Create Structural Shop Drawings for Concrete, Precast, and Steel Structures in Revit

Dan McCloskey, P.E.

Principal, MB BIM Solutions

Erich Bretz, P.E.

Principal, MB BIM Solutions

Class summary

With the new tools added to Revit software in the last few years, it has become easier for structural engineers and detailers to create shop drawings and fabrication models for structural components. This class will demonstrate Building Information Modeling (BIM) workflows to take a Structural Design Team model into fabrication modeling and shop-drawings production for rebar, precast-concrete, structural-steel, and concrete-lift drawings. Attendees will learn new rebar modeling and annotation features for rebar shop-drawing creation. They will also learn how the new steel-connections tool works in Revit 2017 software and links with Advance Steel software; how to create precast-concrete erection (shop) and piece drawings in Revit software; and how to create detailed concrete-lift drawings in Revit software. We will also demonstrate add-ons that make shop-drawing production more efficient for each structural component type, and we'll discuss workflows and best practices. This session features Revit Structure and Advance Steel.

Key learning objectives

At the end of this class, you will be able to:

- Learn how rebar shops drawings can be created within Revit, and discover the new tools for rebar modeling and annotation
- See families and workflows that enable precast-concrete fabricators to create erection and piece drawings in Revit
- Learn how to create concrete-lift drawings in Revit to enhance coordination and improve field productivity
- Discover new steel connection tools in Revit 2017—and learn how to create steel shops in Revit and Advance Steel

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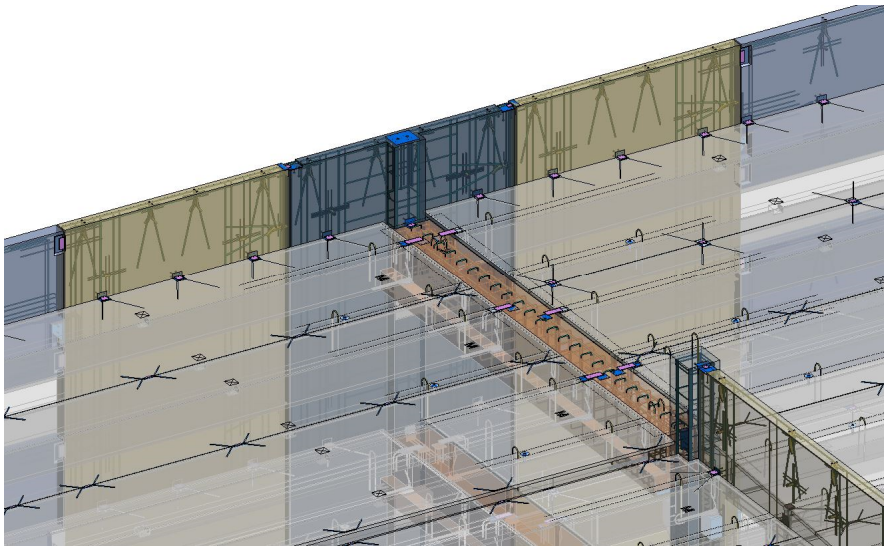
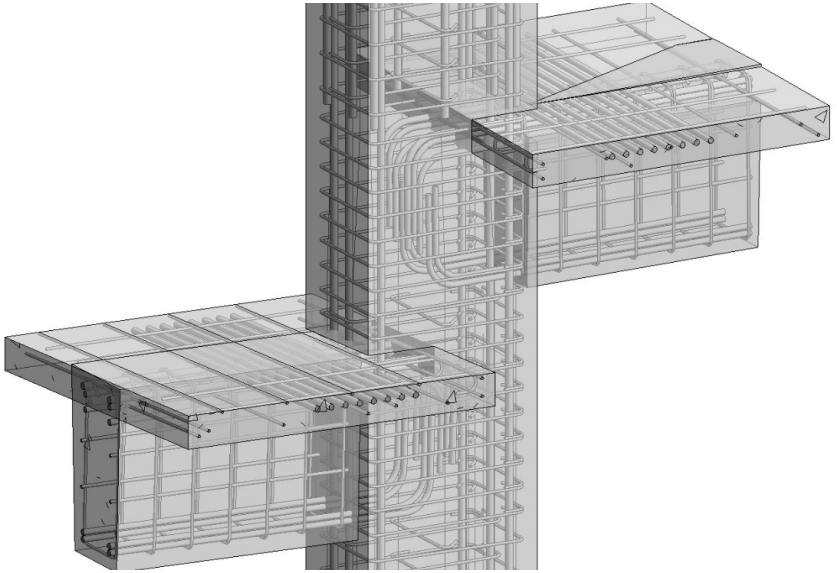
A Quick Overview of What We Do:

- Fabrication Level Models (and Shop Drawings from these models):
  - Rebar, Precast, Structural Steel and Miscellaneous Metals





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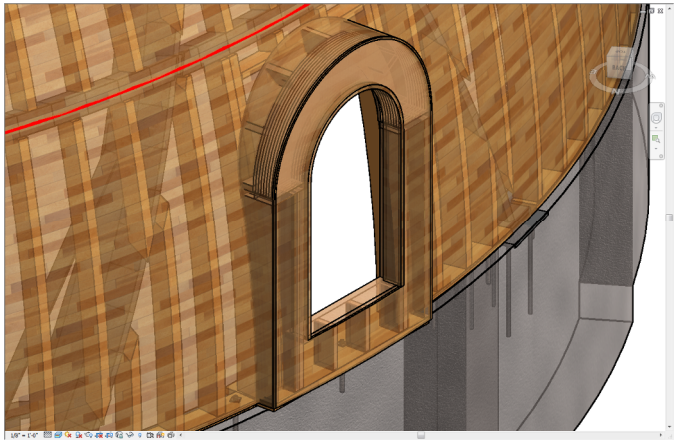
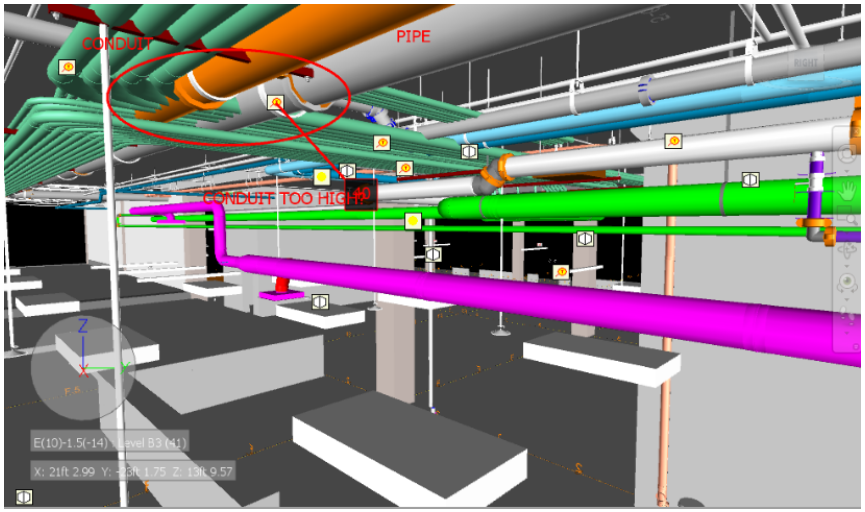
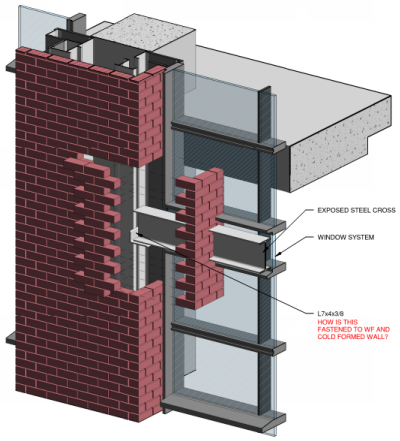
A Quick Overview of What We Do:

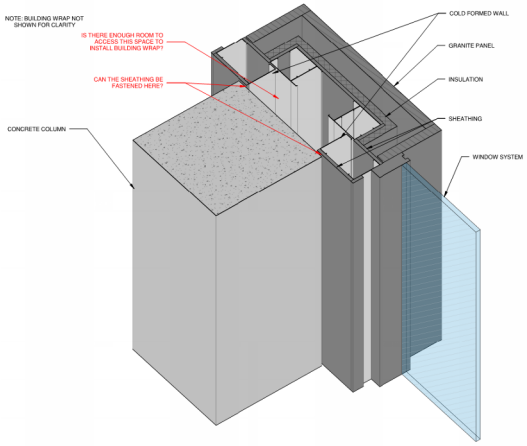
- Navisworks Coordination
- Custom Modeling
  - Virtual Mock-Ups, Constructability Studies







1 3D VIEW - EXPOSED STEEL CROSS CONNECTION



3 CONSTRUCTION AT COLUMN BASE

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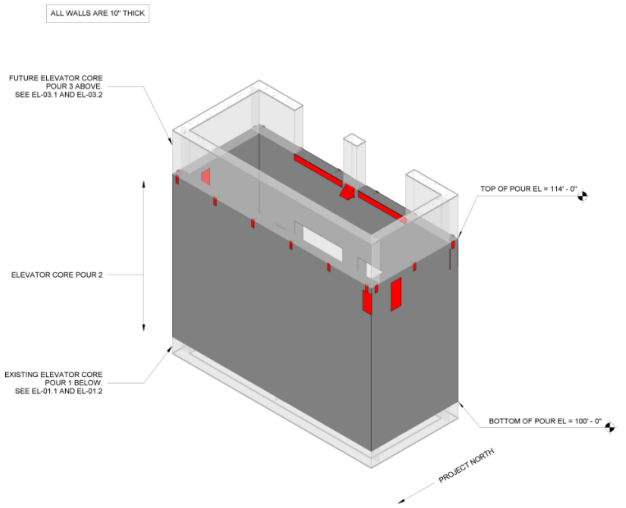
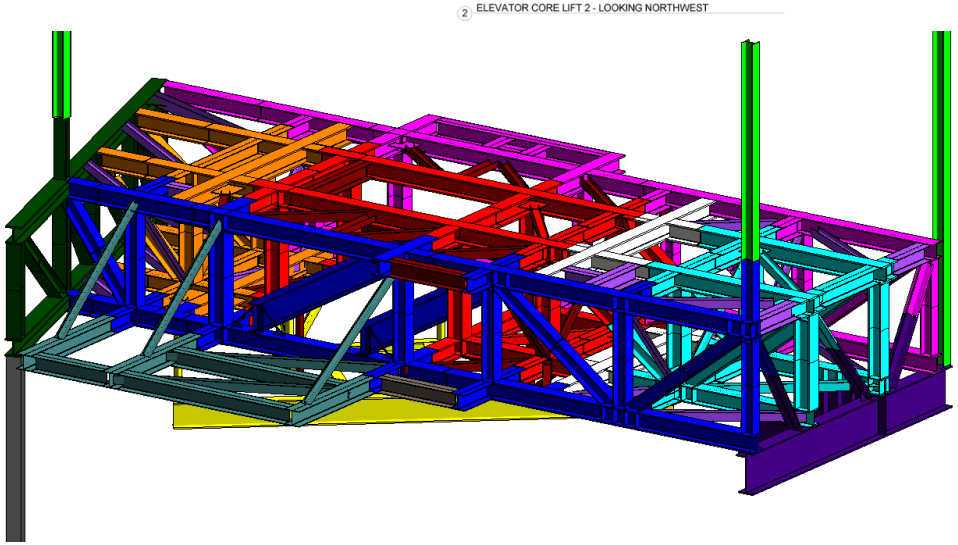
A Quick Overview of What We Do:

