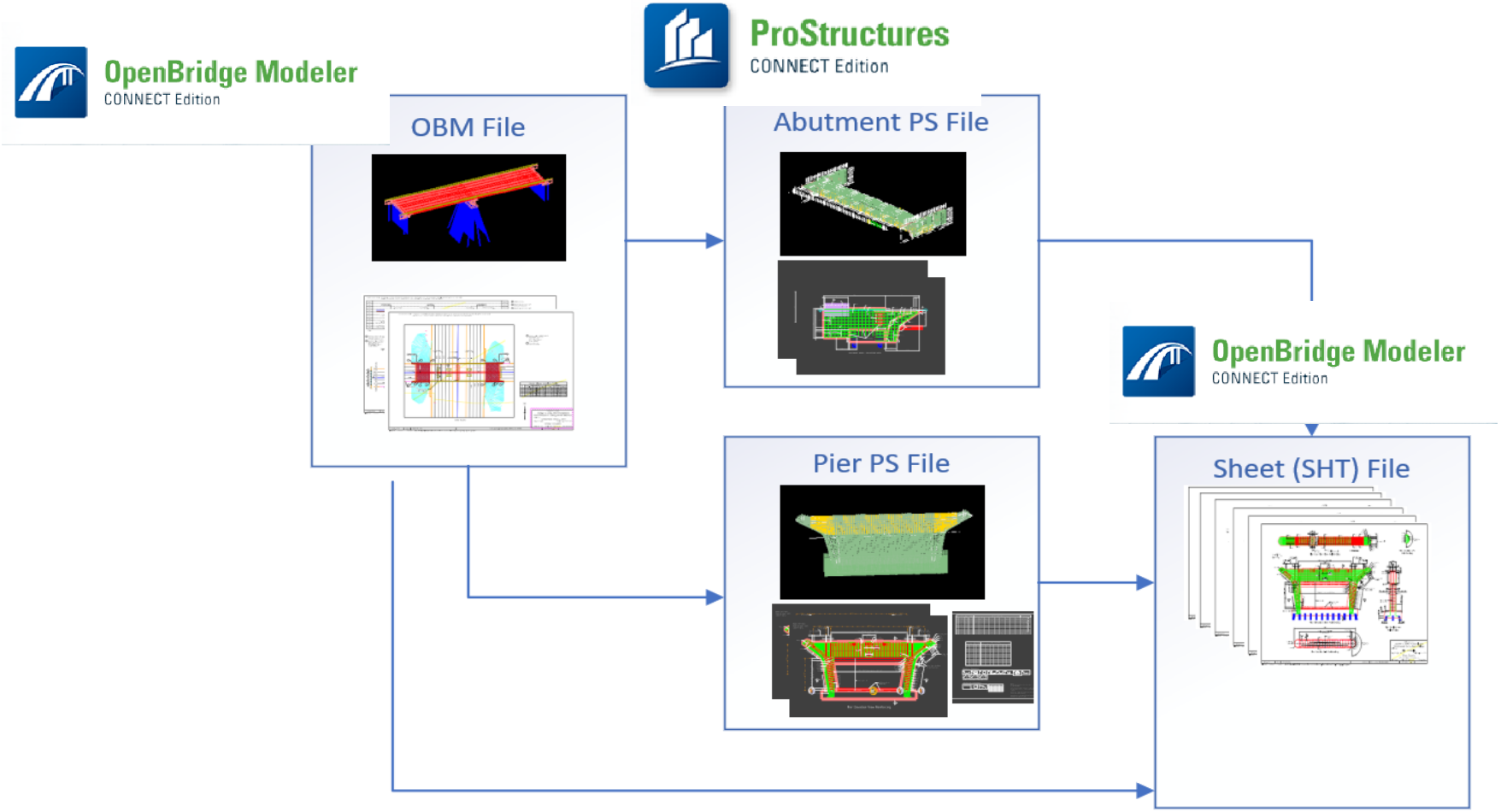
Iowa Pilot Project IA 210 over I-35

- Project and File Setup



Iowa Pilot Project IA 210 over I-35

- Project and File Setup



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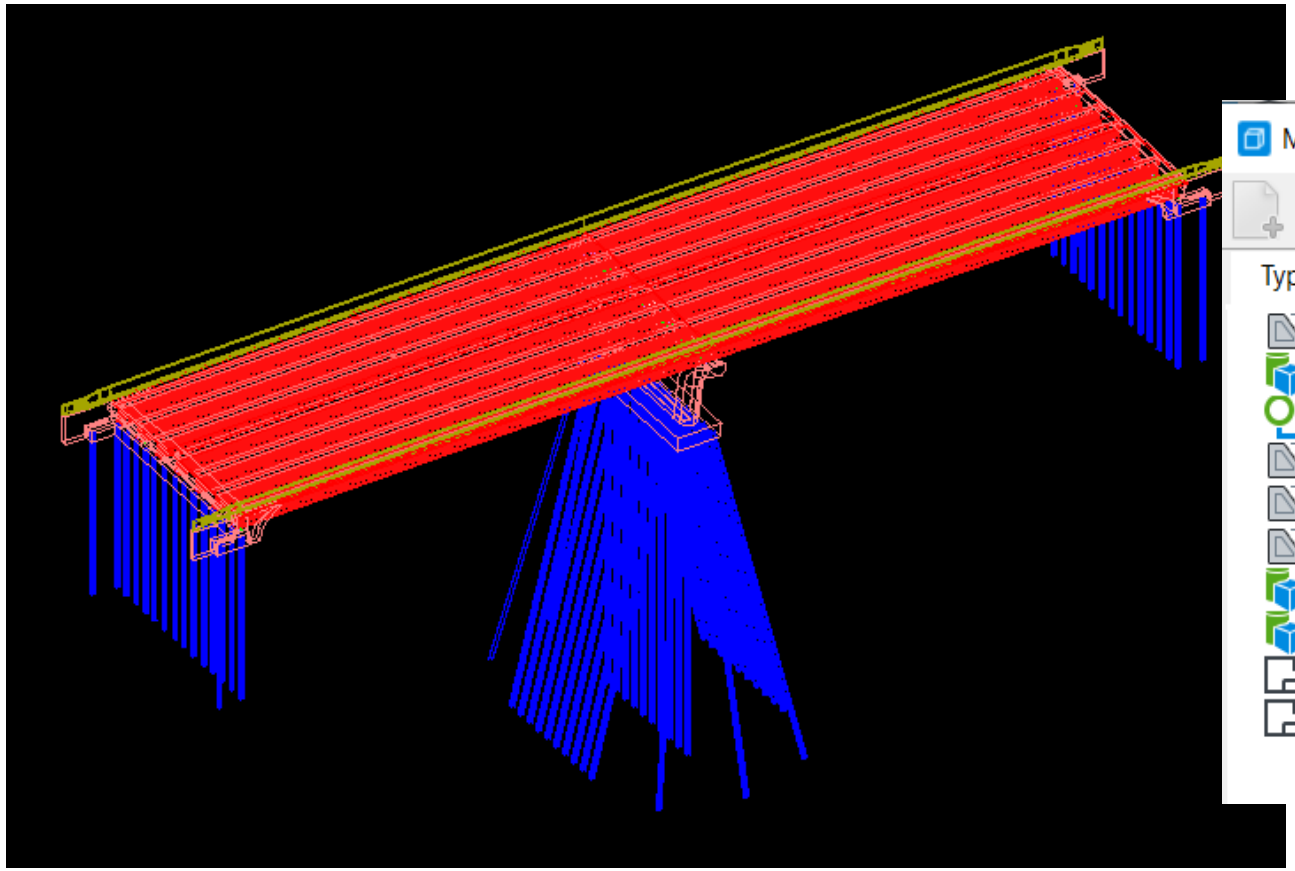

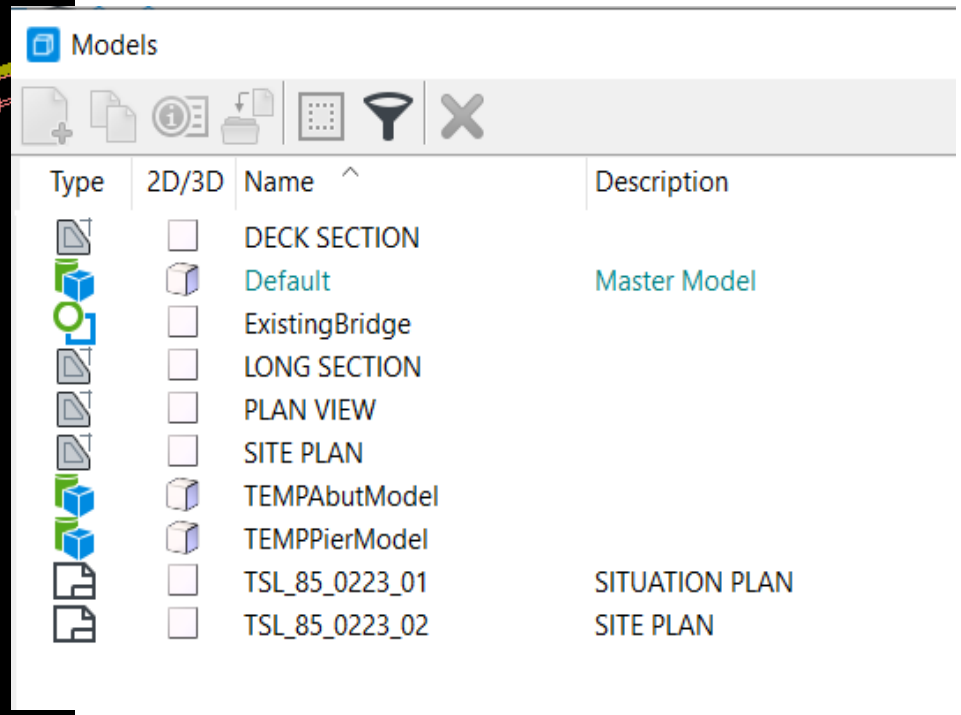

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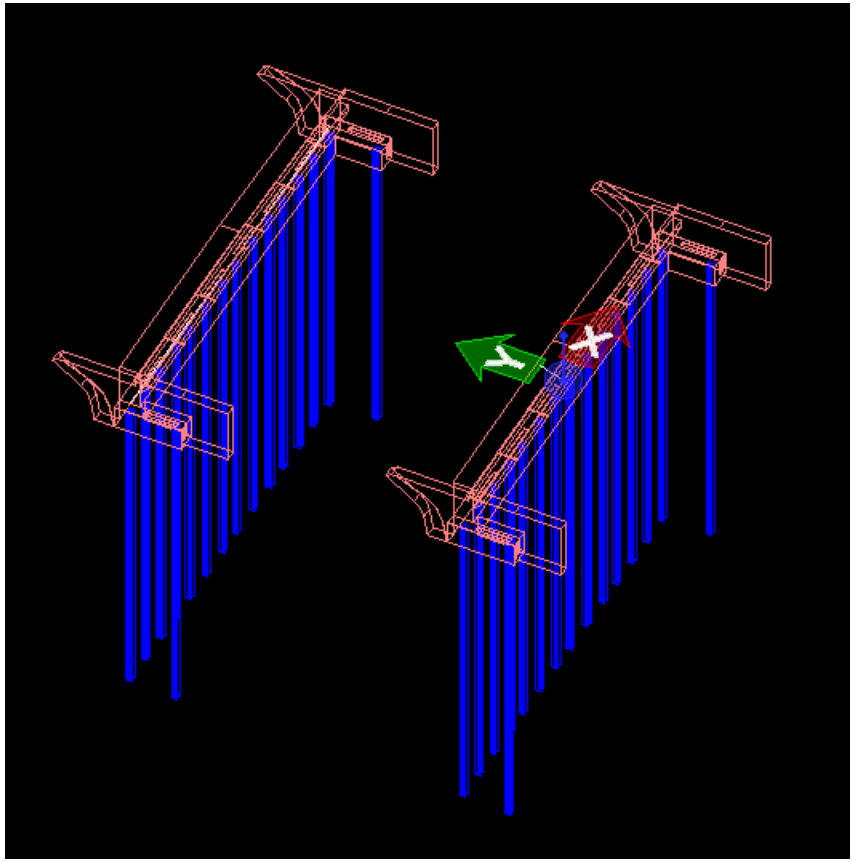

