

FINLEY

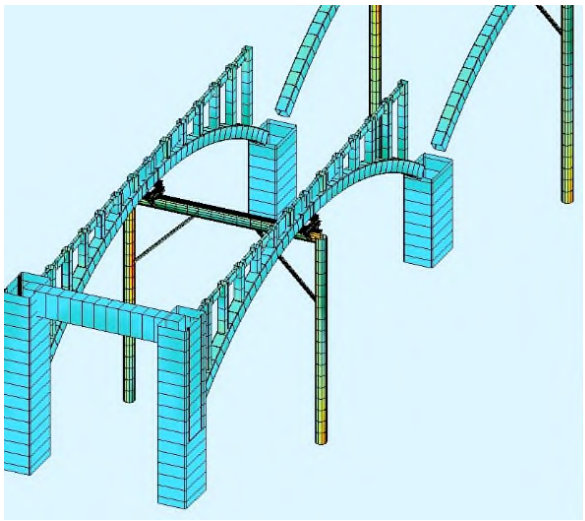
2020 FTBA Construction Conference - Ivan Liu, P.E.

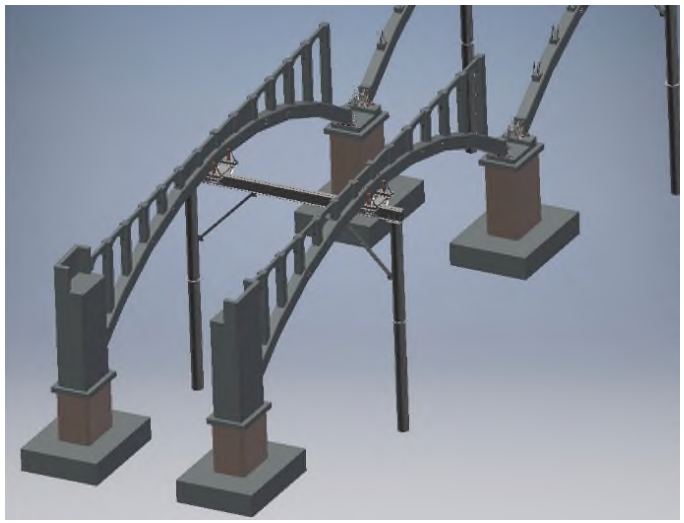
Integrated Design and Construction for Florida Bridges


Presentation Objectives

- FINLEY BrIM Workflow
- Tom Staed Veterans Memorial Bridge
- Wekiva Parkway Signature Segmental Bridge
- SR-826 Okeechobee/Palmetto Expressway Interchange Improvement

Goals for BrIM Workflow





Analysis → Production → Reality

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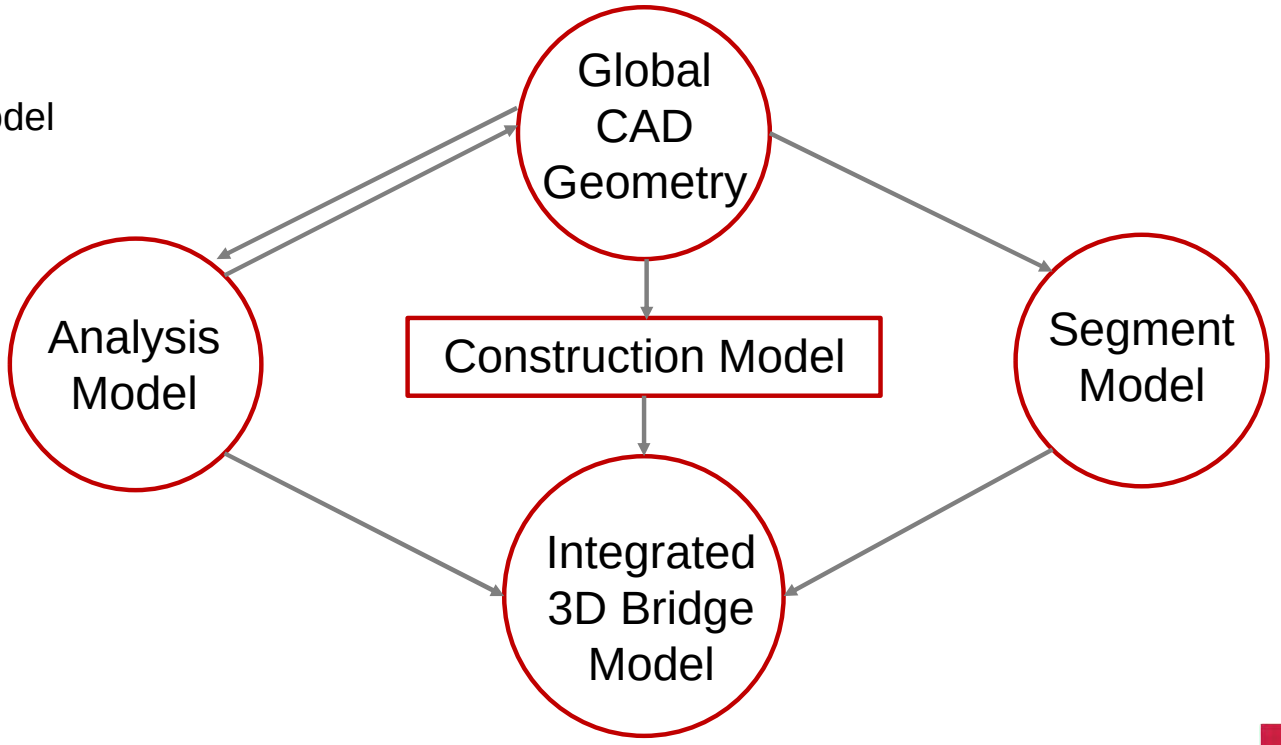
FINLEY BrIM Workflow

BrIM = Bridge *Integration* Modeling

Phase 1 → Input of Geometry

Phase 2 → Development of Models

Phase 3 → Assemble Integrated Model



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Veterans Memorial Bridge

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Wekiva Parkway Signature Segmental Bridge

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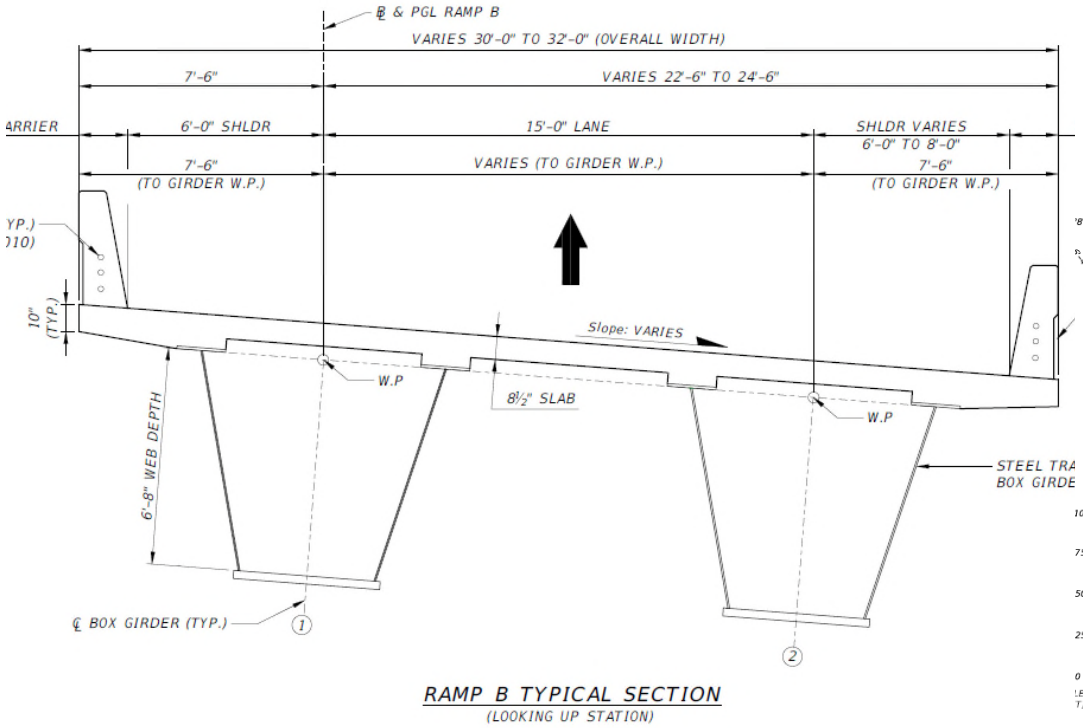
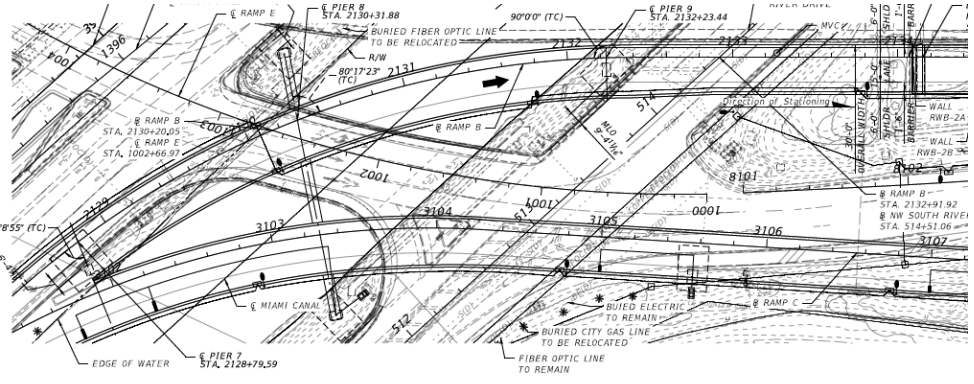
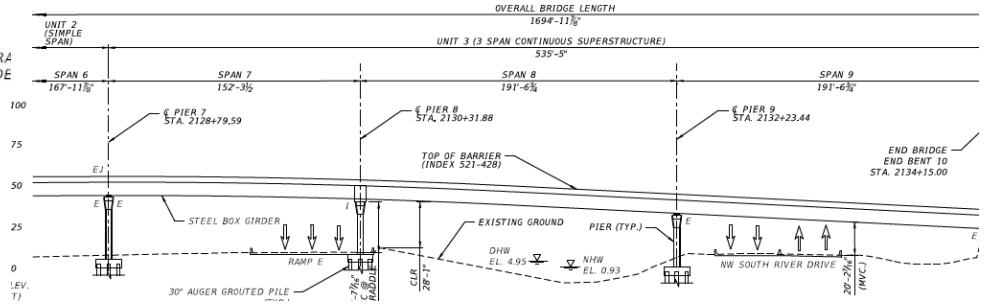
Okeechobee/Palmetto Expressway Interchange



RAMP B TYPICAL SECTION
(LOOKING UP STATION)



PLAN



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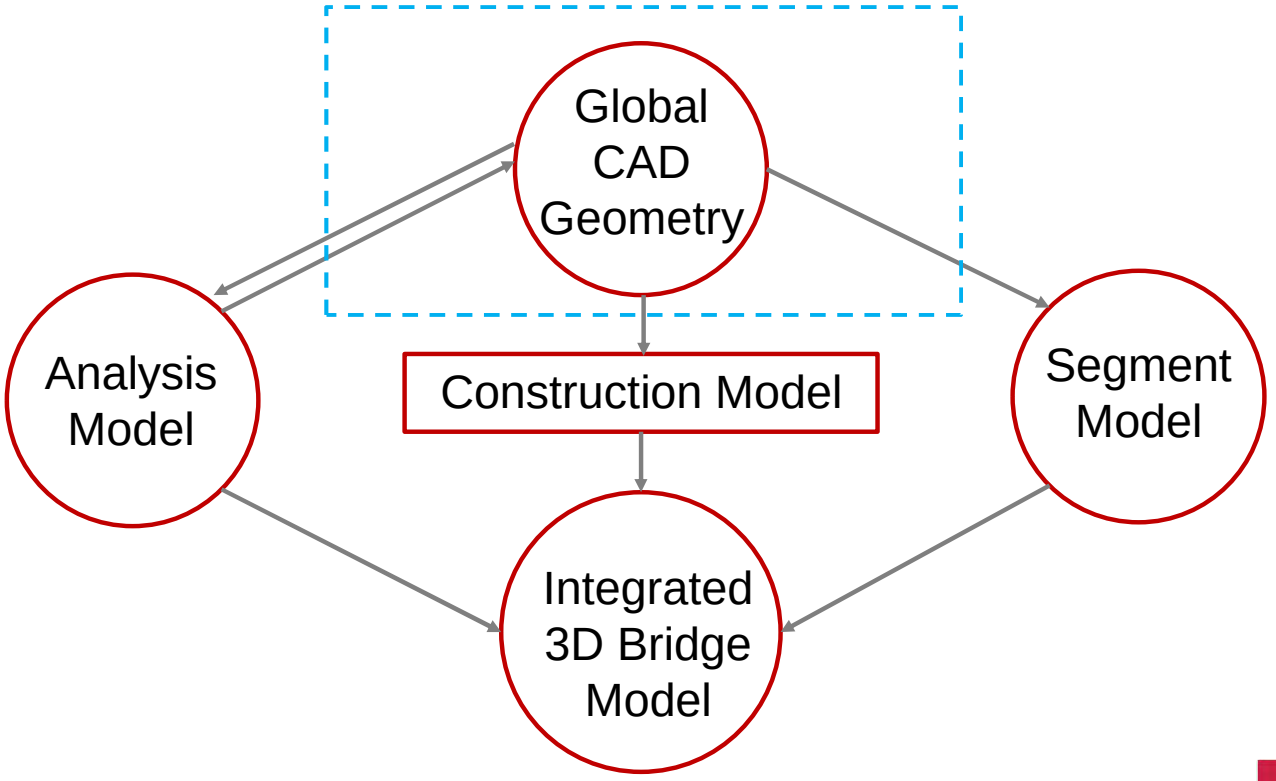
BrIM Workflow – Phase 1

