

# Designing Substations Part by Part with Autodesk® Inventor®

Terri Humel & Chip Cullum

Principal Associate Engineer & Senior Associate Engineer – Nashville Electric Service

# Class summary

- In the electric utility industry, it seems that everything we design is “just like that one, only different.” Using Autodesk® Inventor® software we can easily alter standard content with intelligent model based design. These exercises show how the relationships between parameters, formulas, iProperties and dimensional constraints in sketches work together to ultimately auto update drawings and Parts List.

# Key learning objectives

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

- Create standardized content using improved sketching techniques
- Alter standard models to fit any unique application
- Quickly generate quality construction drawings
- Create an accurate parts list using intelligent 3D models



# Speaker Introductions





# Chip Cullum

## Senior Associate Engineer – Substation Design

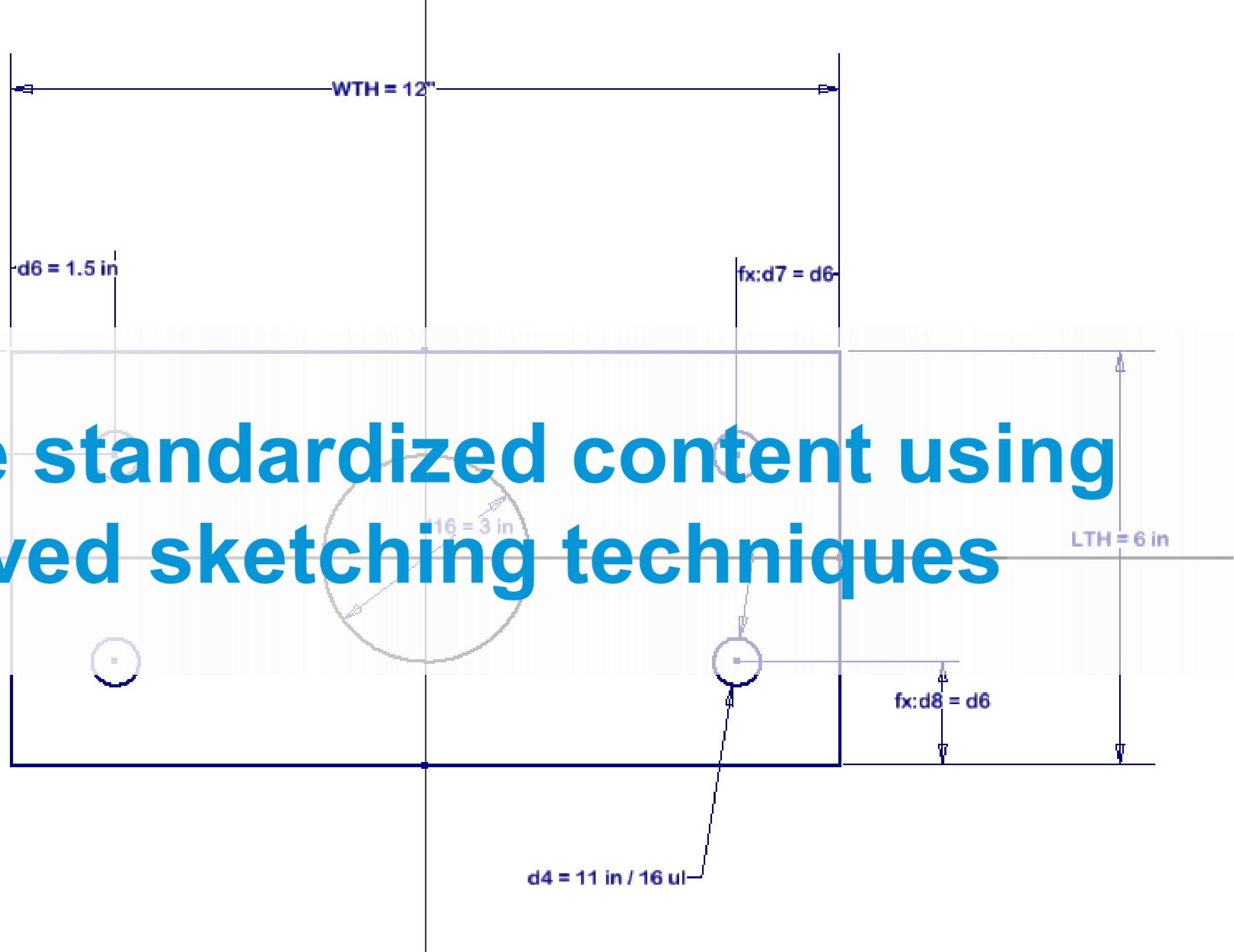
- 7 yrs. at NES
  - Previous to NES, 17 years' experience in manufacturing industry.
  - Use Autodesk Inventor to document substation designs. This includes field checking and using existing paper drawings then transferring this information into Inventor format.
  - Have used AutoCAD since 1989 and previous to NES, has 8 years' experience using Pro-Engineer.
- About Substation Design
  - 3 Designers and 2 Engineers
  - 68 Primary Substations – 30 Customer Substations
  - Build 1 new Station every 2-3 years and work 15-25 Station upgrades per year
  - AutoCAD® Version 1.2 - 1985
  - AutoCAD® Map3D – 2007
  - Autodesk® Inventor® since 2008 & Substation Designer Suite since 2010

# Terri Humel

## Principal Associate Engineer – Substation Design

- 30 Years in Substation Design
  - Designing physical substation layouts including foundations, conduit, grounding and structures
  - Devise workflows and procedures
  - Managed the implementation of Inventor & Substation Designer to create intelligent substations models
- About Nashville Electric Service
  - Publicly Owned Utility – Distribution and Transmission
  - Purchase power from Tennessee Valley Authority at 23 feed points
  - Over 359,000 customers covering 700 sq. miles, including all of Davidson Co. and part of 6 surrounding counties
  - NES is one of the 12 largest public electric utilities in the nation
  - 2010 – One of 6 utilities in the nation awarded APPA's Reliable Public Power Providers (RP3) Diamond Status, the industry's highest designation for reliability and safety.