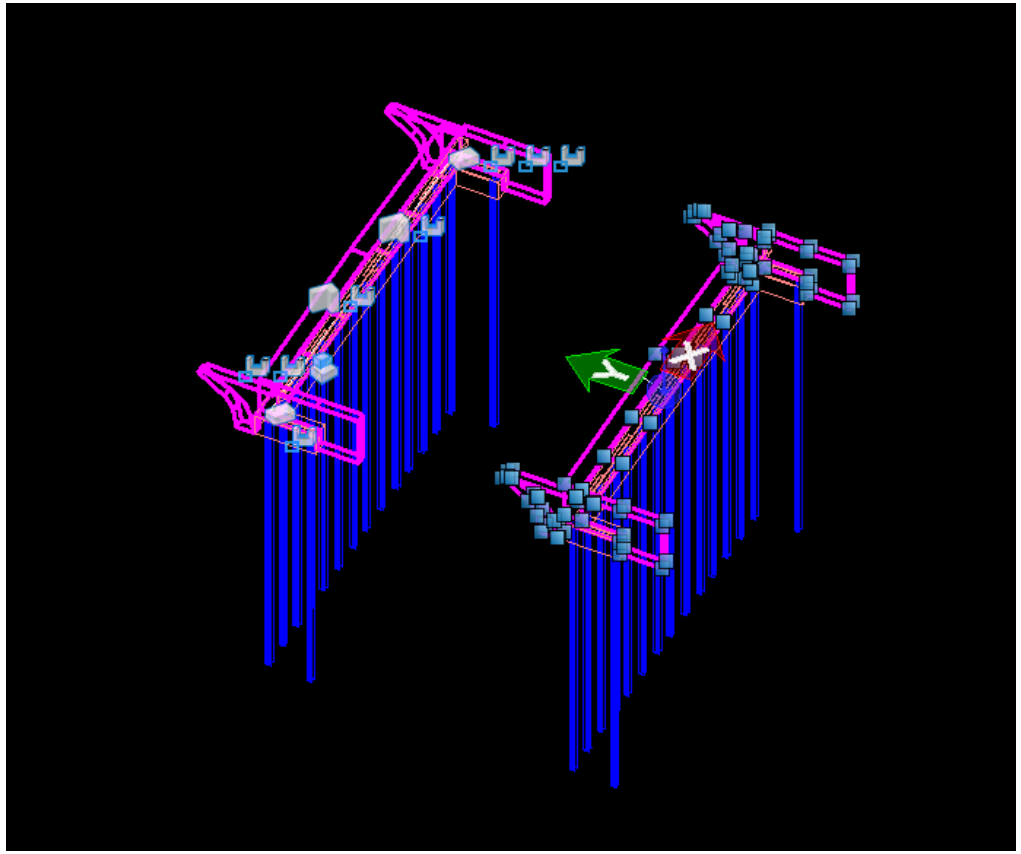

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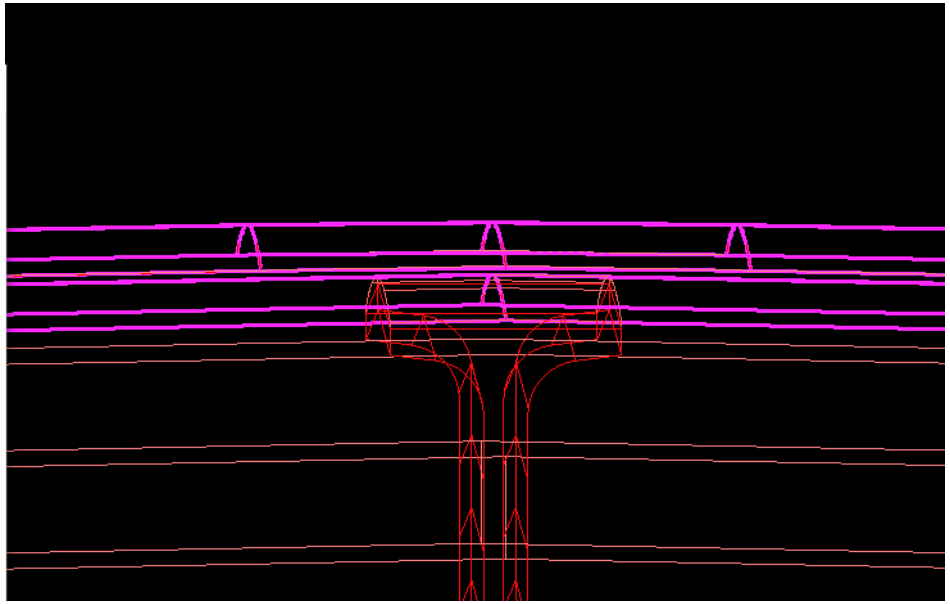

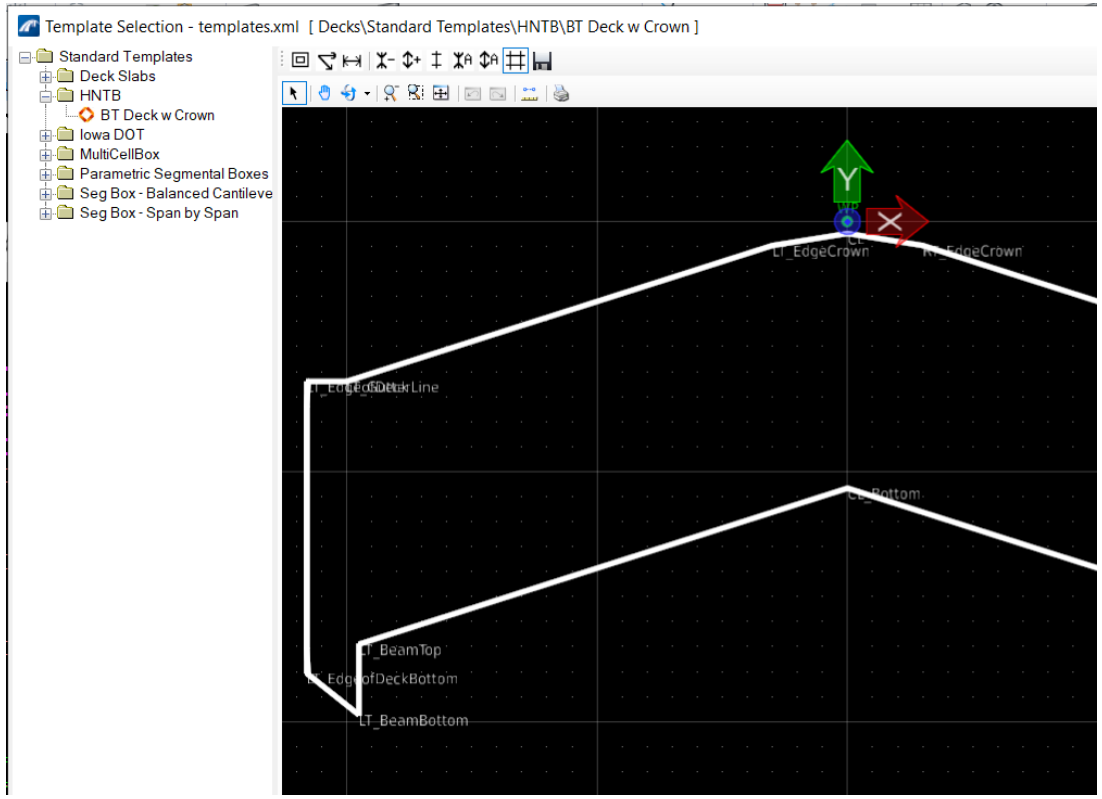

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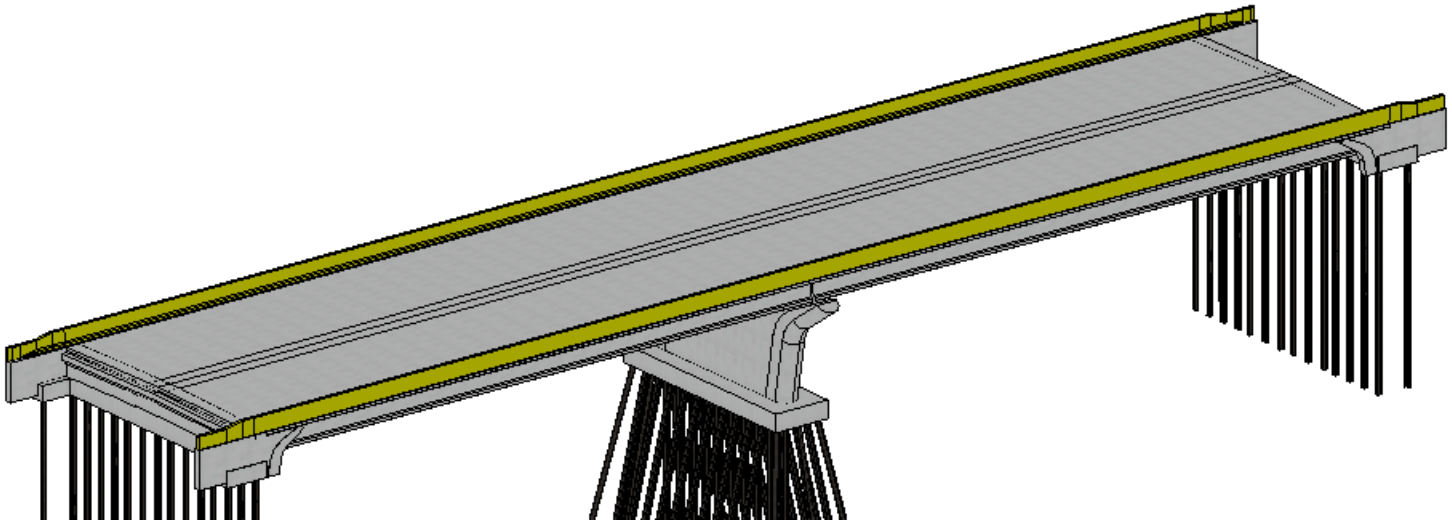