- Concrete Lift Drawings
- Construction Sequence Modeling/Animations
- Model-Based Estimating



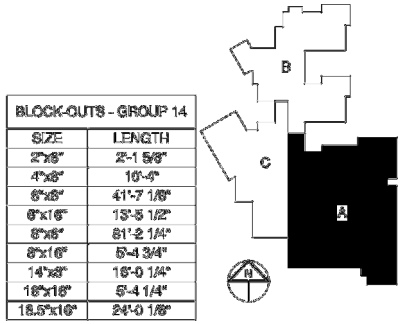


Shop Drawings – 'Who', 'When', 'How' is Changing

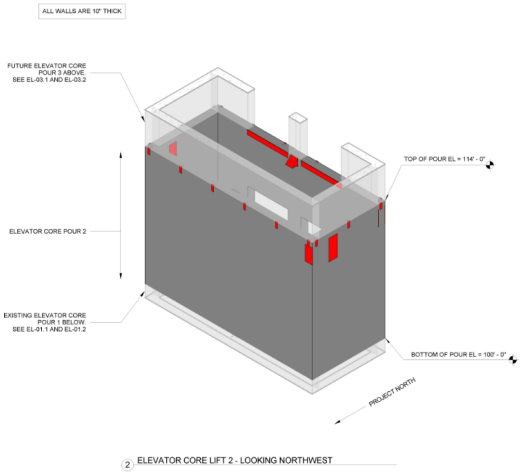
- Prevent Drop-Off of Information and Knowledge into Construction
  - Enhance quality of the final built product
- BIM Tools Enabling Change in Workflow and Responsibilities
- Typical Design-Bid-Build Is Changing
  - Pros and Cons
- Who Realizes the Benefit?
  - Design Teams
  - Fabricators / Specialty Subs
  - GC's
  - Owners

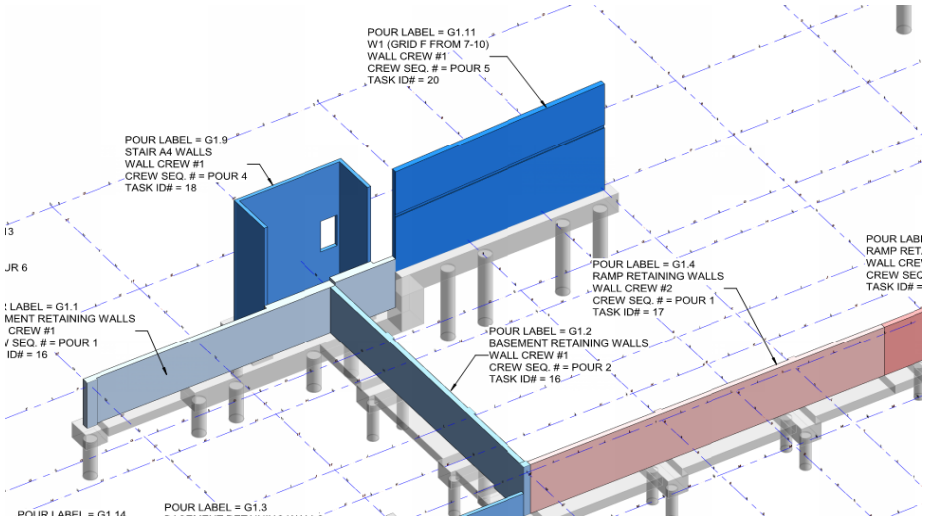
Concrete Lift (Line) Drawings

- Benefits:
  - Enhanced Productivity
  - Field Labor Visualization
  - Sharing of Models
  - Enhanced Coordination
  - Quantity Management
  - Schedule Management



BLOCK-OUTS - GROUP 14	
SIZE	LENGTH
2"x8"	2'-1 5/8"
4"x8"	10'-4"
6"x8"	41'-7 1/8"
6"x16"	13'-5 1/2"
8"x8"	81'-2 1/4"
8"x16"	5'-4 3/4"
14"x8"	16'-0 1/4"
16"x16"	5'-4 1/4"
18.5"x16"	24'-0 1/8"



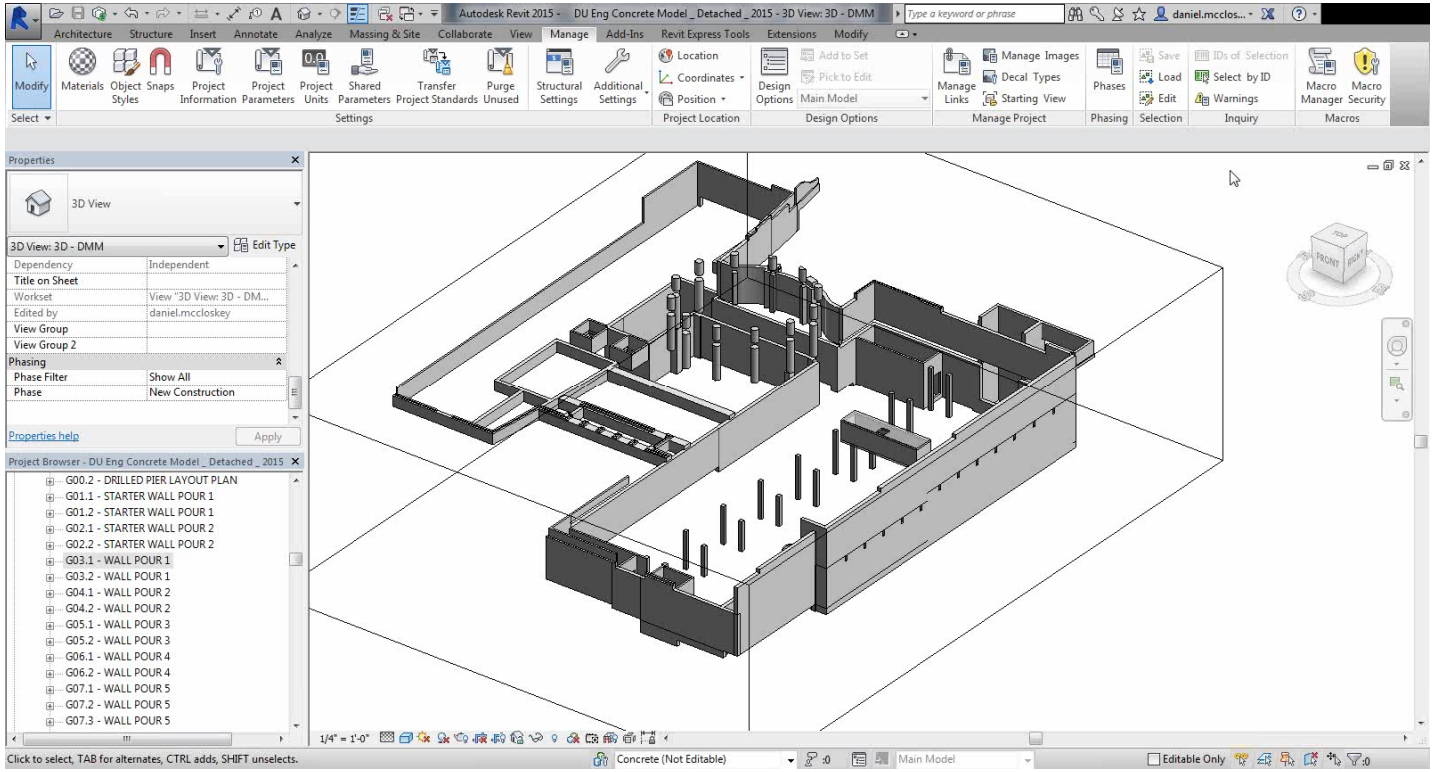


Concrete Lift (Line) Drawings

- Modeling:

Concrete Lift (Line) Drawings

- Modeling:

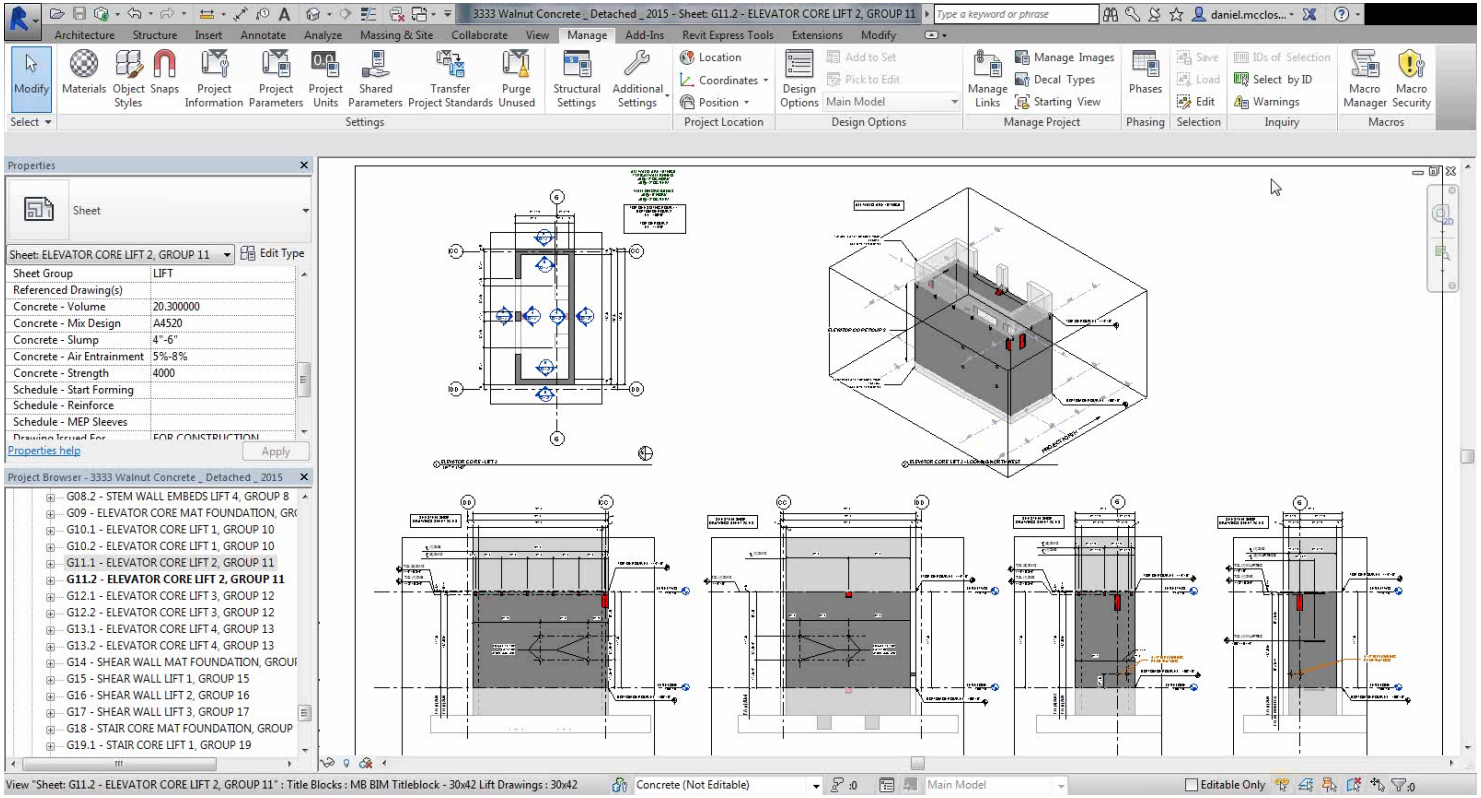


Concrete Lift (Line) Drawings

- Annotation / Data:

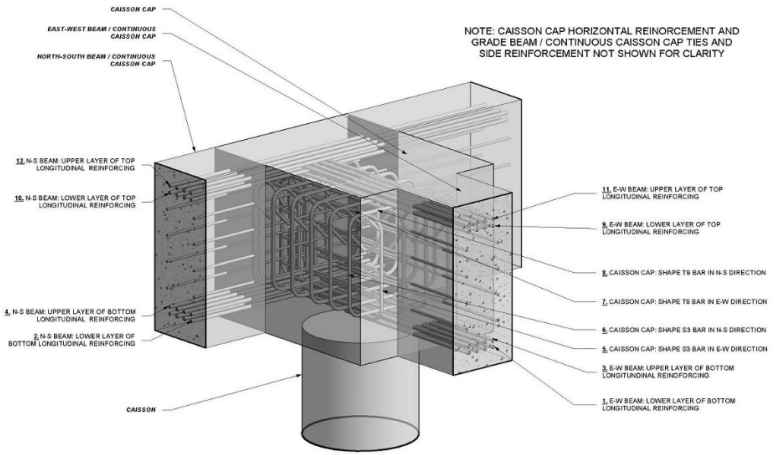
Concrete Lift (Line) Drawings

- Annotation / Data:



Rebar Shop (Placing) Drawings

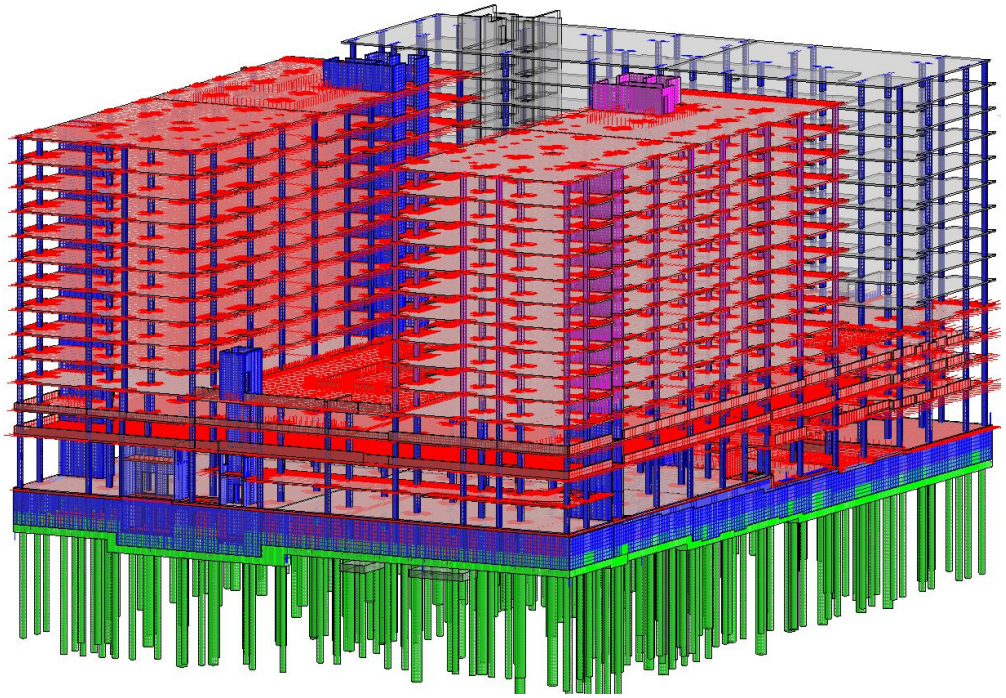
- Advantages:
  - Material Savings
  - Better Shops = Easier Installation
  - Enhanced Coordination
  - Reduced Congestion
  - Schedule!!



CAISSON CAP AND GRADE BEAM / CONTINUOUS CAISSON CAP SAME DEPTH

General Model Set-Up

- Rebar Model and Design Models as a Single Model or Separate Models
- Using Design Team Models as a Starting Point for a Rebar Model
- Multiple Rebar Models?

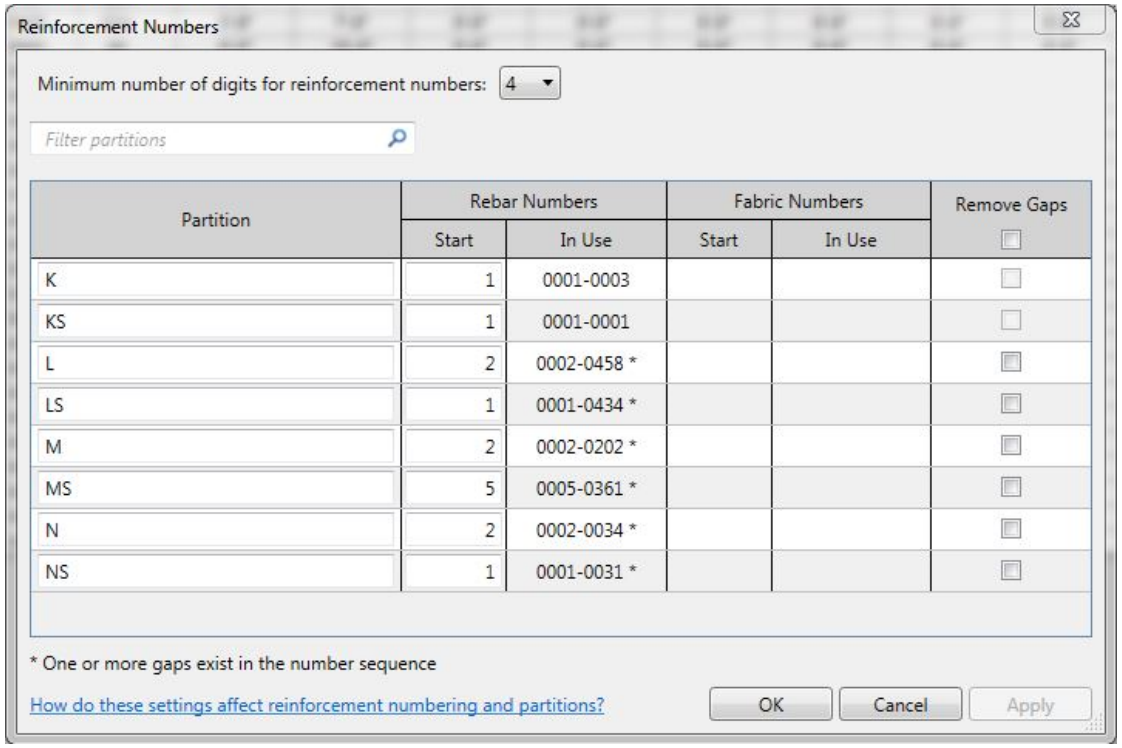


Rebar Parameter Management

- Purpose of and Goals for Parameters in Rebar Models
  - Sheet / view visibilities / filters
  - Bend schedules and bills of material (BOM's)
  - Tags
  - Assemblies
  - QC
  - Bar marking and numbering

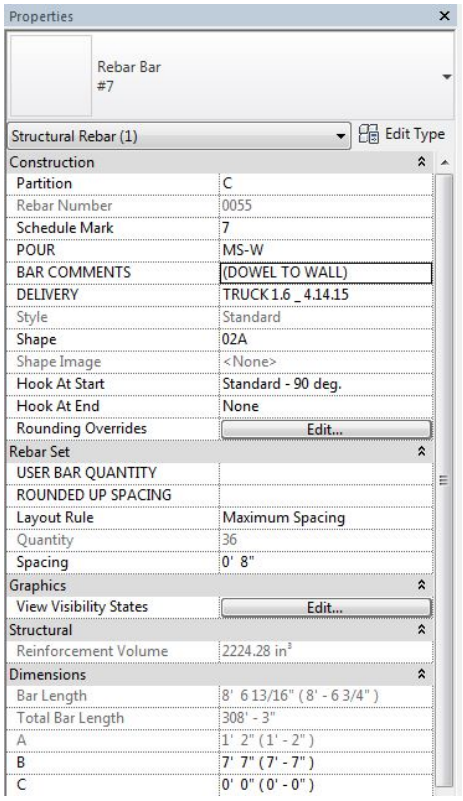
Rebar Parameter Management

- Parameters Used
  - Partition
  - Rebar Number



Rebar Parameter Management

- Parameters Used
  - Partition
  - Rebar Number
  - Pour
  - Delivery
  - Bar Comments

