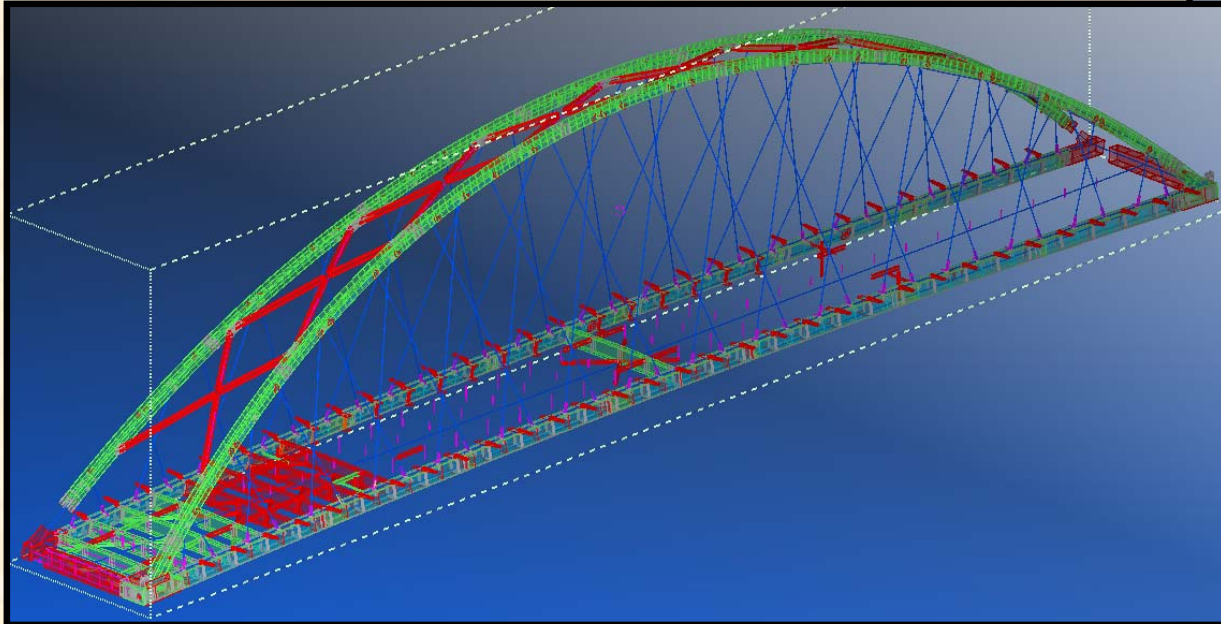


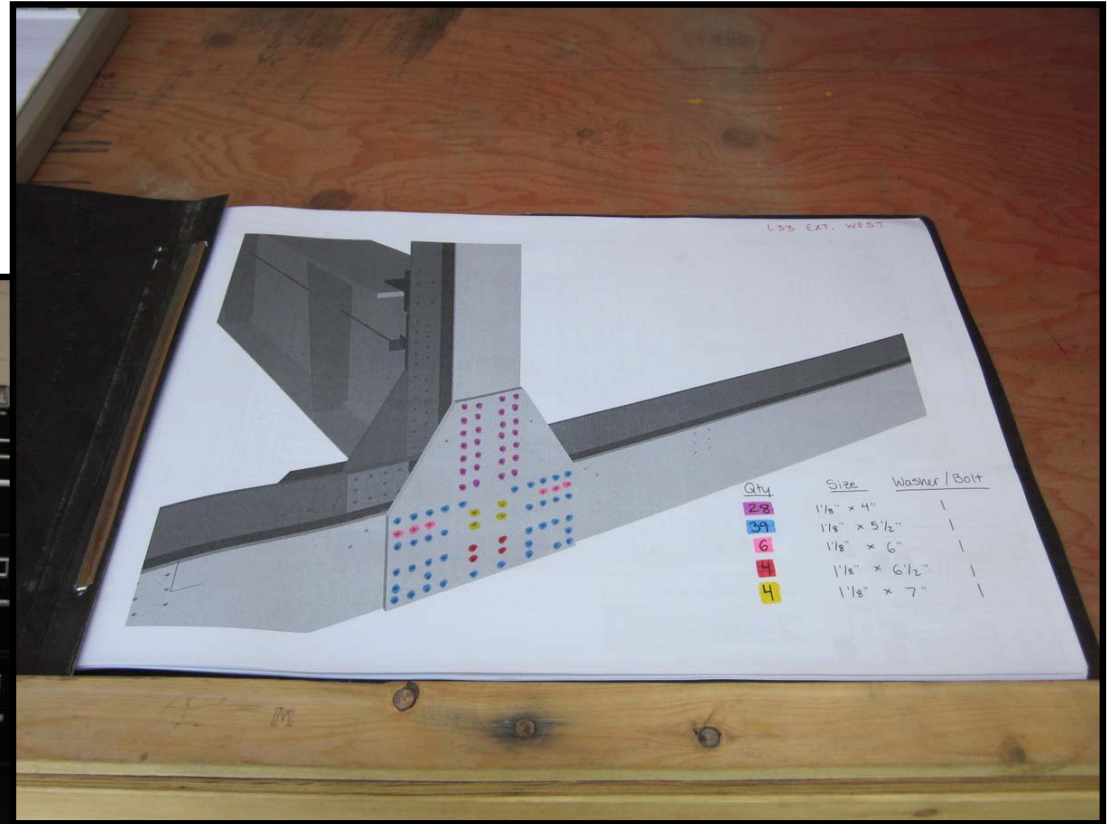
High Steel Open House

October 4, 2013

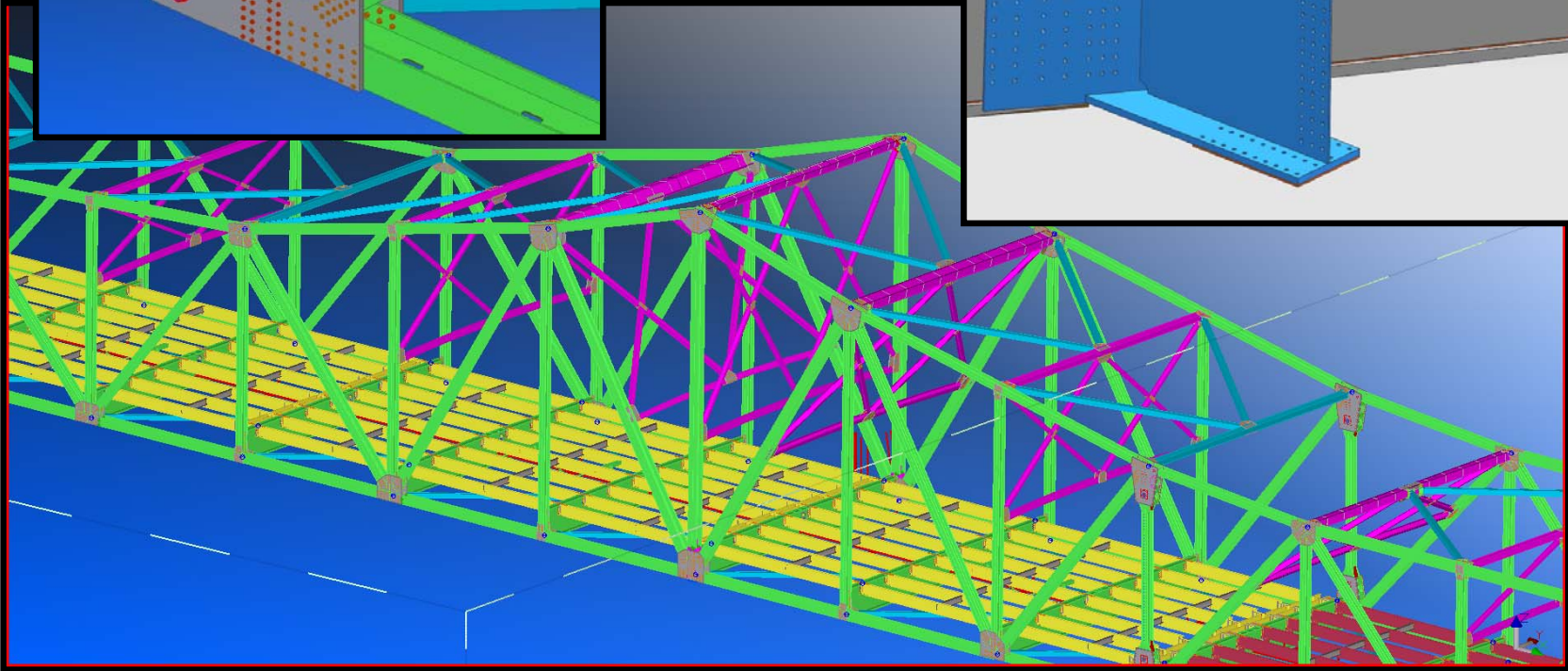
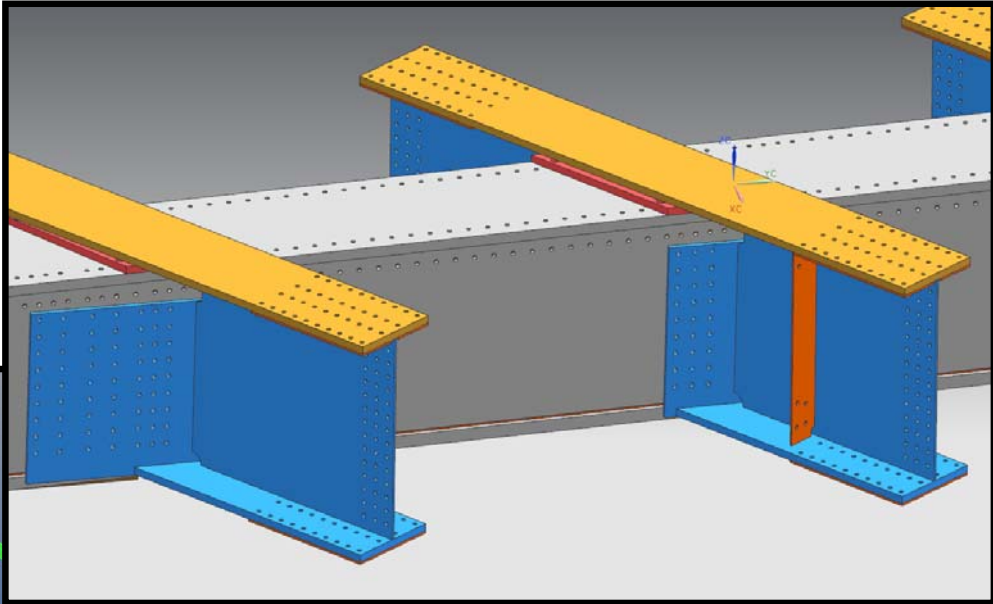
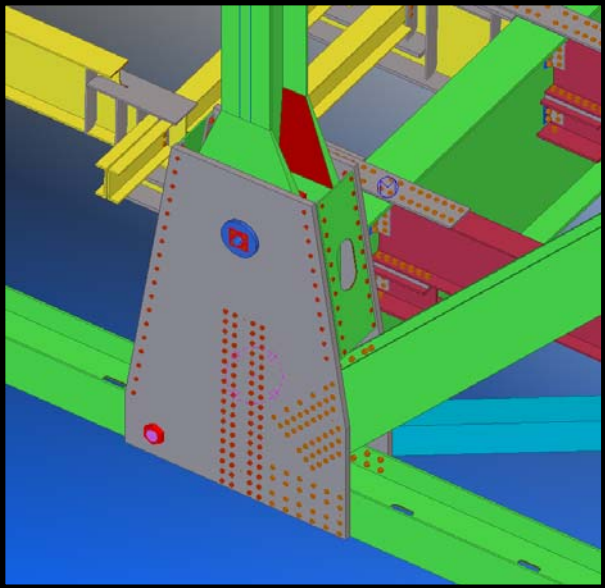
BrIM in Structural Steel Fabrication: Current Uses, Benefits and Potential