BrIM = Bridge *Integration* Modeling

Phase 1 → Input of Geometry



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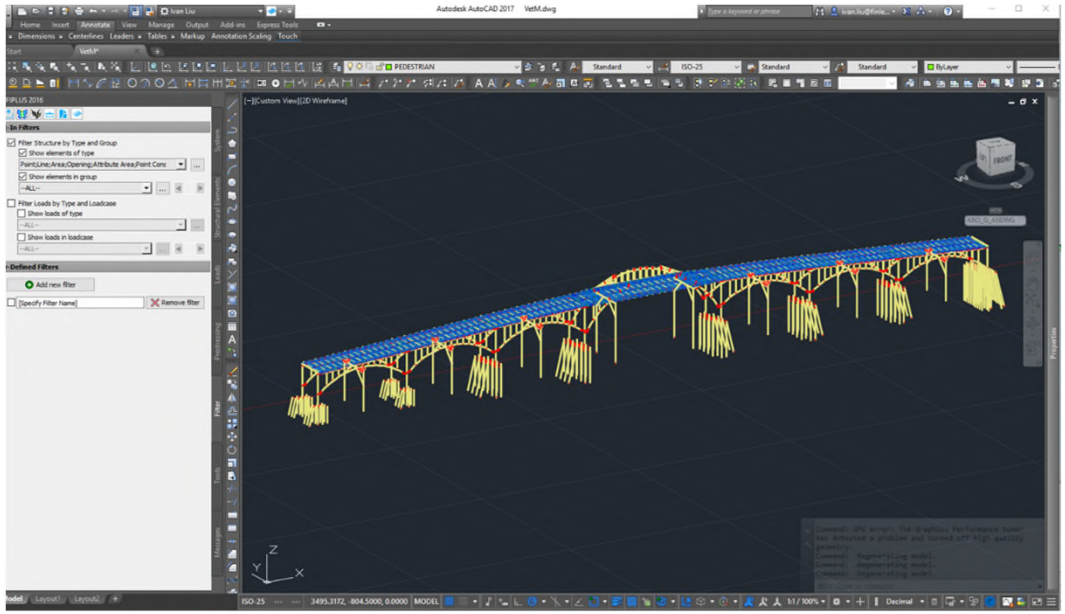
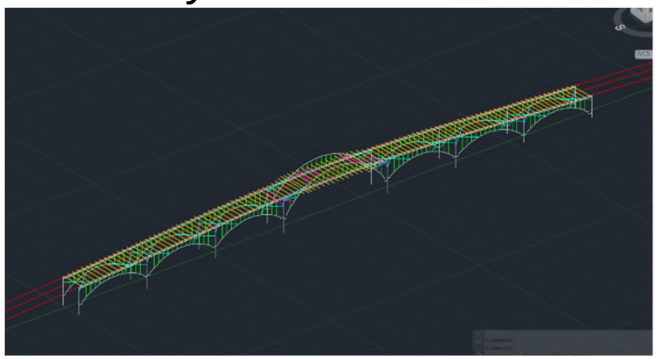
BrIM Workflow – Phase 1

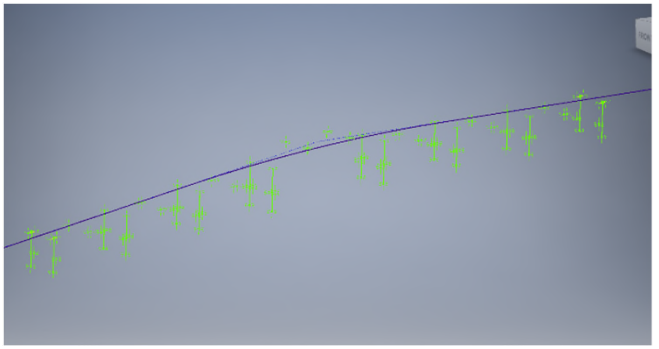
Global CAD Geometry in SOFiPlus:



Geometry in AutoCAD:



Coordinates to Production:



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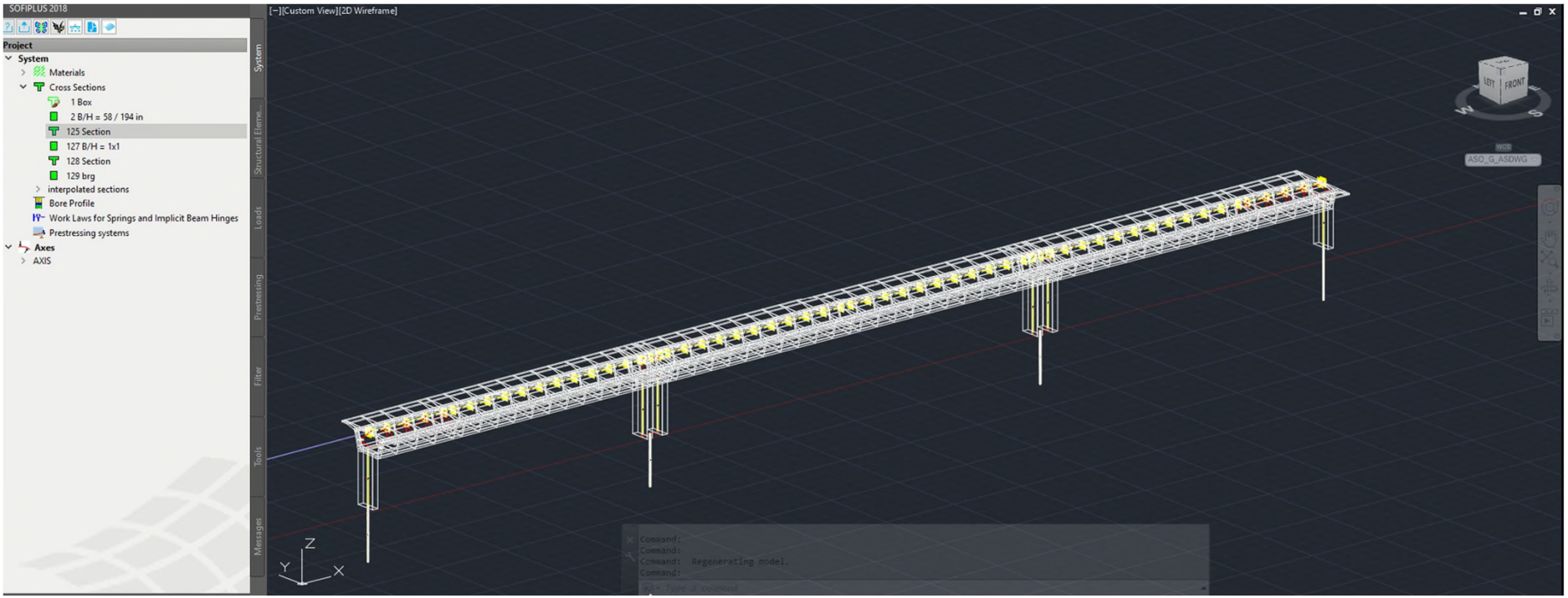
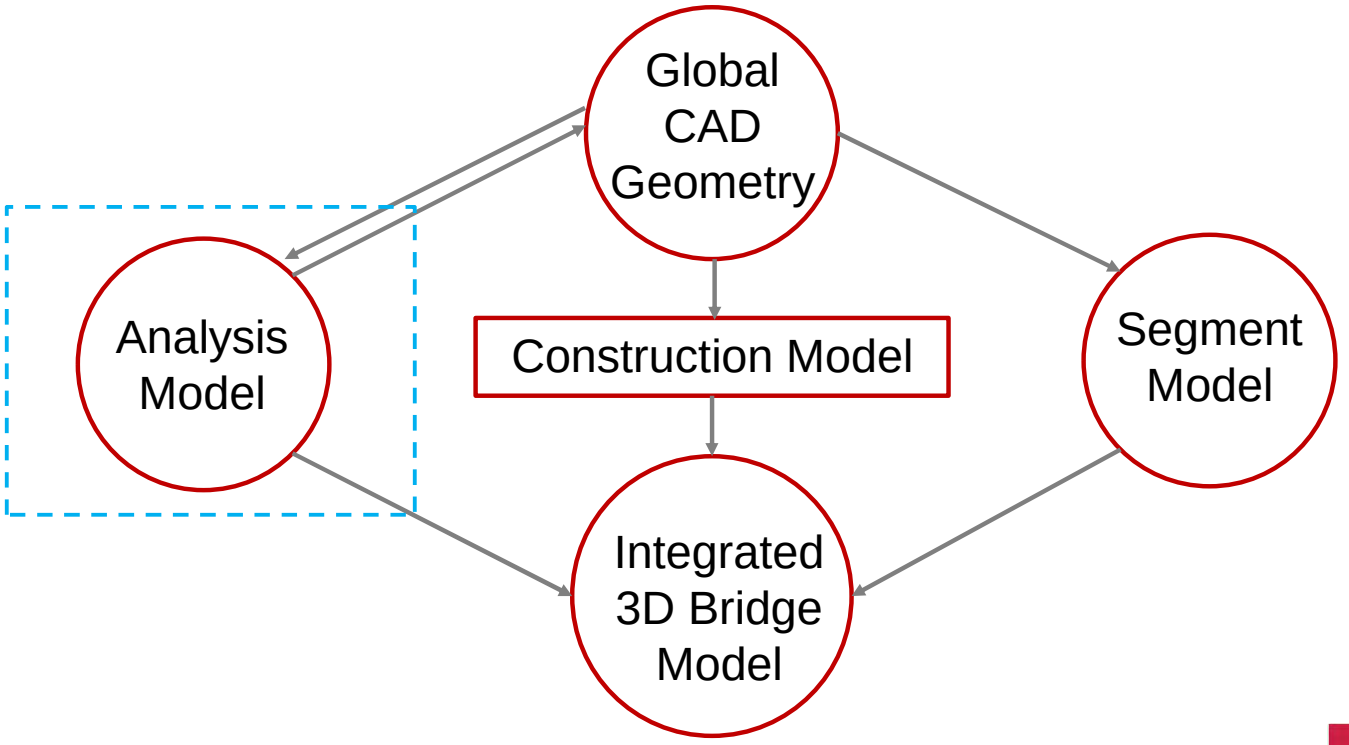
BrIM Workflow – Phase 1