# Create standardized content using improved sketching techniques

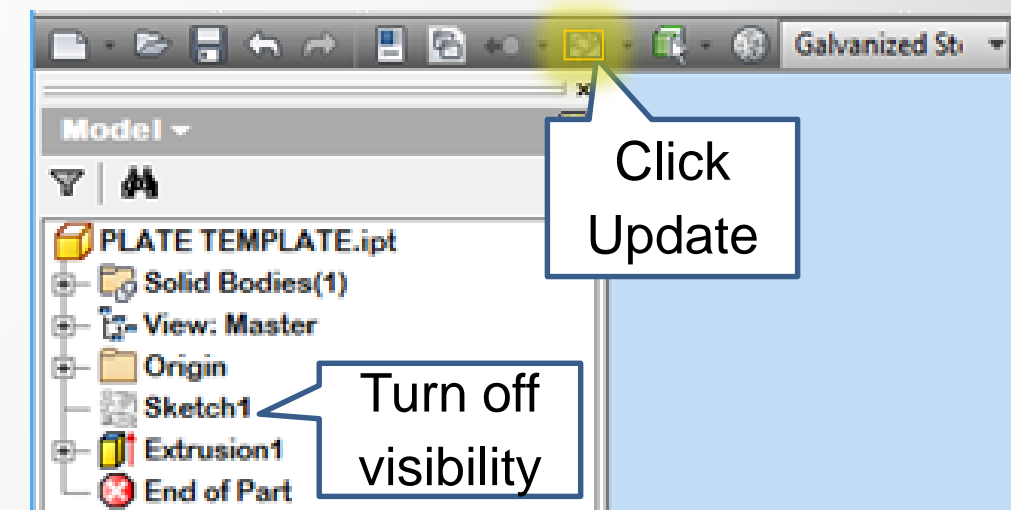
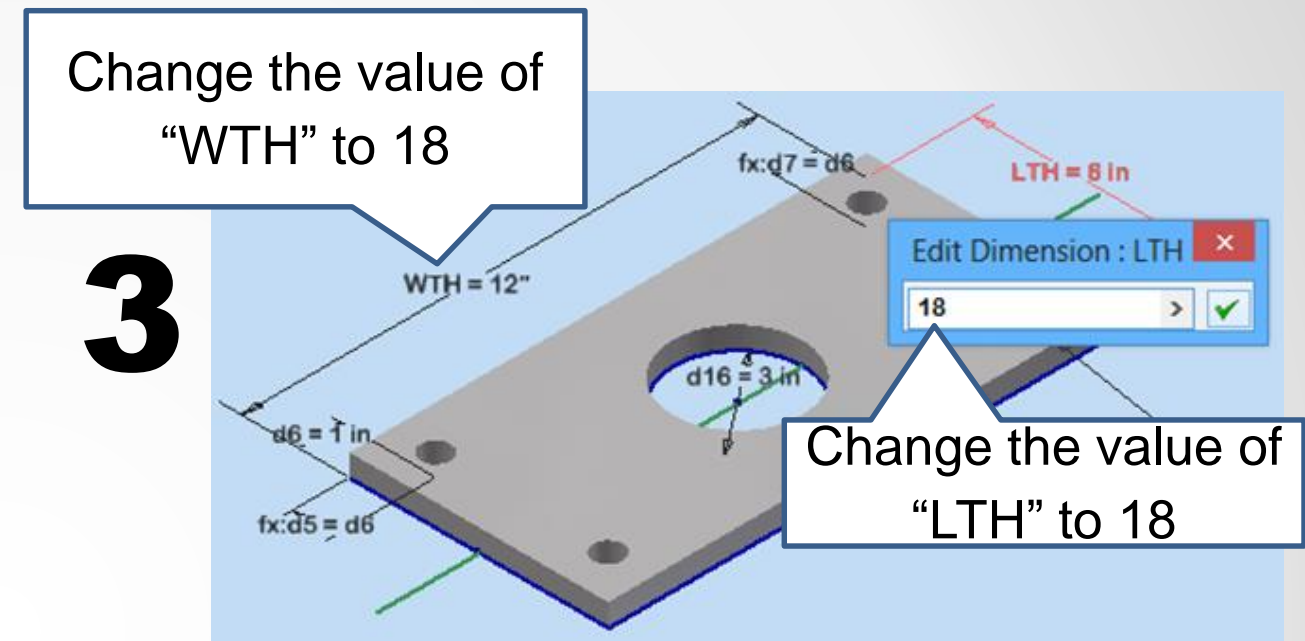
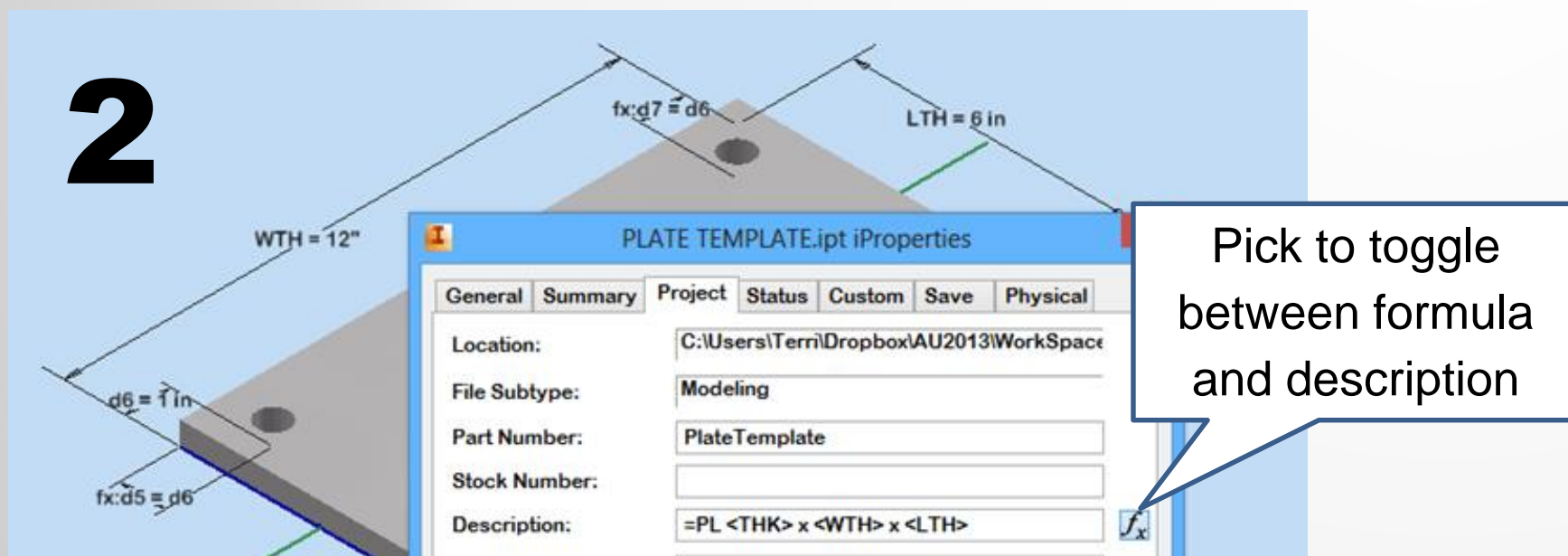
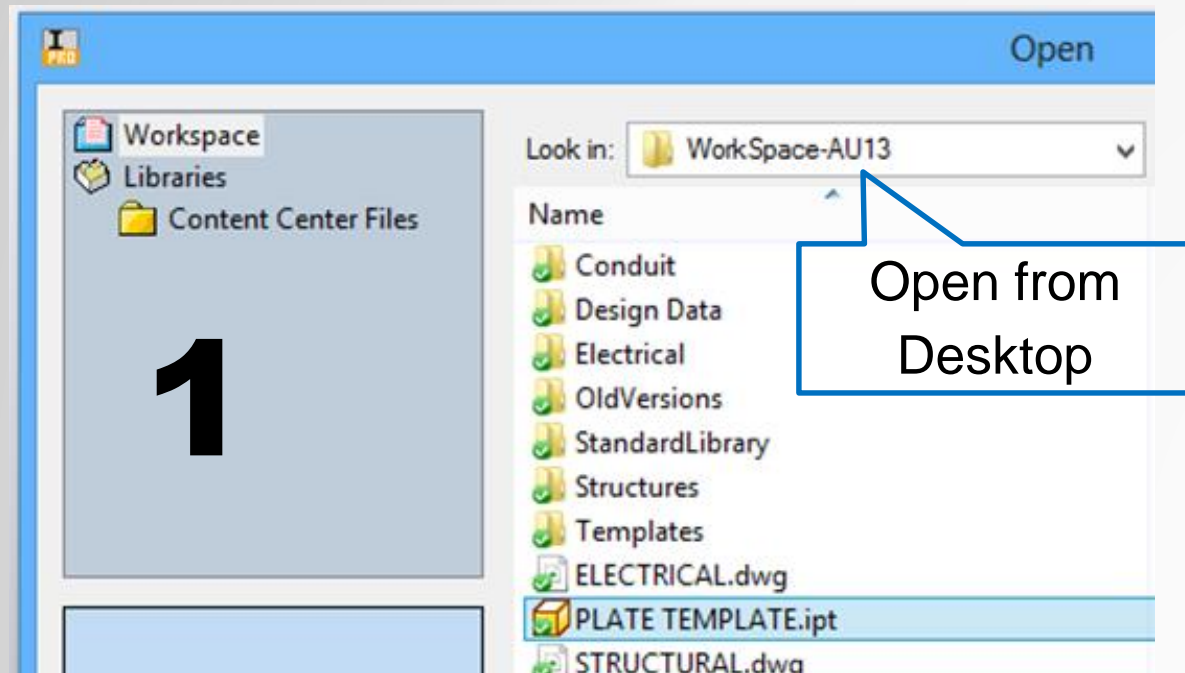


# Where we begin

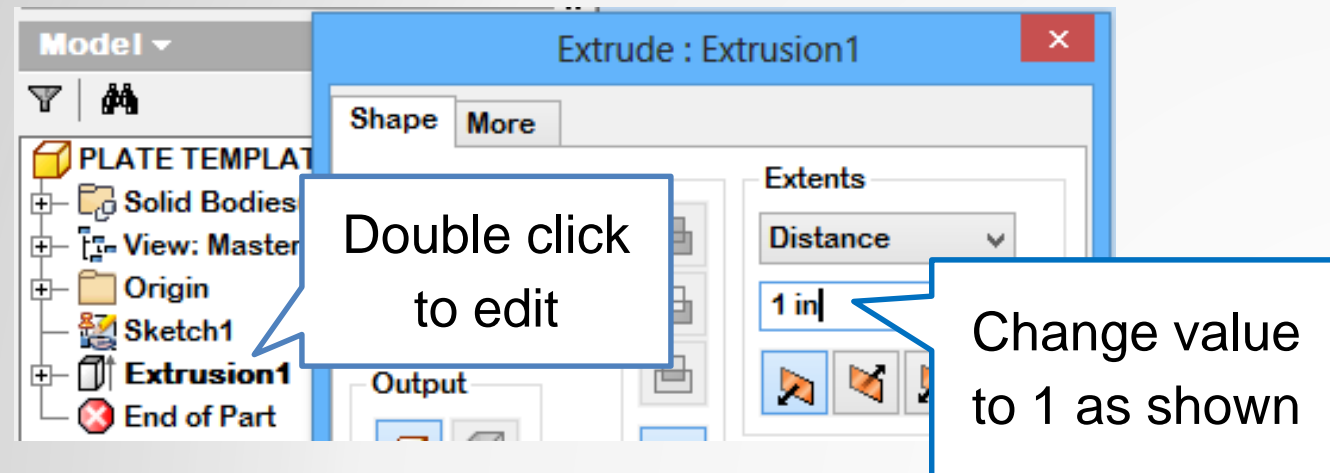
- Start with a PART TEMPLATE with the functionality to update the BOM information by using parameters, formulas and dimensional sketch constraints
- Alter a library part of a typical circuit breaker by editing the dimensional values in the sketch. One library part can be used for several different circuit breakers
- There are several more ways to use standard library parts in specific installations just by altering the sketch