“Traditional” BrIM in Steel Fabrication

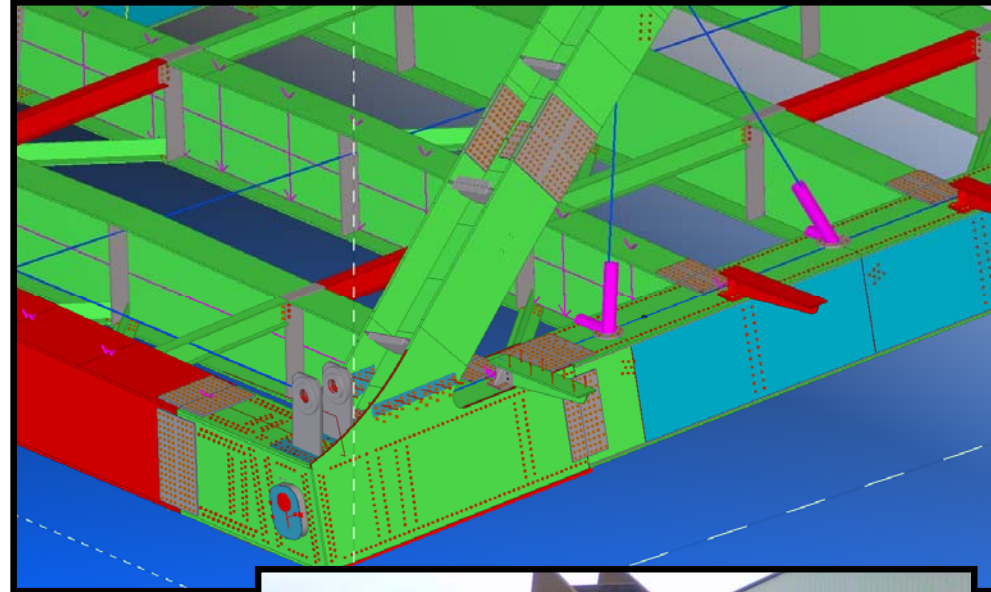


Current BrIM in Steel Fabrication



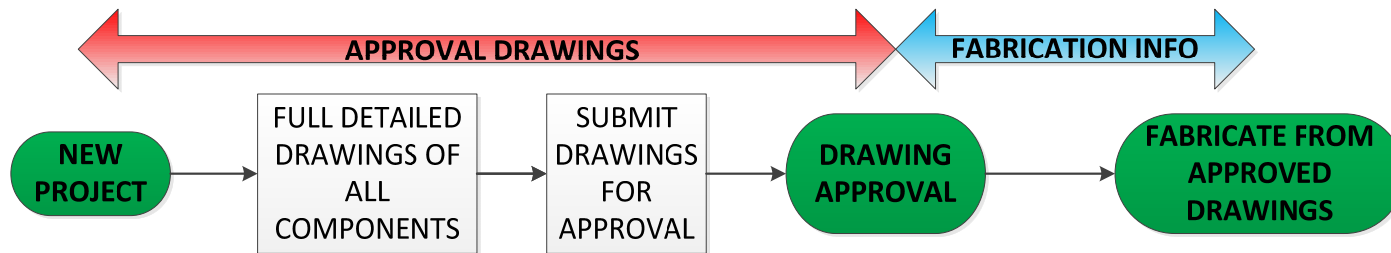
Current Uses of BrIM

- Generation of Shop Drawings, Fab Data & CAM Files
- Fabrication Planning
- Fit Verification and Clash Detection
- Data Warehouse for Fabrication Documentation (QC Data)
- Steel Erection Planning



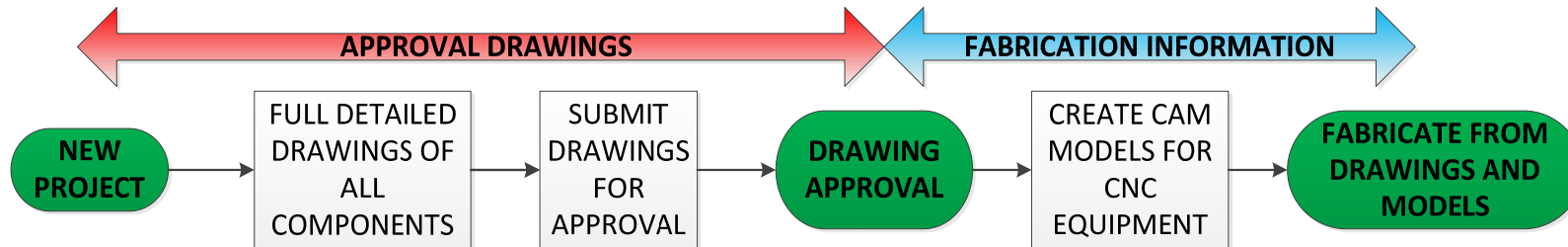
BrIM and Shop Drawings

SHOP DRAWING TO FABRICATION FLOW - TRADITIONAL



DRAWINGS
GOVERN!

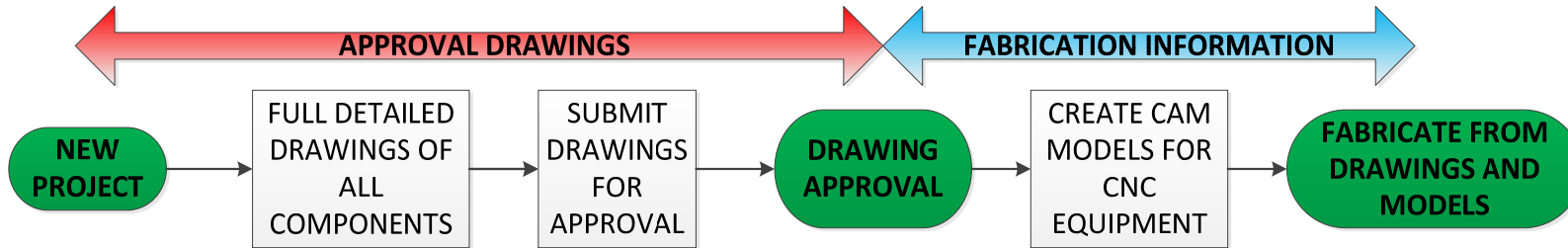
SHOP DRAWING TO FABRICATION FLOW - WITH ADVENT OF CNC EQUIPMENT



DRAWINGS
GOVERN, BUT
MODELS/DATA
USED

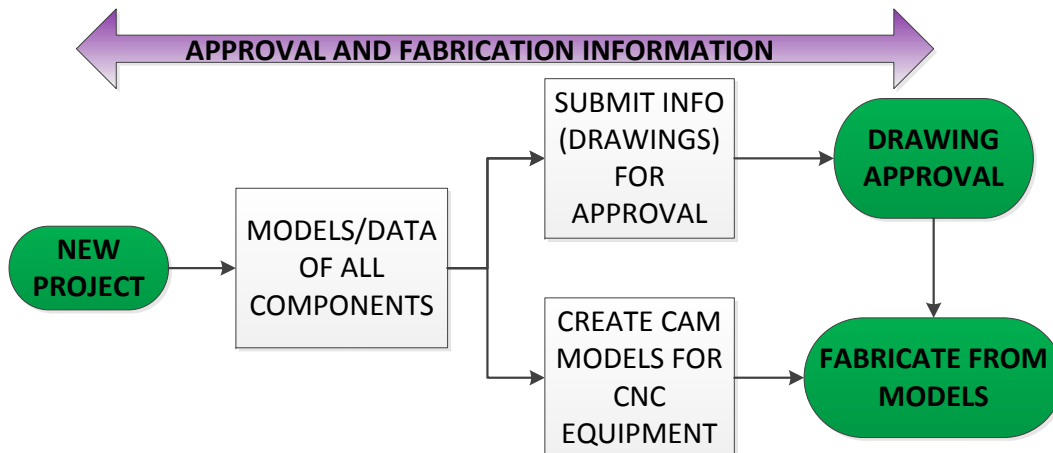
BrIM and Shop Drawings

SHOP DRAWING TO FABRICATION FLOW - WITH ADVENT OF CNC EQUIPMENT



DRAWINGS
GOVERN, BUT
MODELS/DATA
USED

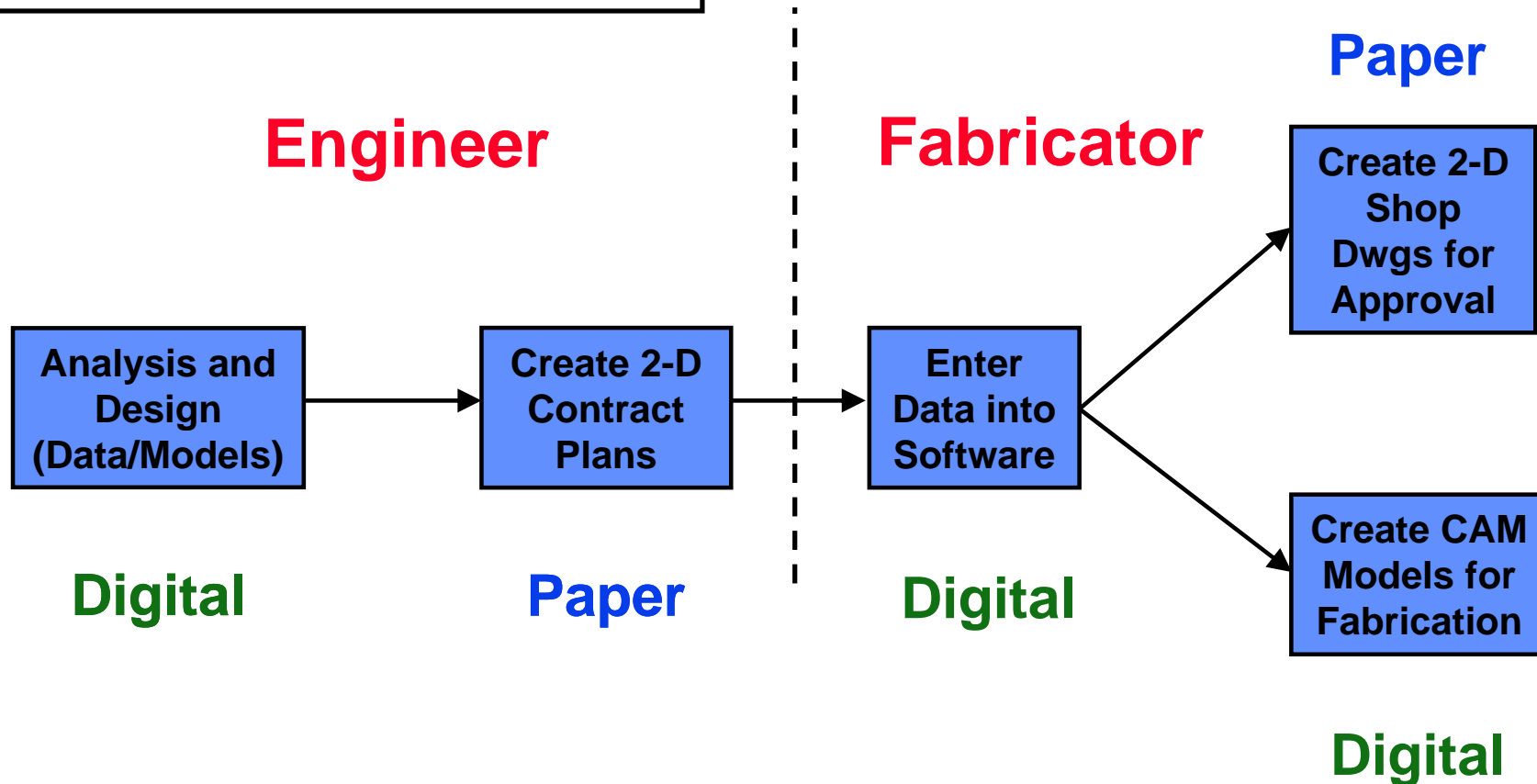
SHOP DRAWING TO FABRICATION FLOW - WITH FULL UTILIZATION OF BrIM AND CNC EQUIPMENT



MODELS/DATA
GOVERN!