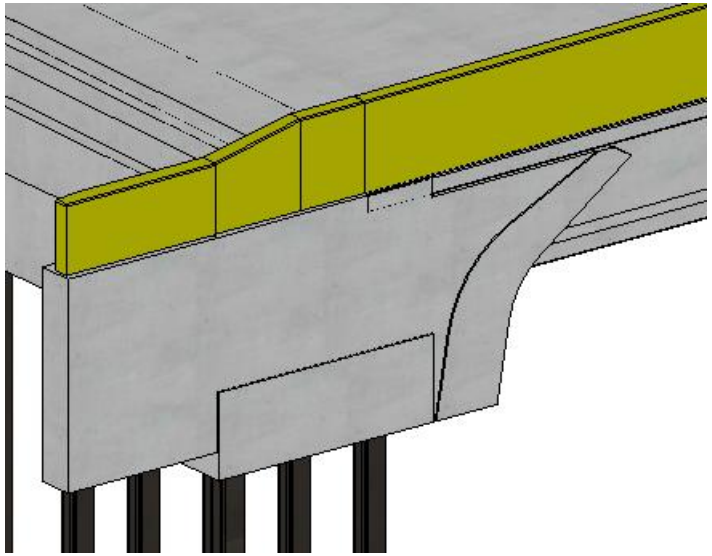

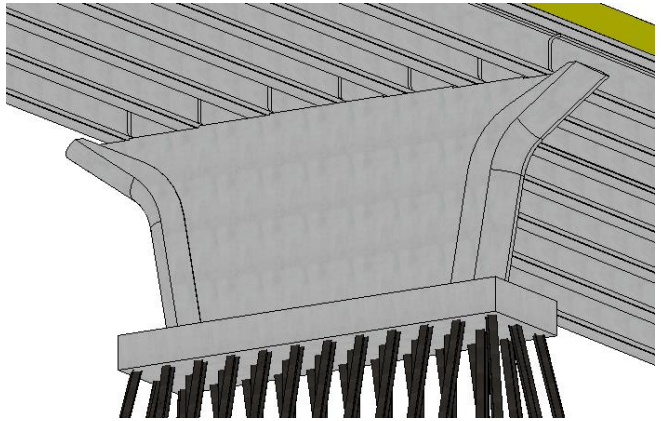

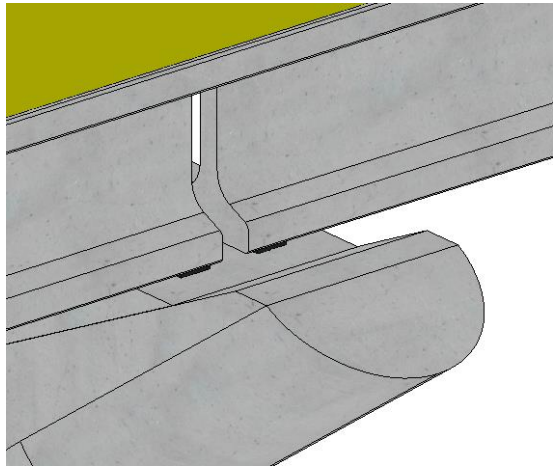

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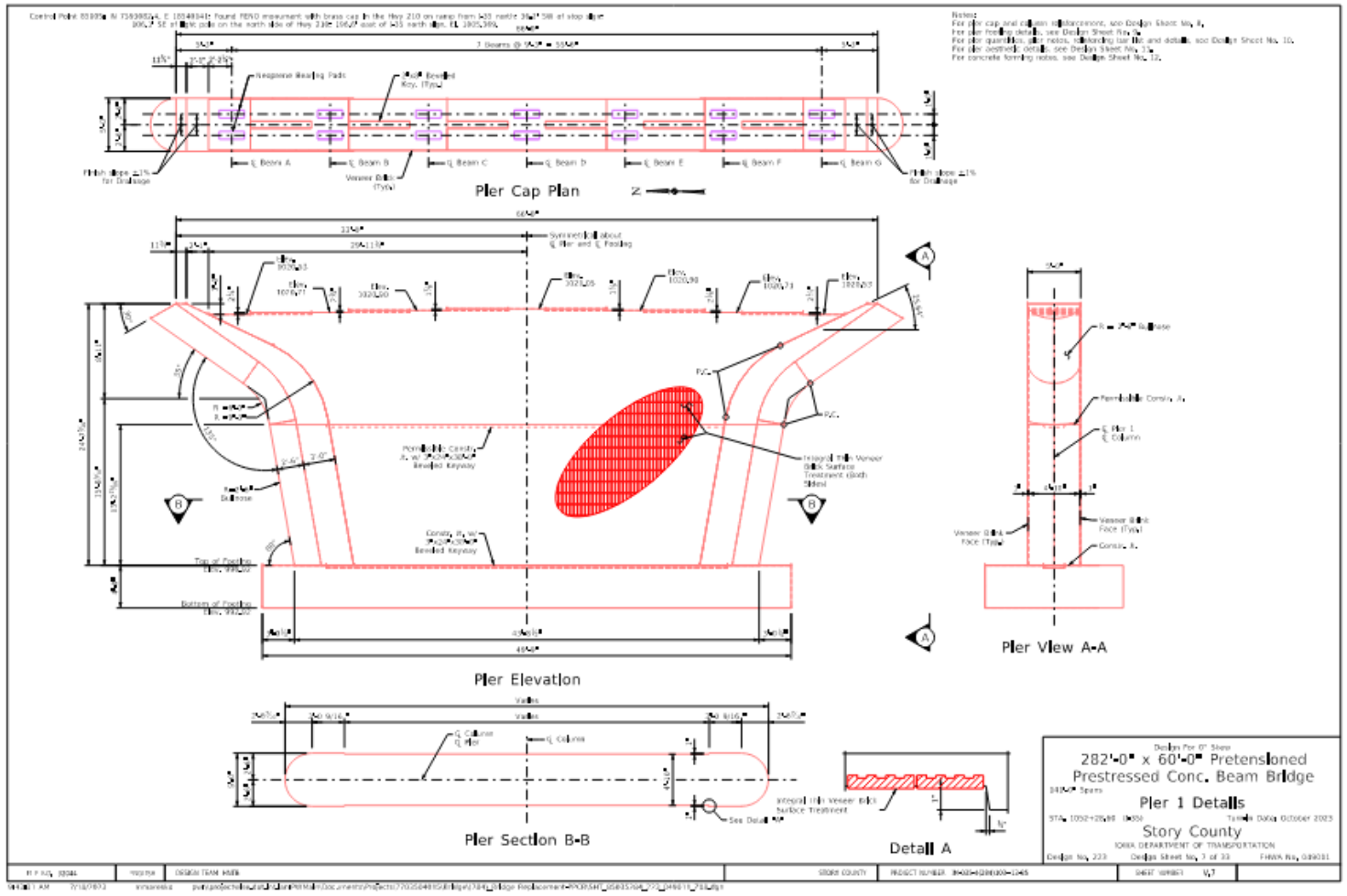

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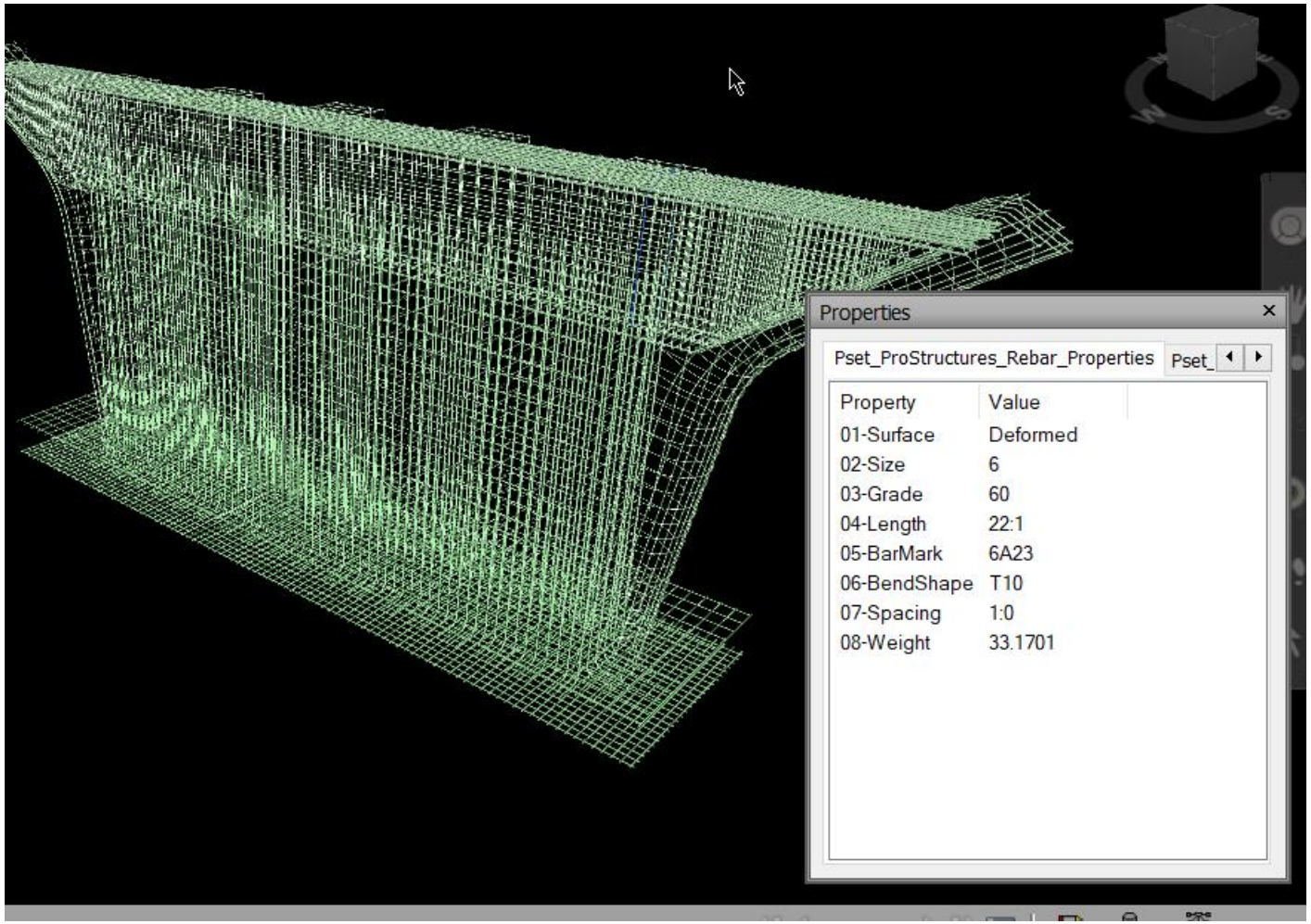