# Part Template



# Part Template



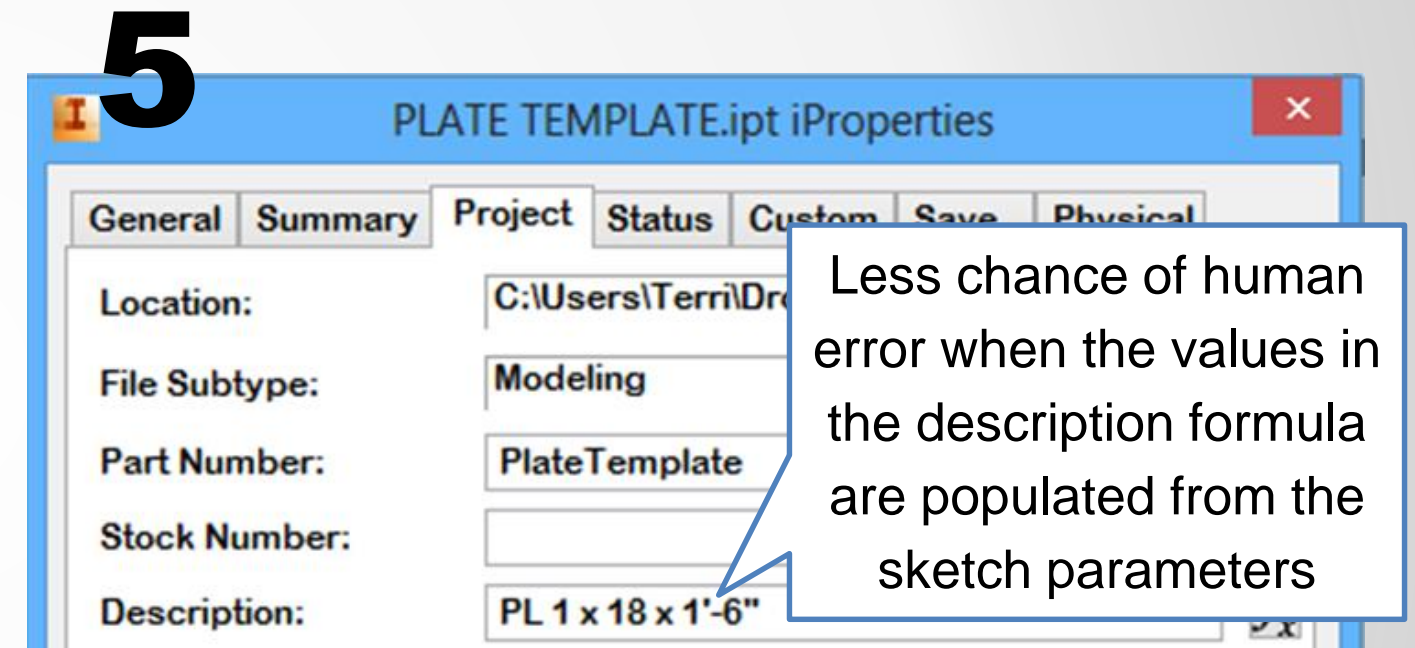
OR

4

Parameter Name	Unit/Type	Equation
Mo		
		6 in
		12"
		1 in
d3	deg	0.0 deg
d4		11 in / 16 ul

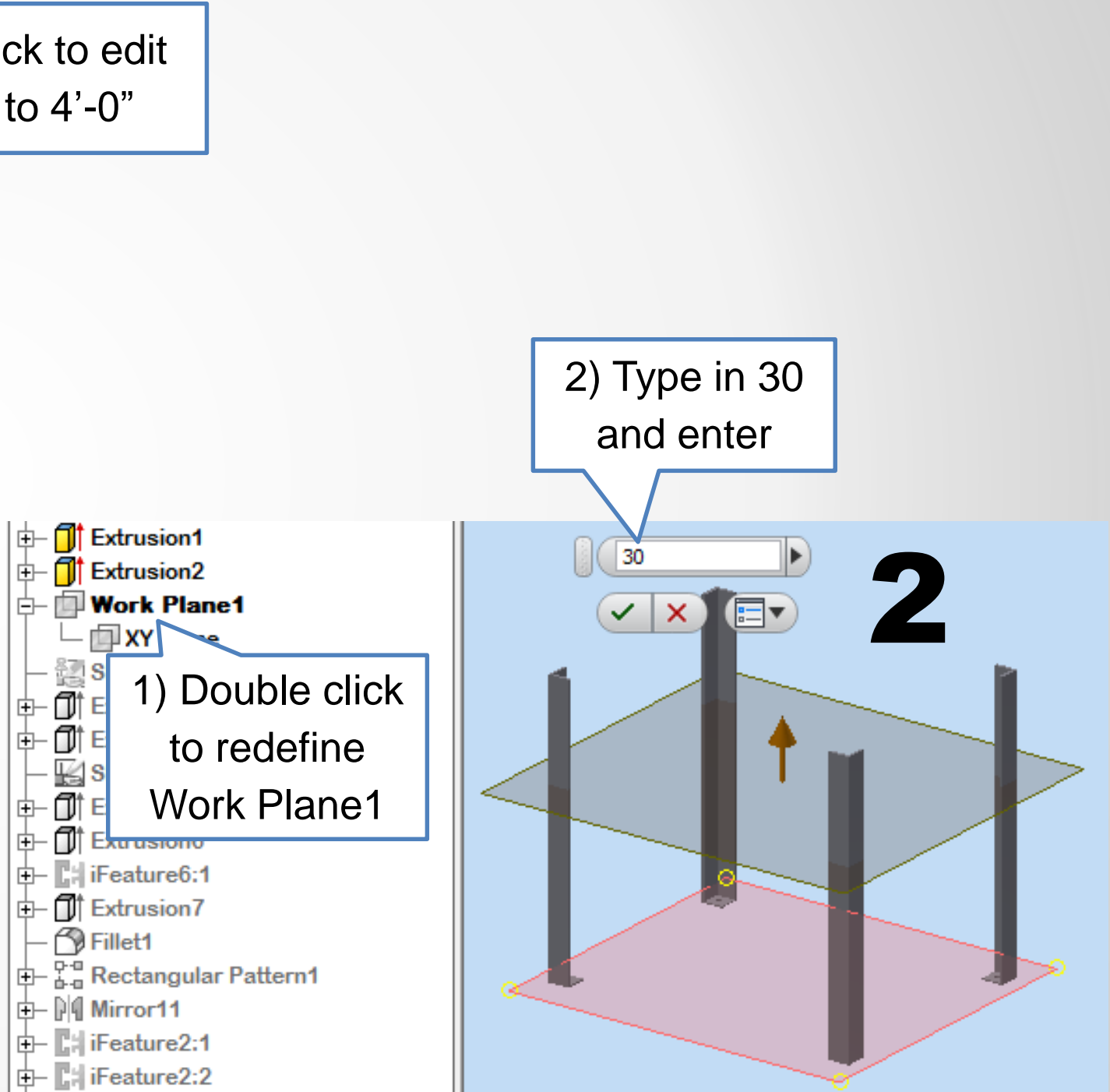
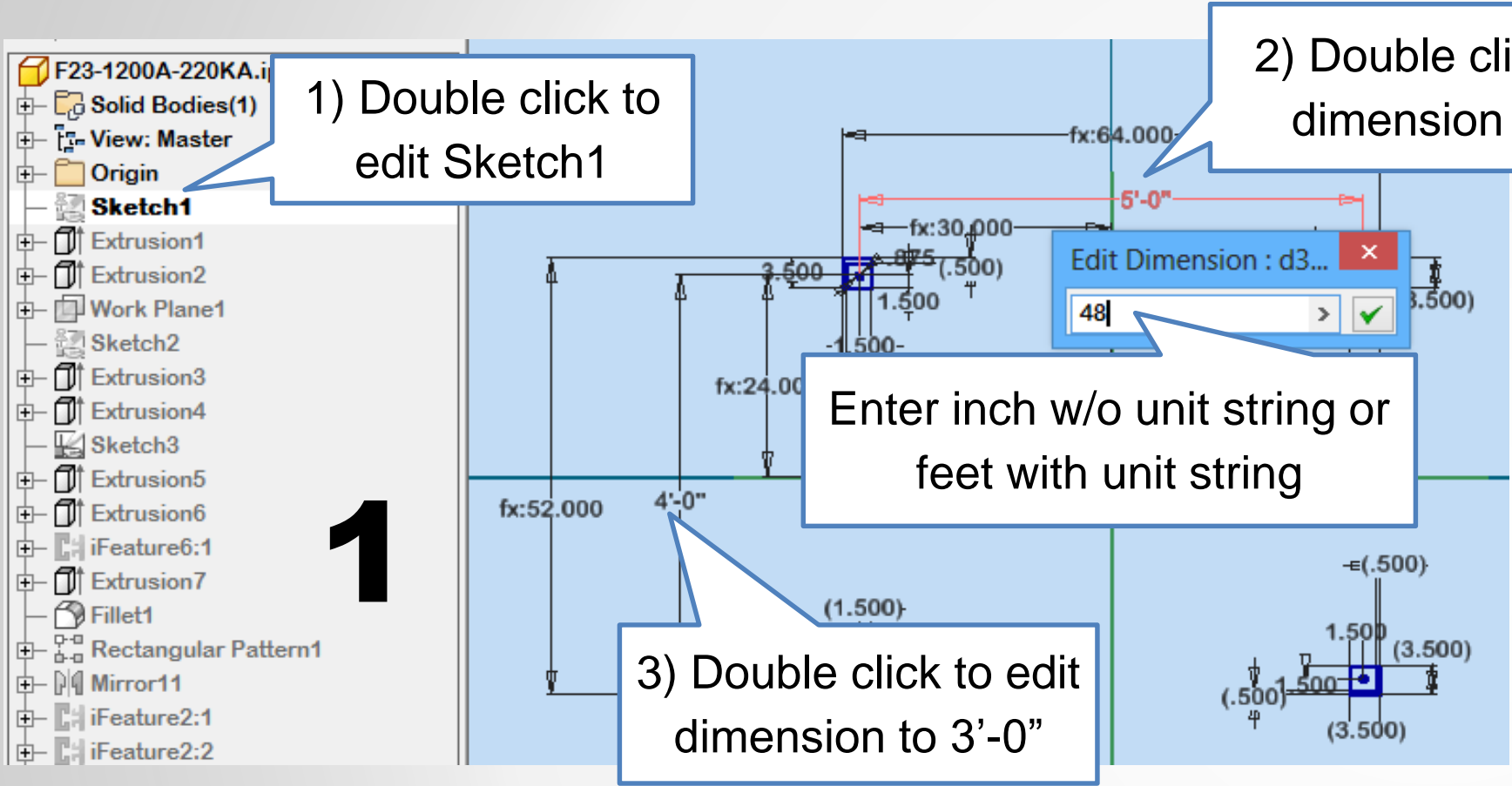
THK is consumed by Extrusion1