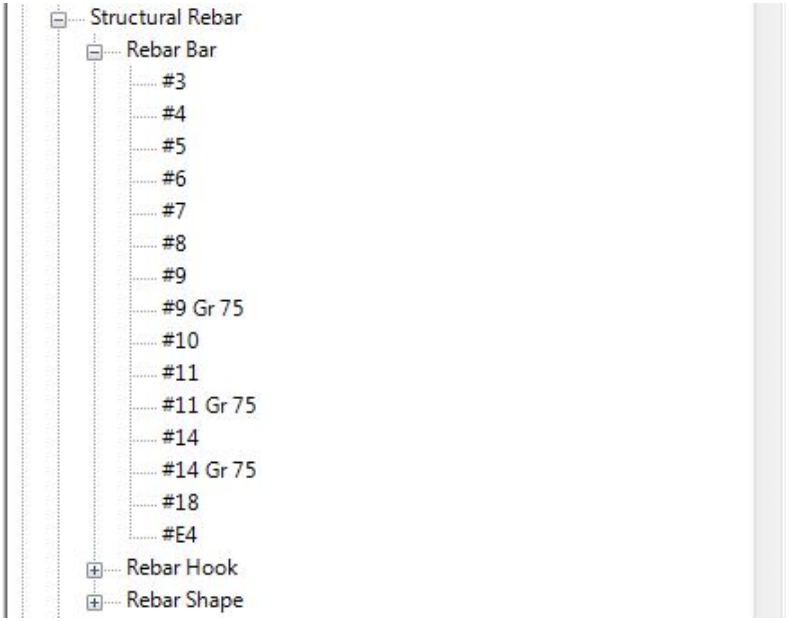


<BAR COMMENTS>

A	B	C	D	E	F
GRADE	BAR COMMENTS	R	J	O	Est. Tons
60		0'-0"		0'-0"	62.90
60		0'-0"	0'-0"	0'-0"	0.58
60	(2@8'-0") (B)	0'-0"	0'-0"	0'-0"	1.28
75	(ADD'L)(T)	0'-0"	0'-0"	0'-0"	0.45
75	(ADD'L)(T)(CNTR'D ON GRID)	0'-0"	0'-0"	0'-0"	0.13
	(B)	0'-0"	0'-0"	0'-0"	241.51
75	(B) (ADD'L) (CENTER OVER SPA	0'-0"	0'-0"	0'-0"	0.99
60	(B) (ADD)	0'-0"	0'-0"	0'-0"	0.78
75	(B) (CENTER OVER SPAN)	0'-0"	0'-0"	0'-0"	1.43
60	(B) (EA. SLAB)	0'-0"	0'-0"	0'-0"	0.07
60	(B) (FIELD BEND)	0'-0"	0'-0"	0'-0"	0.05
60	(B) (TYP.)	0'-0"	0'-0"	0'-0"	0.69
60	(B) COL. DOWELS	0'-0"	0'-0"	0'-0"	0.13
60	(B)(FIELD BEND)	0'-0"	0'-0"	0'-0"	0.15
60	(B)(POUR JOINT)	0'-0"	0'-0"	0'-0"	0.91
60	(B)(TH)	0'-0"	0'-0"	0'-0"	0.01
60	(BOT MAT)	0'-0"	0'-0"	0'-0"	146.90
60	(COL. BOTT)	0'-0"	0'-0"	0'-0"	34.91
60	(CURB TOP)	0'-0"	0'-0"	0'-0"	0.71
60	(DOWEL E.F.)	0'-0"	0'-5"	0'-0"	0.86
60	(DOWEL TO BEAM)	0'-0"	0'-0"	0'-0"	0.00
60	(DOWEL TO CMU)	0'-0"		0'-0"	3.88
60	(DOWEL TO COLUMN)	0'-0"	0'-0"	0'-0"	0.21
60	(DOWEL TO KNEEWALL)	0'-0"	0'-4"	0'-0"	1.03
60	(DOWEL TO RAMP SLAB)	0'-0"	0'-0"	0'-0"	0.06
60	(DOWEL TO SLAB)	0'-0"	0'-0"	0'-0"	0.02
60	(DOWEL)	0'-0"		0'-0"	0.56
60	(DROP CAP)	0'-0"	0'-0"	0'-0"	0.16
60	(DWL)	0'-0"	0'-0"	0'-0"	7.26
60	(DWL)(B)	0'-0"	0'-0"	0'-0"	2.31
60	(DWL)(T)	0'-0"	0'-0"	0'-0"	2.23
60	(EACH FACE)	0'-0"	0'-0"	0'-0"	3.00
60	(EACH FACE)(HORIZ.)	0'-0"	0'-0"	0'-0"	0.65
60	(EACH FACE)(VERT.)	0'-0"	0'-0"	0'-0"	0.53
60	(HORIZ.)	0'-0"	0'-0"	0'-0"	4.52
60	(LF.)	0'-0"	0'-0"	0'-0"	0.01
60	(M)	0'-0"	0'-0"	0'-0"	1.01
60	(O.F.)	0'-0"	0'-0"	0'-0"	0.01
60	(SIDE) (E.F.)	0'-0"	0'-0"	0'-0"	0.49
60	(SIDE) (E.F.) (CENTER OVER SPA	0'-0"	0'-0"	0'-0"	0.16
60	(SUPPORT BARS)	0'-0"	0'-0"	0'-0"	30.45
60	(T&B)	0'-0"	0'-0"	0'-0"	0.02
	(T)	0'-0"	0'-0"	0'-0"	187.32
	(T) (ADD'L)	0'-0"	0'-0"	0'-0"	0.76
60	(T) (FIELD BEND)	0'-0"	0'-0"	0'-0"	0.10
60	(T) (TYP.)	0'-0"	0'-0"	0'-0"	0.91
60	(T)(EA. SLAB)	0'-0"	0'-0"	0'-0"	0.05
60	(T)(EACH FACE)	0'-0"	0'-0"	0'-0"	0.04
60	(T)(FIELD BEND)	0'-0"	0'-0"	0'-0"	0.10
60	(T.O.W.)	0'-0"	0'-0"	0'-0"	2.59
60	(TH)	0'-0"	0'-0"	0'-0"	0.05

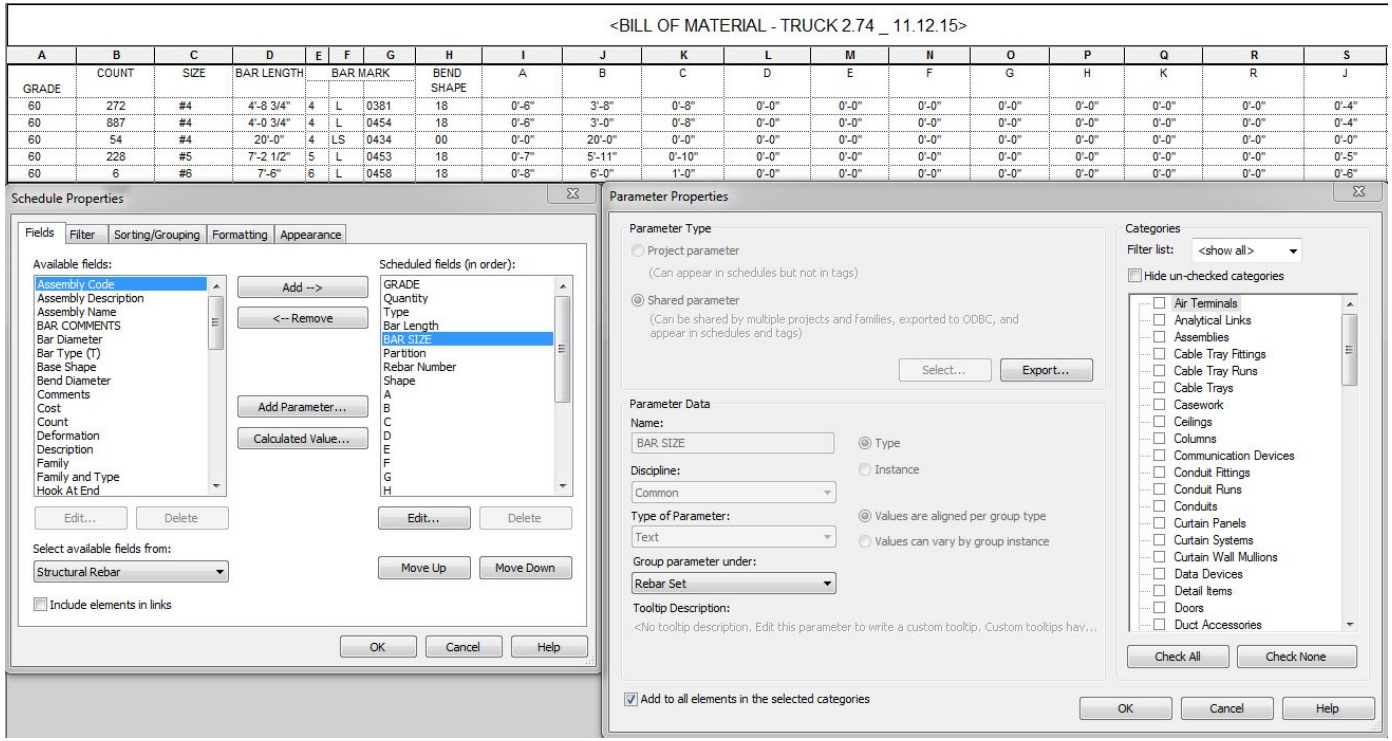
Rebar Parameter Management

- Parameters Used
  - Partition
  - Rebar Number
  - Pour
  - Delivery
  - Bar Comments
  - User Bar Quantity
  - Epoxy Coated and GR75



Rebar Parameter Management

- Use of Parameters Across Model Management
  - Bar Marking and Numbering

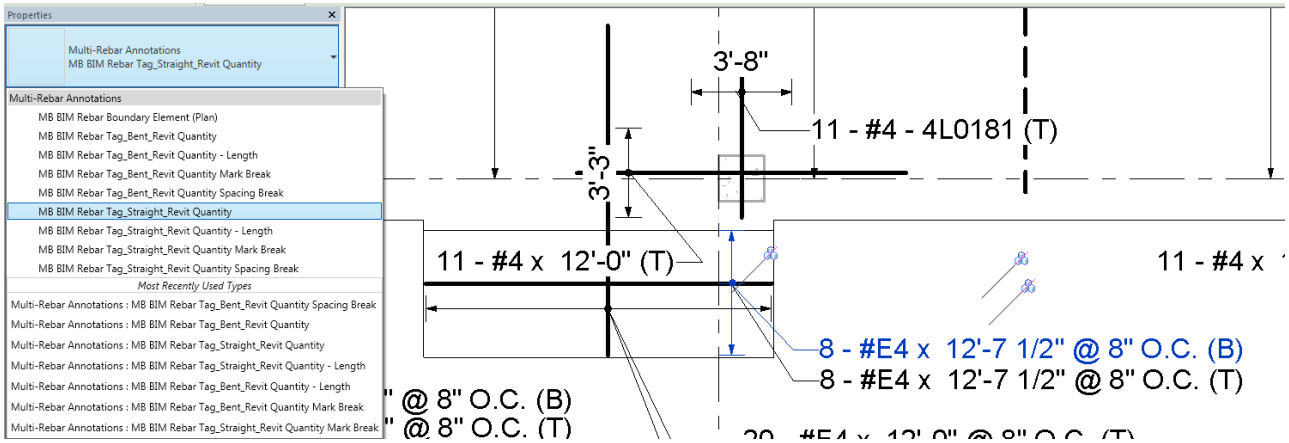


<BILL OF MATERIAL - TRUCK 2.74 _ 11.12.15>

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
GRADE	COUNT	SIZE	BAR LENGTH	BAR MARK			BEND SHAPE	A	B	C	D	E	F	G	H	K	R	J
60	272	#4	4'-8 3/4"	4	L	0381	18	0'-6"	3'-8"	0'-8"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-4"
60	887	#4	4'-0 3/4"	4	L	0454	18	0'-6"	3'-0"	0'-8"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-4"
60	54	#4	20'-0"	4	LS	0434	00	0'-0"	20'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"
60	228	#5	7'-2 1/2"	5	L	0453	18	0'-7"	5'-11"	0'-10"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-5"
60	6	#6	7'-6"	6	L	0458	18	0'-8"	6'-0"	1'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-6"