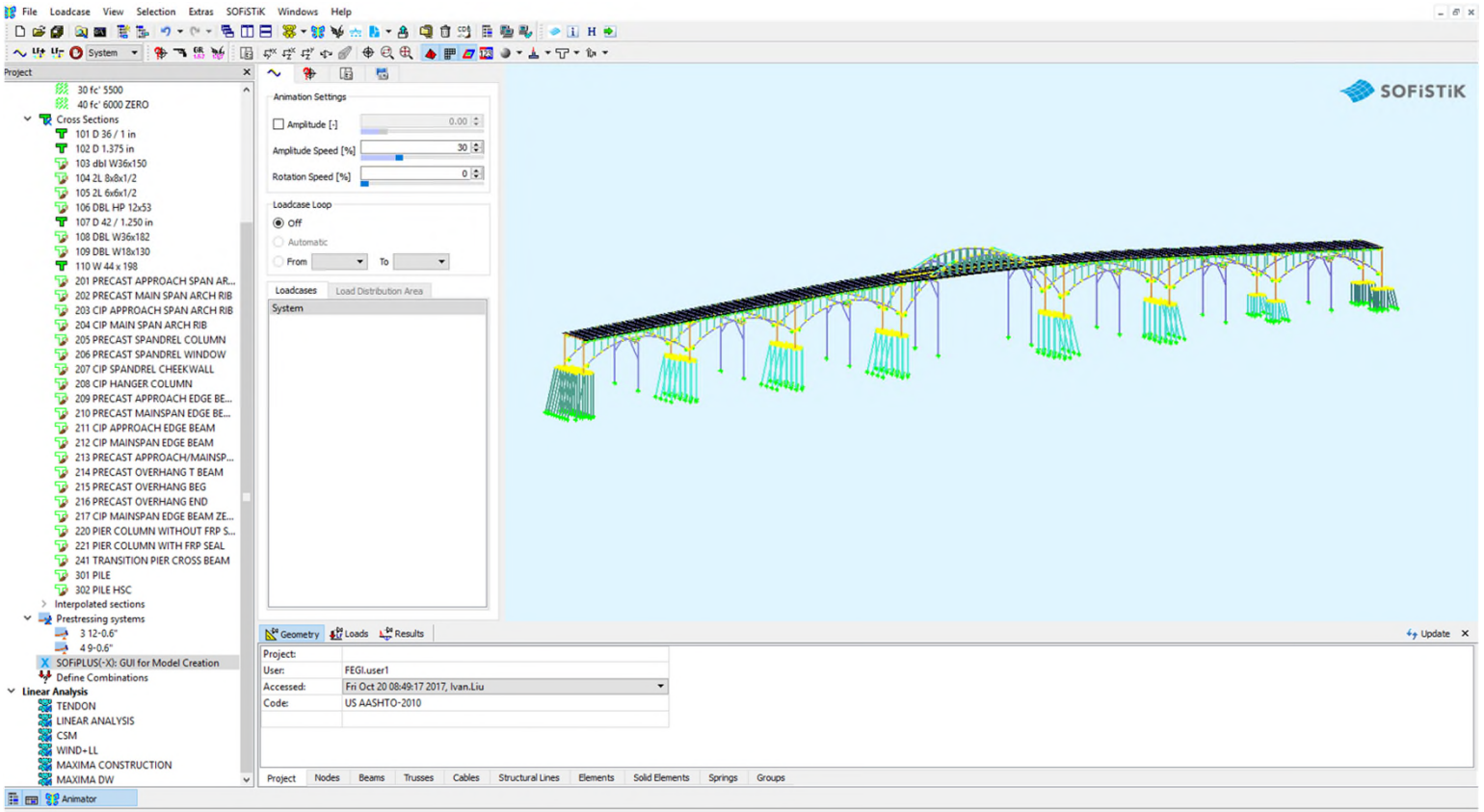
BrIM Workflow – Phase 2 Analysis

BrIM = Bridge *Integration* Modeling

Phase 2 → Development of Models



BrIM Workflow – Phase 2 Analysis



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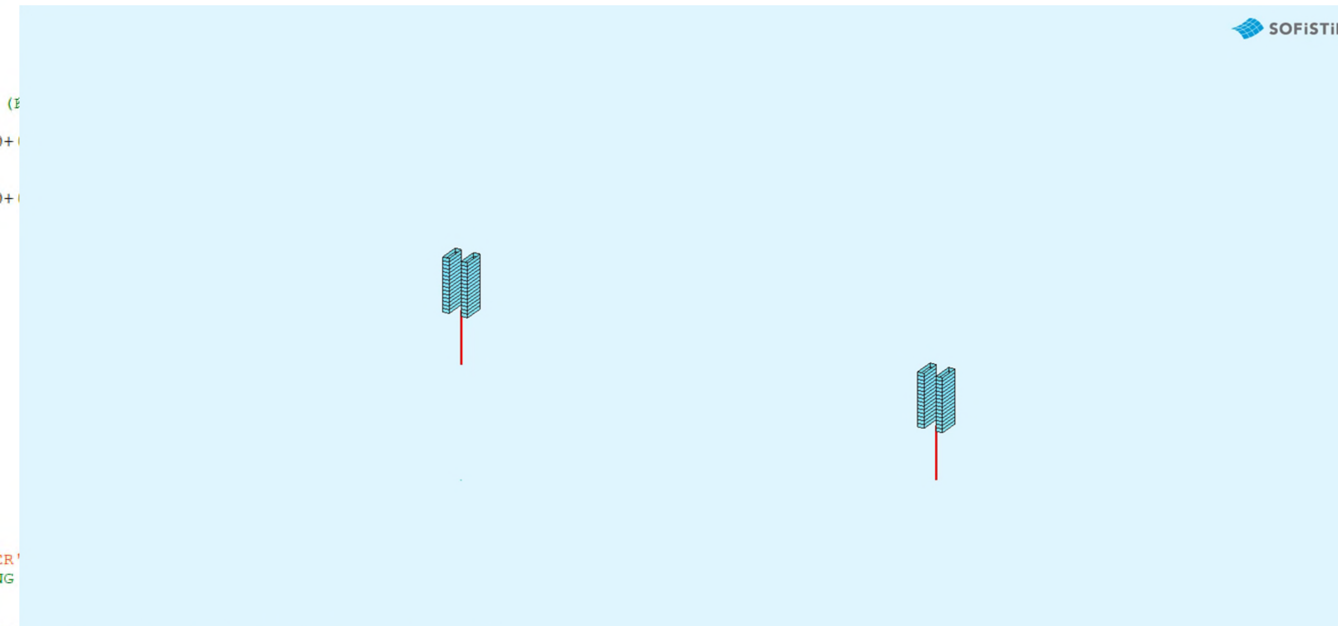
BrIM Workflow – Phase 2 Analysis

```
 $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
 $ DOWNSTATION SEGMENTS OF PIER 2 / UPSTATION SEGMENTS OF PIER 3 $
 $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

LET#J 0

LOOP 9 $#N_DOWN(#SEQ(#I)-1)

 CS #N(#I)*1000+(2*#J+2)*10 TYPE D_1 TITL '2DN/3UP+'
  $ THE NEXT LINE IS USED FOR THE ACTUAL ACTIVATION OF EACH GROUP (
  $PIER 2 DOWNSTATION
  GRP 2*100+(2*#J+2) ICS1 #N(#I)*1000+(2*#J+2)*10 ICSD #N(#I)*1000+

  $PIER 3 UPSTATION
  GRP 3*100+(2*#J+1) ICS1 #N(#I)*1000+(2*#J+2)*10 ICSD #N(#I)*1000+

     $UPDATE STAGE MATRIX (DEFINE CS# IN LOAD ACTION CALCULATED)
     STO#STAGE #N(#I)*1000+(2*#J+2)*10
     STO#STG(#STAGE)     #STAGE
     STO#CSD_1(#STAGE)   #STAGE
     STO#CSD_3(#STAGE)   0
     STO#CSD_4(#STAGE)   0
     STO#CSPS_1(#STAGE)  0
     STO#CSPS_2(#STAGE)  0
     STO#CSPB(#STAGE)    0
     STO#CSZP(#STAGE)    0
     STO#CSCR_1(#STAGE)  0
     STO#CSCR_2(#STAGE)  0
     STO#CSD_7(#STAGE)   0
     STO#CSSL(#STAGE)   0
     STO#CSSL_2(#STAGE)   0
     STO#N_STAGE #N_STAGE+1 $STAGE COUNT

 CS #N(#I)*1000+(2*#J+2)*10+1 TYPE D_7 TITL '2DN/3UP FORM_TRAVELLER'
  $ THE NEXT LINE DEFINES THE FORM TRAVELLER LOAD AND CORRESPONDING
  $PIER 2 DOWNSTATION
  IF #J<8
   LC 1*1000+(2*#J+2)*10+1 ICS1 #N(#I)*1000+(2*#J+2)*10+1 ATIL #N(#I)
  ELSE
   LC 1*1000+(2*#J+2)*10+1 ICS1 #N(#I)*1000+(2*#J+2)*10+1 ATIL 1250  $REMOVE LOAD AT 8-10D DOWN+ STAGE
```



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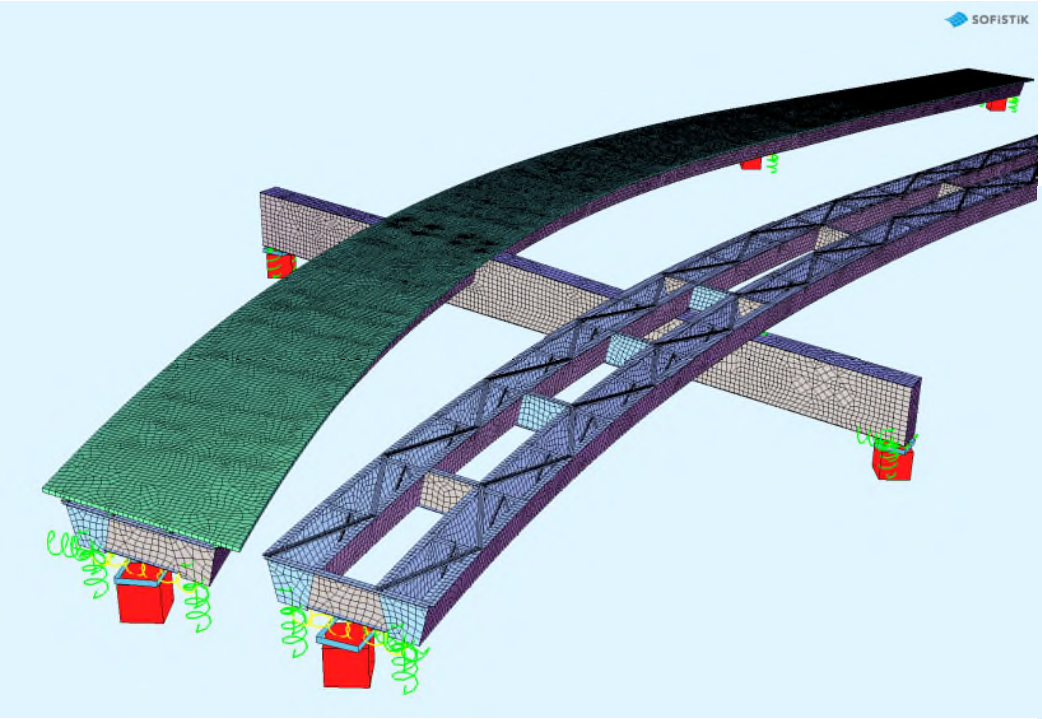
BrIM Workflow – Phase 2 Analysis



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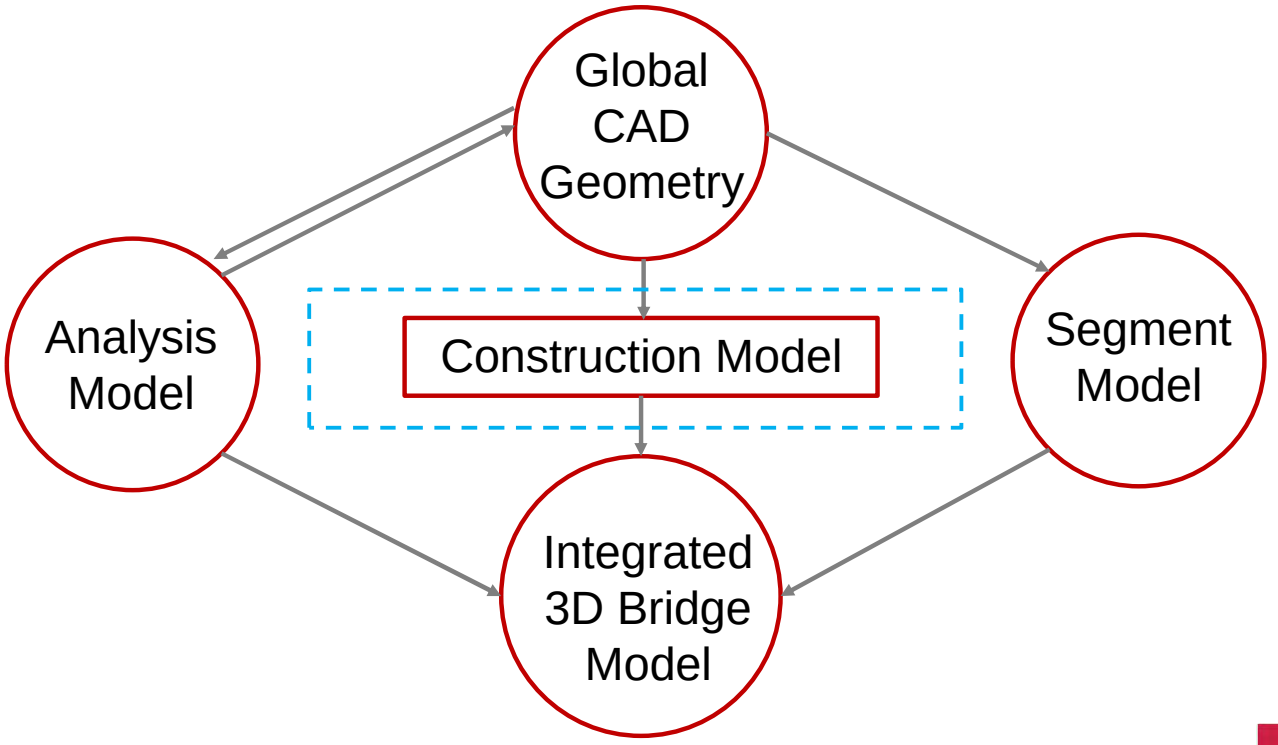
BrIM Workflow – Phase 2 Construction

BrIM = Bridge *Integration* Modeling

Phase 2 → Development of Models



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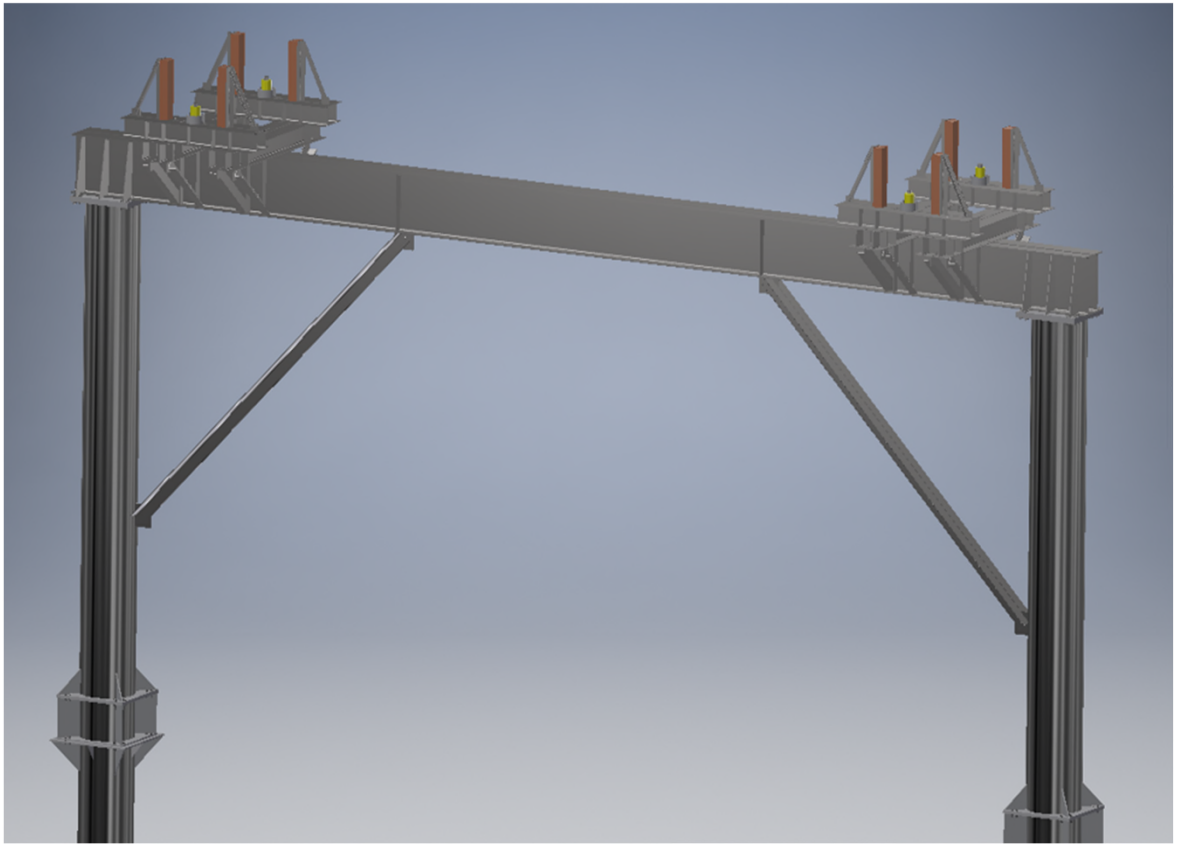
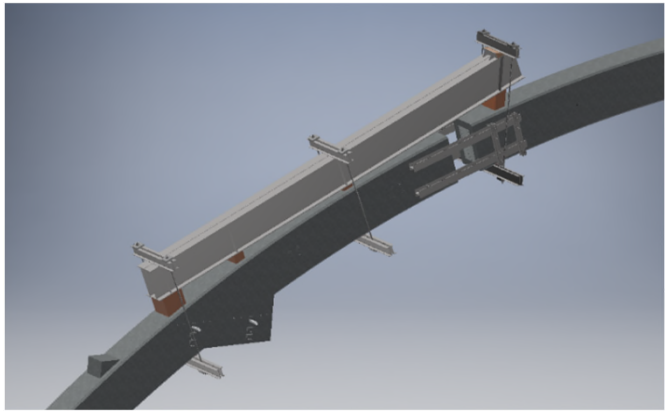
BrIM Workflow – Phase 2 Construction