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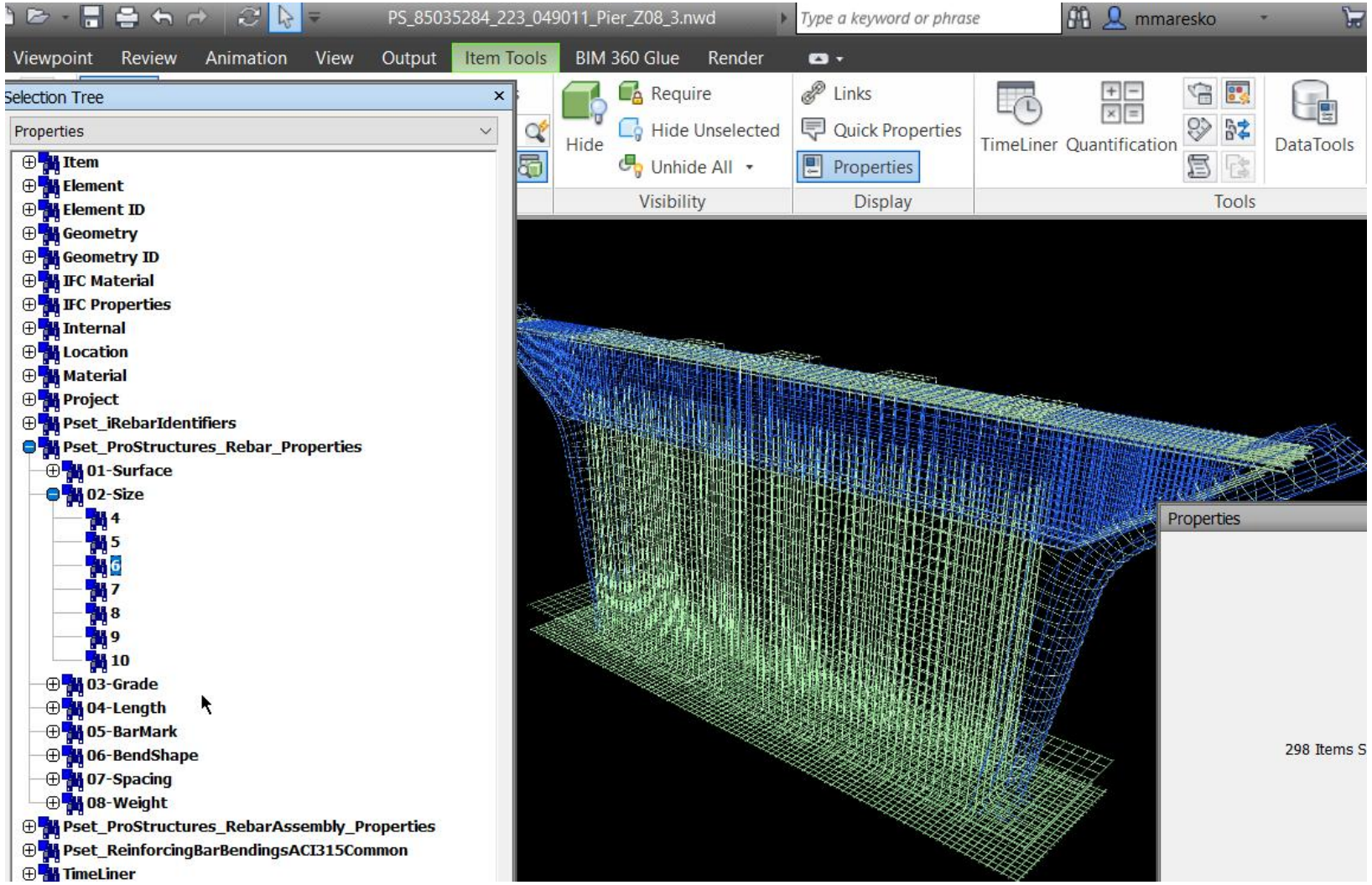

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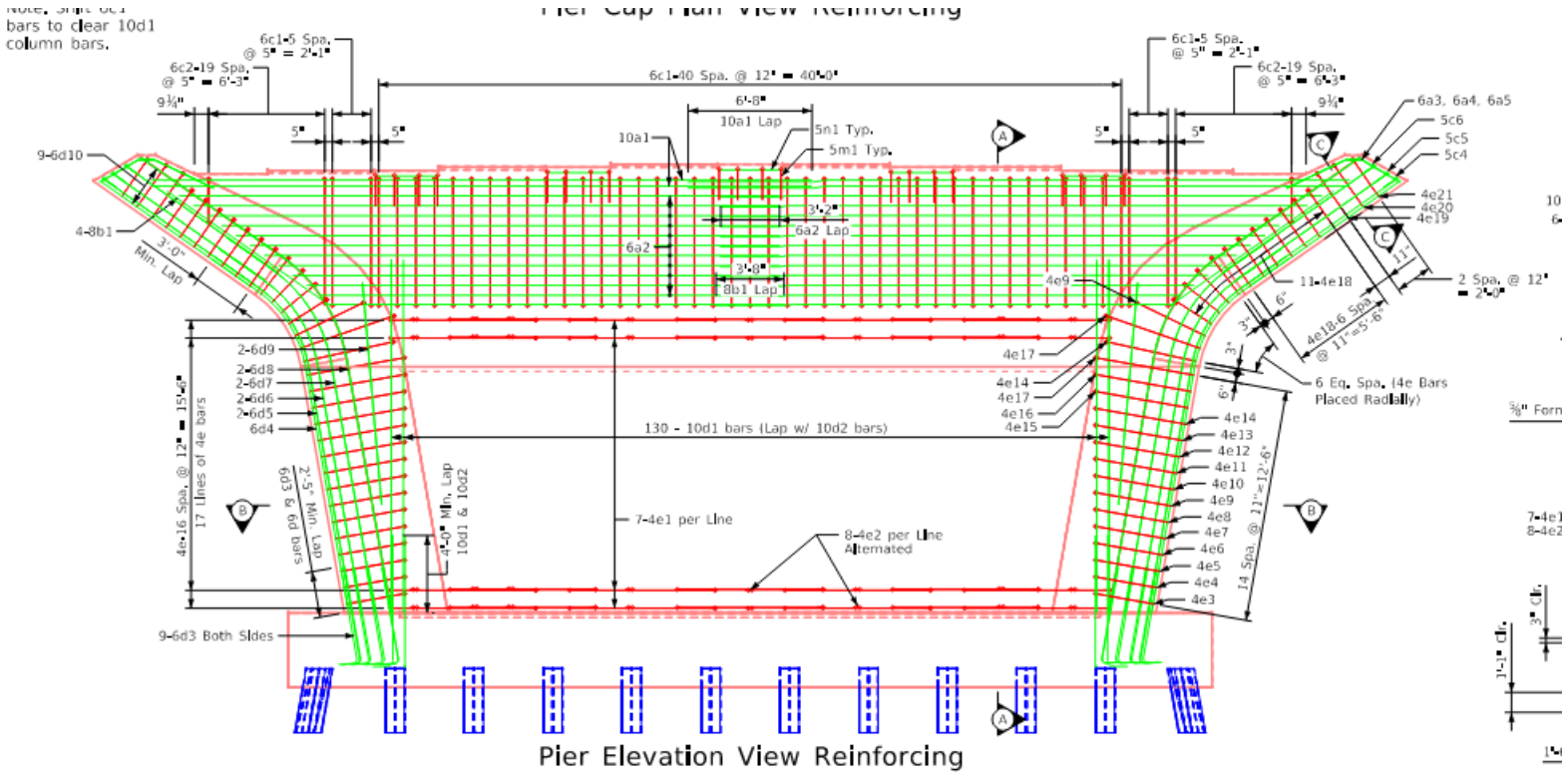

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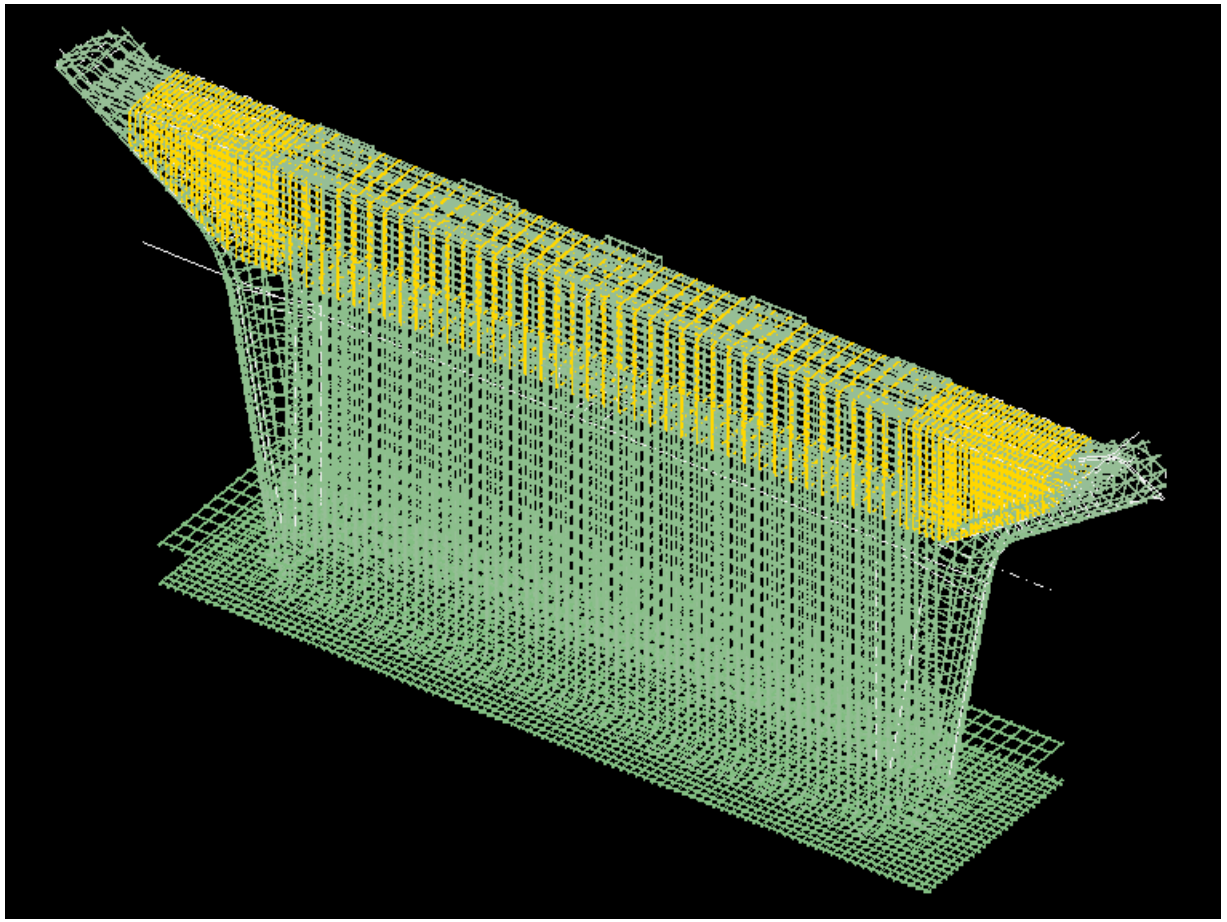