Change value to 1 as shown



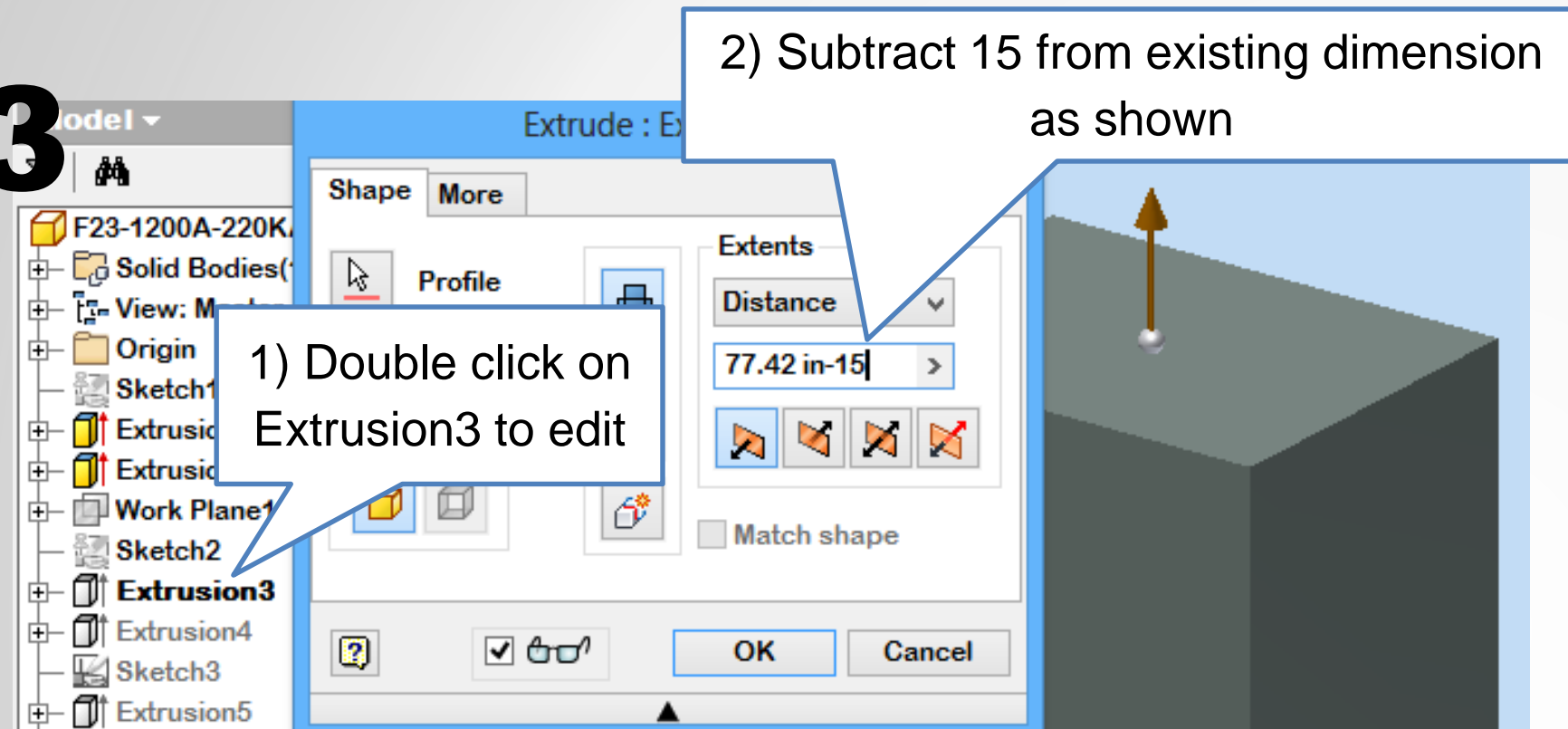
6 Save and close the PLATE TEMPLATE

# Typical Circuit Breaker

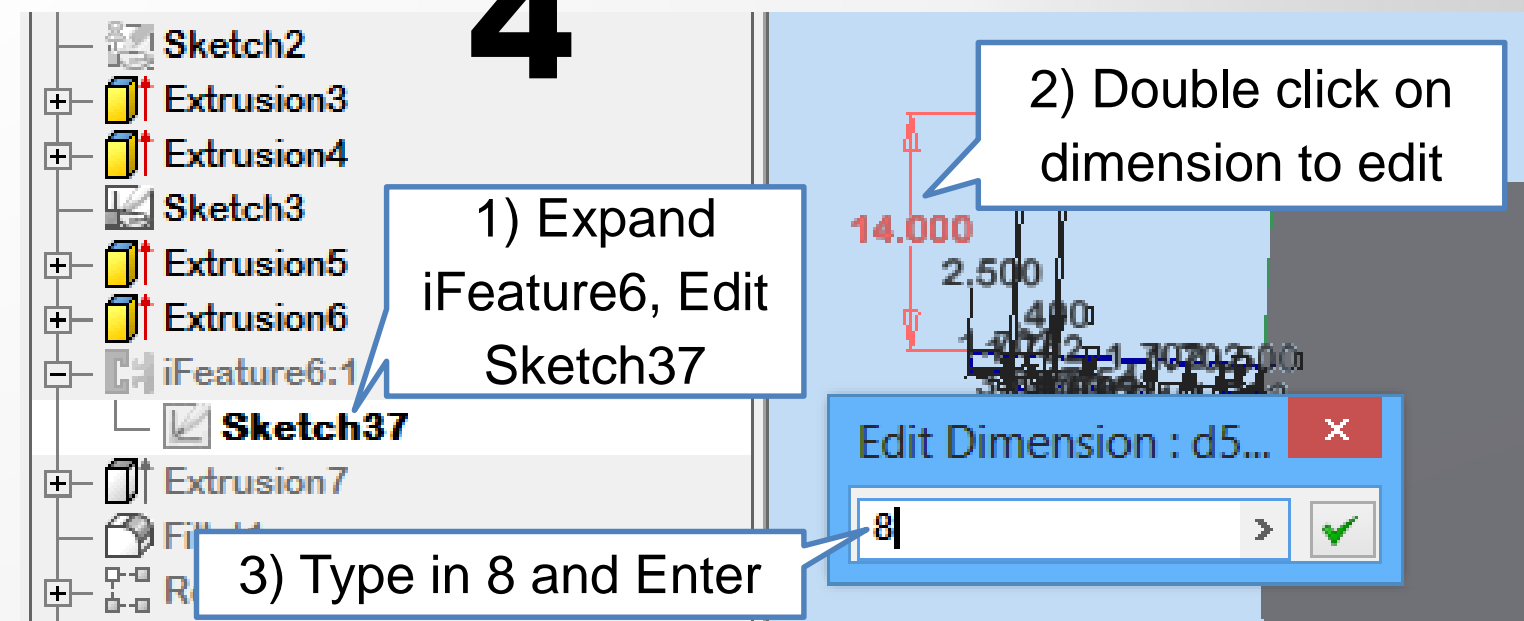


# Typical Circuit Breaker

3



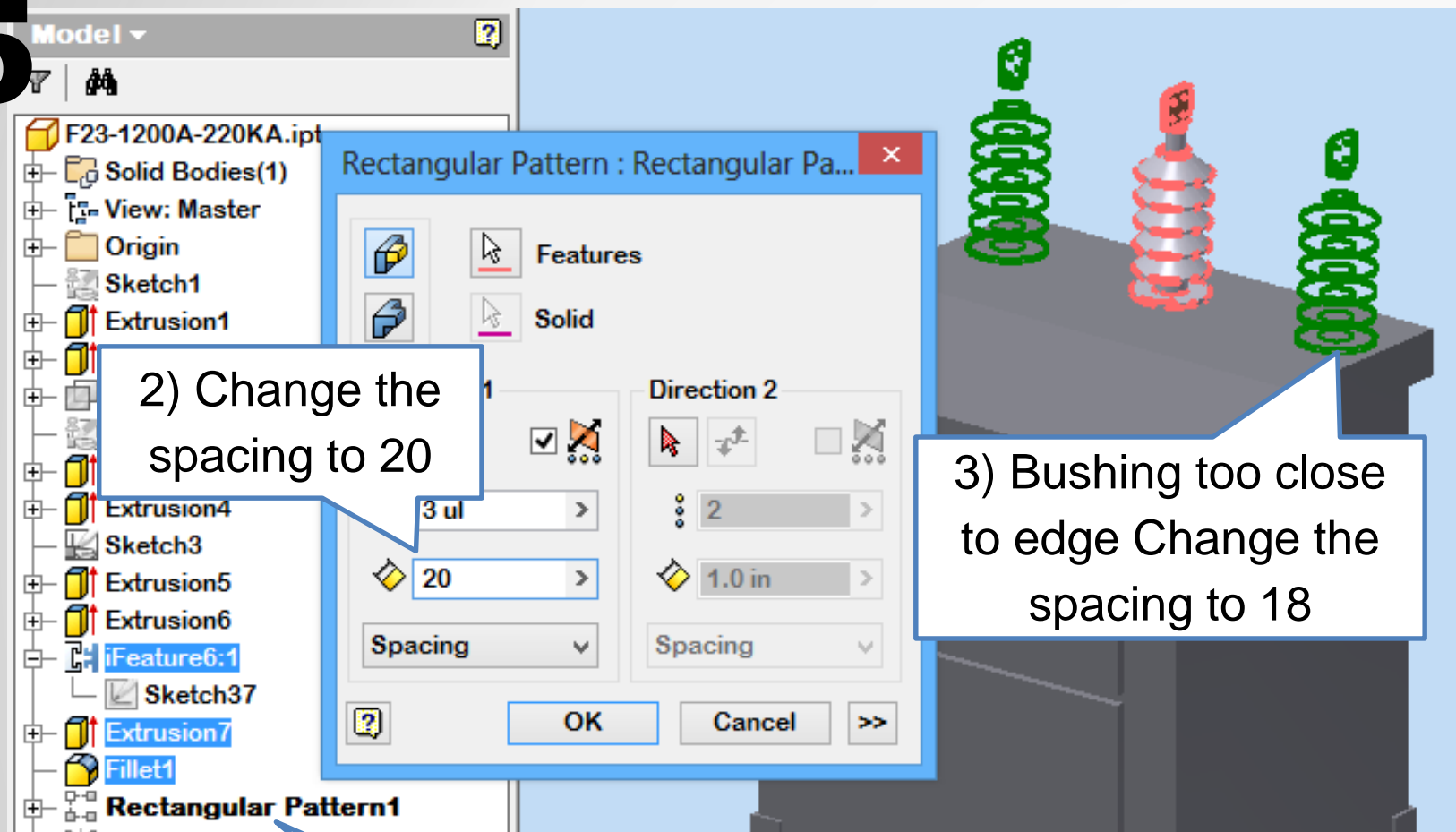
4





# Typical Circuit Breaker

5



2) Change the spacing to 20

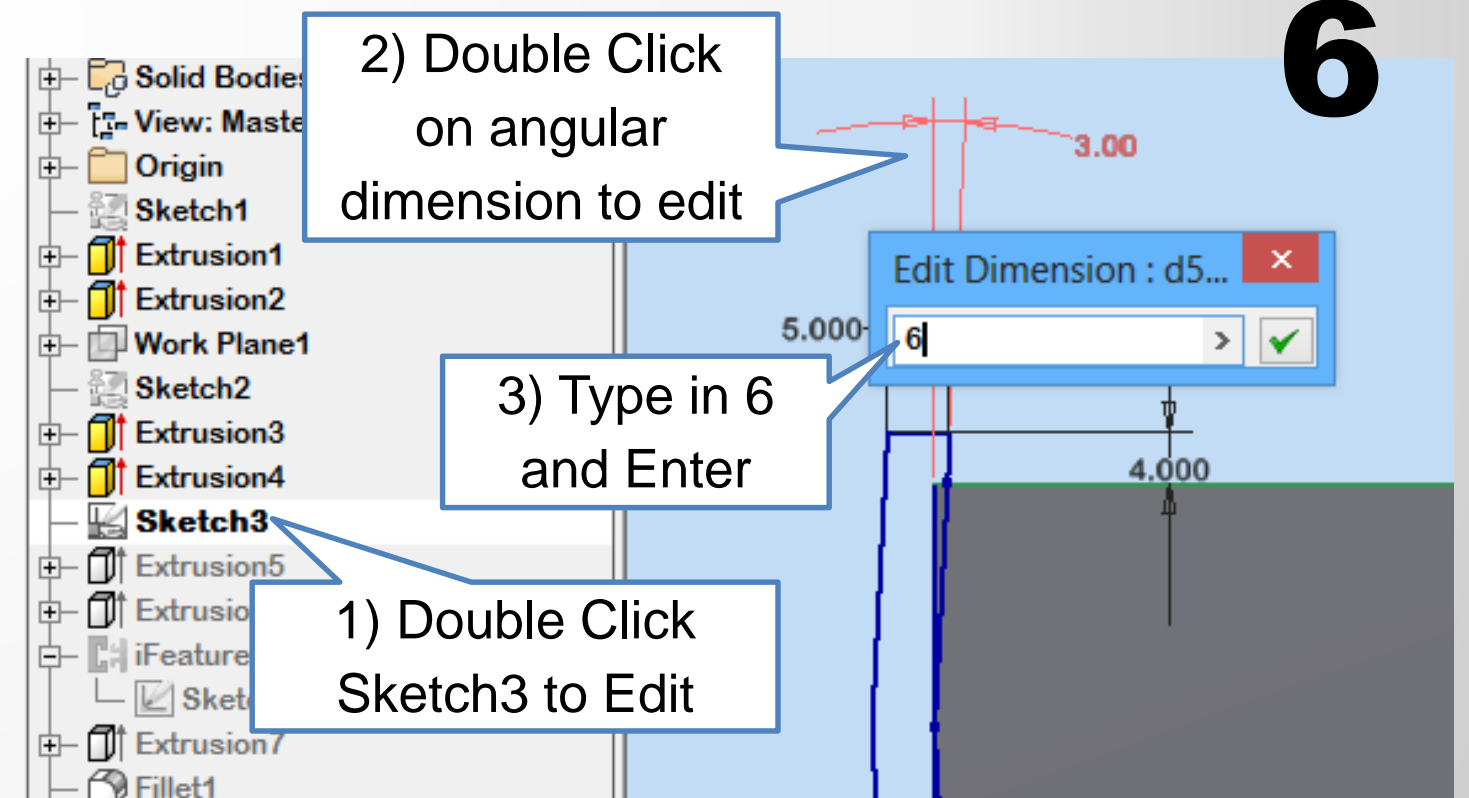
3) Bushing too close to edge Change the spacing to 18

1) Double click to edit

7

Save and close the file


6



2) Double Click on angular dimension to edit

3) Type in 6 and Enter

1) Double Click Sketch3 to Edit

A detailed 3D CAD model of a high-voltage electrical substation. The model features a complex arrangement of metal structures, including a large central busbar system supported by multiple insulators. Various components like circuit breakers, disconnect switches, and potential transformers are visible, all interconnected by a network of conductors. The entire assembly is mounted on a series of concrete or metal foundations. The text "Alter standard models to fit any unique application" is overlaid in a large, blue, sans-serif font across the center of the image.