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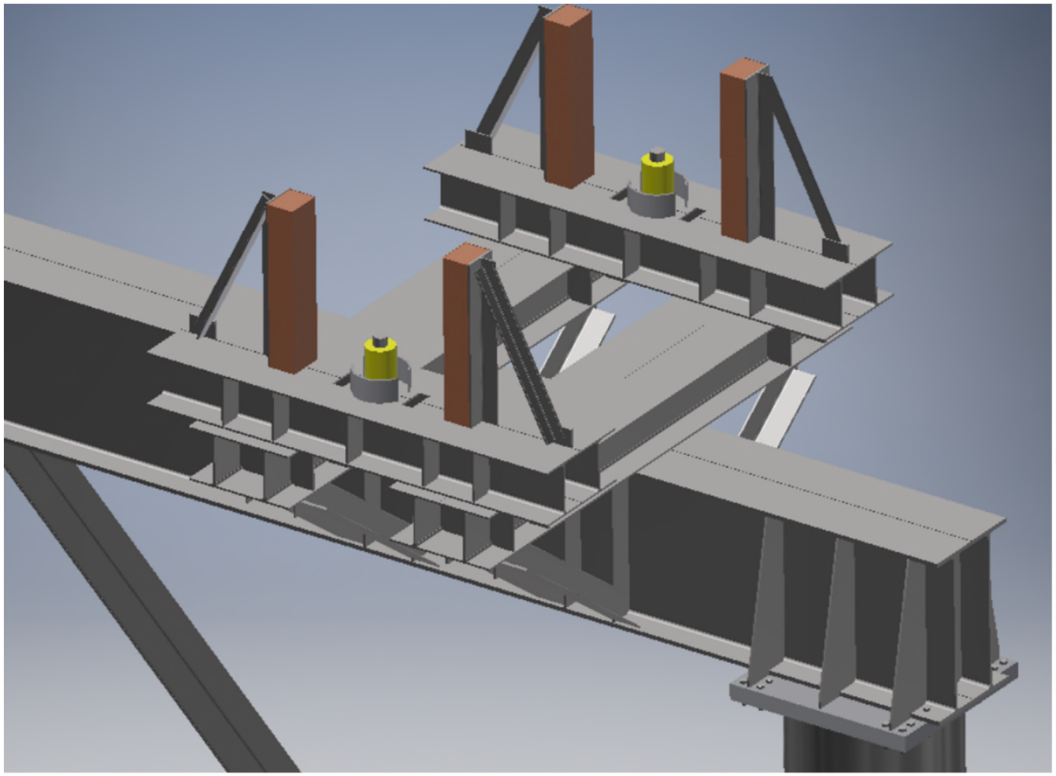
BrIM Workflow – Phase 2 Construction



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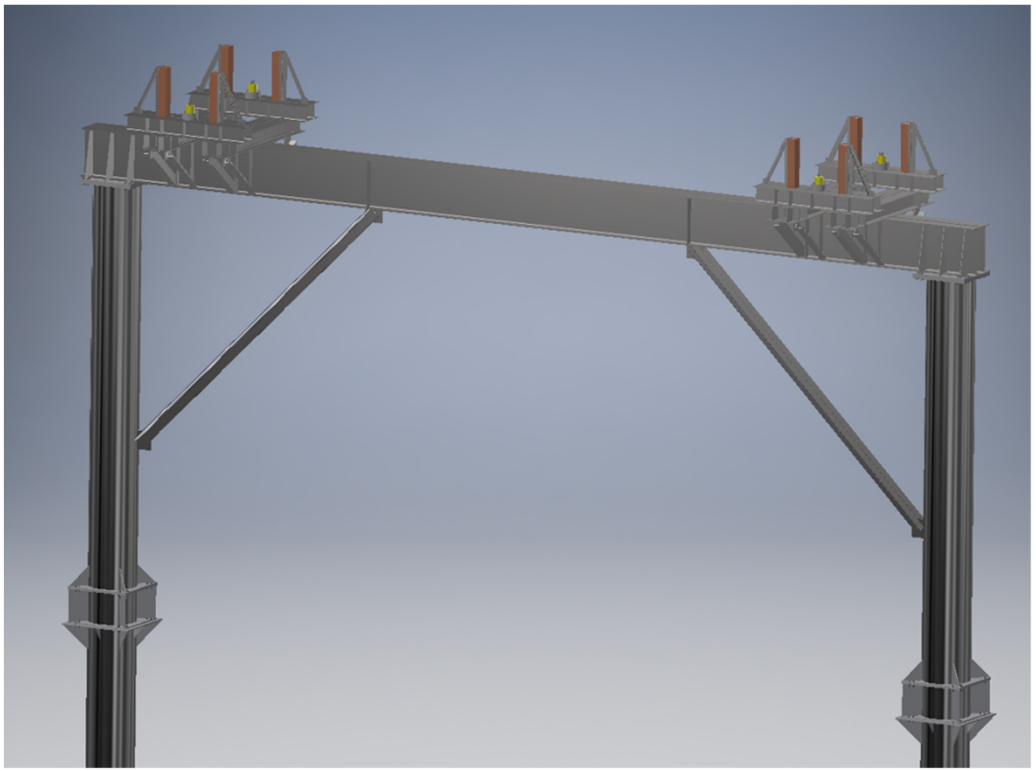
BrIM Workflow – Phase 2 Construction



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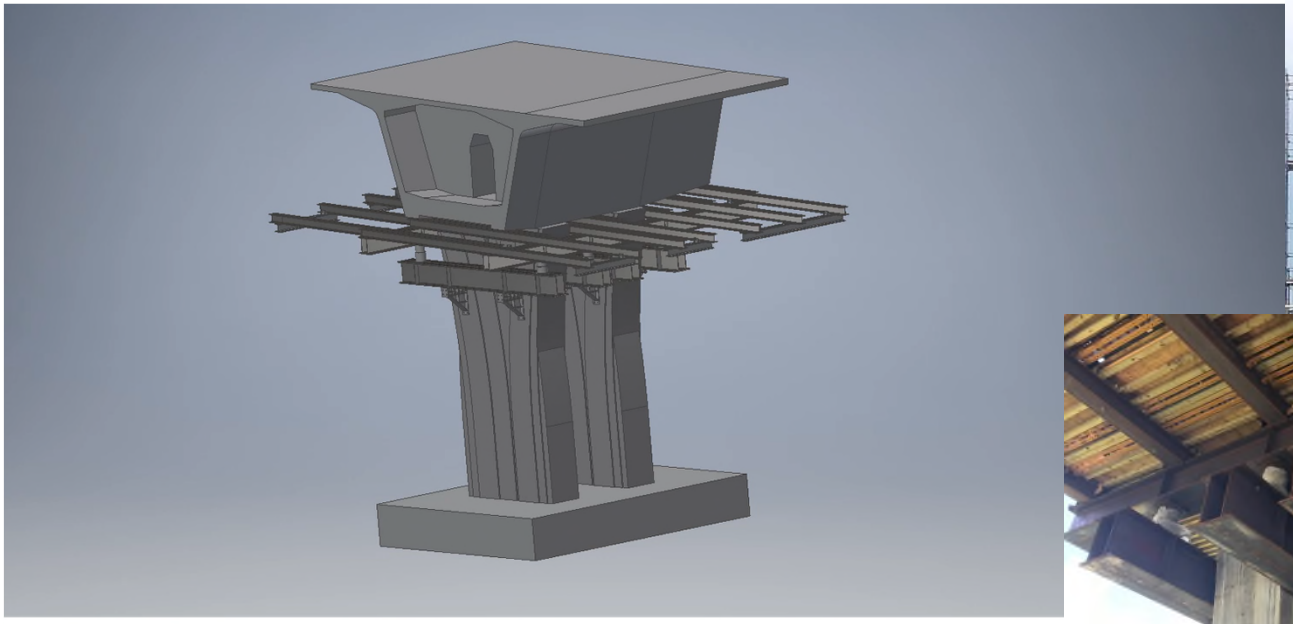
BrIM Workflow – Phase 2 Construction



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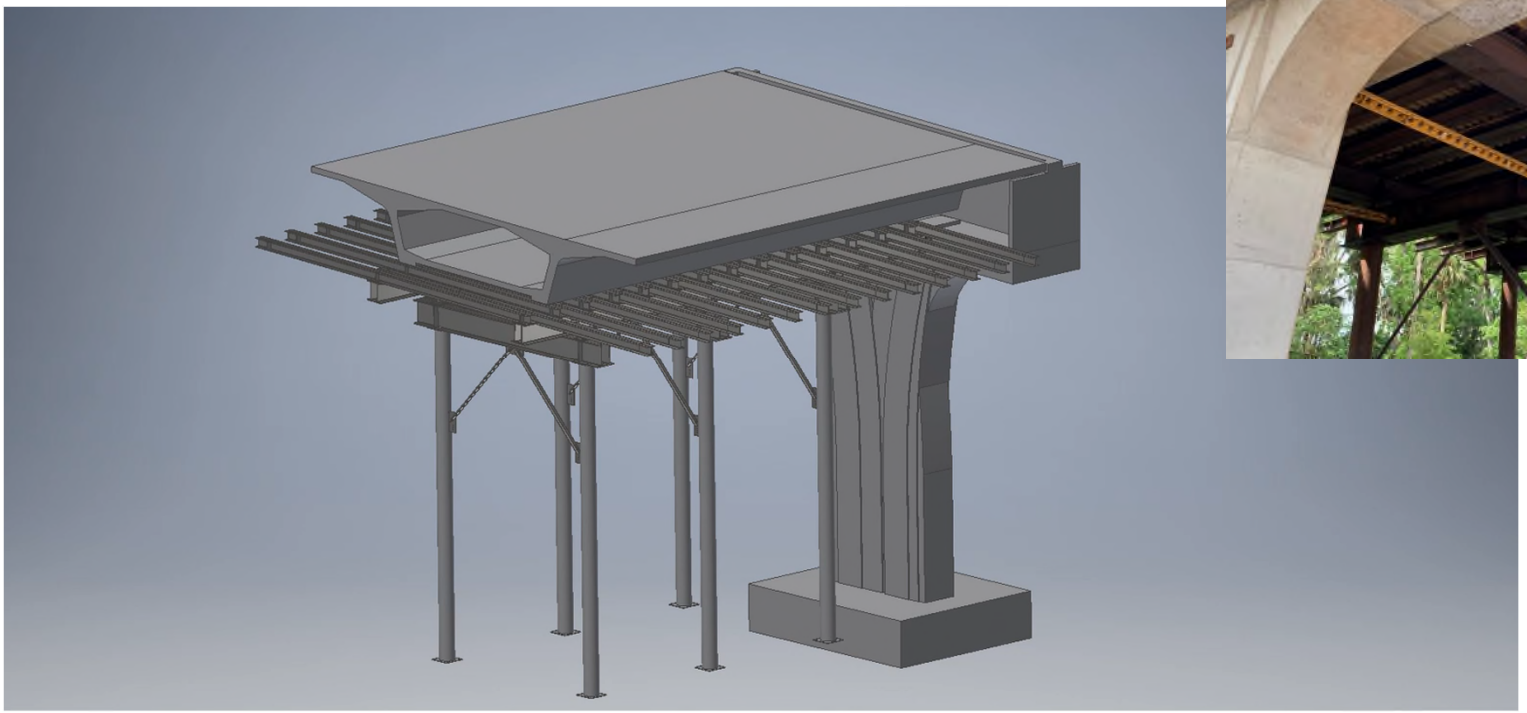
BrIM Workflow – Phase 2 Construction