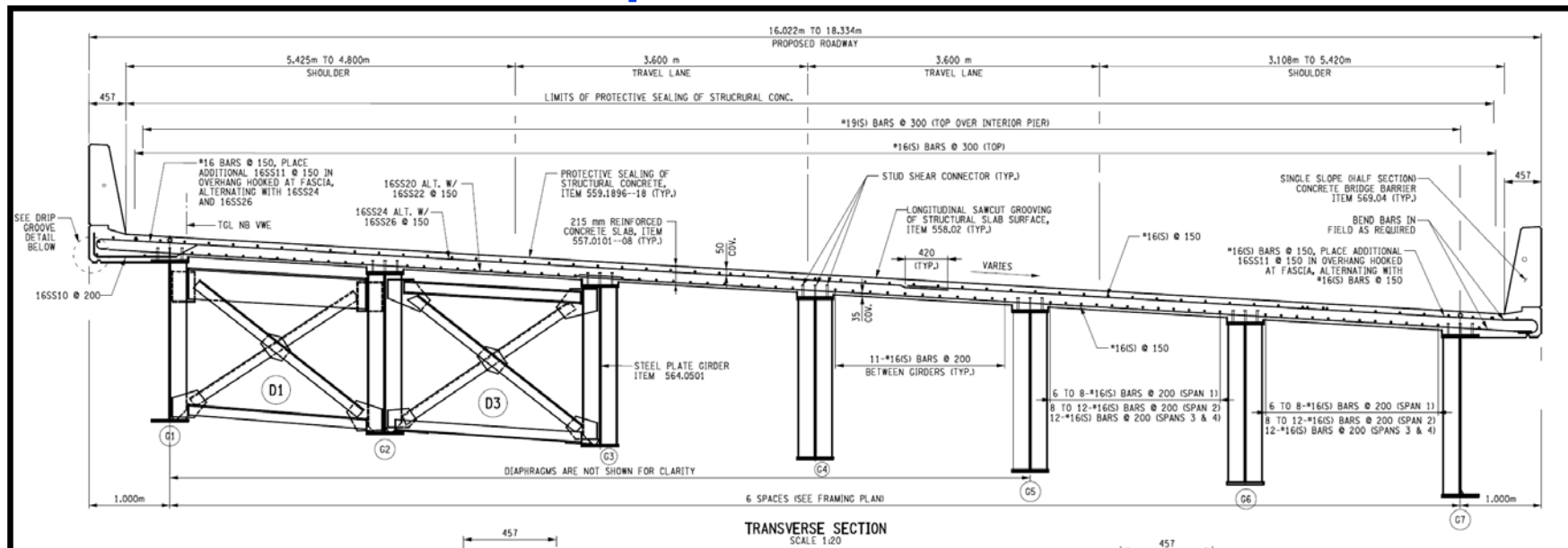
BrIM and Design Interaction

Traditional Workflow



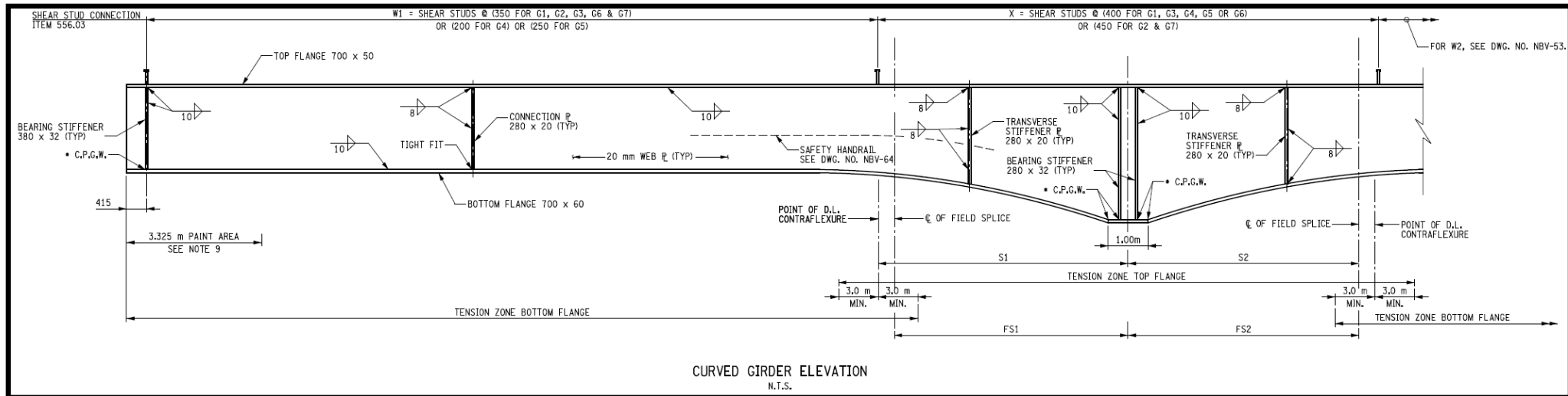
BrIM and Design Interaction

- Design Data Transfer - Project Geometry
 - Roadway - Horizontal, Vertical, Cross slopes
 - Span
 - Deck – Thickness, Haunches
 - Structural Steel – Top of Steel Elevations, Camber Data



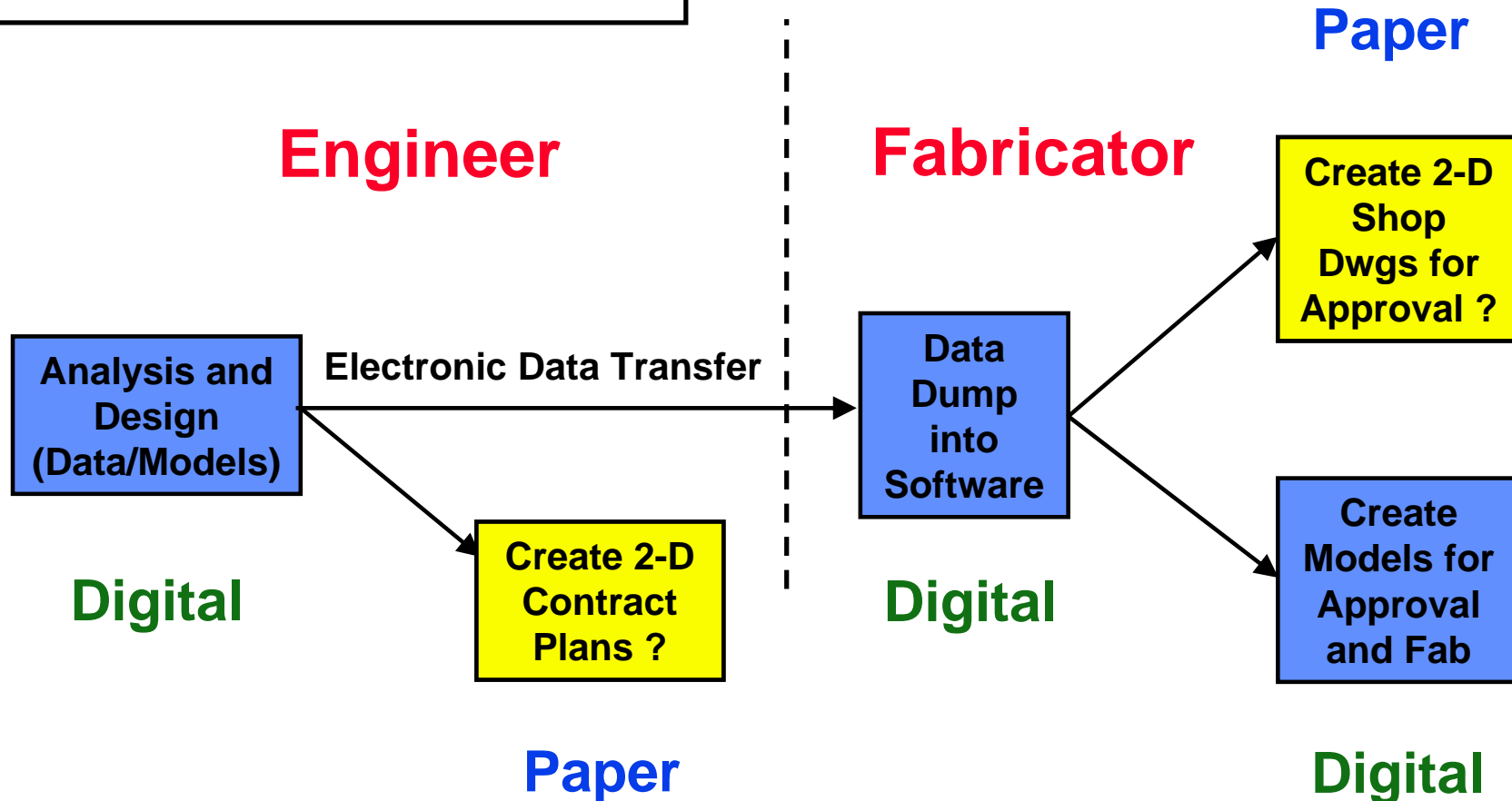
BrIM and Design Interaction

- Design Data Transfer – Member Properties
 - Steel Member Sizes, Shapes
 - Size Transition Locations
 - Material Specifications