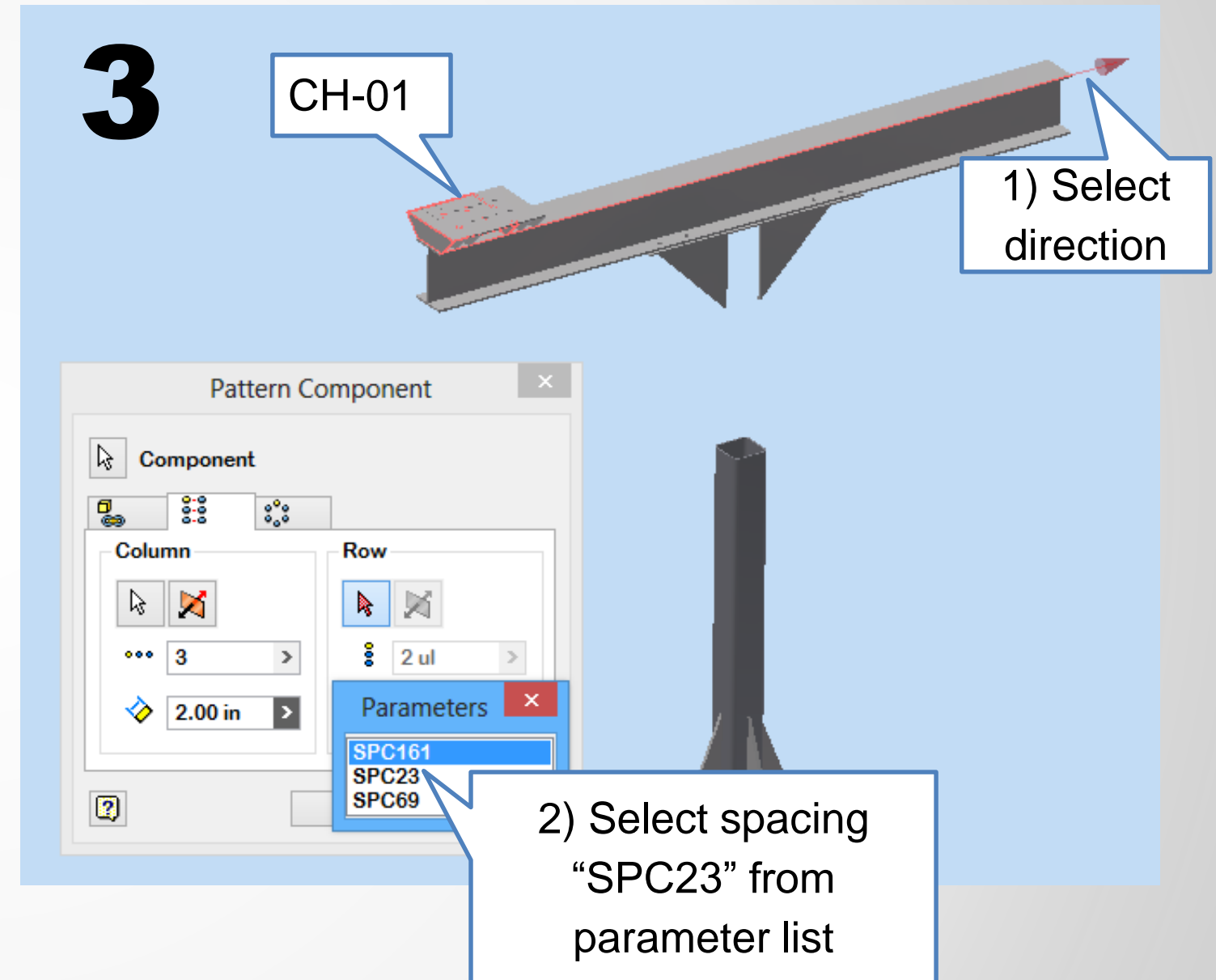
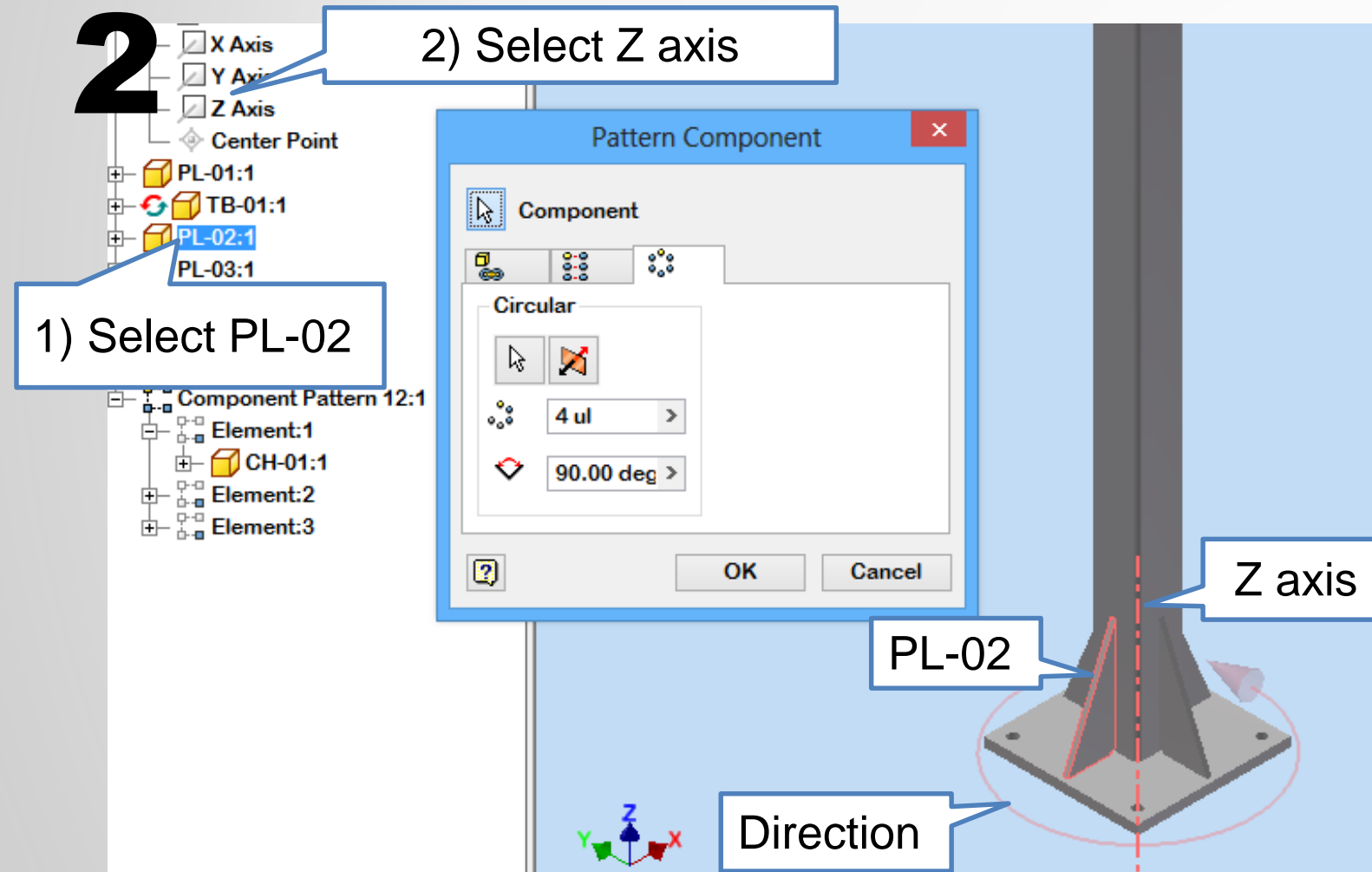
**Alter standard models to fit any unique application**

# Standard Sub-Assembly

- Use one Standard Sub-Assembly for multiple applications
- The constraint relationships between the parts allows the model to adapt to dimensional changes
- Use pattern spacing and constraints to make a standard model for a specific installation
- The assembly and drawing will automatically update as the model is altered.

# Standard Bus Support Model

**1** Open the file STANDARD-BUS-SUP.iam





# Standard Bus Support Model

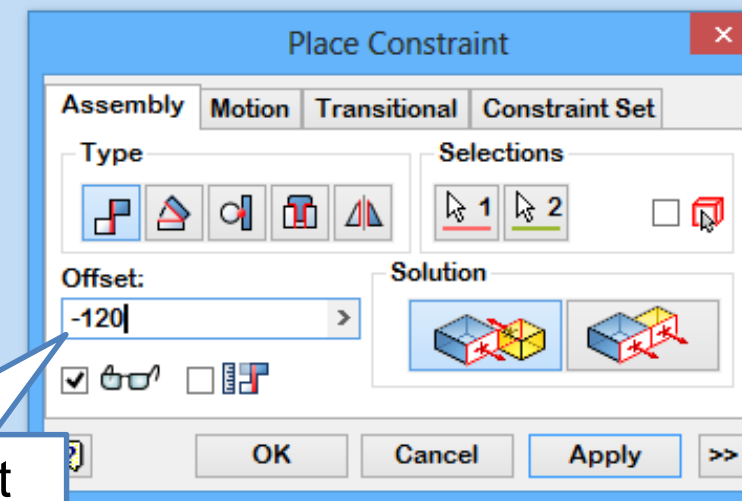
## TYPICAL PHASE TO PHASE SPACING

User Parameters are set up to correspond to the phase to phase spacing for different voltages as shown below.

User Parameters			
161kV Spacing (SPC161) = 9'-0"	SPC161	in	9'-0"
69kV Spacing (SPC69) = 6'-0"	SPC69	in	6'-0"
23kV Spacing (SPC23) = 3'-6"	SPC23	in	3'-6"