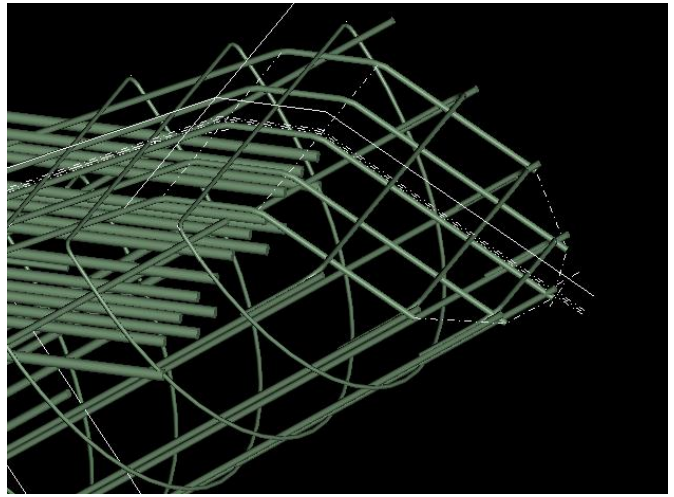

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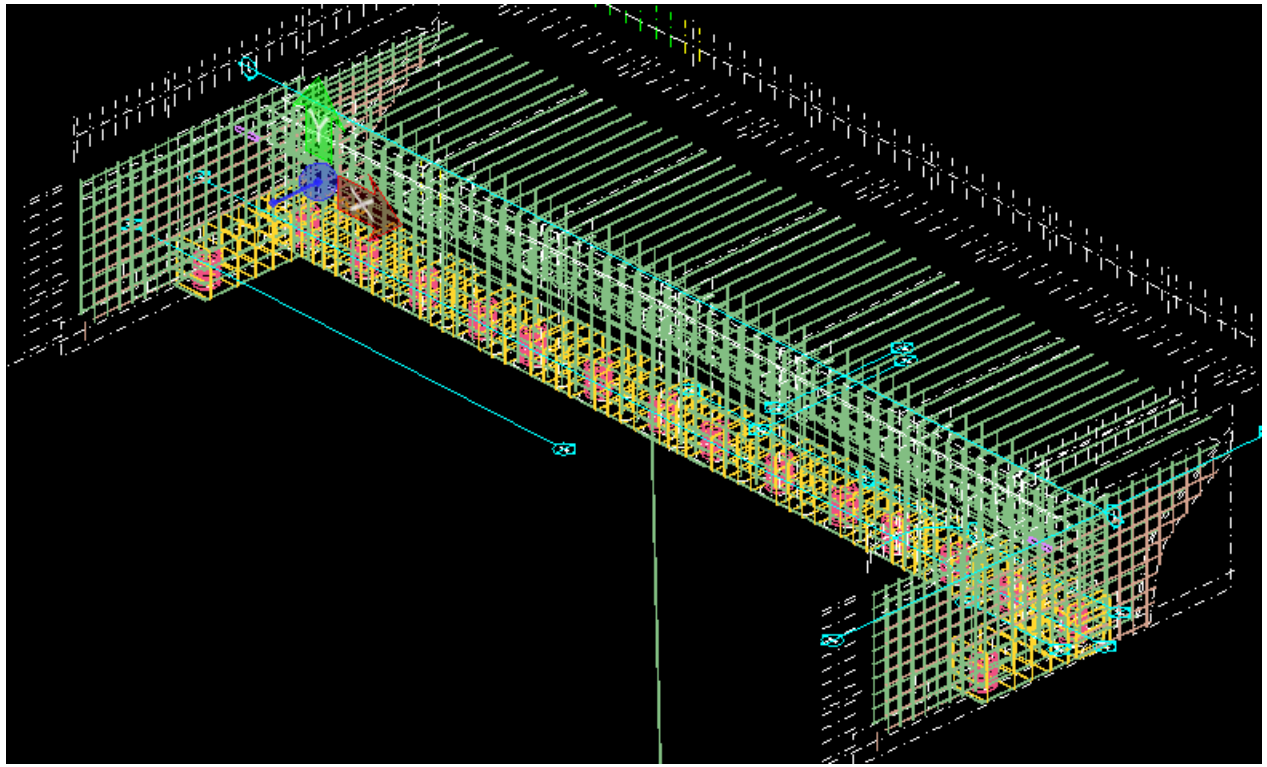

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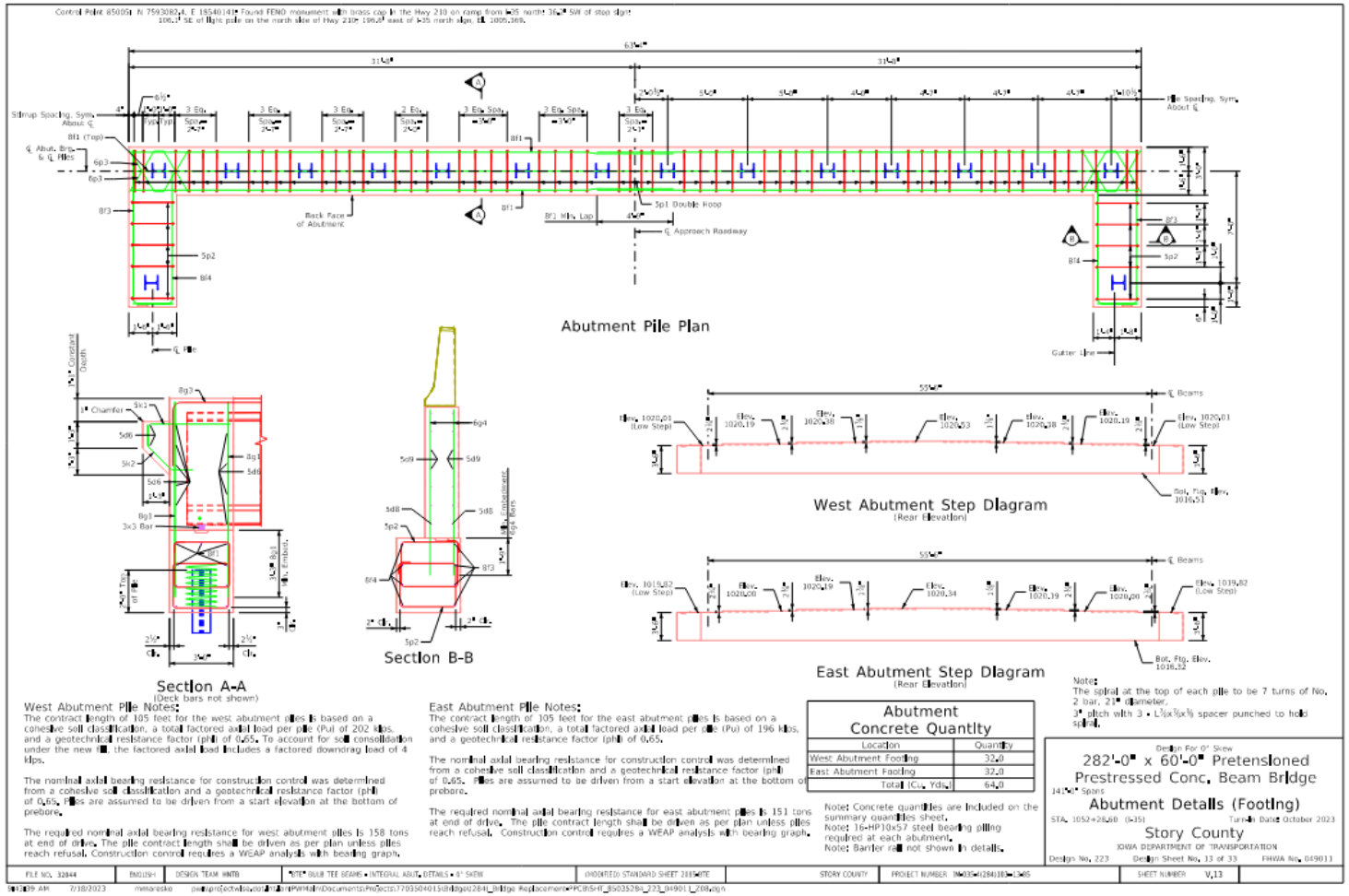

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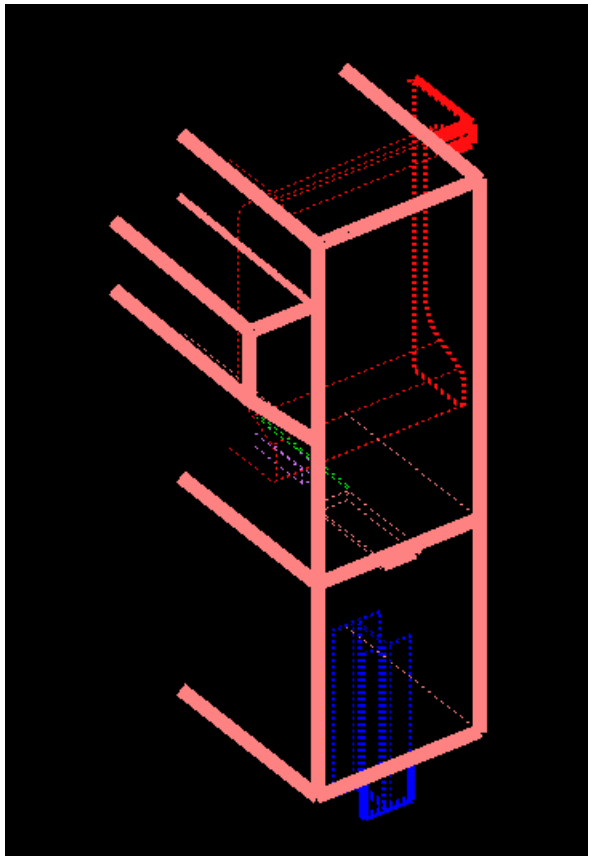