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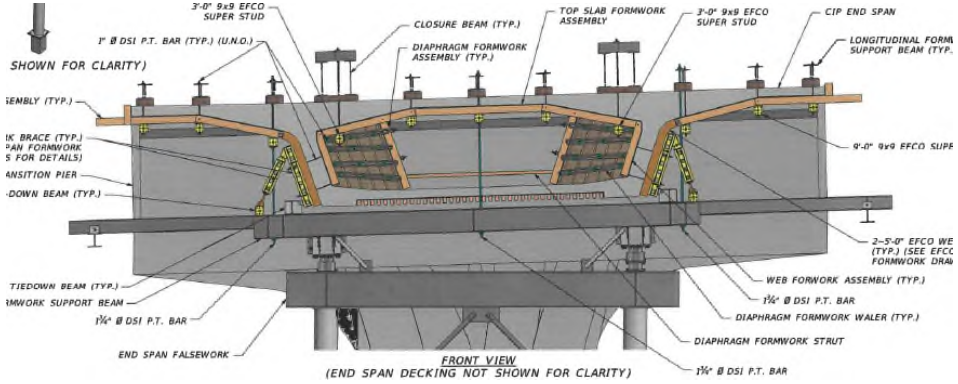
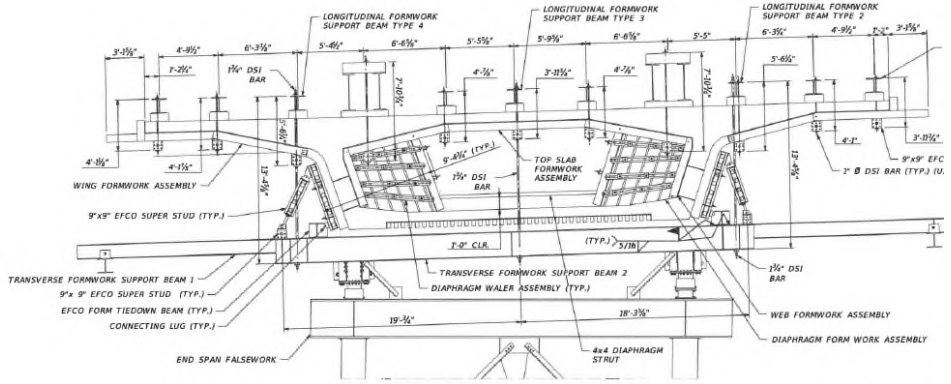
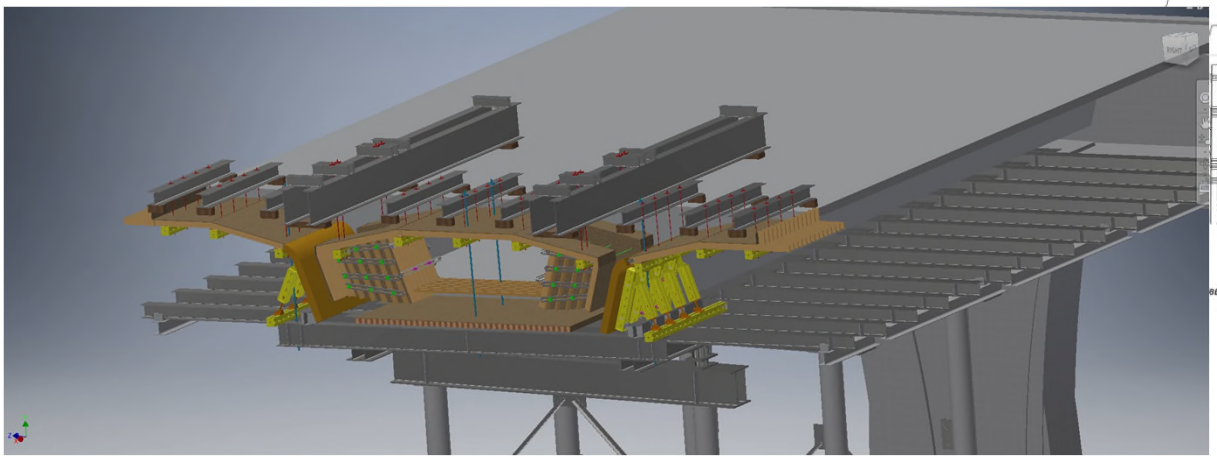
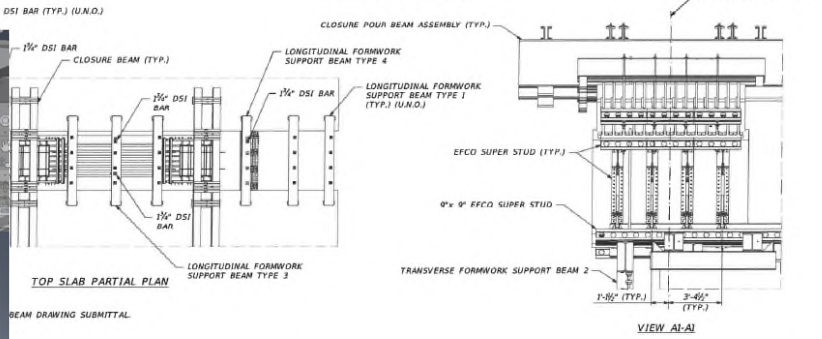
BrIM Workflow – Phase 2 Construction









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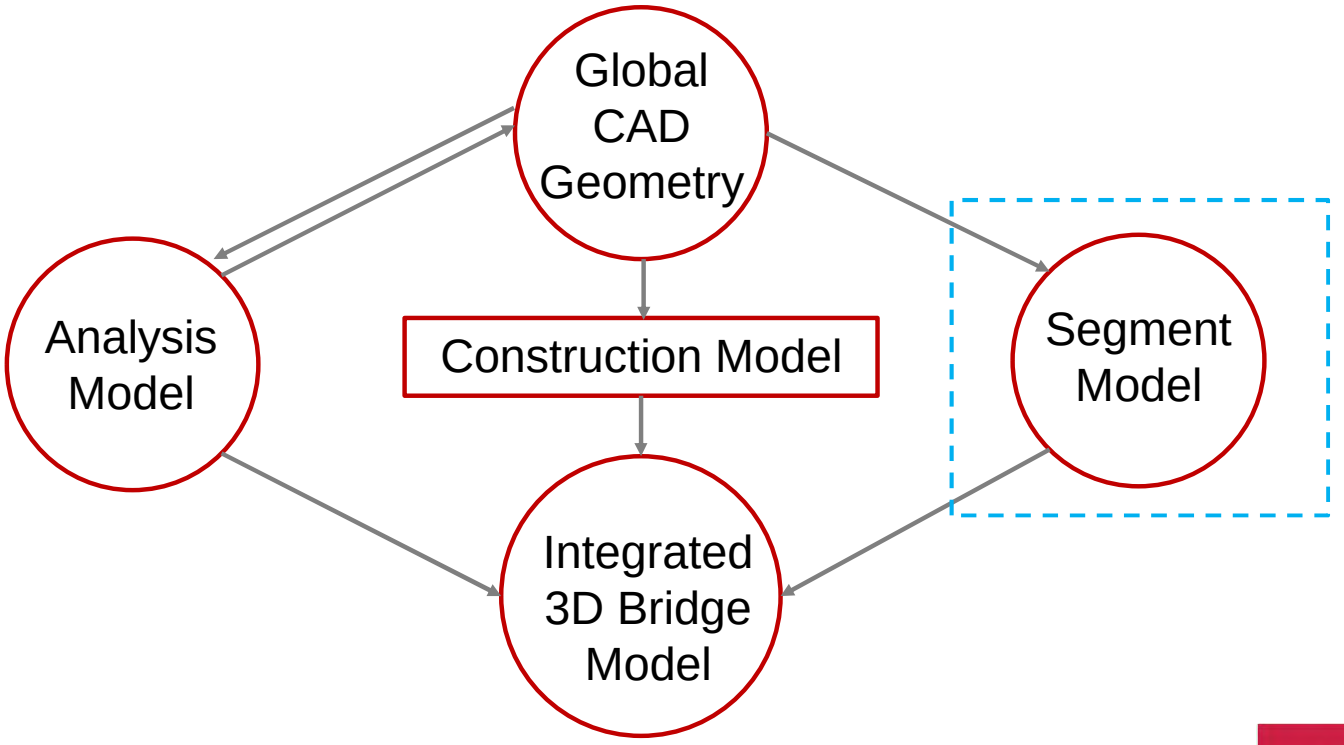
BrIM Workflow – Phase 2 Segment

BrIM = Bridge *Integration* Modeling

Phase 2 → Development of Models



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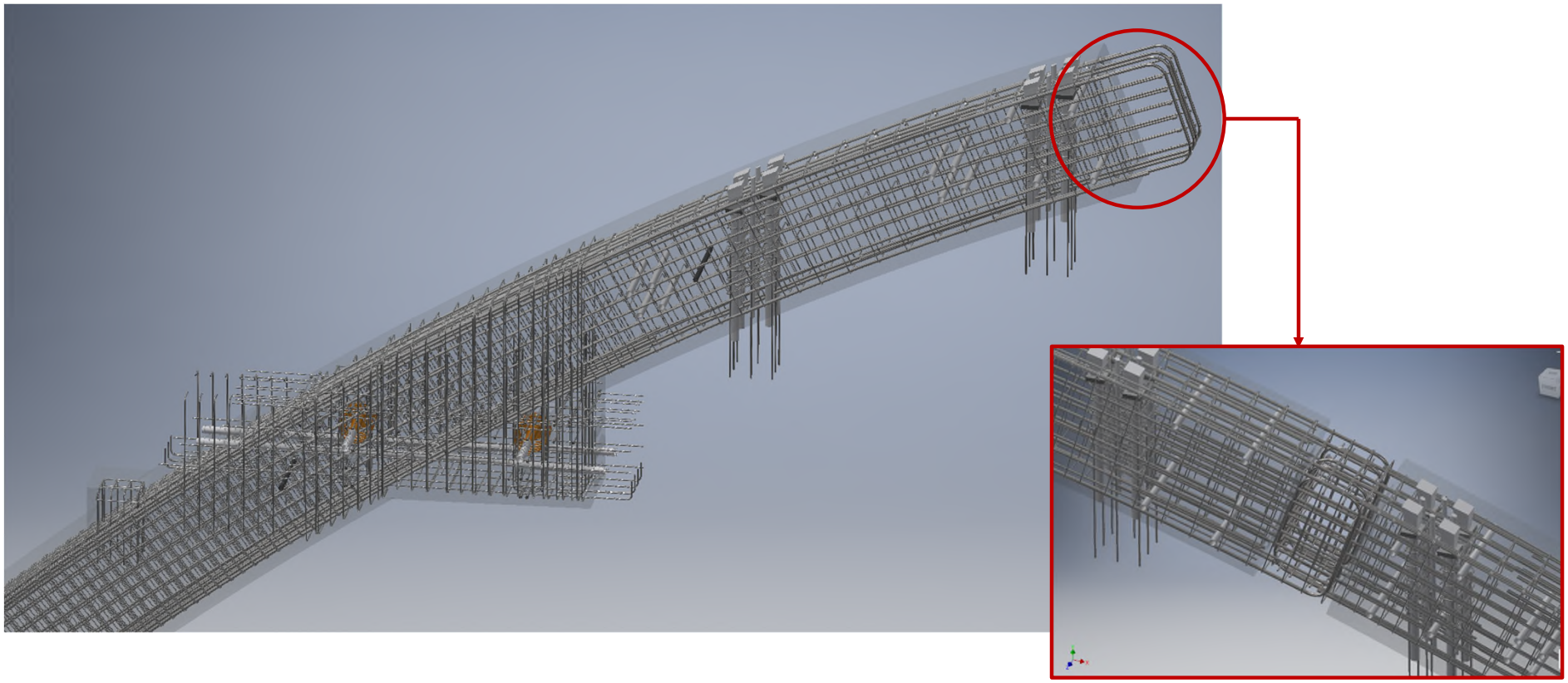

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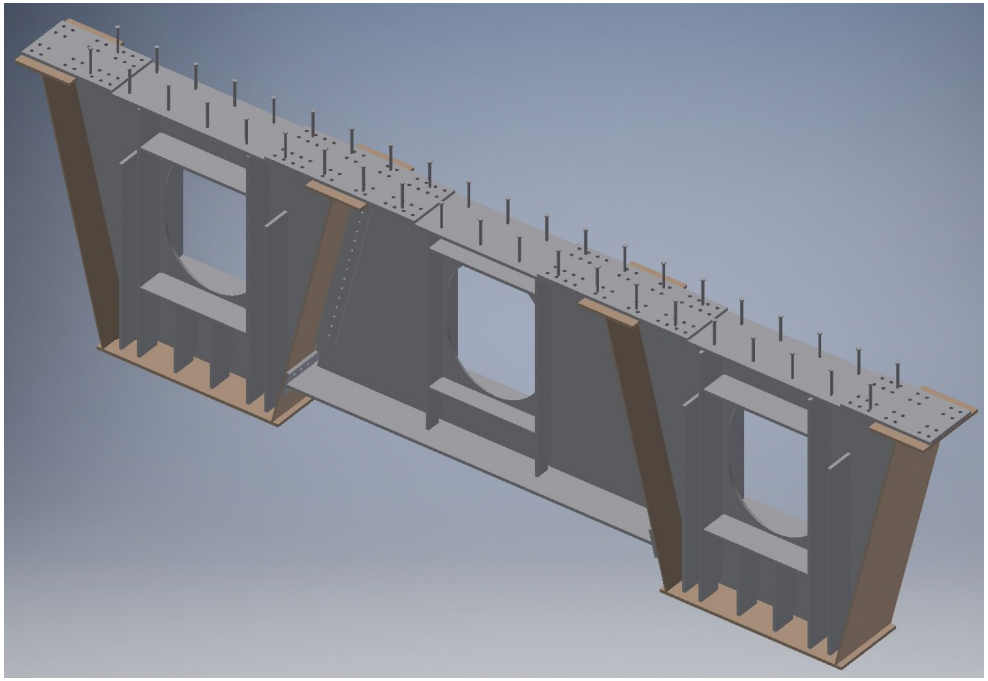
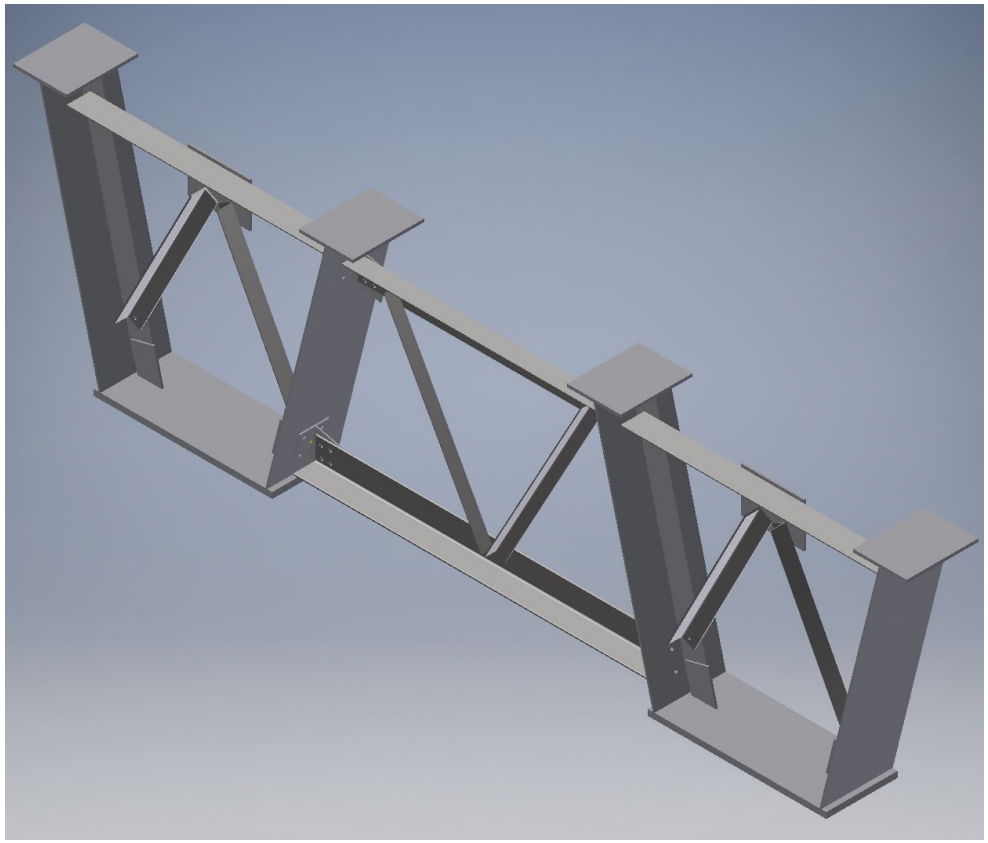
BrIM Workflow – Phase 2 Segment