BrIM and Design Interaction

Preferred Workflow

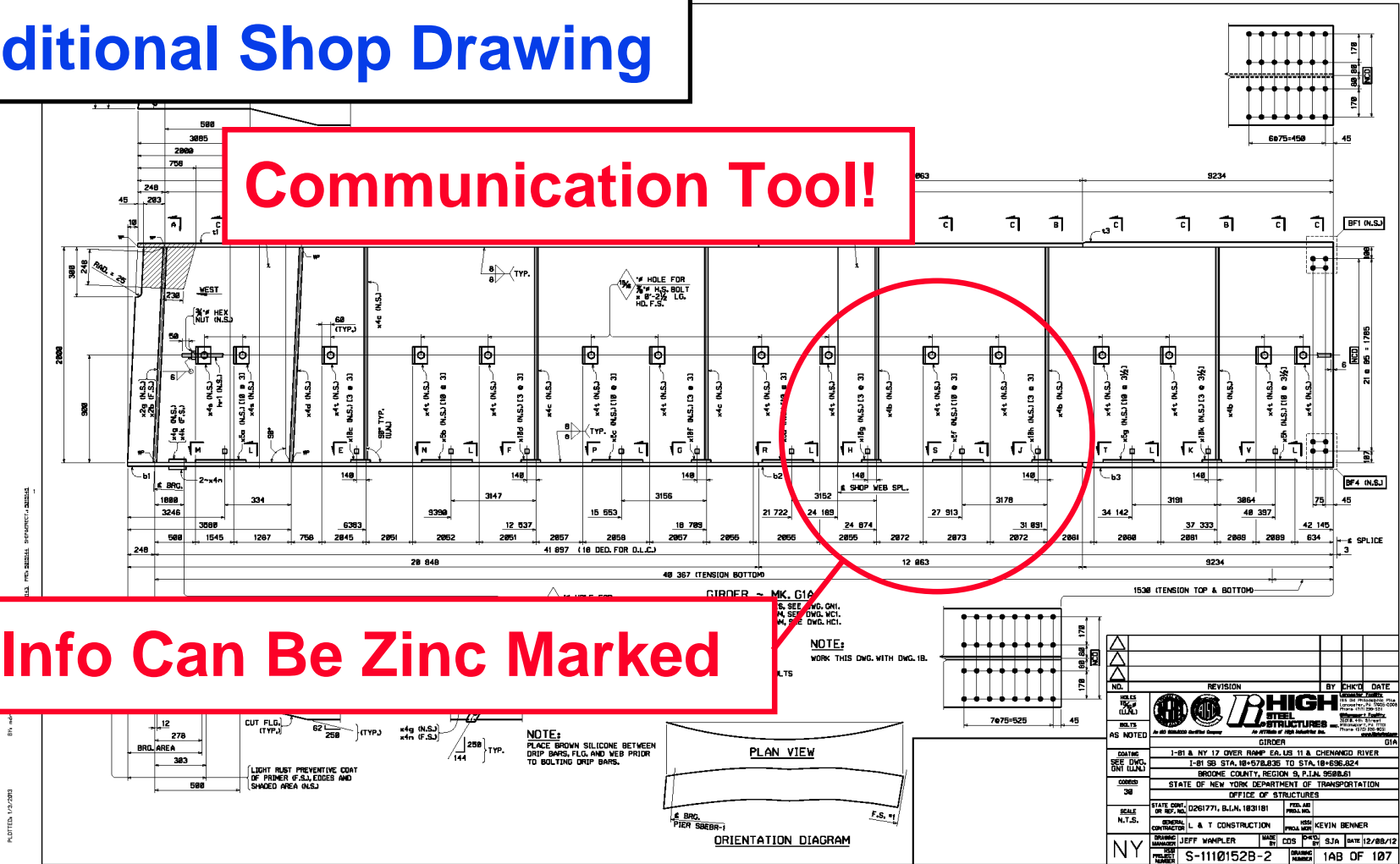


BrIM and Fabrication

Traditional Shop Drawing

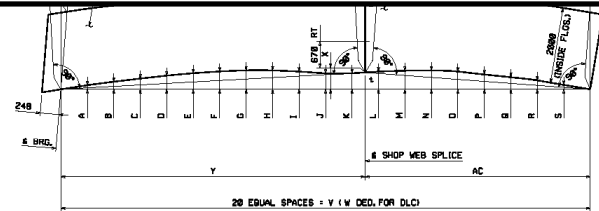
Communication Tool!

Info Can Be Zinc Marked



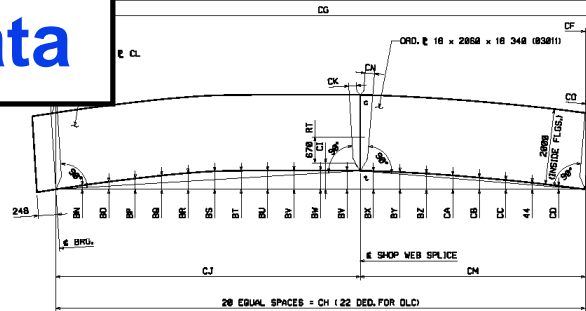
BrIM and Fabrication

Current Transfer of CAM Data



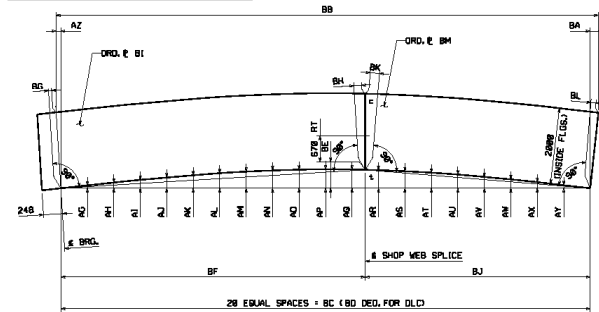
MARK	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB							
G1A	18	19	25	32	38	42	45	44	42	38	38	42	44	44	42	35	28	21	10	10	41	857	41	857	18	35	23	941	13	3	18	× 2068	× 24	568	(83084)
G2A	14	27	39	52	62	70	76	80	82	81	80	79	76	71	63	53	42	30	16	4	42	811	41	809	28	68	24	839	11	7	18	× 2068	× 24	460	(83087)

MARK	AC	AD	AE	AF					
G1A	17	556	5	6	18	× 2068	× 18	128	(83812)
G2A	17	558	9	7	18	× 2040	× 18	848	(83815)



MARK	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN								
G5A	27	51	74	94	111	123	127	127	126	129	124	117	107	94	79	63	23	13	23	42	473	42	437	126	24	337	18	18	× 2068	× 24	748	(83883)	18	100	14
G7A	18	35	51	71	88	103	117	129	137	130	132	123	112	99	82	64	22	14	21	42	841	42	886	135	24	538	11	18	× 2068	× 25	868	(83085)	18	256	15

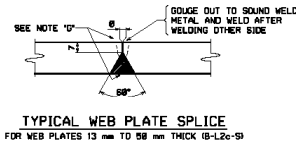
MARK	CD
G5A	9
G7A	6



MARK	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH			
C3A	18	36	53	66	82	96	105	113	118	120	119	115	100	93	87	72	56	39	19	1	18	42	143	42	124	19	117	24	139	9	18
G4A	24	46	67	88	106	122	130	148	155	161	163	159	146	138	112	91	70	49	24	8	22	42	298	42	268	21	161	24	236	5	13
G8A	25	48	71	95	116	135	154	169	188	181	177	169	155	148	123	100	78	54	25	8	25	43	838	43	885	22	173	24	638	6	14
G9A	32	63	93	121	147	178	191	218	224	229	222	207	196	178	147	126	93	64	32	2	31	43	255	43	222	22	215	24	736	15	17

MARK	BI	BJ	BK	BL	BM									
G3A	18	× 2068	× 24	468	(83087)	17	585	13	5	18	× 2068	× 18	128	(83812)
G4A	18	× 2088	× 24	568	(83084)	18	838	18	4	18	× 2068	× 18	128	(83812)
G8A	18	× 2088	× 24	958	(83882)	18	367	19	6	18	× 2068	× 18	588	(83818)
G9A	18	× 2108	× 25	858	(83881)	18	486	24	8	18	× 2068	× 18	588	(83818)

Transferred Electronically



NOTE 'C'
GRIND THE WELDS FLUSH IN THE AREAS TO BE TESTED AND FOR THE FULL DEPTH OF WEB ON G1A, G1B, G1C (F.S.) AND G8A, G8B, G8C (N.S.). ALL OTHER WELDS MAY HAVE A MAXIMUM REINFORCEMENT OF 3 mm.

NOTES:
FOR GENERAL, SHOP NOTES, SEE DRAWING GNI.
ALL WEB PLATES REQUIRE CHAMFY V-NOTCH TEST.
NEGATIVE CAMBER ORDINATES INDICATE CURVE IS BELOW BASELINE.
THE LETTERS 'Y' & 'Z' AT WEB SPLICES INDICATE TENSION AND COMPRESSION EDGES AT SPLICES.
RT INDICATES RADIOGRAPHIC TESTING FOR 1/3 OF THE WEB DEPTH AT TENSION EDGE.

NO.	REVISION	BY	CHK'D	DATE

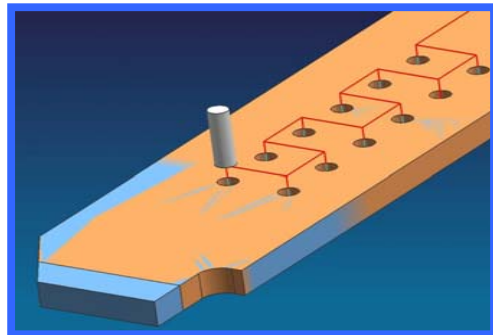
SCALE	AS SHOWN
DATE	1-81 & NY 17 OVER RAMP EA US 11 & CHENANGO RIVER
CONTRACT	1-81 STA 18+57.835 TO STA 18+636.324
CONTRACT	BROOME COUNTY, REGION 9, P.I.N. 958841
CONTRACT	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION
CONTRACT	OFFICE OF STRUCTURES
STATE	NEW YORK
PROJECT	D261771, B.L.N. 183181
SCALE	1" = 40'
DESIGNED BY	L & T CONSTRUCTION
CHECKED BY	JEFF WAMPLER
DATE	4/11/12
PROJECT NO.	S-1110152B-2
CONTRACT NO.	WCI OF WC2

DRAWING NO. 183181-1000
 PROJECT NO. S-1110152B-2
 DATE 4/11/12
 BY KEVIN BENNER
 CHECKED BY KEVIN BENNER
 APPROVED BY KEVIN BENNER
 PROJECT NO. S-1110152B-2
 DRAWING NO. WCI OF WC2