4

Pick the top  
of CH-01



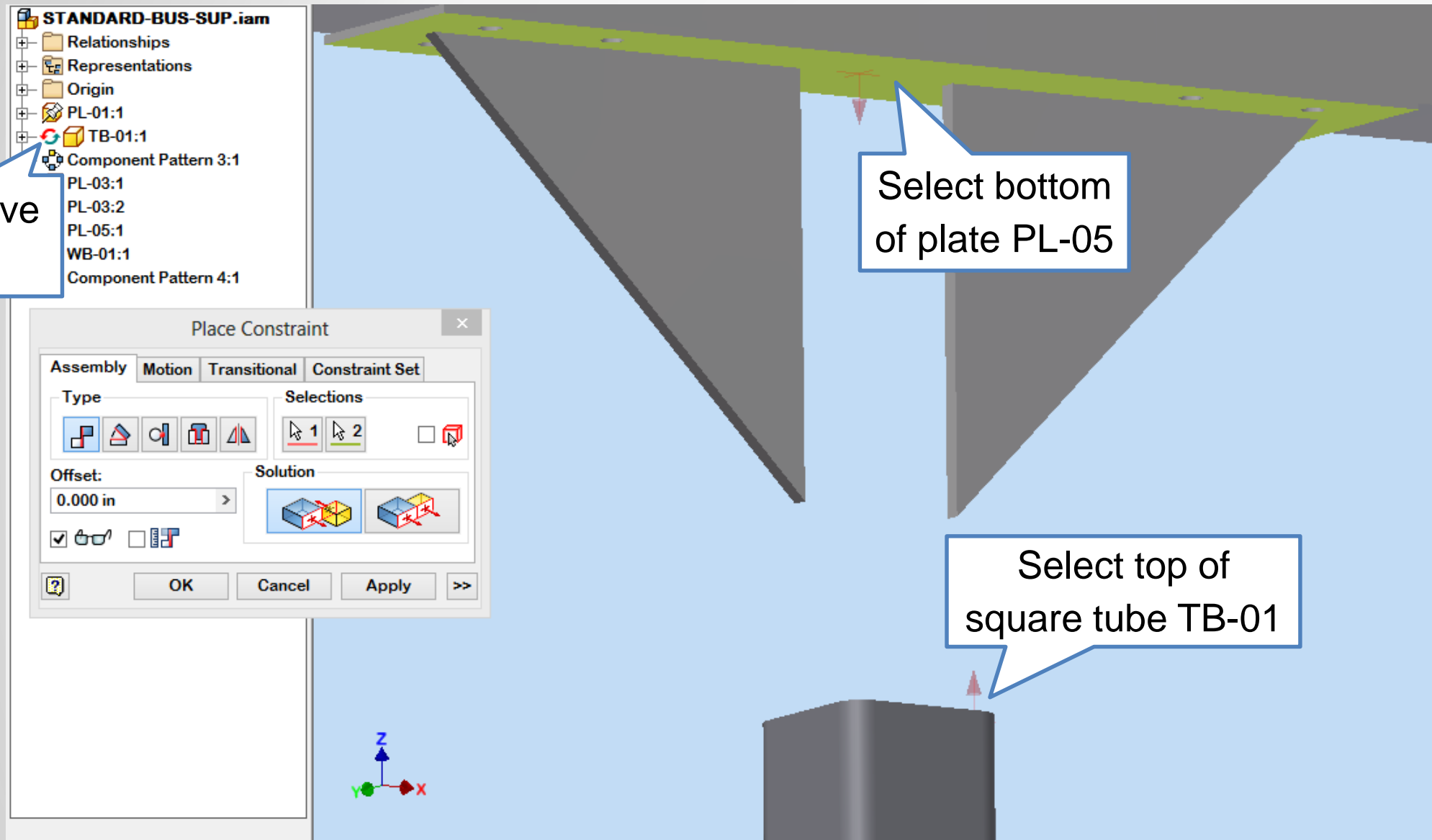
Type in Offset  
value as shown

Pick the bottom  
of PL-01

# Standard Bus Support Model

5

Adaptive  
icon

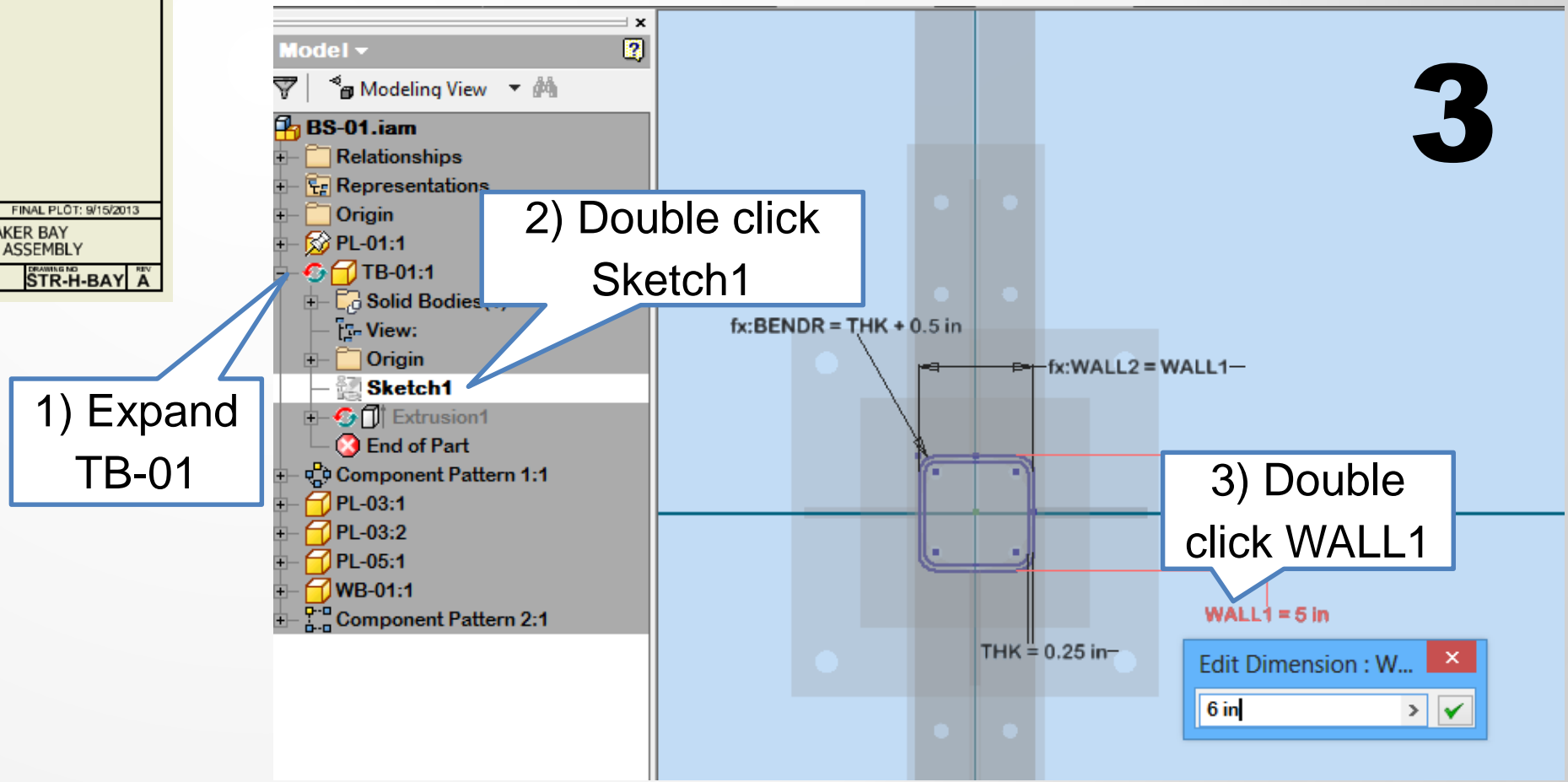
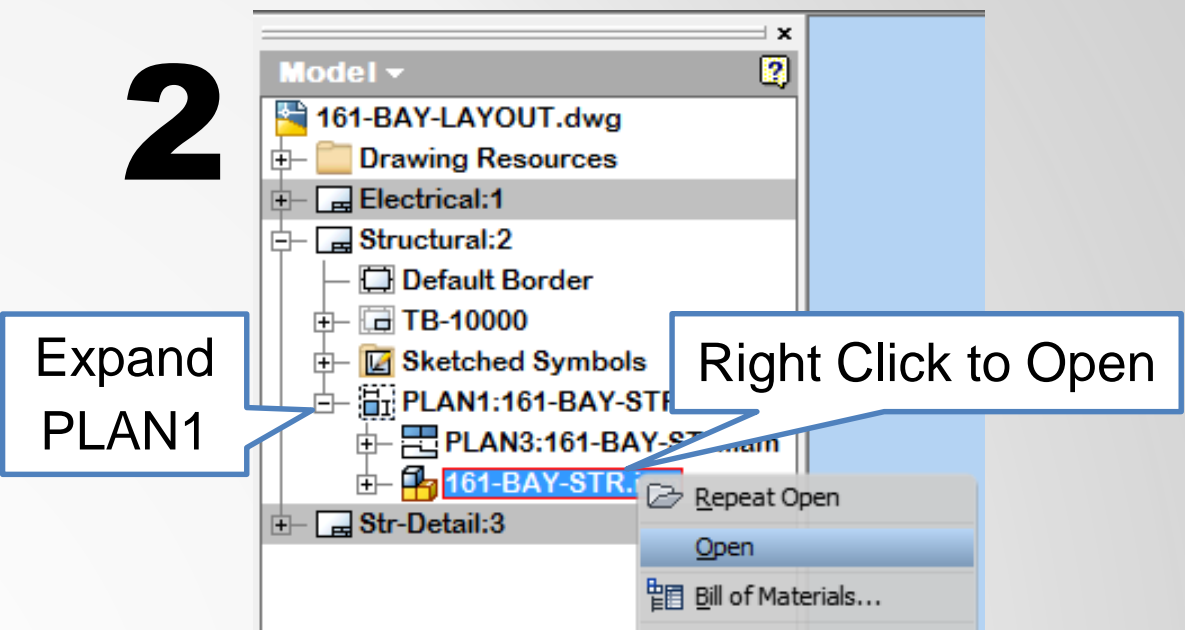
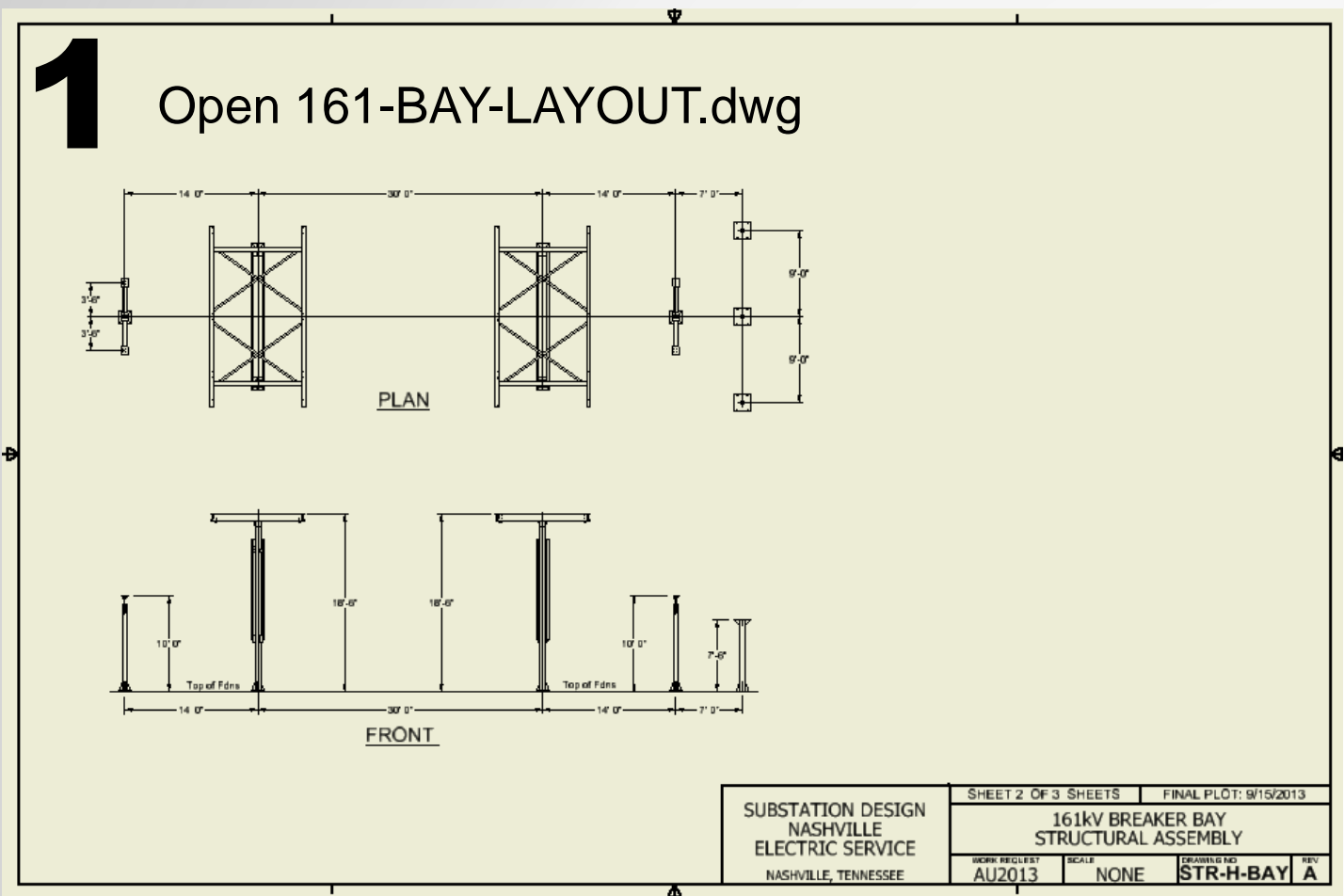