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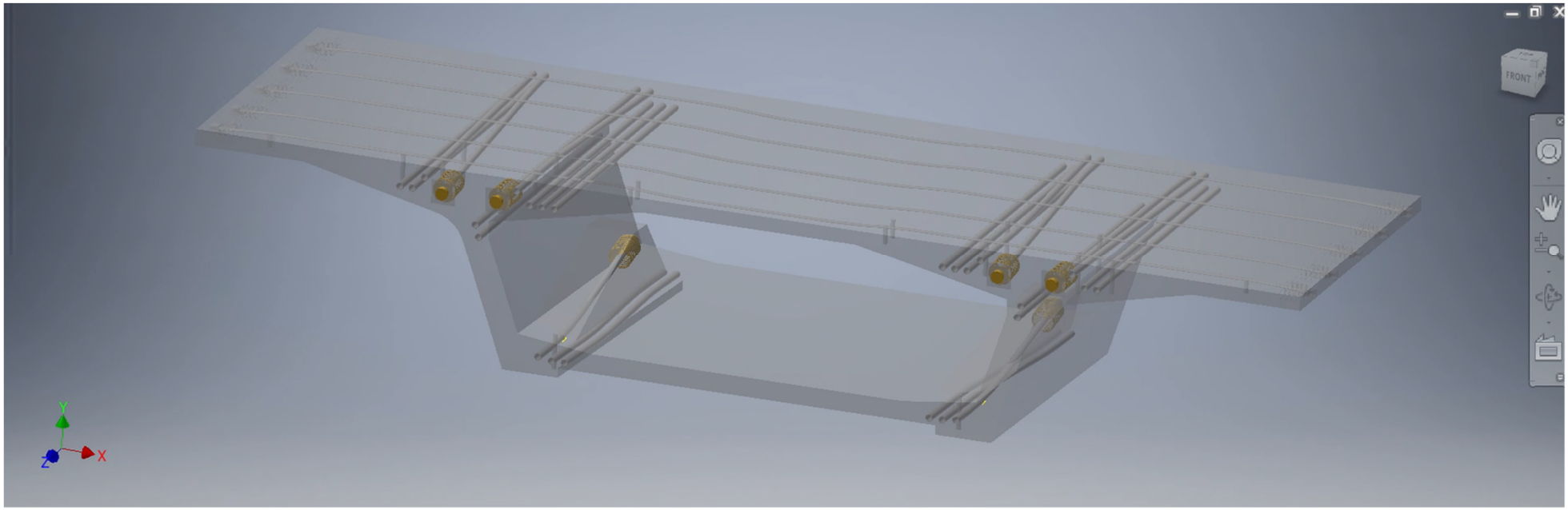
BrIM Workflow – Phase 2 Segment



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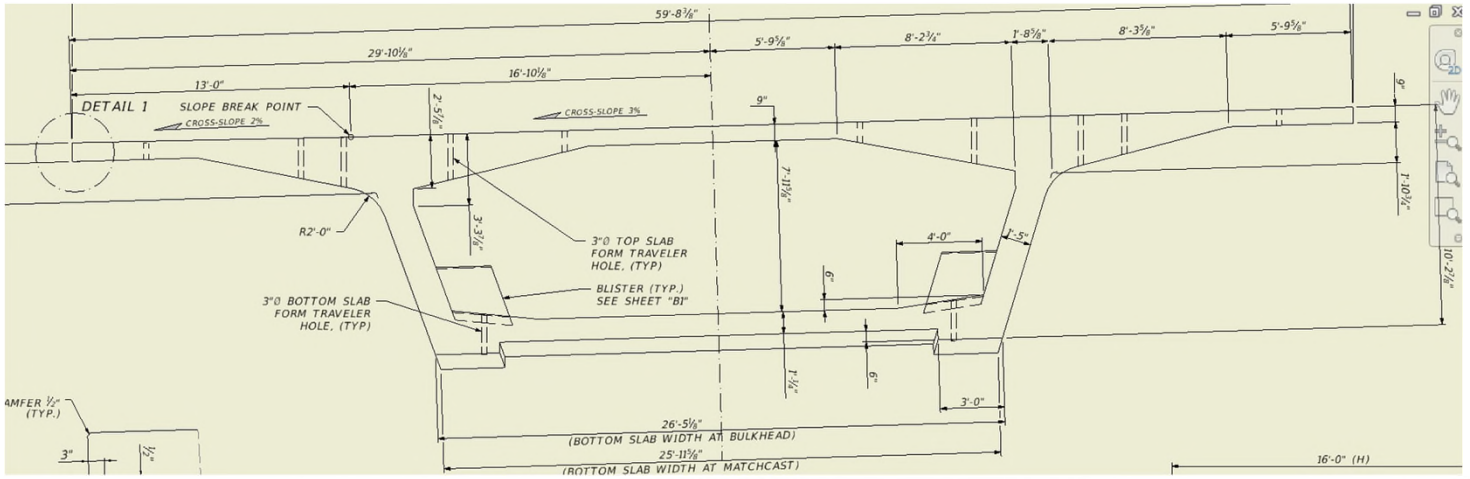
BrIM Workflow – Phase 2 Segment



REINFORCEMENT QUANTITIES

BARMARK	DESCRIPTION	ITEM QTY	SIZE	TYPE	LENGTH	A	B	C	D	E	F	G	H	I	J	K	L	N	O	R	DIM LIMIT	TOTAL LBS
4TS01a	Bottom Slab Batt	1	#4	13	27'-8 3/4"		26'-6"	8"	8"									71.57	71.57			18.5
4TS01b	Bottom Slab Batt	1	#4	13	27'-8 1/2"		26'-6"	8"	8"									71.57	71.57			18.5
4TS01c	Bottom Slab Batt	1	#4	13	27'-8 1/4"		26'-5 3/4"	8"	8"									71.57	71.57			18.5
4TS01d	Bottom Slab Batt	1	#4	13	27'-8"		26'-5 1/4"	8"	8"									71.57	71.57			18.5
4TS01e	Bottom Slab Batt	1	#4	13	27'-7 3/4"		26'-5 1/4"	8"	8"									71.57	71.57			18.5
4TS01f	Bottom Slab Batt	1	#4	13	27'-7 1/2"		26'-5"	8"	8"									71.57	71.57			18.5
4TS01g	Bottom Slab Batt	1	#4	13	27'-7 1/4"		26'-4 3/4"	8"	8"									71.57	71.57			18.4
4TS01h	Bottom Slab Batt	1	#4	13	27'-7"		26'-4 1/2"	8"	8"									71.57	71.57			18.4
4TS01i	Bottom Slab Batt	1	#4	13	27'-7"		26'-4 1/4"	8"	8"									71.57	71.57			18.4
4TS01j	Bottom Slab Batt	1	#4	13	27'-6 3/4"		26'-4"	8"	8"									71.57	71.57			18.4
4TS01k	Bottom Slab Batt	1	#4	13	27'-6 1/2"		26'-3 3/4"	8"	8"									71.57	71.57			18.4
4TS01l	Bottom Slab Batt	1	#4	13	27'-6 1/4"		26'-3 1/2"	8"	8"									71.57	71.57			18.4
4TS01m	Bottom Slab Batt	1	#4	13	27'-6"		26'-3 1/4"	8"	8"									71.57	71.57			18.4
4TS01n	Bottom Slab Batt	1	#4	13	27'-5 3/4"		26'-3 1/4"	8"	8"									71.57	71.57			18.4
4TS01o	Bottom Slab Batt	1	#4	13	27'-5 1/2"		26'-3"	8"	8"									71.57	71.57			18.3
4TS01p	Bottom Slab Batt	1	#4	13	27'-5 1/4"		26'-2 3/4"	8"	8"									71.57	71.57			18.3
4TS01q	Bottom Slab Batt	1	#4	13	27'-5"		26'-2 1/2"	8"	8"									71.57	71.57			18.3
4TS01r	Bottom Slab Batt	1	#4	13	27'-4 3/4"		26'-2 1/4"	8"	8"									71.57	71.57			18.3
4TS01s	Bottom Slab Batt	1	#4	13	27'-4 1/2"		26'-2"	8"	8"									71.57	71.57			18.3
4TS01t	Bottom Slab Batt	1	#4	13	27'-4 1/4"		26'-1 3/4"	8"	8"									71.57	71.57			18.3
4TS01u	Bottom Slab Batt	1	#4	13	27'-4 1/4"		26'-1 1/2"	8"	8"									71.57	71.57			18.3
4TS01v	Bottom Slab Batt	1	#4	13	27'-4"		26'-1 1/4"	8"	8"									71.57	71.57			18.3

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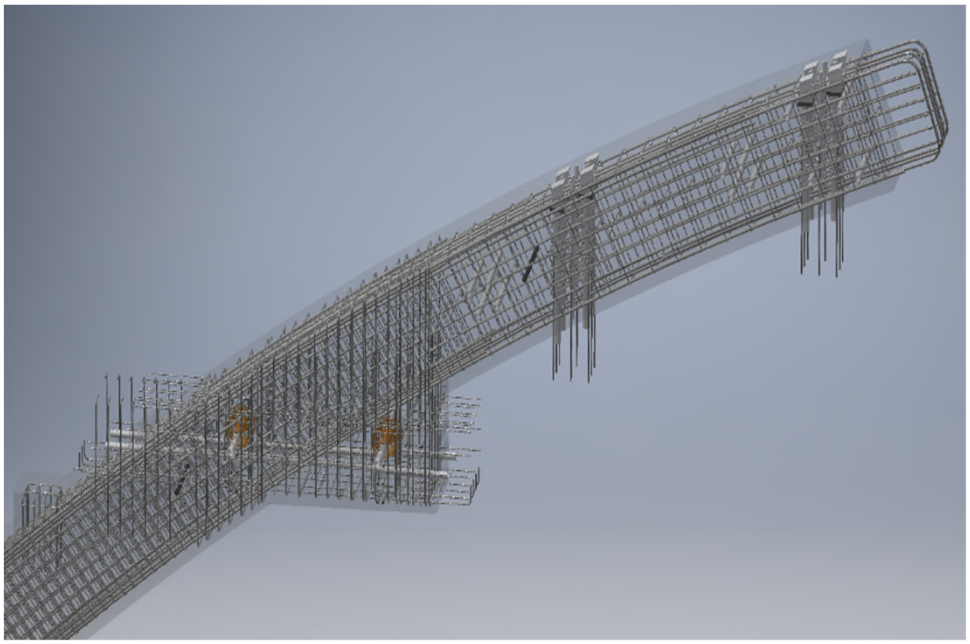
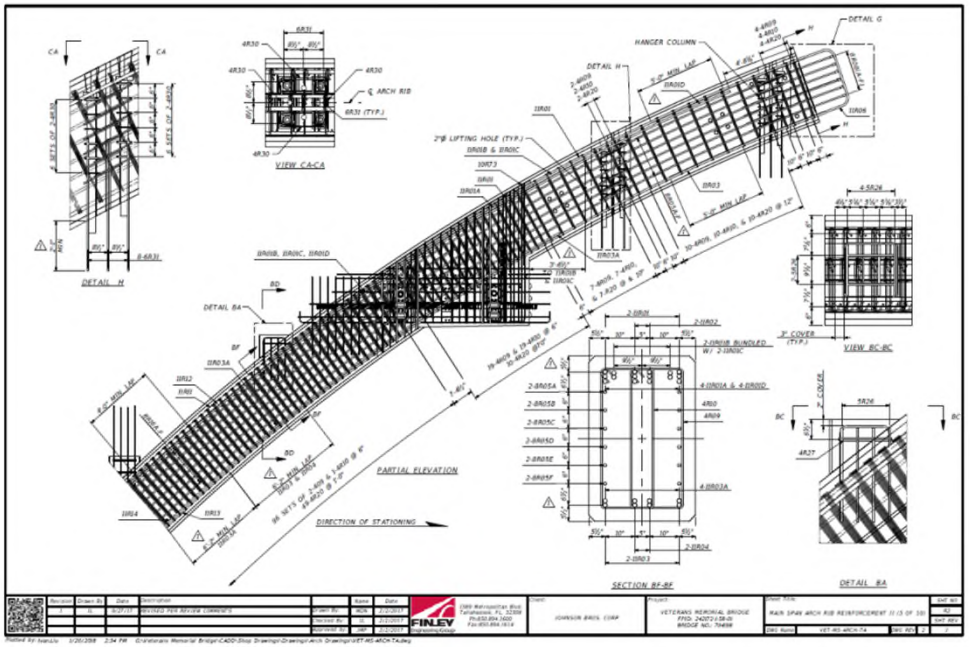
BrIM Workflow – Phase 2 Segment