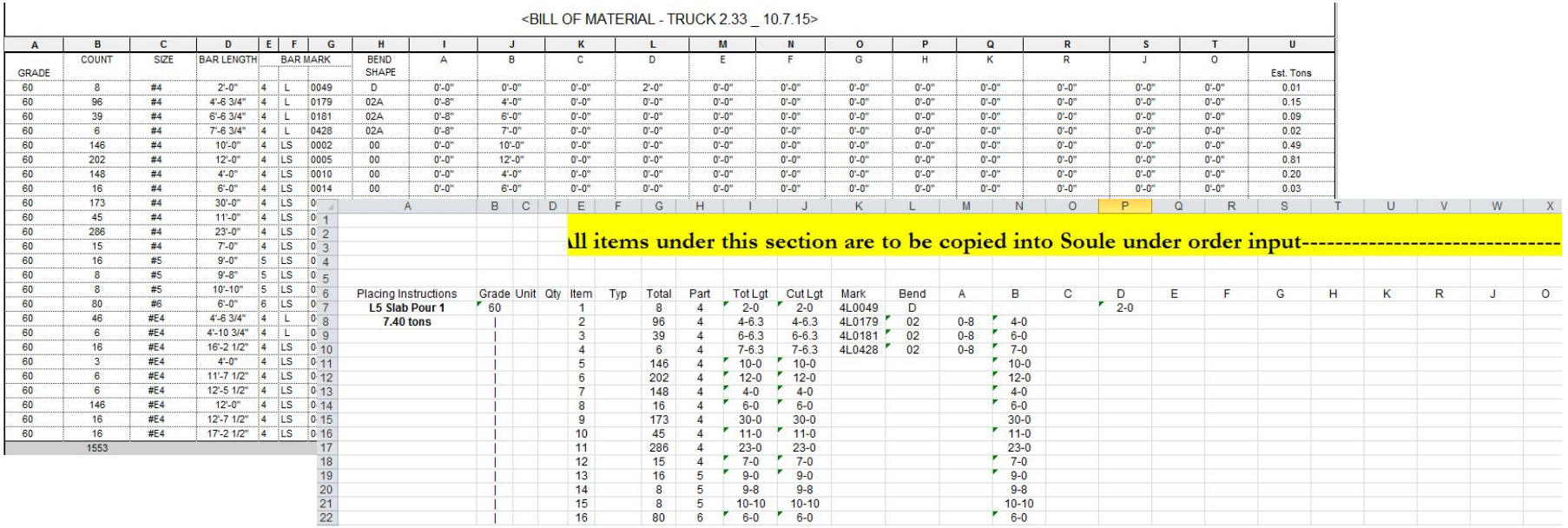
Rebar Parameter Management

- Use of Parameters Across Model Management
  - Bar Marking and Numbering
  - Sheets / Filters / View Templates and Visibilities
  - Bend Schedules and BOM's
  - Tags
  - QC Views and QC Schedules



Exporting Data From Revit for Bar Bending and Cutting Software Import

- Why to Export and Manage Data
- Revit Export for Soule Import
- aSa-Revit Link



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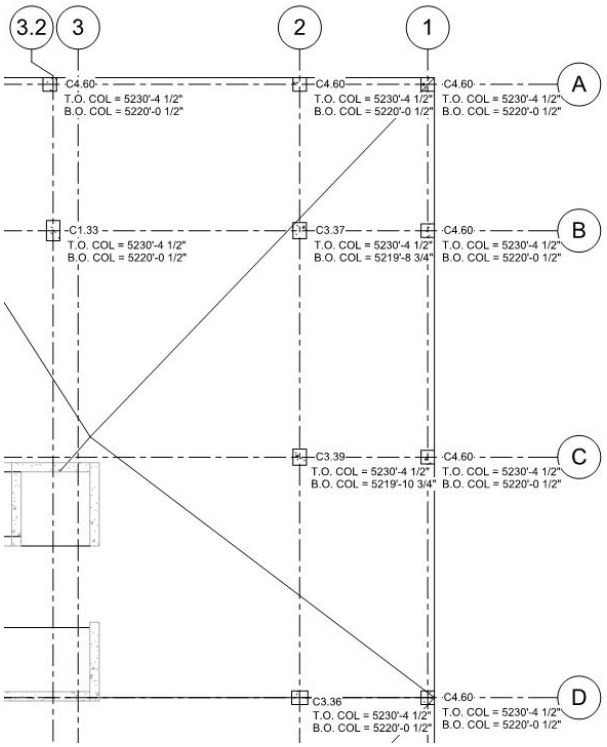
GRADE	COUNT	SIZE	BAR LENGTH	BAR MARK			BEND SHAPE	A	B	C	D	E	F	G	H	K	R	J	O	Est. Tons
60	8	#4	2'-0"	4	L	0049	D	0'-0"	0'-0"	0'-0"	2'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.01
60	96	#4	4'-6 3/4"	4	L	0179	02A	0'-8"	4'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.15
60	39	#4	6'-6 3/4"	4	L	0181	02A	0'-8"	6'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.09
60	6	#4	7'-6 3/4"	4	L	0428	02A	0'-8"	7'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.02
60	146	#4	10'-0"	4	LS	0002	00	0'-0"	10'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.49
60	202	#4	12'-0"	4	LS	0005	00	0'-0"	12'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.81
60	148	#4	4'-0"	4	LS	0010	00	0'-0"	4'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.20
60	16	#4	6'-0"	4	LS	0014	00	0'-0"	6'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0'-0"	0.03
60	173	#4	30'-0"	4	LS	0														
60	45	#4	11'-0"	4	LS	0														
60	286	#4	23'-0"	4	LS	0														
60	15	#4	7'-0"	4	LS	0														
60	16	#5	9'-0"	5	LS	0														
60	8	#5	9'-8"	5	LS	0														
60	8	#5	10'-10"	5	LS	0														
60	80	#6	6'-0"	6	LS	0														
60	46	#E4	4'-6 3/4"	4	L	0														
60	6	#E4	4'-10 3/4"	4	L	0														
60	16	#E4	16'-2 1/2"	4	LS	0														
60	3	#E4	4'-0"	4	LS	0														
60	6	#E4	11'-7 1/2"	4	LS	0														
60	6	#E4	12'-5 1/2"	4	LS	0														
60	146	#E4	12'-0"	4	LS	0														
60	16	#E4	12'-7 1/2"	4	LS	0														
60	16	#E4	17'-2 1/2"	4	LS	0														
	1553																			

All items under this section are to be copied into Soule under order input----------

Placing Instructions	Grade	Unit	Qty	Item	Typ	Total	Part	Tot Lgt	Cut Lgt	Mark	Bend	A	B	C	D	E	F	G	H	K	R	J	O
L5 Slab Pour 1	60			1		8	4	2-0	2-0	4L0049	D				2-0								
7.40 tons				2		96	4	4-6.3	4-6.3	4L0179	02	0-8	4-0										
				3		39	4	6-6.3	6-6.3	4L0181	02	0-8	6-0										
				4		6	4	7-6.3	7-6.3	4L0428	02	0-8	7-0										
				5		146	4	10-0	10-0				10-0										
				6		202	4	12-0	12-0				12-0										
				7		148	4	4-0	4-0				4-0										
				8		16	4	6-0	6-0				6-0										
				9		173	4	30-0	30-0				30-0										
				10		45	4	11-0	11-0				11-0										
				11		286	4	23-0	23-0				23-0										
				12		15	4	7-0	7-0				7-0										
				13		16	5	9-0	9-0				9-0										
				14		8	5	9-8	9-8				9-8										
				15		8	5	10-10	10-10				10-10										
				16		80	6	6-0	6-0				6-0										