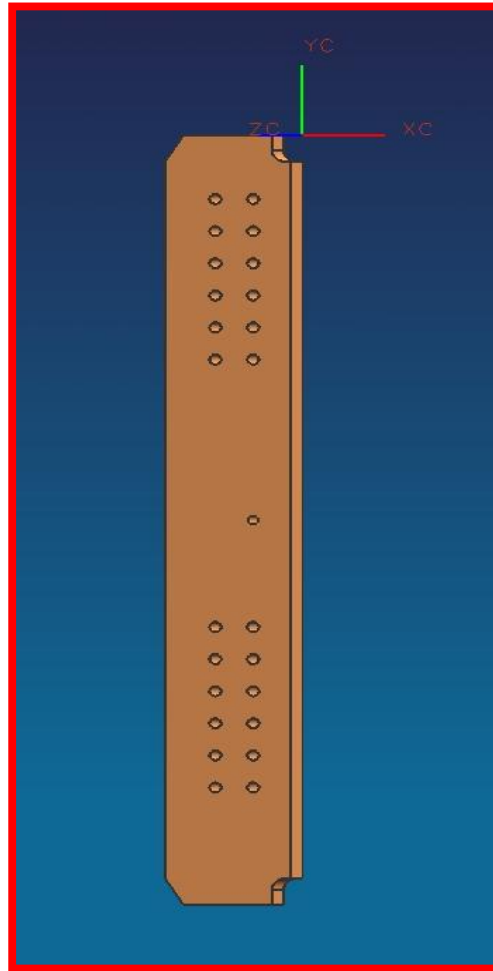
BrIM and Fabrication

```
1. Edit Plus V8.3 [C:\1amg\PARTS - 1\2228A.nc - Unmodified]
File Edit Search View Options Window Help
N5 G0228A.NC
N10 (PART1/US4)
N15 G90
N20 G40
N25 G70
N30 G02 X0.0 Y0.0
N35 M19
N40 M37T3
N45 M37T4
N50 R.185 DIA. TORCH
N55 (JERFENNIG)
N60 G00 X.000 Y.625
N65 M17
N70 M03
N75 G02X.185
N80 G41
N85 G01 X.014 Y1.825 F12.0
N90 X.165 Y18.563
N95 G03 X1.476 Y28.816 R913 J1.5
N100 G01 X13.53 Y27.813
N105 X28.401 Y2.196
N110 G03 X28.396 Y1.75 R4.368 J3.929
N115 G01 X32.939
N120 Y0.0
N125 X1.496
N130 G03 X.014 Y1.625 I1.495 J1.125
N135 G40
N140 M05
N145 M18
N150 M19
N155 M27
N160 M08
N165 (CYCLE TIME = 18.4 MINUTES)
Total Lines 3000028 Cursor at Column 01 Line 0000001
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CNC Code

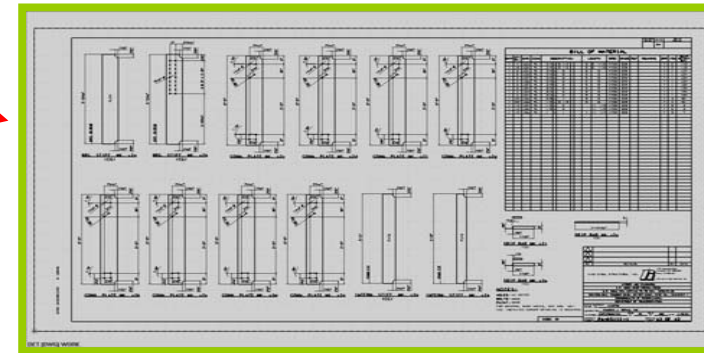


CAM Toolpath



Part Model

- Parametric 3D models created for girder parts
- One associative part model shared by all disciplines
- Reduces redundant efforts



CAD Drawings

BILL OF MATERIAL														
SHIP	QTY	MARK	COMP	DESCRIPTION	LENGTH	SPEC	GRADE	TEST	REMARKS	APP	DATE			
	1	+	20	PL 3/4	9 1/2	5	5	1/10	A709	SDW		2	118	
	1	110	+20	PL 3/4	8 1/2	5	5	1/10	A709	SDW		2	118	
	1	10	+20	PL 3/4	9	5	5		A709	SDW		1	124	
	1	9	+20	PL 3/4	9	5	5		A709	SDW		1	124	
	1	13	+20	PL 3/4	9	5	5		A709	SDW		1	124	
	1	10	+20	PL 3/4	9	5	5		A709	SDW		1	124	
	1	8	+20	PL 3/4	9	5	5		A709	SDW		1	124	