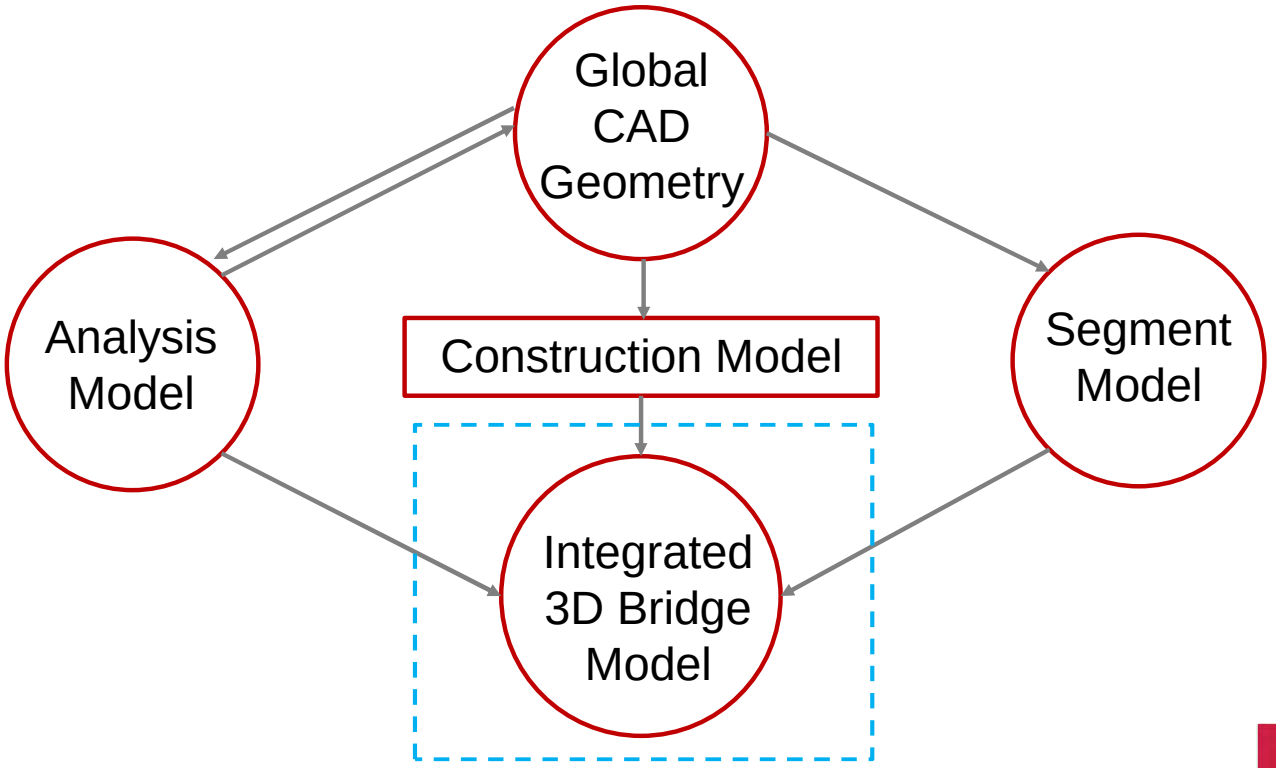




BrIM Workflow – Phase 3 Integrated 3D Model

BrIM = Bridge *Integration* Modeling

Phase 3 → Assemble Integrated Model



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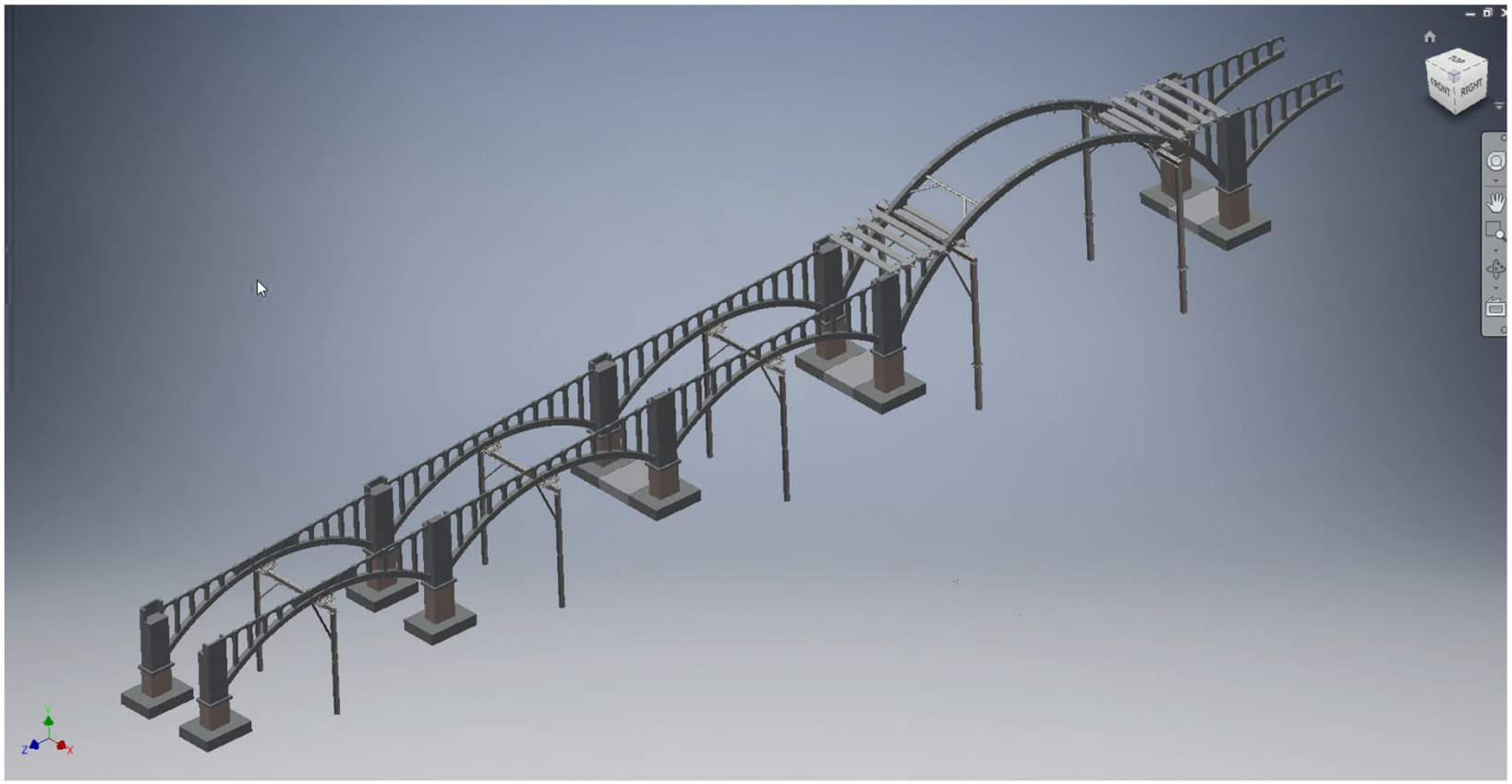
BrIM Workflow – Phase 3 Integrated 3D Model



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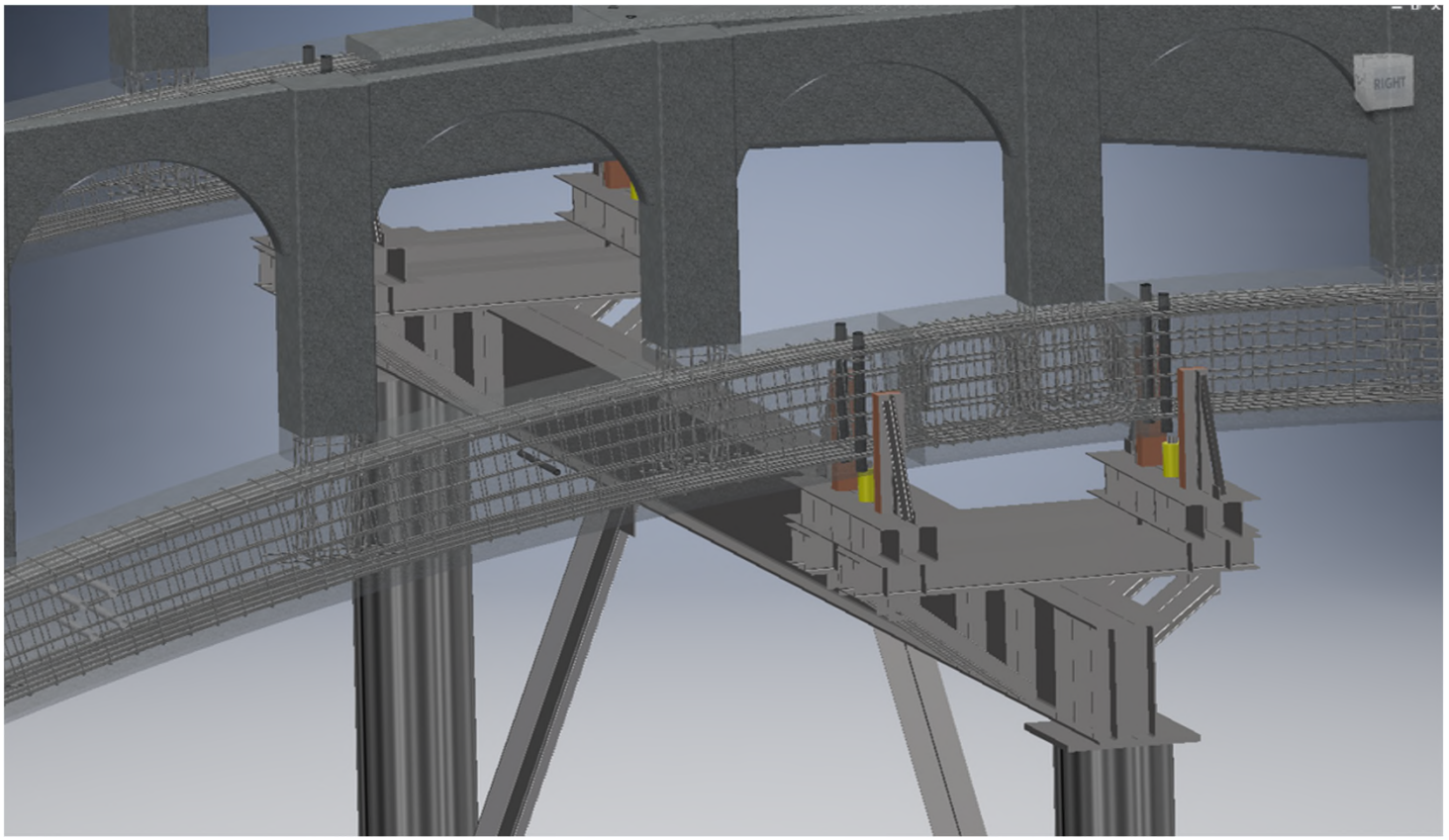
BrIM Workflow – Phase 3 Integrated 3D Model



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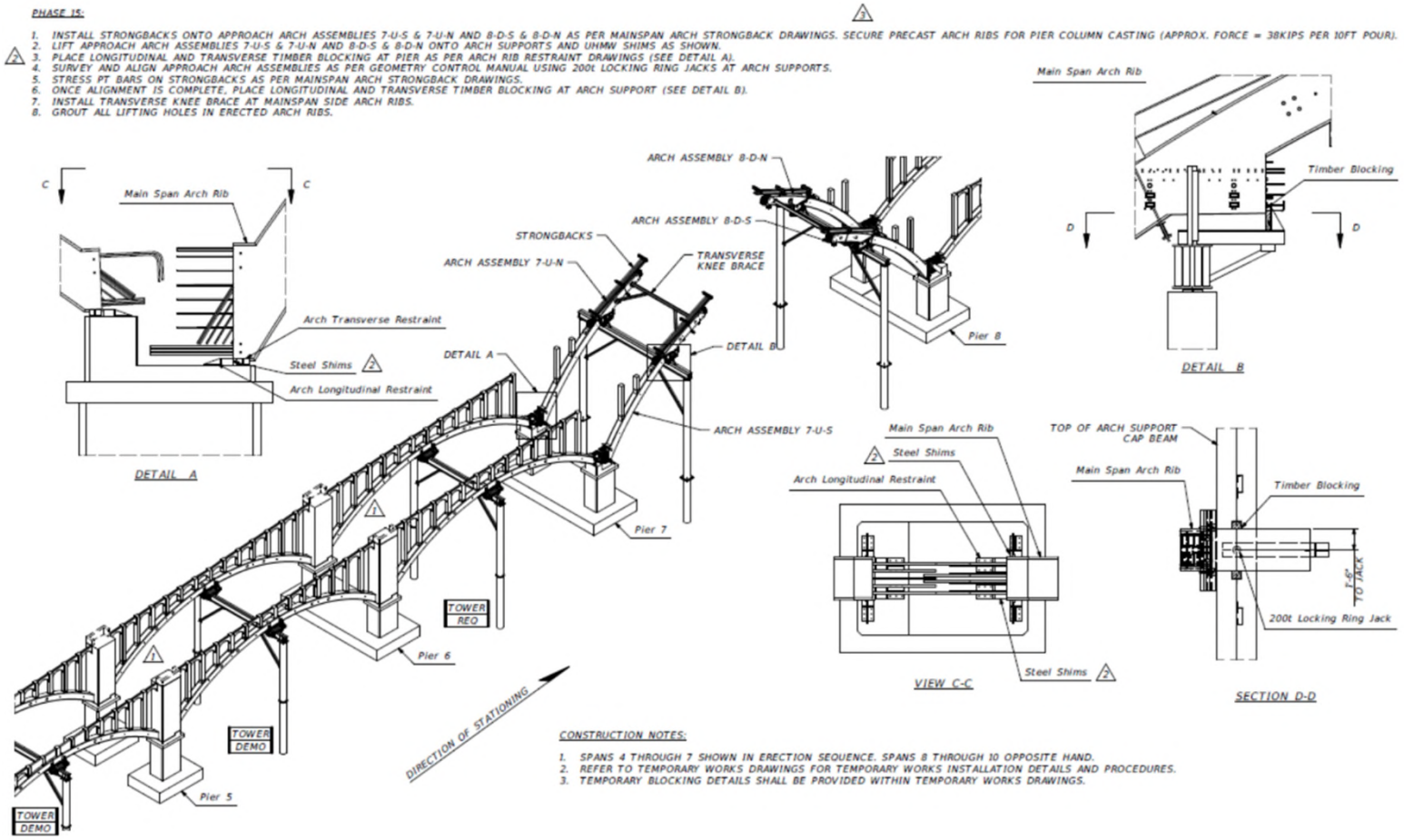
BrIM Workflow – Phase 3 Integrated 3D Model