Rebar Modeling and Annotation Efficiencies in Revit

- How to Model More Efficiently?
  - Model Groups
  - Assemblies

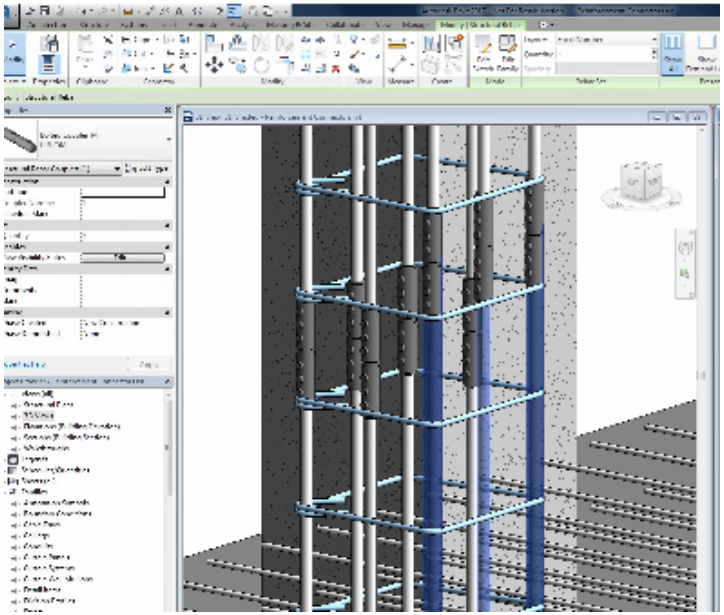


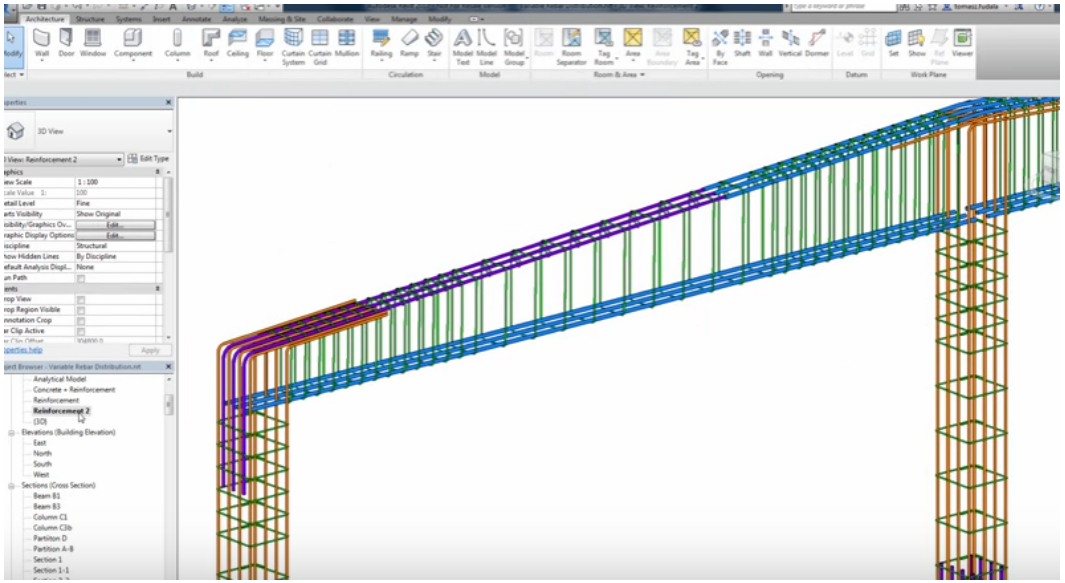
COLUMN REINF. SCHEDULE - SEG 2, LEVEL 03

TIES PER COLUMN	VERTS PER COLUMN	BAR SIZE	BAR MARK	STRAIGHT BAR LENGTH	BAR USE	SPACING
C1.33						
	6	#11 Gr 75	11 G 0434		VERT	
	6	#11 Gr 75	11 G 0435		VERT	
5		#4	4 G 0006		TIES	16"
5		#4	4 G 0011		TIES	16"
5		#4	4 G 0013		TIES	16"
C1.36						
	6	#11 Gr 75	11 G 0398		VERT	
	6	#11 Gr 75	11 G 0419		VERT	
5		#4	4 G 0006		TIES	16"
5		#4	4 G 0011		TIES	16"
5		#4	4 G 0013		TIES	16"
C1C.13						
	6	#11 Gr 75	- - -	9'-9 3/4"	VERT	
	6	#11 Gr 75	11 G 0358		VERT	
8		#4	4 G 0013		TIES	16"
8		#4	4 G 0355		TIES	16"
	6	#10	- - -	9'-0"	DWL	
C2.23						
	4	#10	- - -	9'-8"	VERT	
	4	#10	10 G 0420		VERT	
7		#3	3 G 0005		TIES	20"
7		#3	3 G 0037		TIES	20"
	6	#9	- - -	8'-0"	DWL	
C2B.5						
	10	#10	- - -	9'-4"	VERT	
	2	#10	10 G 0302		VERT	
6		#3	3 G 0369		TIES	20"
6		#3	3 G 0370		TIES	20"
6		#3	3 G 0459		TIES	20"
	7	#9	- - -	8'-0"	DWL	
C3.36						
	6	#10	10 G 0302		VERT	
7		#3	3 G 0005		TIES	20"
7		#3	3 G 0037		TIES	20"
C3.37						
	6	#10	10 G 0303		VERT	
7		#3	3 G 0005		TIES	20"
7		#3	3 G 0037		TIES	20"
C3.39						
	6	#10	10 G 0107		VERT	
7		#3	3 G 0005		TIES	20"
7		#3	3 G 0037		TIES	20"
C4.60						
	4	#9	9 G 0297		VERT	
7		#3	3 G 0004		TIES	18"

New Rebar Tools in Revit 2017

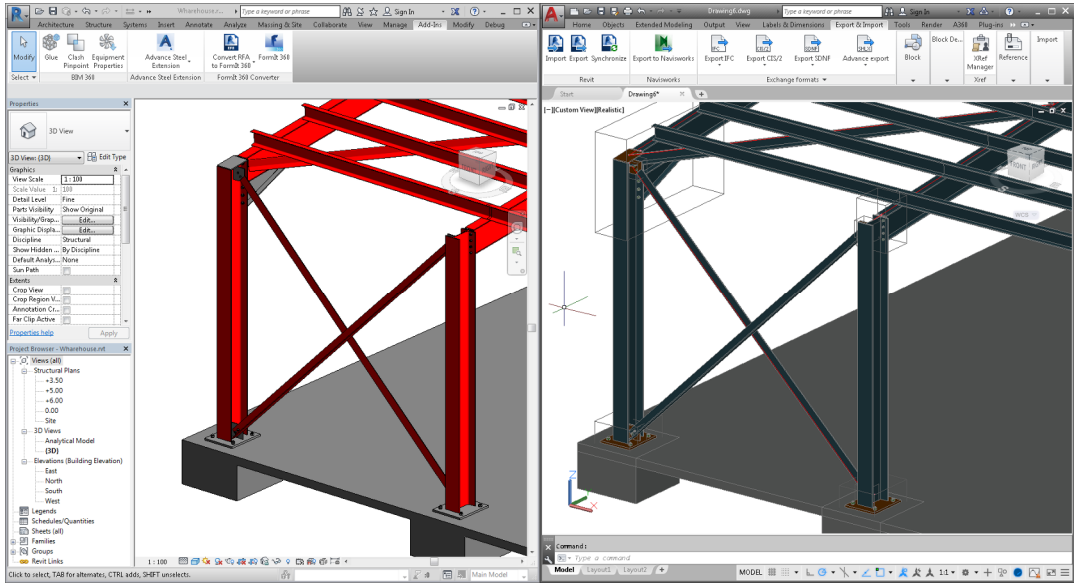
- Reinforcement Connectors
- Variable Rebar Distribution
- Rebar Constraints Enhancements





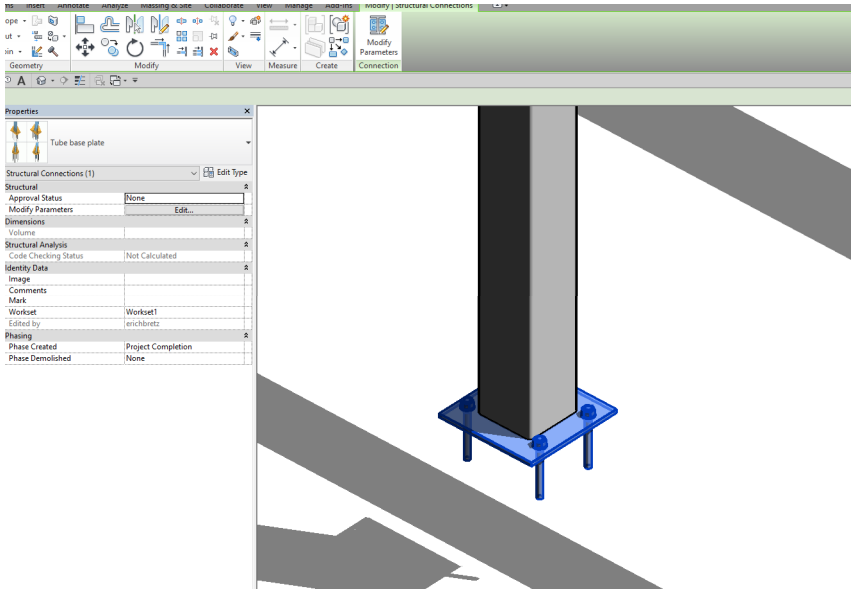
Steel Shop Drawings (in Revit)

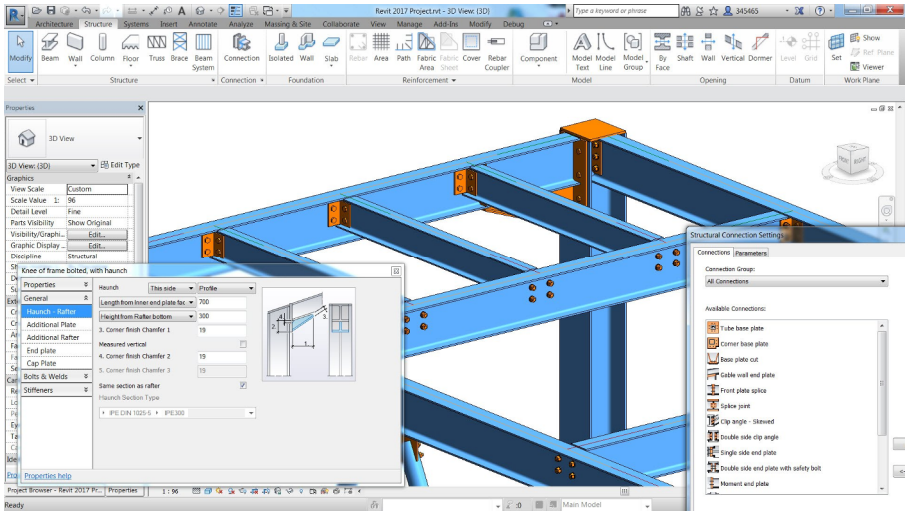
- Benefits:
  - Reduces Lead Time on Steel
  - Revit Integration with Advance Steel
    - Design Model sent to Detailing



Steel Shop Drawings (in Revit)

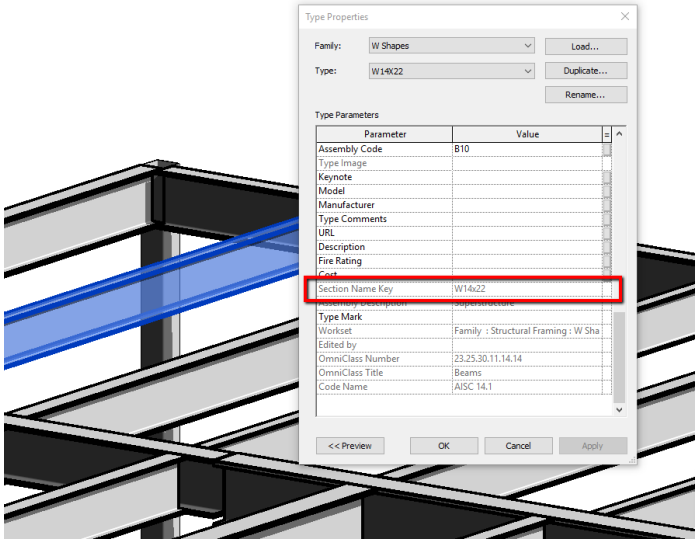
- Detriments:
  - Need for Single Part Sheets
  - No Automation of Repetitive Tasks (Dimensioning)
  - No CNC Output
  - Creating Complex Connections is Very Difficult
  - Complex Elements (Stairs) are Difficult to Model
  - Steel Connections Cannot be Added To Assemblies