	1	3	+20	PL 3/4	9	5	5		A709	SDW		1	124	
	1	40	+20	PL 5/8	7	5	5		A709	SDW		3	81	
	1	84	+20	PL 1/2	5 1/2	5	5		A709	SDW		4	51	
	1	10	+20	PL 1/2	2	11	1/2		A709	SDW		1	6	3
	1	10	+20	PL 1/2	2	11	1/2		A709	SDW		1	6	3
	1	10	+20	PL 1	1	11	1/2		A709	SDW		1	6	3

BOM

BrIM and Fit Verification/Assembly

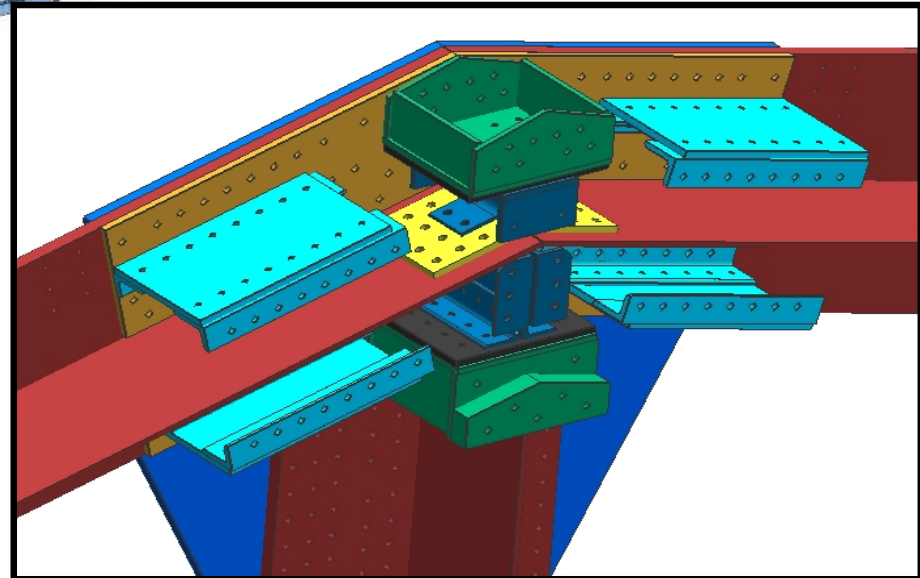
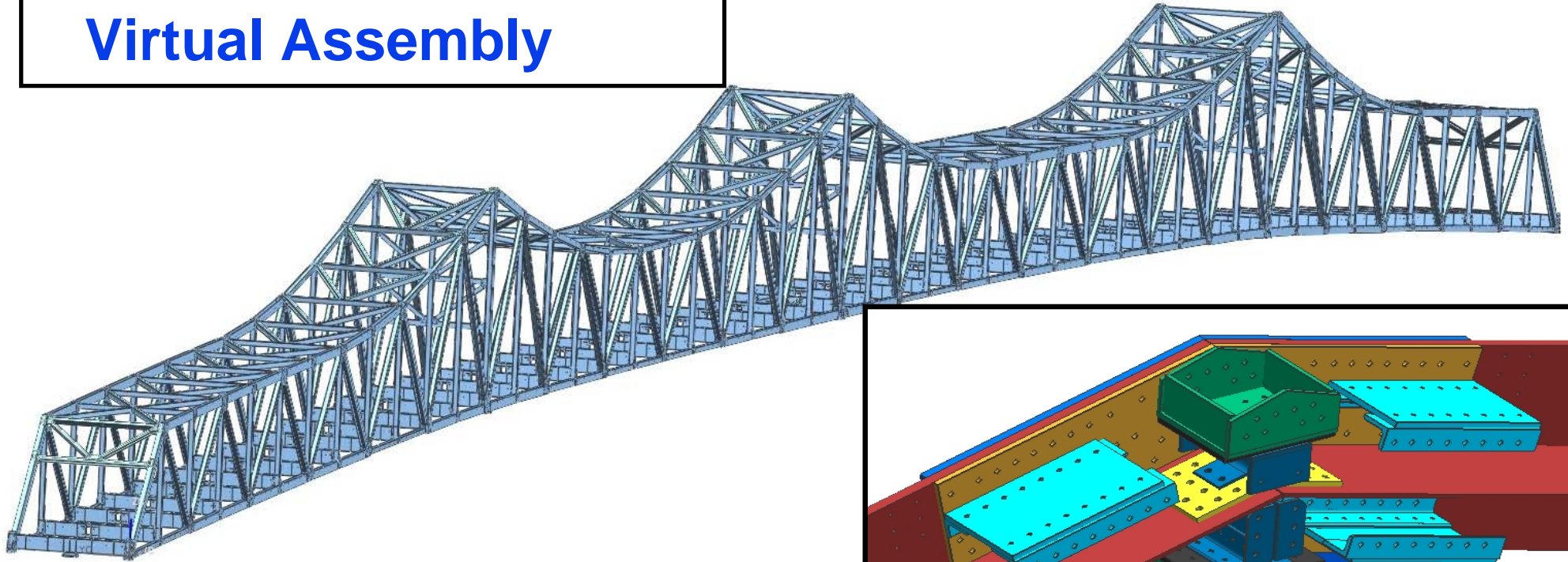
Traditional Assembly

- Labor Intensive
- Time Consuming
- Costly

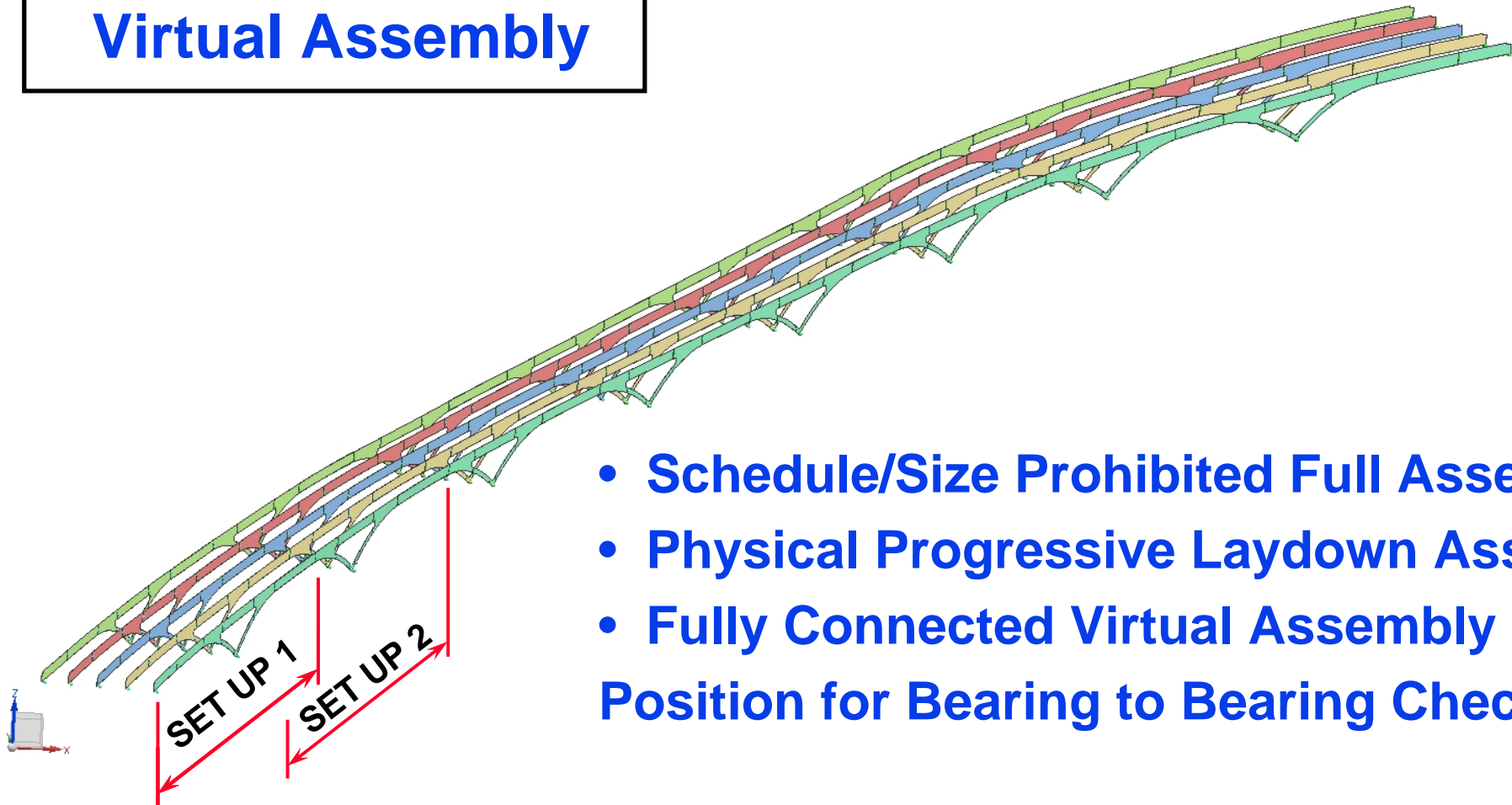


BrIM and Fit Verification/Assembly

IN Milton Madison Truss Virtual Assembly



OH Innerbelt Bridge Virtual Assembly



- Schedule/Size Prohibited Full Assembly
- Physical Progressive Laydown Assembly
- Fully Connected Virtual Assembly in Position for Bearing to Bearing Check

BrIM and Fit Verification/Assembly

Physical Assembly avoids issues here, **BUT** Virtual Assembly can achieve same result



Case Study – PennDOT I-81/Rt 22



May 9, 2013

LOCAL NEWS

High Steel Structures awarded PennDOT contract for emergency replacement of bridge at I-81 Interchange



Lancaster County based High Steel Structures is awarded a PennDOT contract to fabricate 365 tons of structural steel for the emergency replacement of the bridge carrying Route 22 eastbound traffic into Harrisburg at the Interstate 81 exit 67 interchange.

The overpass bridge was severely damaged on Thursday, May 9, when a tanker truck loaded with diesel fuel overturned and caught fire causing massive traffic delays in the Harrisburg metro.