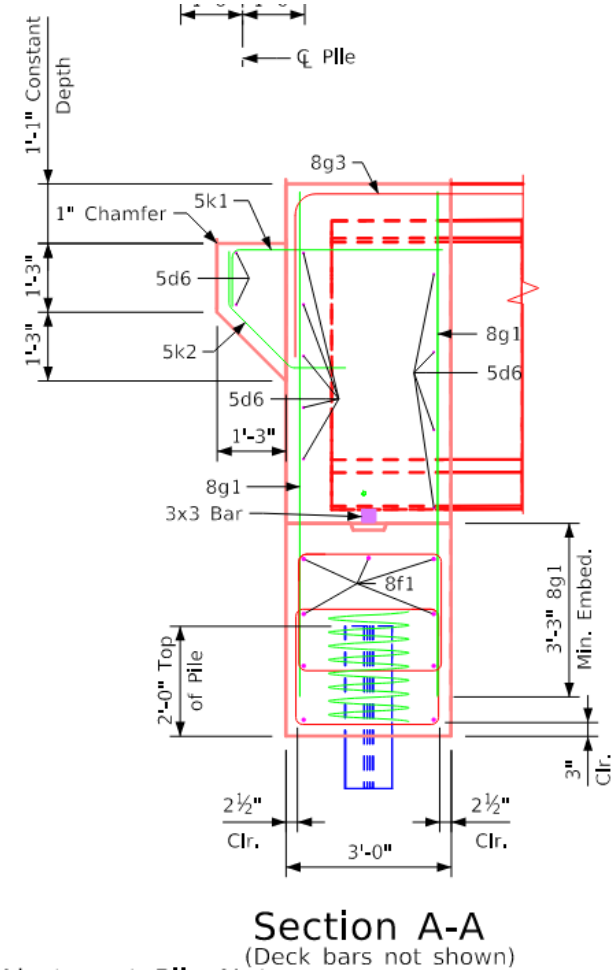

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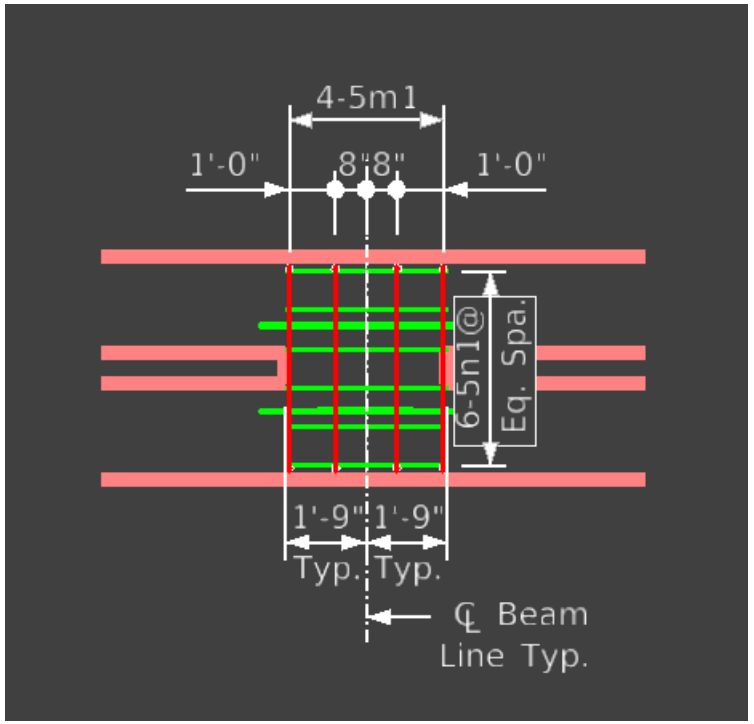

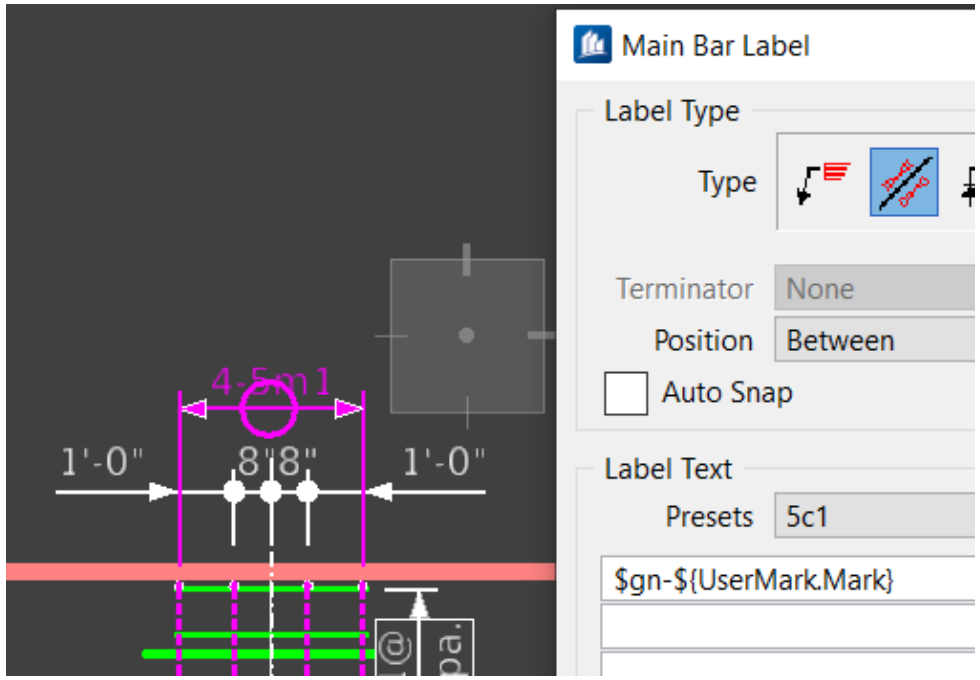

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CRSI Concrete Reinforcing Steel Institute

Detailing Corner

NOVEMBER 2008

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Constraints on Reinforcing Bar Modeling

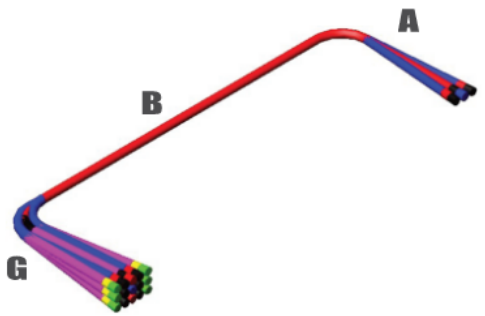
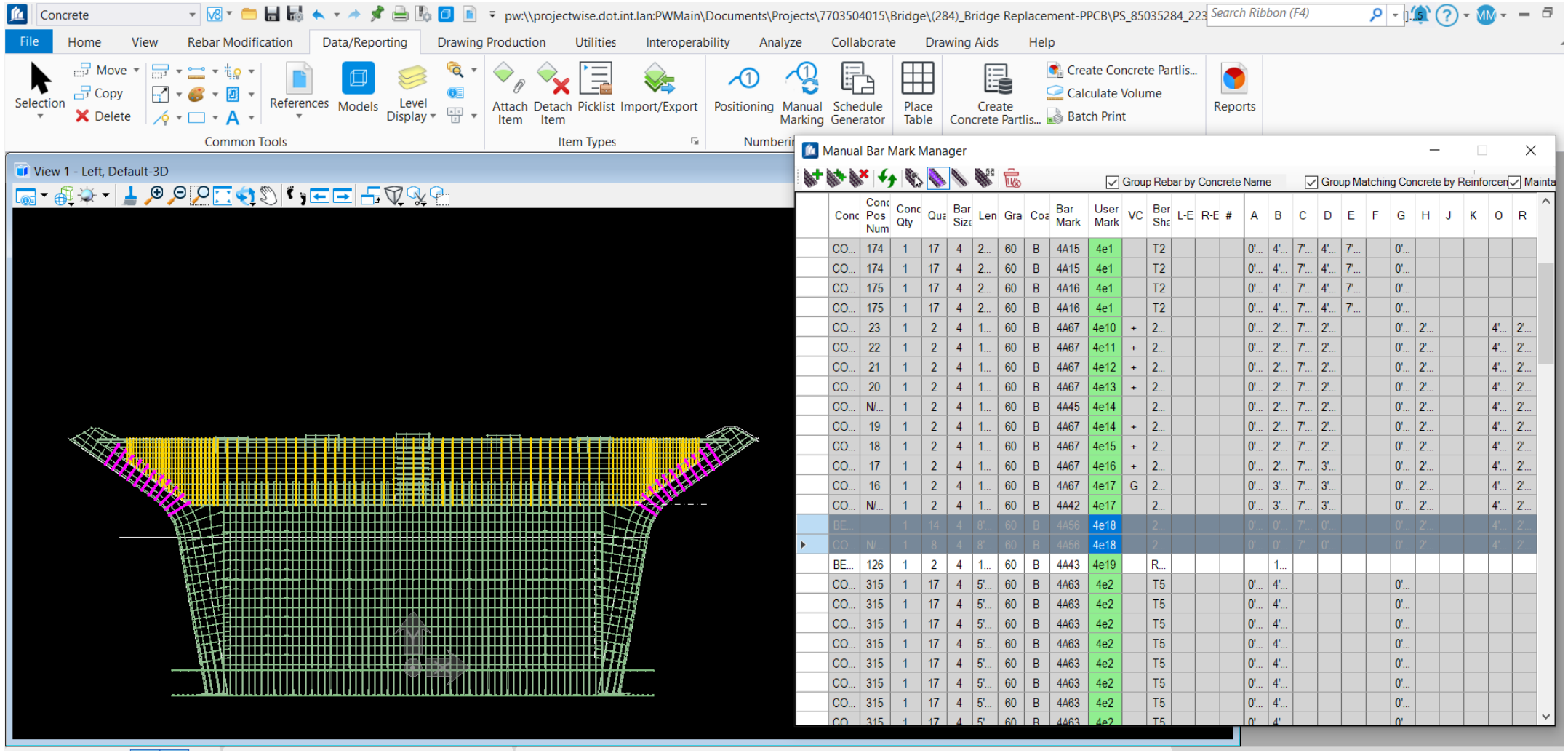


Fig. 3: Tolerances applied to the hooked bar from Fig. 2: ±1 in. (±25 mm) tolerance envelope on Sides A, B, and G; ±2.5 degree in-plane angular tolerance envelope at Sides A and G; and ±2.5 degree out-of-plane angular tolerance envelope at Side G (from Reference 4)

- Sheared length:
  No. 3 to No. 11 = ±1 in.;
  (No. 10 to No. 36 = ±25 mm);
  No. 14 and No. 18 = ±2 in.;
  (No. 43 and No. 57 = ±50 mm);
- Overall length of bars bent at each end:
  No. 3 to No. 11 = ±1 in.;
  (No. 10 to No. 36 = ±25 mm);
  No. 14 = ±2.5 in.;
  (No. 43 = ±65 mm);
  No. 18 = ±3.5 in.;
  (No. 57 = ±90 mm); and
- Angular deviation on 90-degree bends:
  ±2.5 degrees.