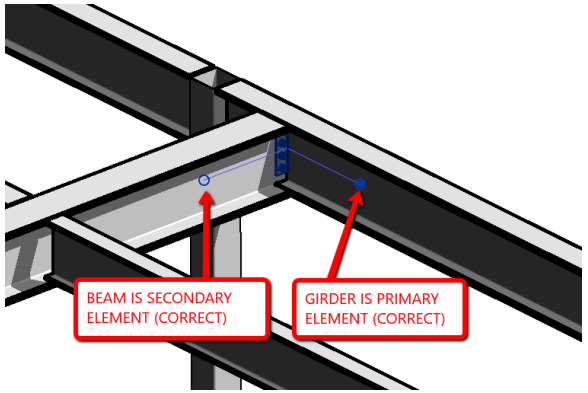


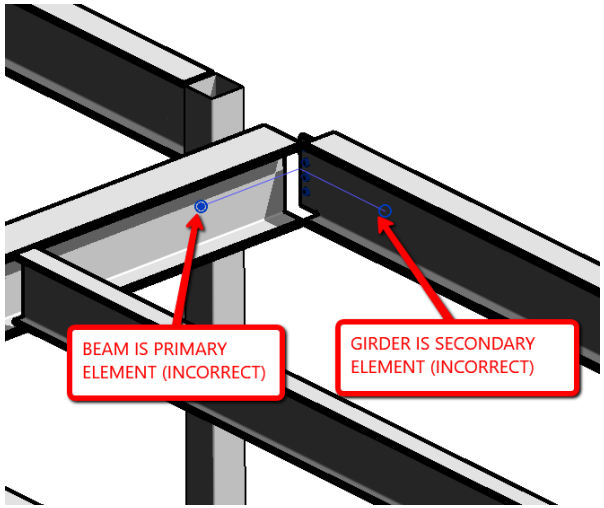


Steel Shop Drawings – Connection Module

- New AISC Shapes
- Connection Library
- Common Errors
- Connections Exported to Advance Steel

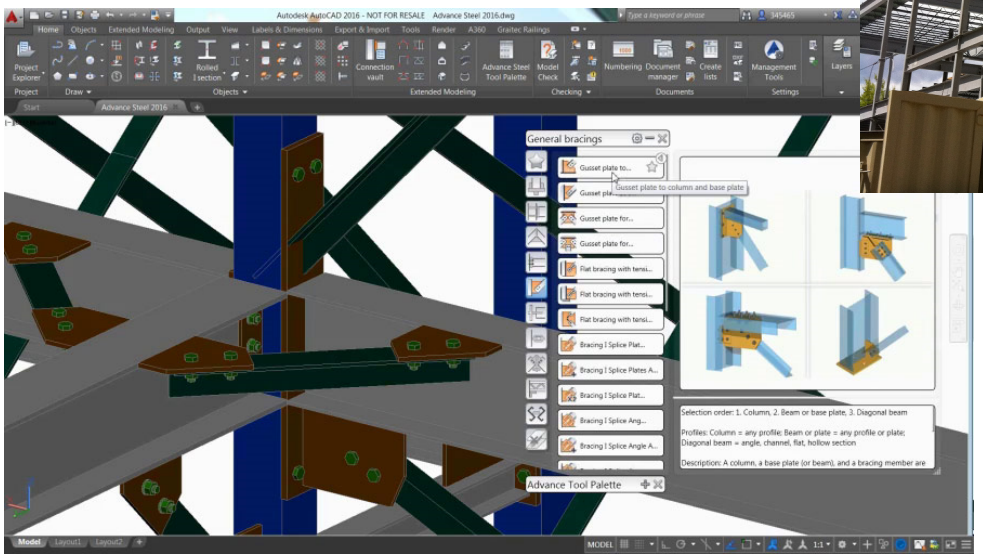






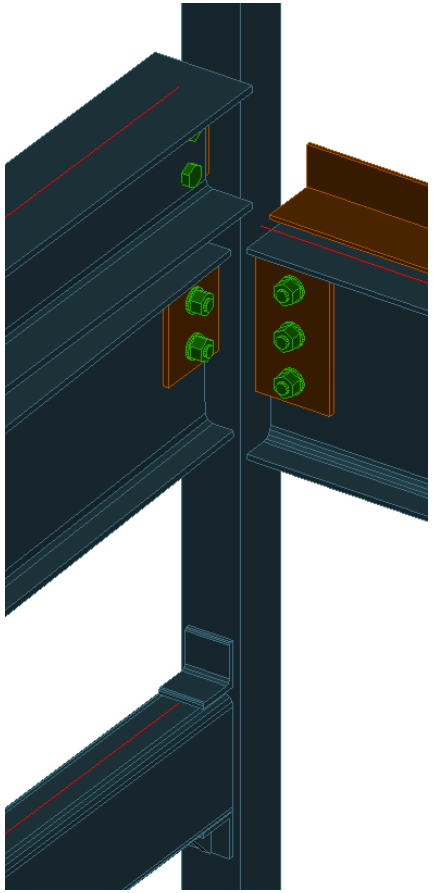
Structural Steel Drawings

- Modeling / Documentation Requires:
  - Extreme Precision
  - Knowledge of Fabrication Techniques
  - Relationship with Fabricator



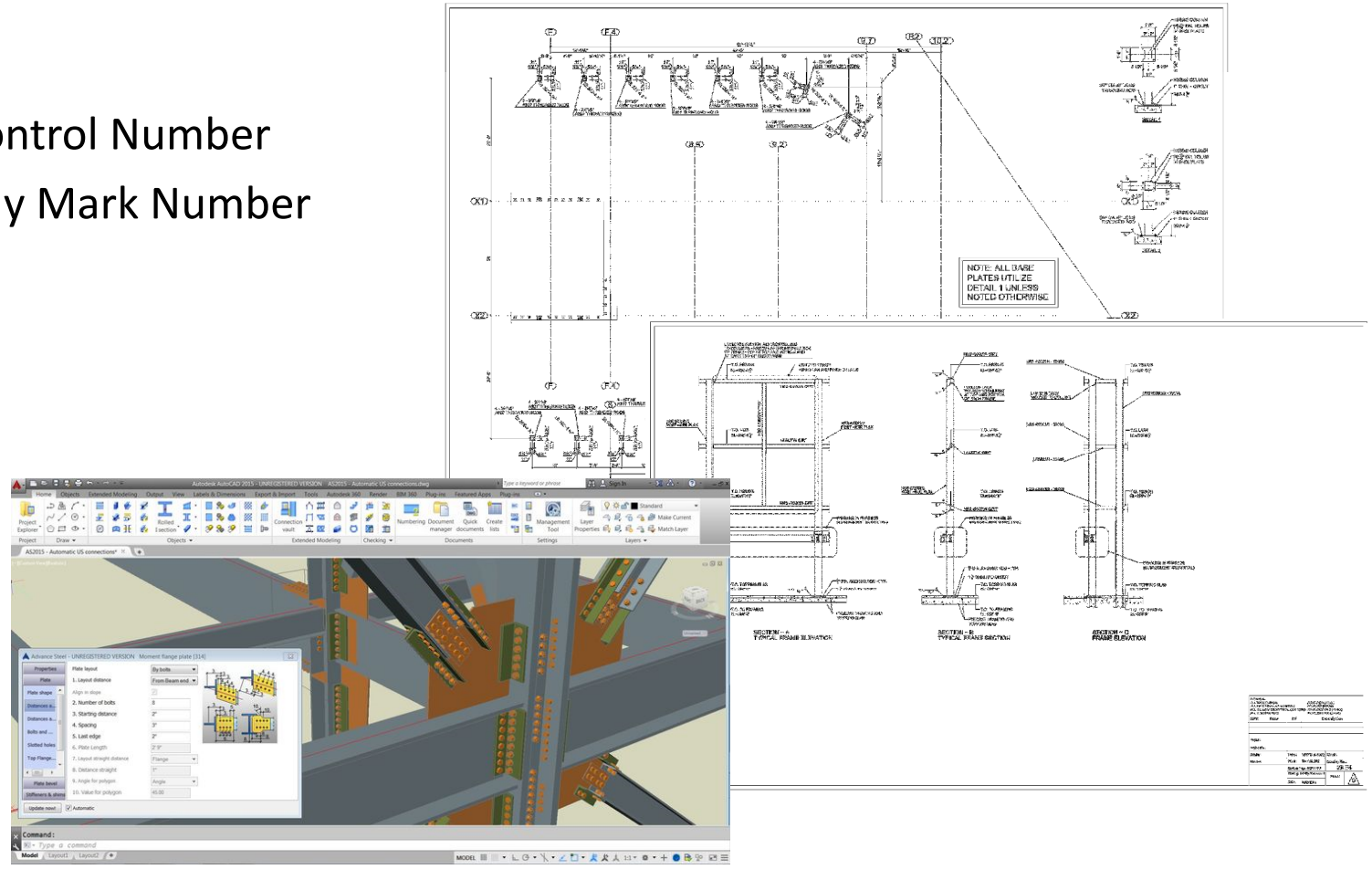
Steel Shop Drawings – Advance Steel!