Courtesy: WPMT43

Case Study – PennDOT I-81/Rt 22

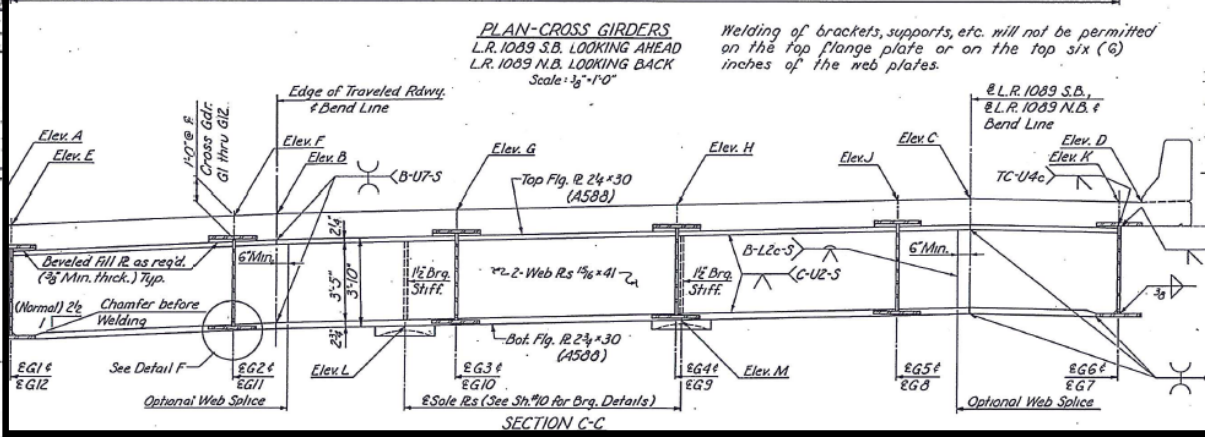
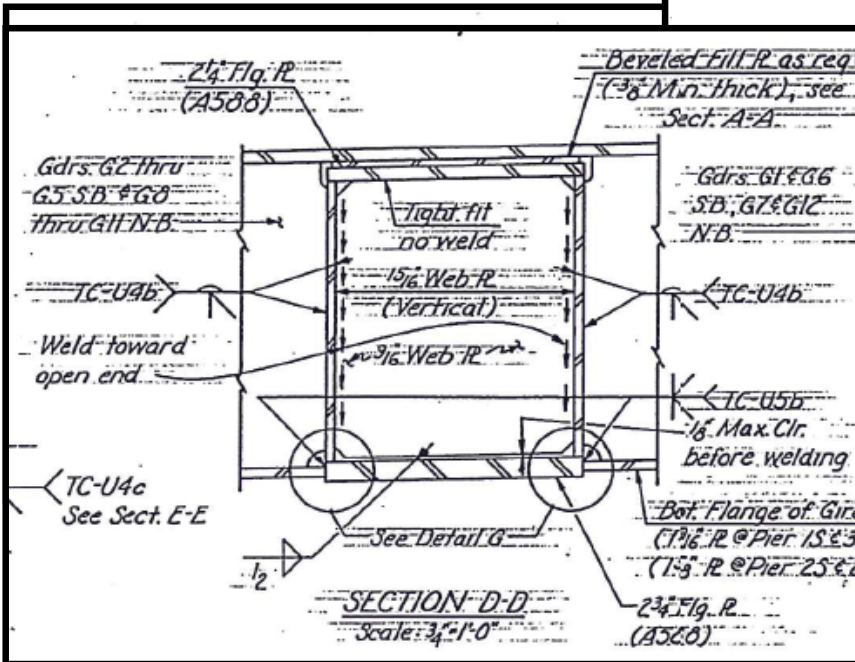
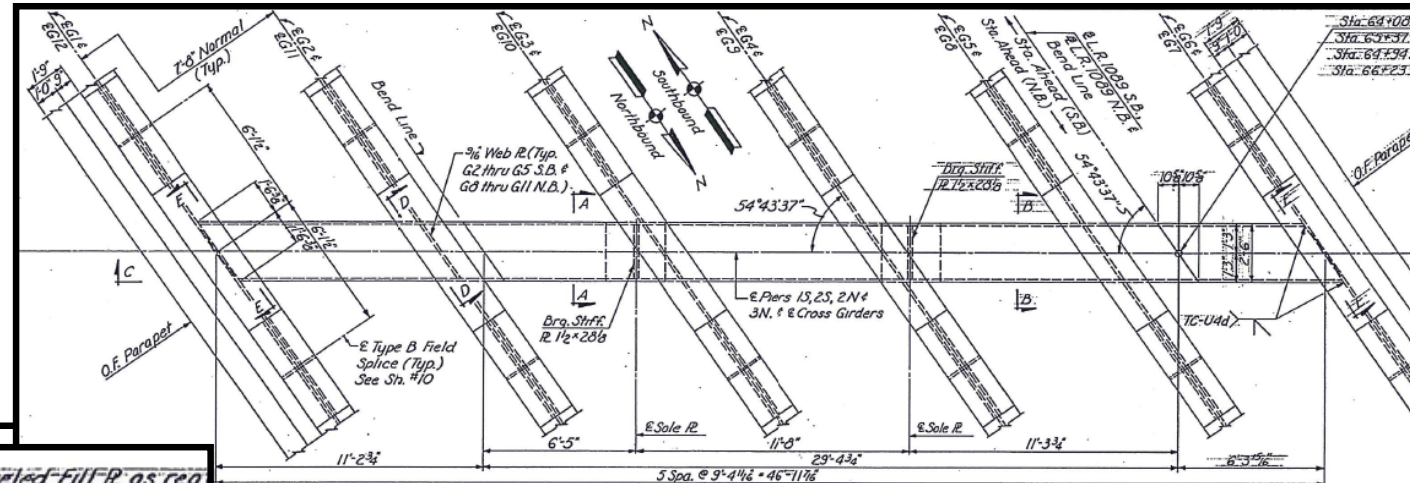


- **Project Timeline**

- **May 09 – Accident Occurred**
- **May 10 – HSSI Contacted PennDOT to Offer Assistance**
- **May 23 – NTP from PennDOT**
- **June 06 – Start of Fabrication (2 weeks after NTP)**
- **August 09 – Start of Steel Delivery (11 weeks after NTP)**
- **August 12 – Start of Steel Erection**
- **August 26 – Completion of Steel Erection (13-1/2 weeks after NTP)**

Case Study – PennDOT I-81/Rt 22

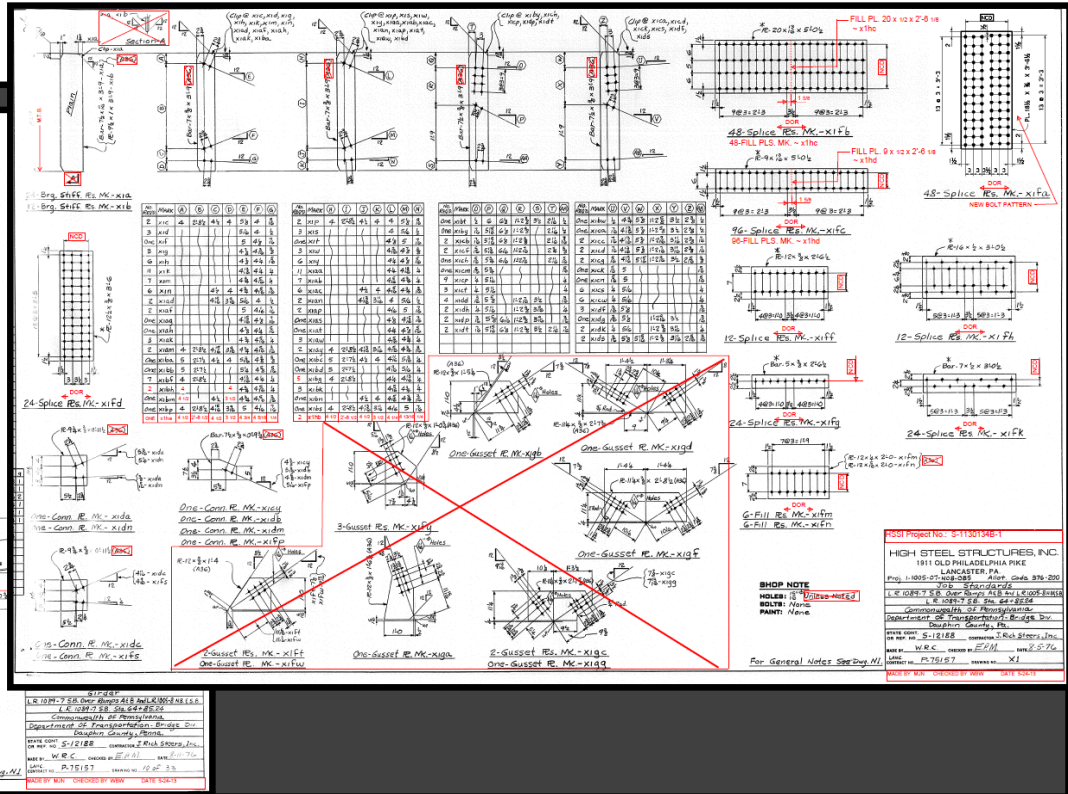
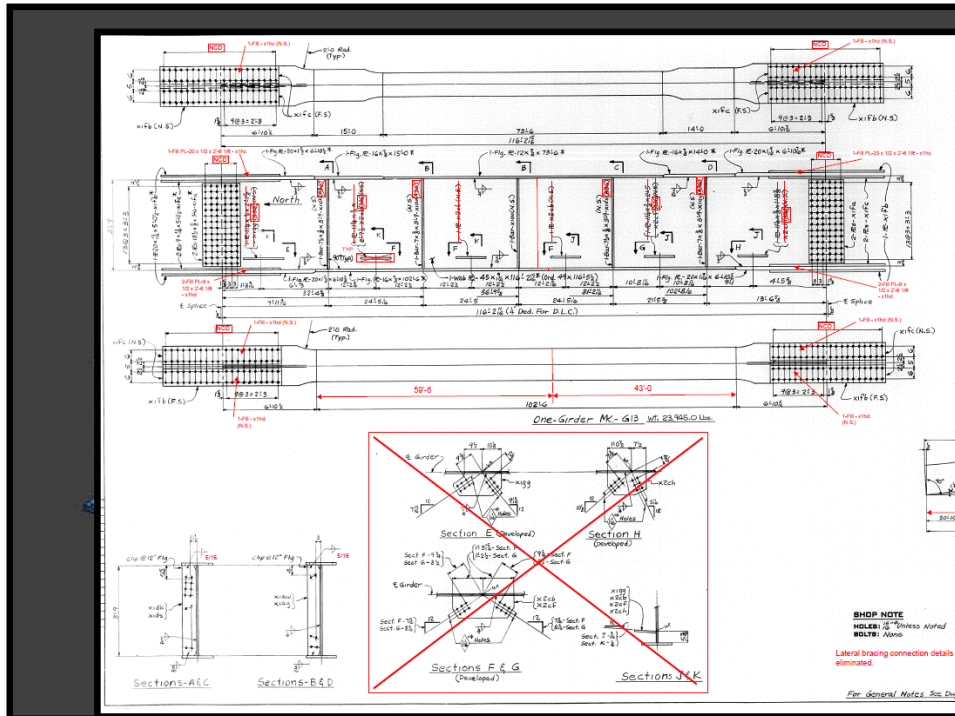
HOW??
365 tons
2 Box Gdrs



COOPERATION

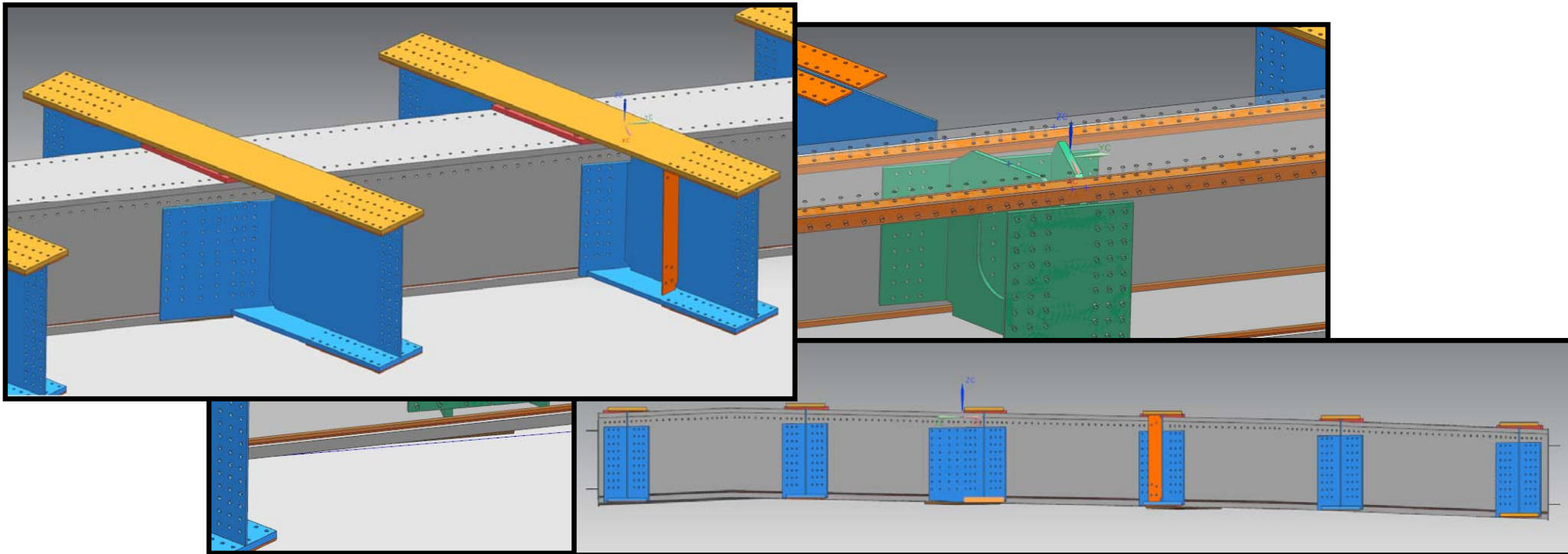
Case Study – PennDOT I-81/Rt 22

- Expedited Shop Drawing/Model Review
 - Direct Communication—PennDOT, Gannett Fleming, HSSI
 - Redline Markup of Existing Shop Drawings
 - Modeling of Box Girders



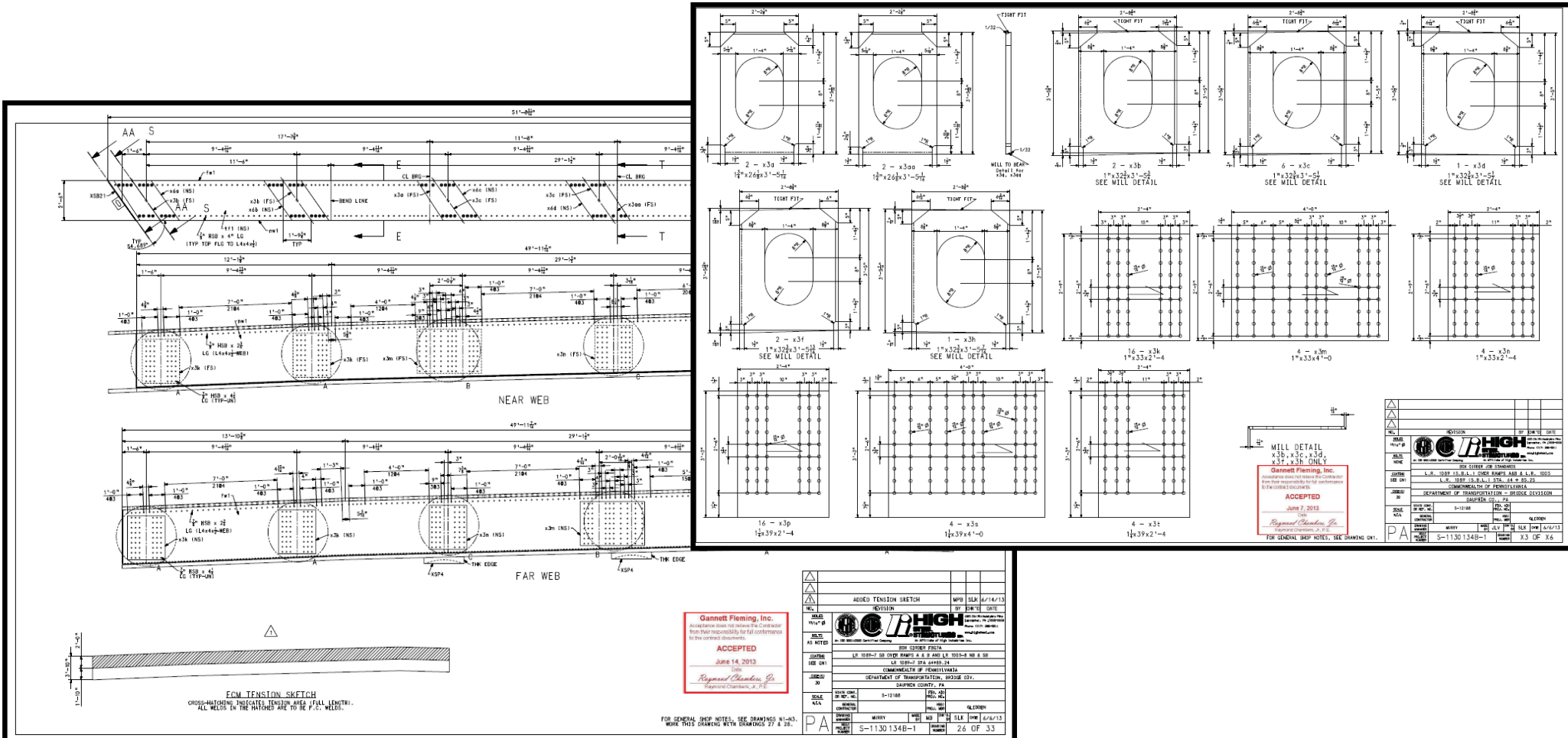
Case Study – PennDOT I-81/Rt 22

- **On-Site Review/Approval of Model**
 - **Design Change from Existing FPW to Bolted Connection**
 - **Investigation/Resolution of Design/Detail Issues**
 - **Verification of Design Requirements**



Case Study – PennDOT I-81/Rt 22

• Fabrication Drawing Approval



Case Study – PennDOT I-81/Rt 22



Case Study – PennDOT I-81/Rt 22