Iowa Pilot Project IA 210 over I-35



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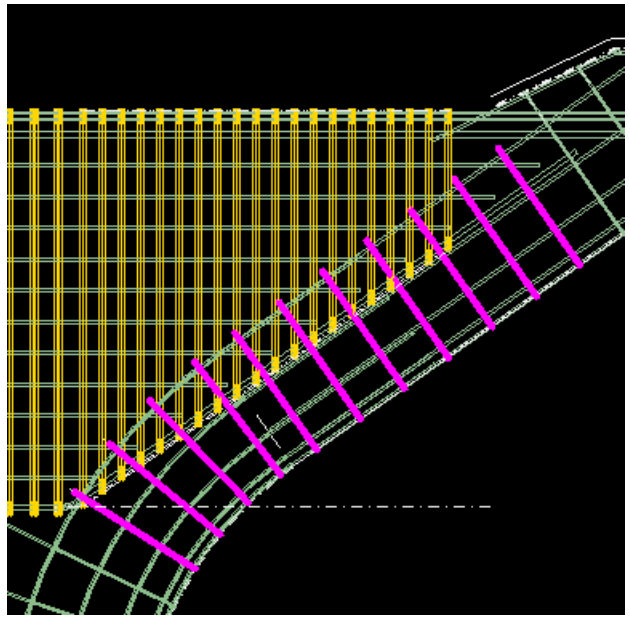

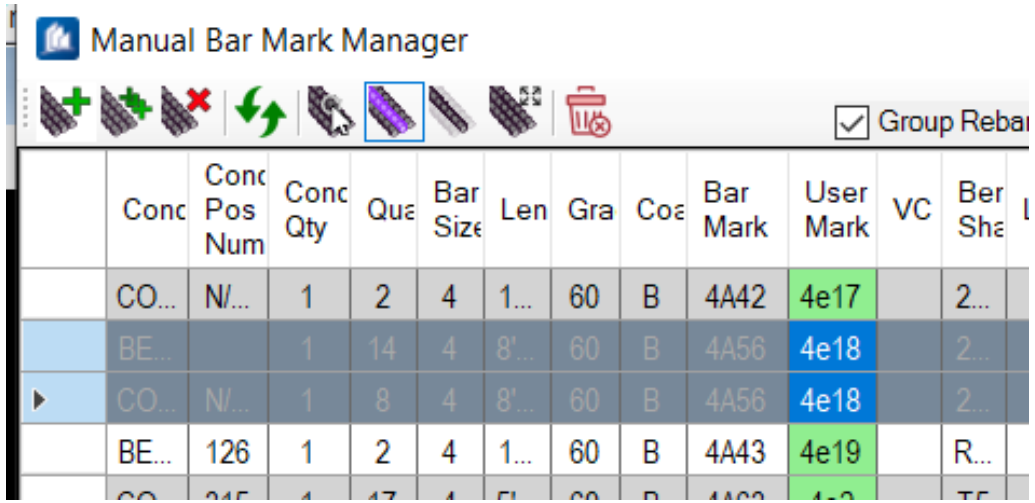

Conc	Conc Pos Num	Conc Qty	Qua	Bar Size	Len	Gra	Coa	Bar Mark	User Mark	VC	Ber Sha
CO...	N/...	1	2	4	1...	60	B	4A42	4e17		2...
BE...		1	14	4	8'...	60	B	4A56	4e18		2...
CO...	N/...	1	8	4	8'...	60	B	4A56	4e18		2...
BE...	126	1	2	4	1...	60	B	4A43	4e19		R...

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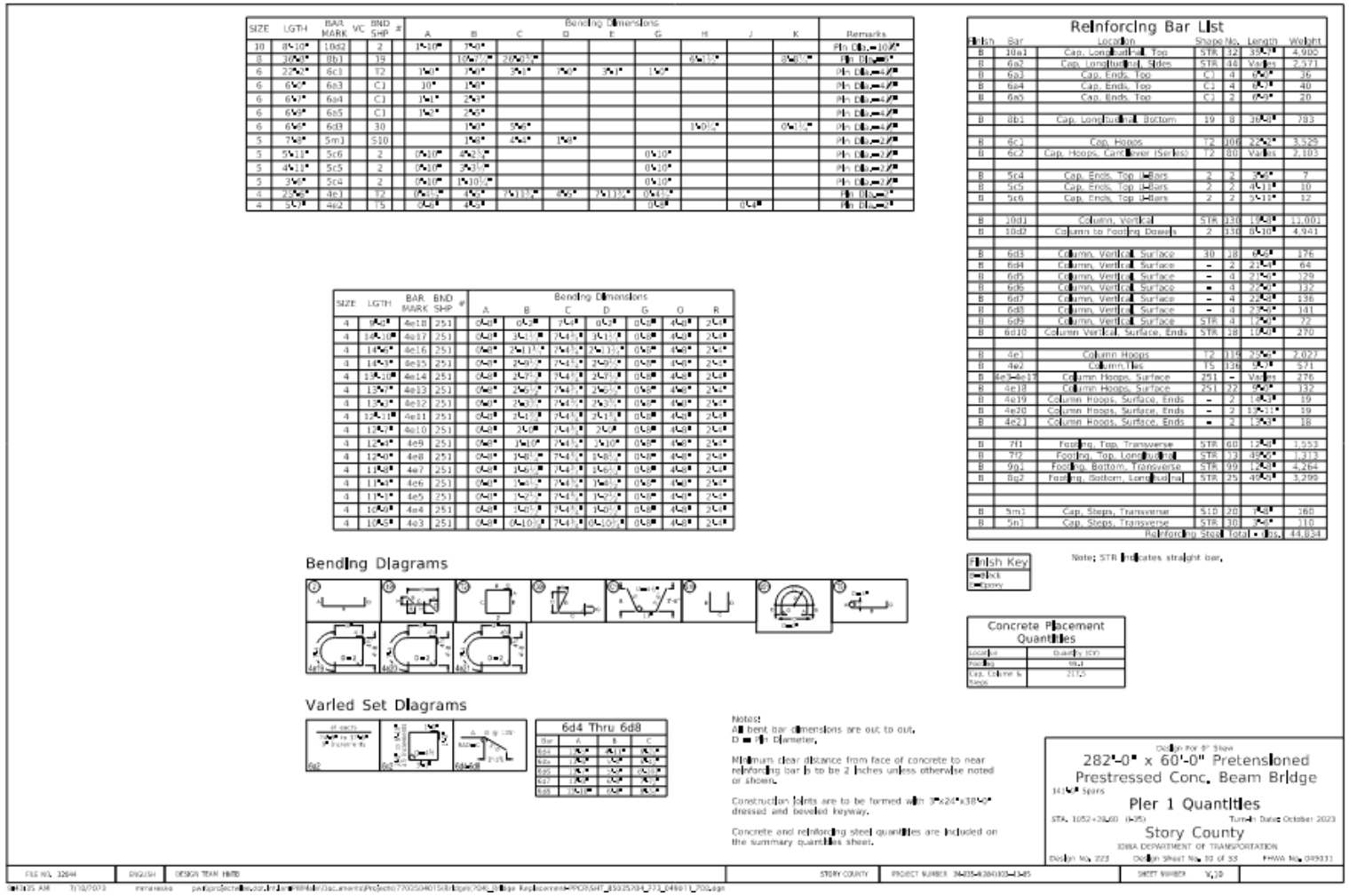


SIZE	LGTH	BAR MARK	VC	BND SHP	#	Bending Dimensions A	B	C	D	E	G	H	J	K	Remarks
10	8'-10"	10d2		2		1'-10"	7'-0"								Pin Dia.=10d"
8	30'-0"	8b1		19			10'-0"	20'-0"				0'-11"		0'-11"	Pin Dia.= "
6	22'-0"	6c1		T2		1'-0"	7'-0"	3'-0"	1'-0"	3'-0"	1'-0"				Pin Dia.=4d"
6	6'-0"	6a3		C1		10"	1'-0"								Pin Dia.=4d"
6	6'-0"	6a4		C1		1'-0"	2'-0"								Pin Dia.=4d"
6	6'-0"	6a5		C1		1'-0"	2'-0"								Pin Dia.=4d"
6	6'-0"	6d8		30			1'-0"	3'-0"				1'-0½"		0'-1½"	Pin Dia.=4d"
5	7'-0"	5m1		S10			1'-0"	4'-0"	1'-0"						Pin Dia.=2d"
5	5'-11"	5c6		2		0'-10"	4'-2½"				0'-10"				Pin Dia.=2d"
5	4'-11"	5c5		2		0'-10"	3'-10"				0'-10"				Pin Dia.=2d"
5	3'-9"	5c4		2		0'-10"	1'-10½"				0'-10"				Pin Dia.=2d"
4	25'-0"	4e1		T2		0'-11"	4'-0"	0'-11½"	1'-0"	0'-11½"	0'-11"				Pin Dia.= "
4	5'-0"	4e2		T5		0'-8"	4'-0"				0'-8"		0'-8"		Pin Dia.= "