- True Steel Detailing Software
- Allows Extensive Customization of Drawings
- Custom Connection
- Automates Repetitive Tasks
- CNC Output
- Import Geometry and Connections from Revit Model



Steel Shop Drawings – Misc Metals in Revit

- Parameters:
  - Piece Control Number
  - Assembly Mark Number
  - Host

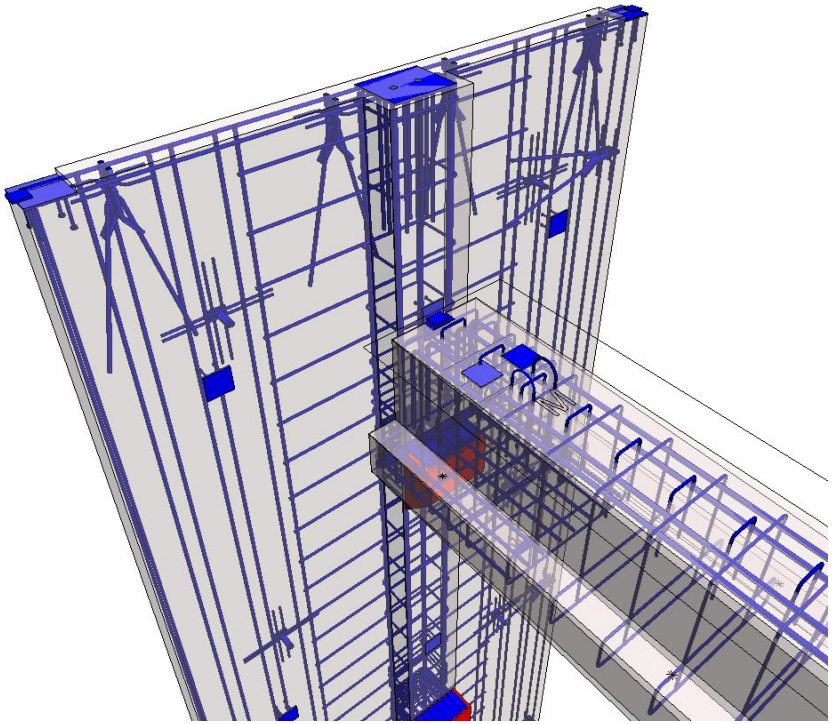


Precast Concrete Shop Drawings

- Benefits:
  - Most Knowledgeable Entity Modeling Precast Element
  - Eliminate Duplication of Effort
  - Clash Detection with Actual Framing
  - Reduced Project Delivery Time
  - Improved Accuracy

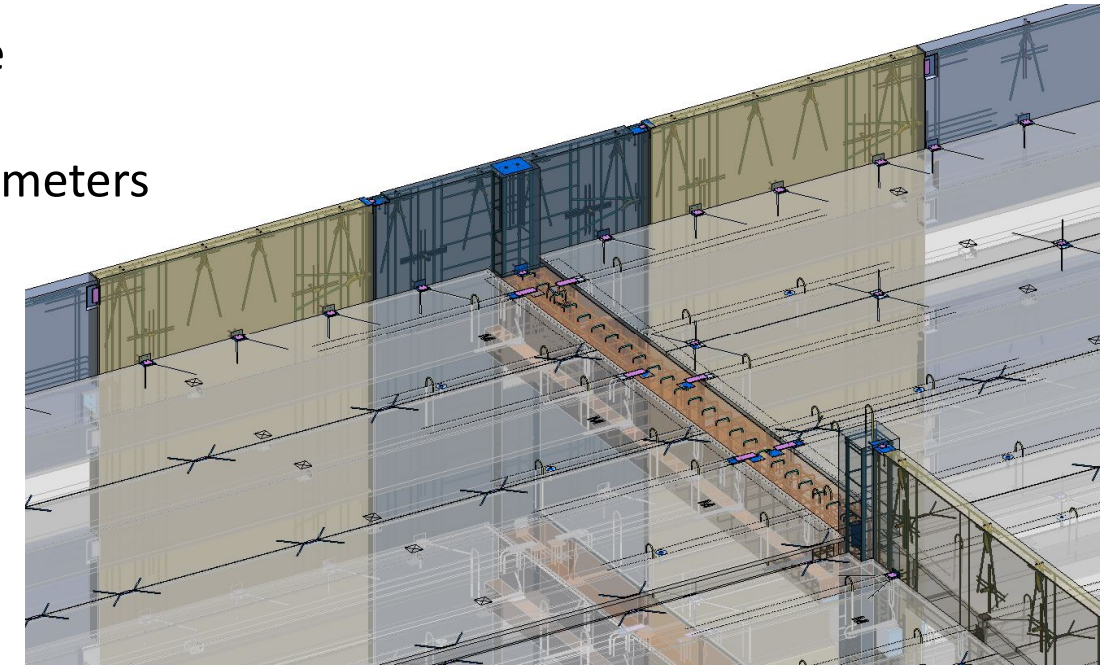
Precast Concrete Shop Drawings – Assemblies

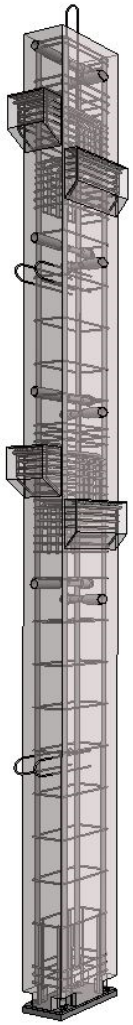
- Each Piece -> Assembly
  - Allows Independent Tagging, Scheduling, and Filtering
- Piece Drawings are Composed of:
  - Assembly Plan / Elevation / Section Views
  - Schedules (Note: not Assembly Schedules)
  - Legends



Precast Concrete Shop Drawings – Parameters

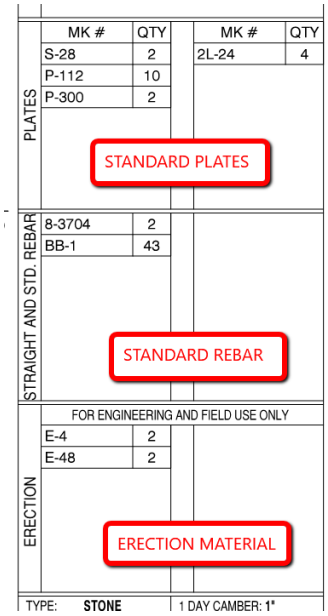
- Piece Control Number
- Assembly Mark Number
- Plate Host
- Plate Category
- Piece Design Type
- Assembly Weight
- Various view parameters





Precast Concrete Shop Drawings – Schedules

- Piece Drawing Data
- Material and Resource Planning / Piece Counting
- QA / QC
- Product Tracking



PLATES

MK #	QTY	MK #	QTY
S-28	2	2L-24	4
P-112	10		
P-300	2		

STANDARD PLATES

STRAIGHT AND STD. REBAR

8-3704	2
BB-1	43

STANDARD REBAR

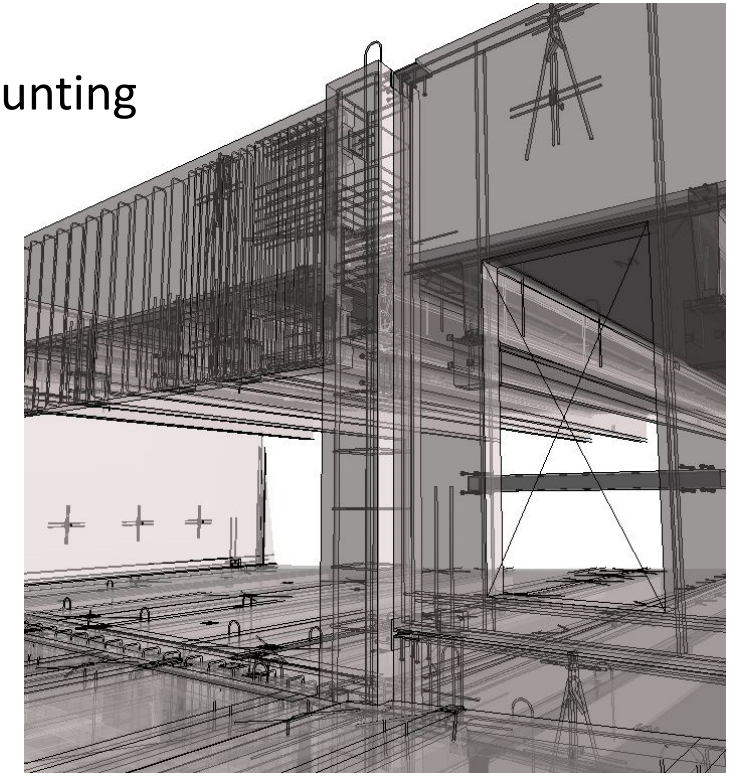
ERECTION

FOR ENGINEERING AND FIELD USE ONLY

E-4	2
E-48	2

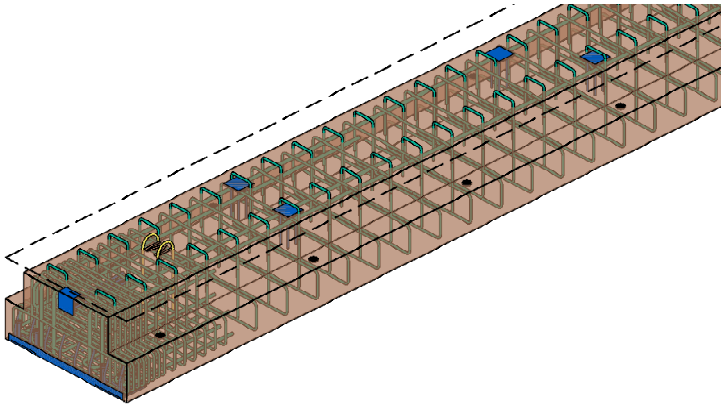
ERECTION MATERIAL

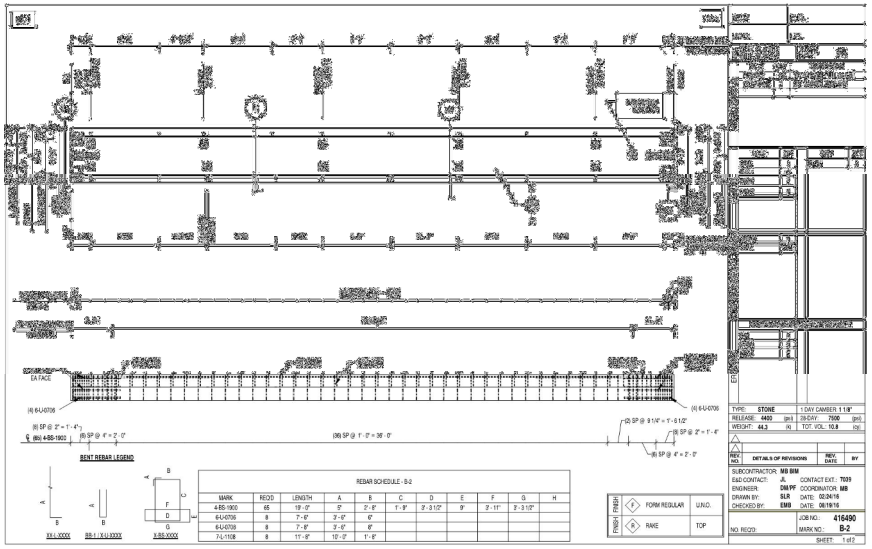
TYPE: **STONE** | 1 DAY CAMBER: 1"



Precast Concrete Shop Drawings – Legends

- Use for Items that are Used Over and Over
  - Typical piece details (used by several pieces in the project)
  - Rebar bend diagrams
  - Piece finish legends
  - Piece end indicators (end 1 – end 2)
  - Assembly view titles





Precast Concrete Shop Drawings – 3rd Party Tools

- Edge^Revit (www.EdgeForRevit.com)

- AGACAD (www.AGA-CAD.com)

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