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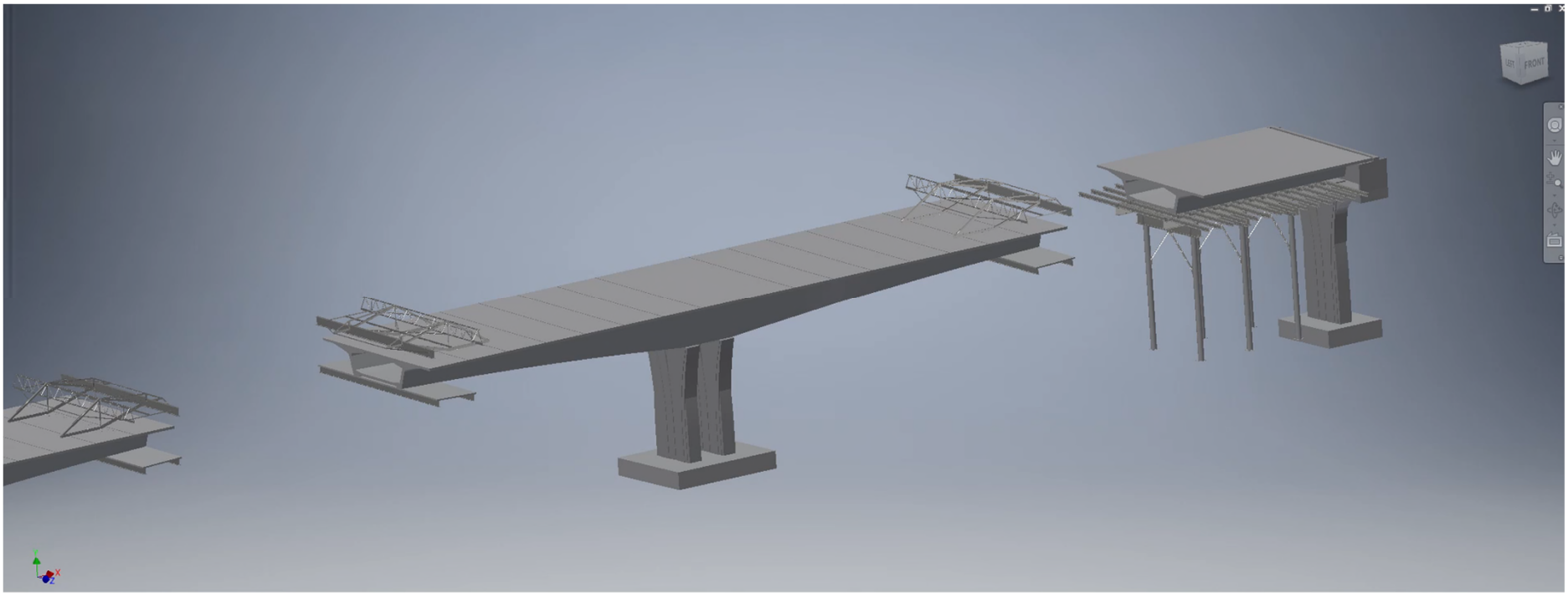
BrIM Workflow – Phase 3 Integrated 3D Model



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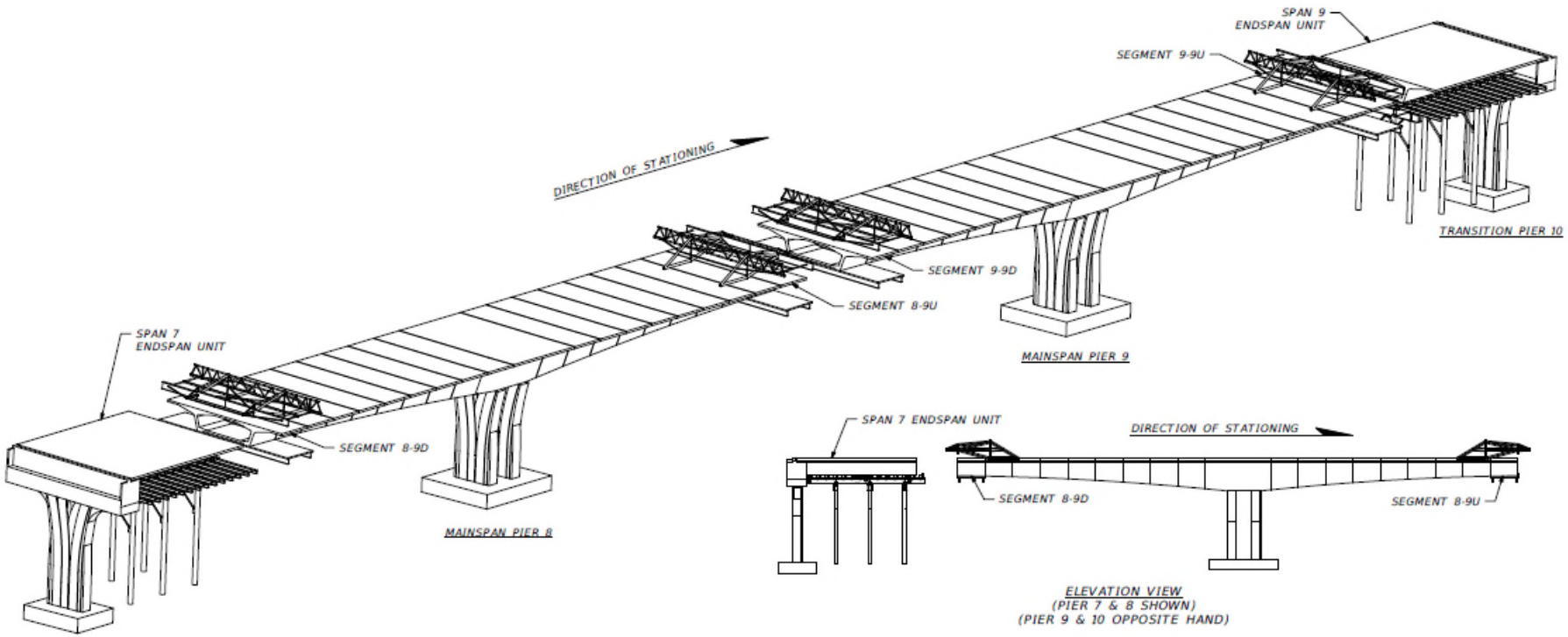
BrIM Workflow – Phase 3 Integrated 3D Model



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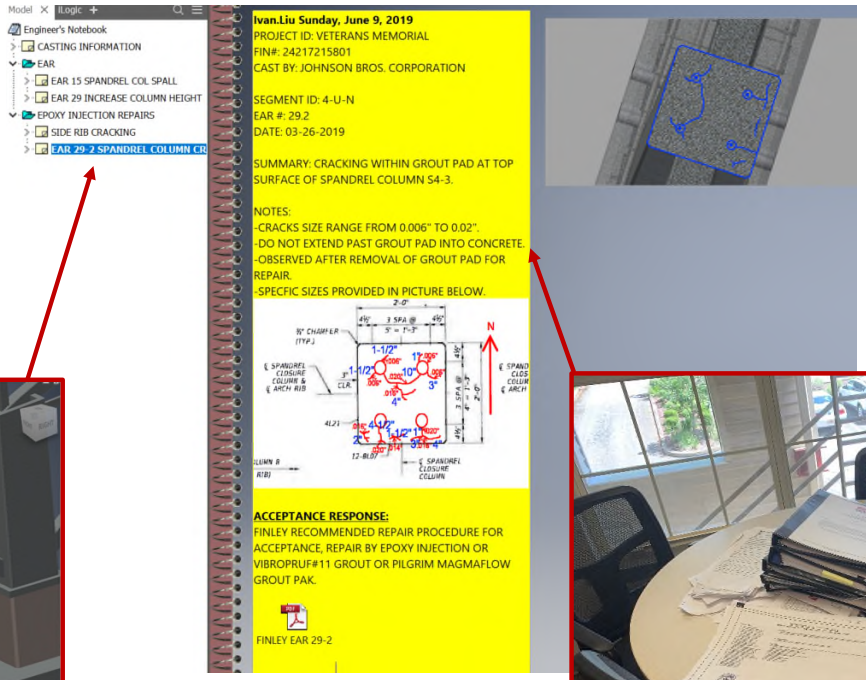
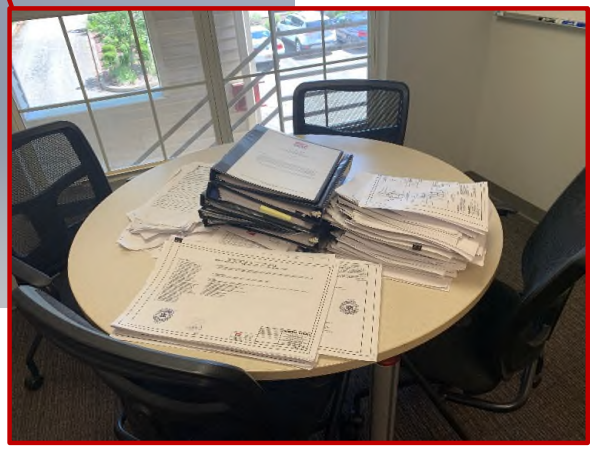
Asset Management

Bridge Asset Management:

- As-Built Records
- Repair Procedures
- Inspection Notes





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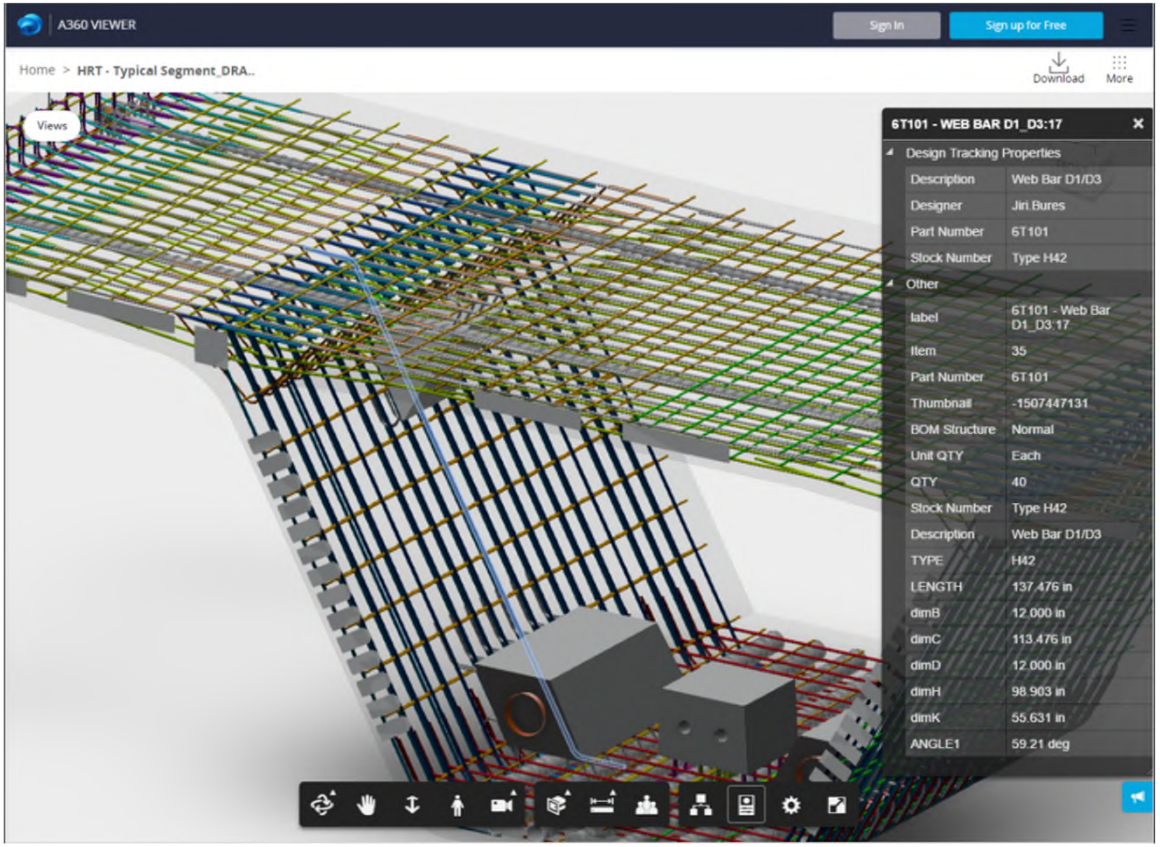
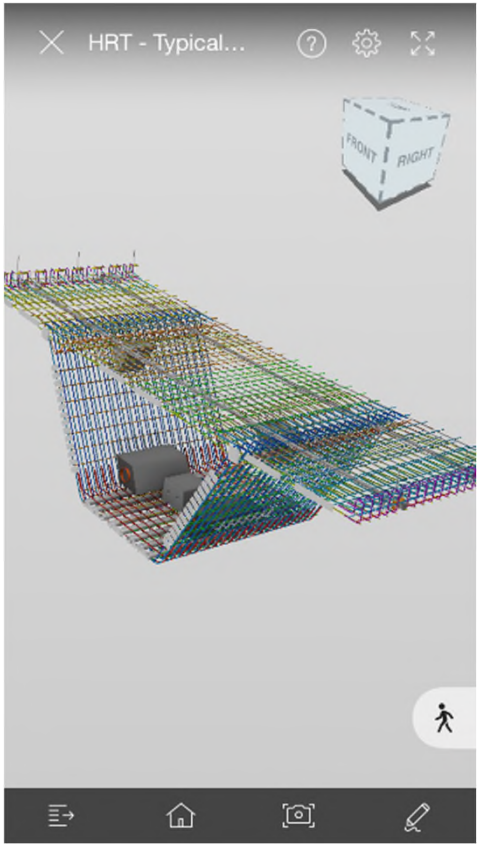
3D Proof Models





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Closing Remarks

Why is BrIM better? Efficient, Integration, and Visualization!

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Questions?

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