Case Study – PennDOT I-81/Rt 22



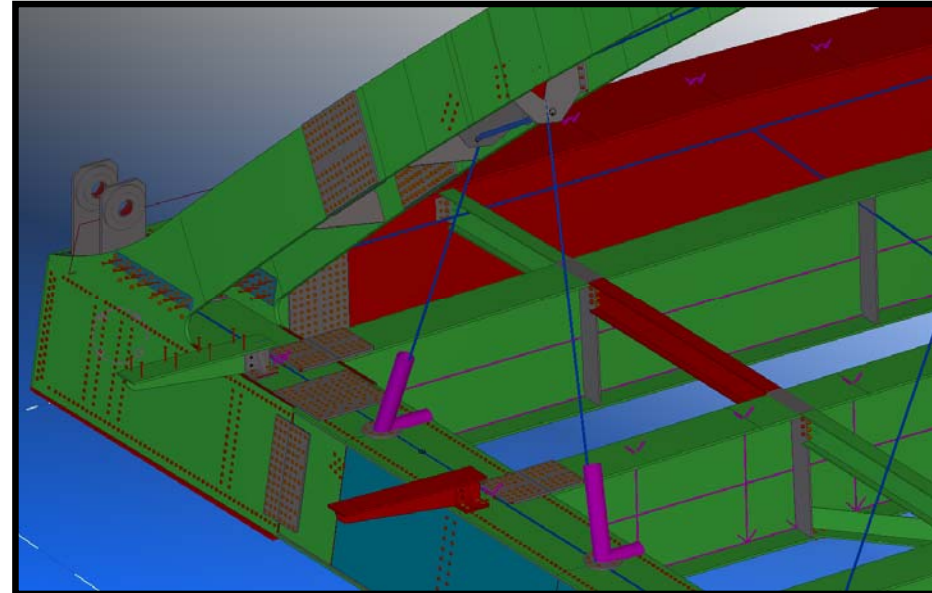
95 Calender Days

NTP to Complete Steel
Erection



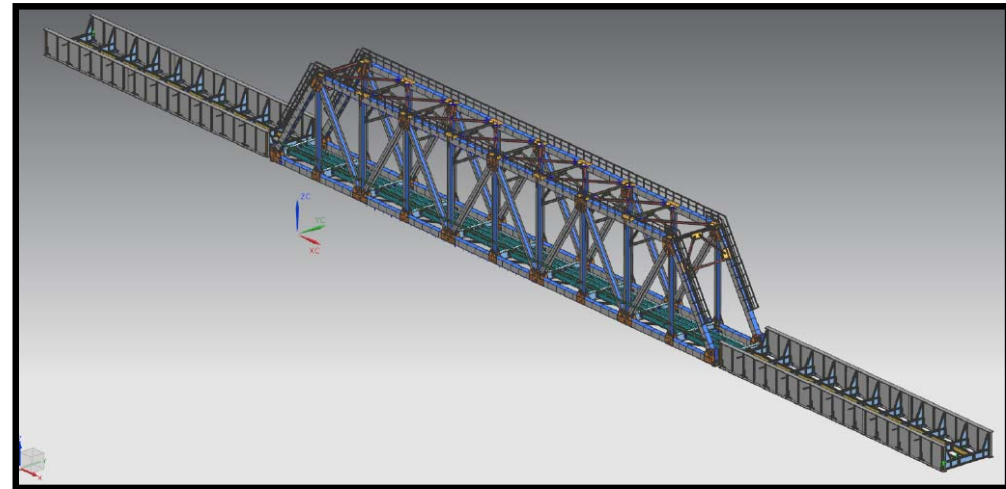
BrIM Benefits in Steel Fabrication

- **Optimizes Workflow from Design to Detailing to Fabrication**
- **Minimizes Errors due to:**
 - Manual Data Transfer
 - Detailing Misfits
- **Provides One Source for Data**
 - Shop Drawings
 - Fabrication Documentation
 - QC Records
- **Eliminates Redundant or Manual Efforts**
 - Manual Programming and Fabrication Processes
 - Physical Assemblies for Fit Verification



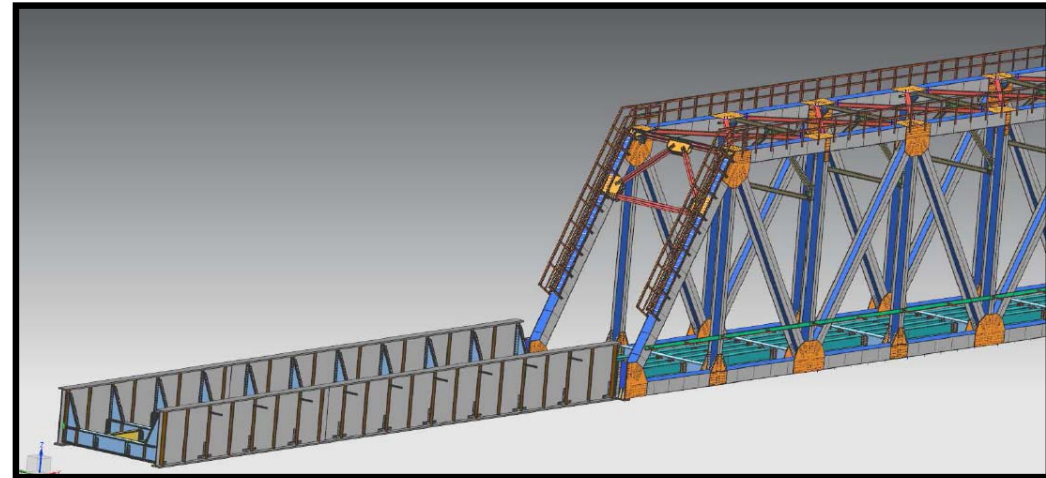
BrIM Potential in Steel Fabrication

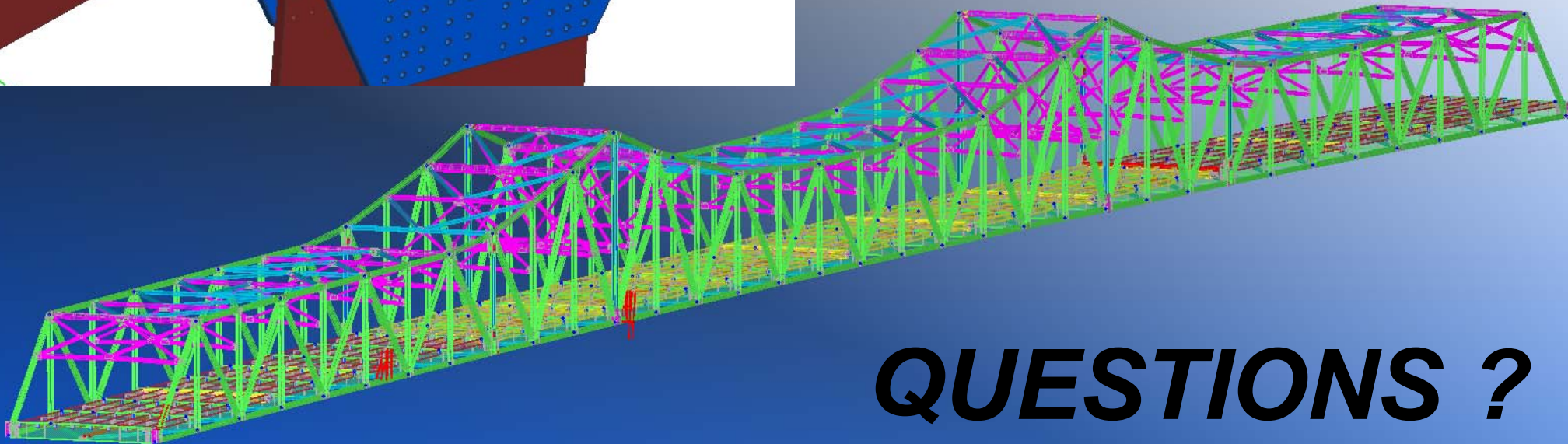
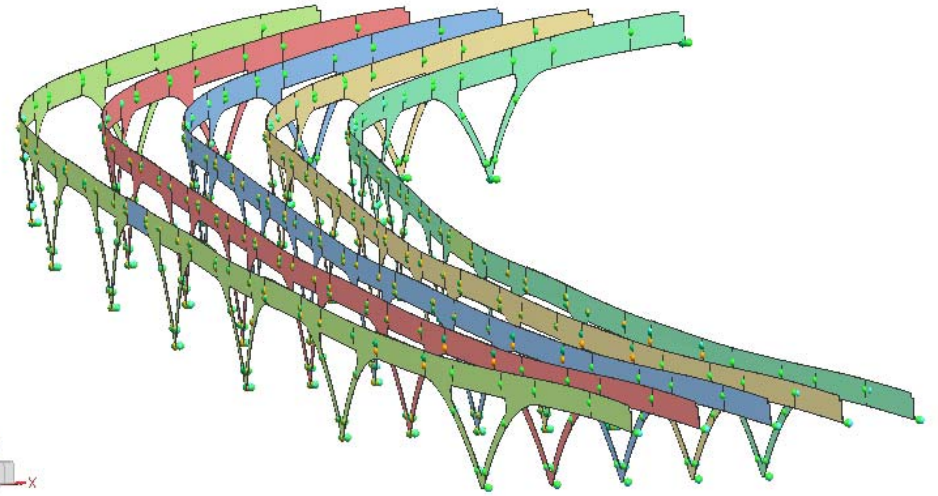
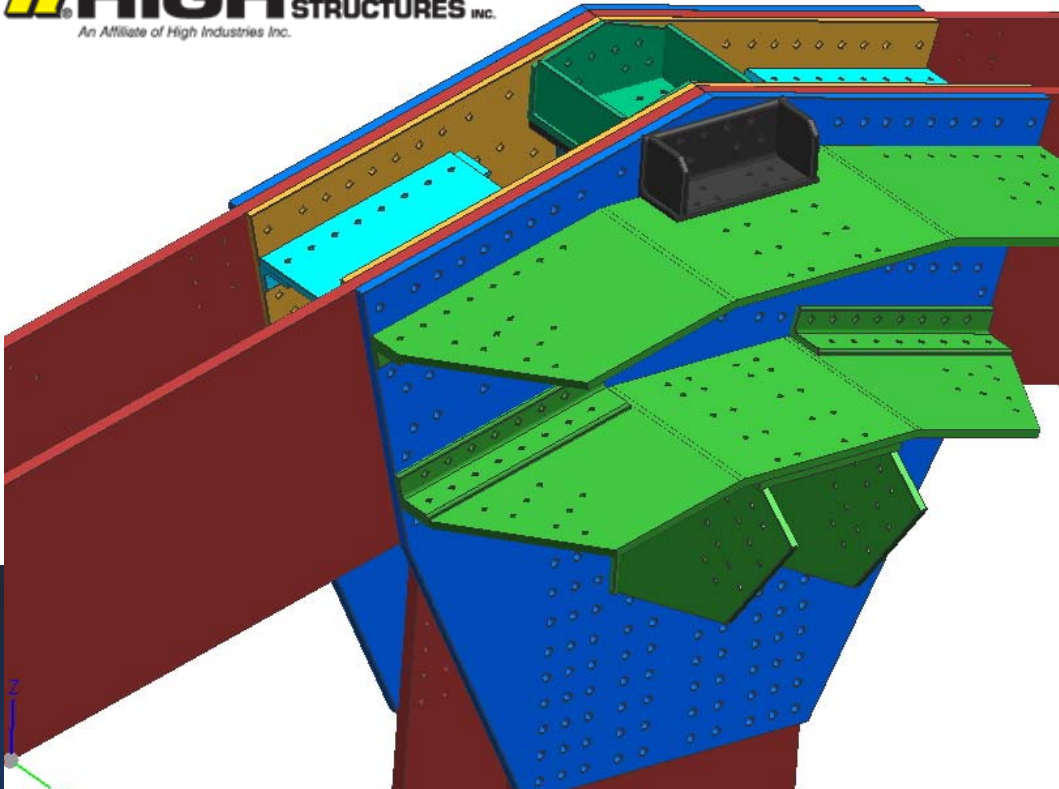
- **Transfer of Design Data from Engineer to Fabricator**
 - Industry format needed
- **Fabrication Approval Process**
 - Use of Models; Fewer Dwgs
- **Project Doc Warehouse**
 - Fabrication Details
 - Fabrication QC Docs
 - As-Built Docs
 - Maintenance / Inspection / Rating Docs
- **Virtual Assemblies & Erection Planning**



Where Do We Go From Here???

- **Be Open to the Possibilities of BrIM**
- **Consider the Benefits to You**
 - **Owner, Engineer, GC**
- **Promote the Benefits**
- **Discuss with Owners**
- **Participate with Industry**
 - **AASHTO/NSBA Steel Bridge Collaboration--TG 15 Data Modeling for Interoperability**





QUESTIONS ?