SIZE	LGTH	BAR MARK	BND SHP	#	Bending Dimensions A	B	C	D	G	O	R
4	8'-0"	4e18	251		0'-8"	0'-8"	7'-0"	0'-8"	0'-8"	4'-0"	2'-0"
4	18'-10"	4e17	251		0'-8"	3'-11½"	7'-4½"	3'-11½"	0'-8"	4'-0"	2'-0"
4	14'-9"	4e16	251		0'-8"	2'-11½"	7'-4½"	2'-11½"	0'-8"	4'-0"	2'-0"
4	14'-3"	4e15	251		0'-8"	2'-9½"	7'-4½"	2'-9½"	0'-8"	4'-0"	2'-0"
4	13'-10"	4e14	251		0'-8"	2'-7½"	7'-4½"	2'-7½"	0'-8"	4'-0"	2'-0"
4	13'-7"	4e13	251		0'-8"	2'-6½"	7'-4½"	2'-6½"	0'-8"	4'-0"	2'-0"
4	13'-3"	4e12	251		0'-8"	2'-5½"	7'-4½"	2'-5½"	0'-8"	4'-0"	2'-0"
4	12'-11"	4e11	251		0'-8"	2'-1½"	7'-4½"	2'-1½"	0'-8"	4'-0"	2'-0"
4	13'-7"	4e10	251		0'-8"	3'-0"	7'-4½"	3'-0"	0'-8"	4'-0"	2'-0"
4	12'-5"	4e9	251		0'-8"	3'-10"	7'-4½"	3'-10"	0'-8"	4'-0"	2'-0"
4	12'-0"	4e8	251		0'-8"	3'-8½"	7'-4½"	3'-8½"	0'-8"	4'-0"	2'-0"
4	11'-8"	4e7	251		0'-8"	3'-6½"	7'-4½"	3'-6½"	0'-8"	4'-0"	2'-0"
4	11'-4"	4e6	251		0'-8"	3'-4½"	7'-4½"	3'-4½"	0'-8"	4'-0"	2'-0"
4	11'-0"	4e5	251		0'-8"	3'-2½"	7'-4½"	3'-2½"	0'-8"	4'-0"	2'-0"
4	10'-8"	4e4	251		0'-8"	3'-0½"	7'-4½"	3'-0½"	0'-8"	4'-0"	2'-0"
4	10'-5"	4e3	251		0'-8"	0'-10½"	7'-4½"	0'-10½"	0'-8"	4'-0"	2'-0"

Reinforcing Bar List						
Finish	Bar	Location	Shape No.	Length		Weight
B	10a1	Cap, Longitudinal, Top	STR	12	39'-0"	4,900
B	6a2	Cap, Longitudinal, Sides	STR	44	Varies	2,571
B	6a3	Cap, Ends, Top	C1	4	1'-0"	36
B	6a4	Cap, Ends, Top	C1	4	1'-0"	40
B	6a5	Cap, Ends, Top	C1	2	1'-0"	20
B	8b1	Cap, Longitudinal, Bottom	19	8	30'-0"	793
B	6c1	Cap, Hoops	T2	108	22'-0"	3,528
B	6c2	Cap, Hoops, Cantilever (Series)	T2	80	Varies	2,103
B	5c4	Cap, Ends, Top U-Bars	2	2	3'-0"	7
B	5c5	Cap, Ends, Top U-Bars	2	2	4'-11"	10
B	5c6	Cap, Ends, Top U-Bars	2	2	5'-11"	12
B	10d1	Column, Vertical	STR	130	1'-0"	11,001
B	10d2	Column to Footing Dowels	2	130	8'-10"	4,941
B	6d3	Column, Vertical, Surface	30	18	1'-0"	176
B	6d4	Column, Vertical, Surface	-	2	2'-0"	64
B	6d5	Column, Vertical, Surface	-	4	2'-0"	129
B	6d6	Column, Vertical, Surface	-	4	2'-0"	132
B	6d7	Column, Vertical, Surface	-	4	2'-0"	136
B	6d8	Column, Vertical, Surface	-	4	2'-0"	141
B	6d9	Column, Vertical, Surface	STR	4	1'-0"	72
B	6d10	Column Vertical, Surface, Ends	STR	18	1'-0"	270
B	4e1	Column Hoops	T2	116	2'-0"	2,027
B	4e2	Column Ties	T5	136	1'-0"	571
B	4e3-4e13	Column Hoops, Surface	251	-	Varies	276
B	4e18	Column Hoops, Surface	251	22	1'-0"	132
B	4e19	Column Hoops, Surface, Ends	-	2	1'-0"	19
B	4e20	Column Hoops, Surface, Ends	-	2	1'-11"	19
B	4e21	Column Hoops, Surface, Ends	-	2	1'-0"	18
B	7f1	Footing, Top, Transverse	STR	60	1'-0"	1,353
B	7f2	Footing, Top, Longitudinal	STR	33	39'-0"	1,313
B	9g1	Footing, Bottom, Transverse	STR	99	1'-0"	4,264
B	8g2	Footing, Bottom, Longitudinal	STR	25	46'-0"	3,298
B	5m1	Cap, Steps, Transverse	S10	20	1'-0"	160
B	5n1	Cap, Steps, Transverse	STR	30	1'-0"	110
					Reinforcing Steel Total = lbs.	44,834

Finish Key
B=Black
E=Epoxy

Note: STR indicates straight bar.

Concrete Placement Quantities

Location	Quantity (CY)
Footing	88.0
Cap, Column & Hinge	217.5

Bending Diagrams

Varied Set Diagrams

6d4 Thru 6d8

Bar	A	B	C
6d4	1'-0"	0'-0"	0'-0"
6d5	1'-0"	0'-0"	0'-0"
6d6	1'-0"	0'-0"	0'-0"
6d7	1'-0"	0'-0"	0'-0"
6d8	1'-0"	0'-0"	0'-0"

Notes:
All bent bar dimensions are out to out.
D = Pin Diameter.

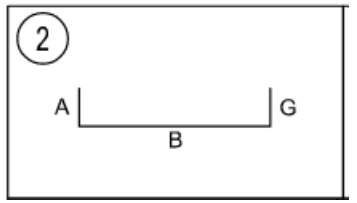
Minimum clear distance from face of concrete to near reinforcing bar is to be 2 inches unless otherwise noted or shown.

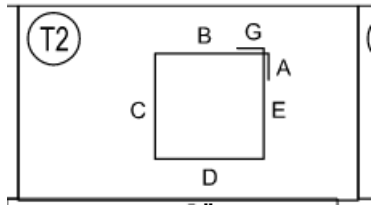
Construction joints are to be formed with 3"x20"x38'-0" dressed and beveled keyway.

Concrete and reinforcing steel quantities are included on the summary quantities sheet.

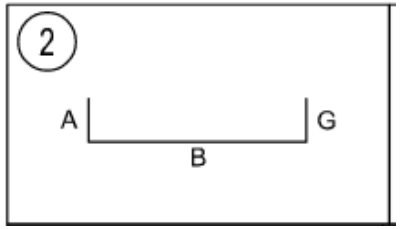
Design for 8° Skew
282'-0" x 60'-0" Pretensioned Prestressed Conc. Beam Bridge
141'-0" Spans
Pier 1 Quantities
STA. 1052+28.60 (I-35) Turn-In Date October 2023
Story County
IOWA DEPARTMENT OF TRANSPORTATION
Design No. 223 Design Sheet No. 10 of 33 FHWA No. 049331

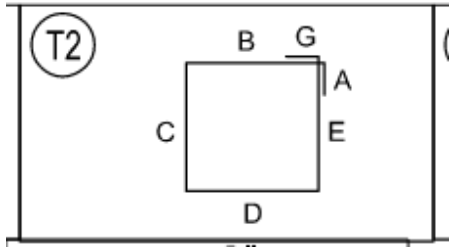
FILE NO. 3264 | ENGLISH | DESIGN TEAM HNTB | STORY COUNTY | PROJECT NUMBER BRM35-4(284)03--43-45 | SHEET NUMBER V.10





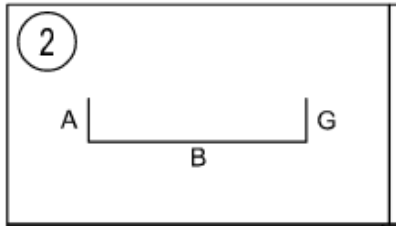
Iowa Pilot Project IA 210 over I-35

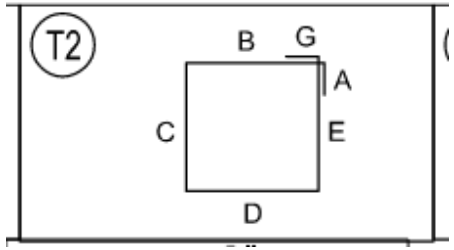




SIZE	LGTH	BAR MARK	VC	BND SHP	#	Bending Dimensions A	B	C	D	E	G	H	J	K	Remarks
10	8'-10"	10d2		2		1'-10"	7'-0"								Pin Dia.=10¾"
8	36'-8"	8b1		19			10'-7¼"	26'-0¾"				6'-1½"		8'-8¼"	Pin Dia.=6"
6	22'-2"	6c1		T2		1'-0"	7'-0"	3'-1"	7'-0"	3'-1"	1'-0"				Pin Dia.=4½"
6	6'-0"	6a3		C1		10"	1'-8"								Pin Dia.=4½"
6	6'-7"	6a4		C1		1'-1"	2'-3"								Pin Dia.=4½"
6	6'-9"	6a5		C1		1'-2"	2'-5"								Pin Dia.=4½"
6	6'-6"	6d3		30			1'-0"	5'-6"				1'-0¼"		0'-1¼"	Pin Dia.=4½"
5	7'-8"	5m1		S10			1'-8"	4'-4"	1'-8"						Pin Dia.=2½"
5	5'-11"	5c6		2		0'-10"	4'-2¾"				0'-10"				Pin Dia.=2½"
5	4'-11"	5c5		2		0'-10"	3'-3½"				0'-10"				Pin Dia.=2½"
5	3'-6"	5c4		2		0'-10"	1'-10¼"				0'-10"				Pin Dia.=2½"
4	25'-6"	4e1		T2		0'-4½"	4'-5"	7'-11¾"	4'-5"	7'-11¾"	0'-4½"				Pin Dia.=2"
4	5'-7"	4e2		T5		0'-6"	4'-5"				0'-8"		0'-4"		Pin Dia.=2"

Iowa Pilot Project IA 210 over I-35





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6	6'-0"	6a3		C1		10"	1'-8"								Pin Dia.=4½"
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Iowa Pilot Project IA 210 over I-35

- Things that went well
  - Pier modeling
  - Abutment modeling
  - OBM components
  - Deck modeling
  - Civil labeler

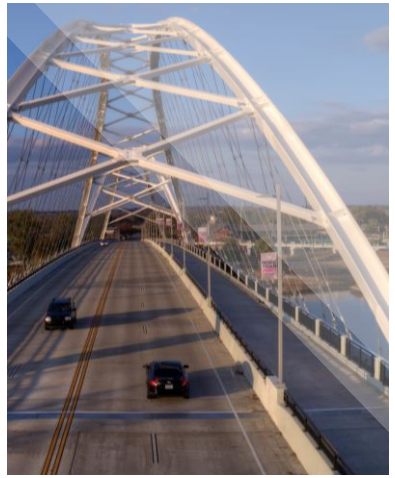
Iowa Pilot Project IA 210 over I-35

- Challenges Opportunities for Improvement
  - Haunch thickness report
  - Cambering
  - Feature symbology.
  - Deck report, Bentley was responsive to our needs.

Iowa Pilot Project IA 210 over I-35

- The Future
  - Working with data
  - Win-win path for adoption
  - Reduced rework and RFI.
  - Potential for Automation
  - Shortened schedules, accommodating changes later in design.

Questions?



HNTB