6

The Standard Bus Support Assembly is complete. Save as BS-01 to keep the Standard Assembly pristine. (Select “Yes” to replace existing BS-01 file.)

7 DO NOT CLOSE

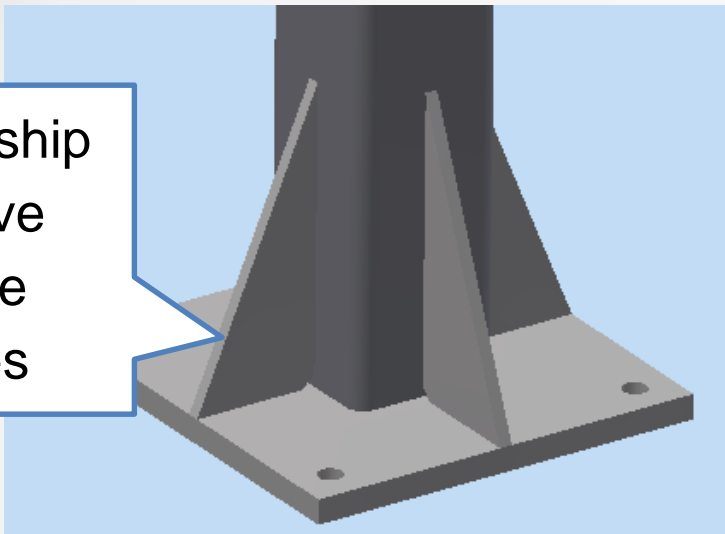
# Standard Structural Models



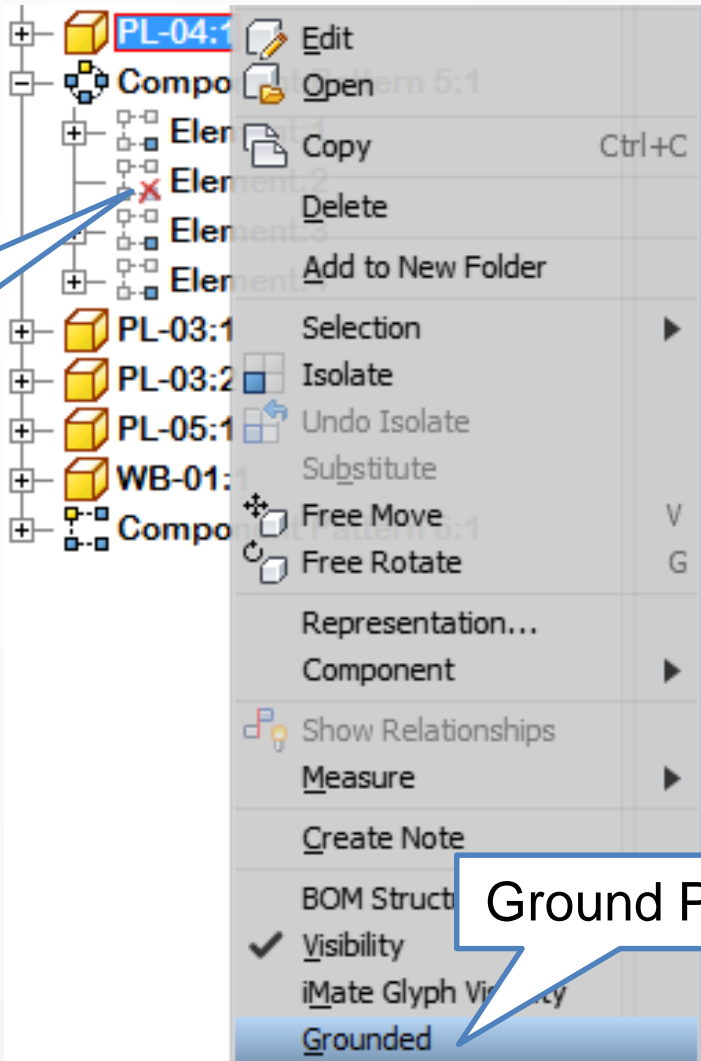
# Standard Structural Models

4

The constraint relationship causes the plate move according to the tube dimensional changes

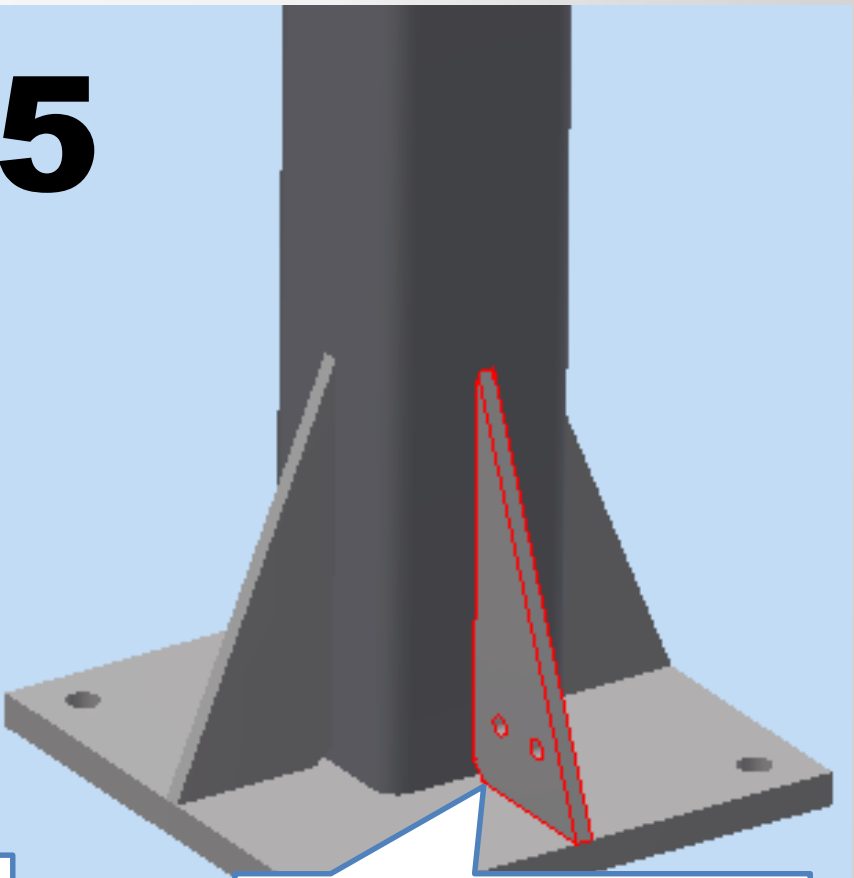


Red x represents  
Element2 is  
Independent Element



Ground PL-04

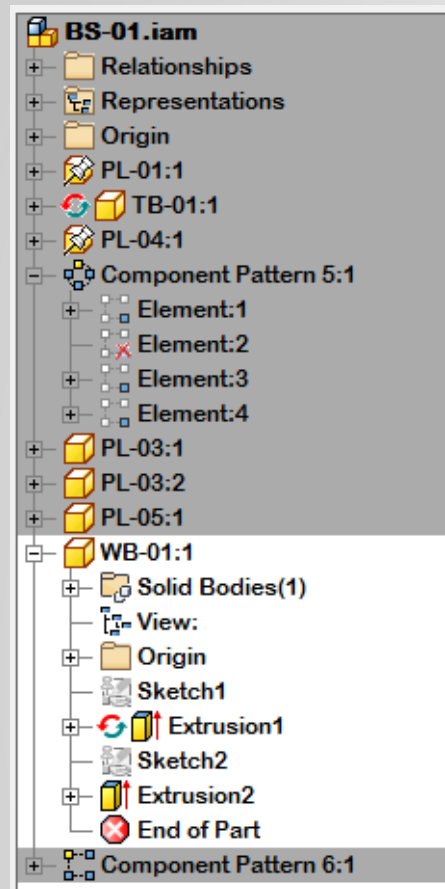
5



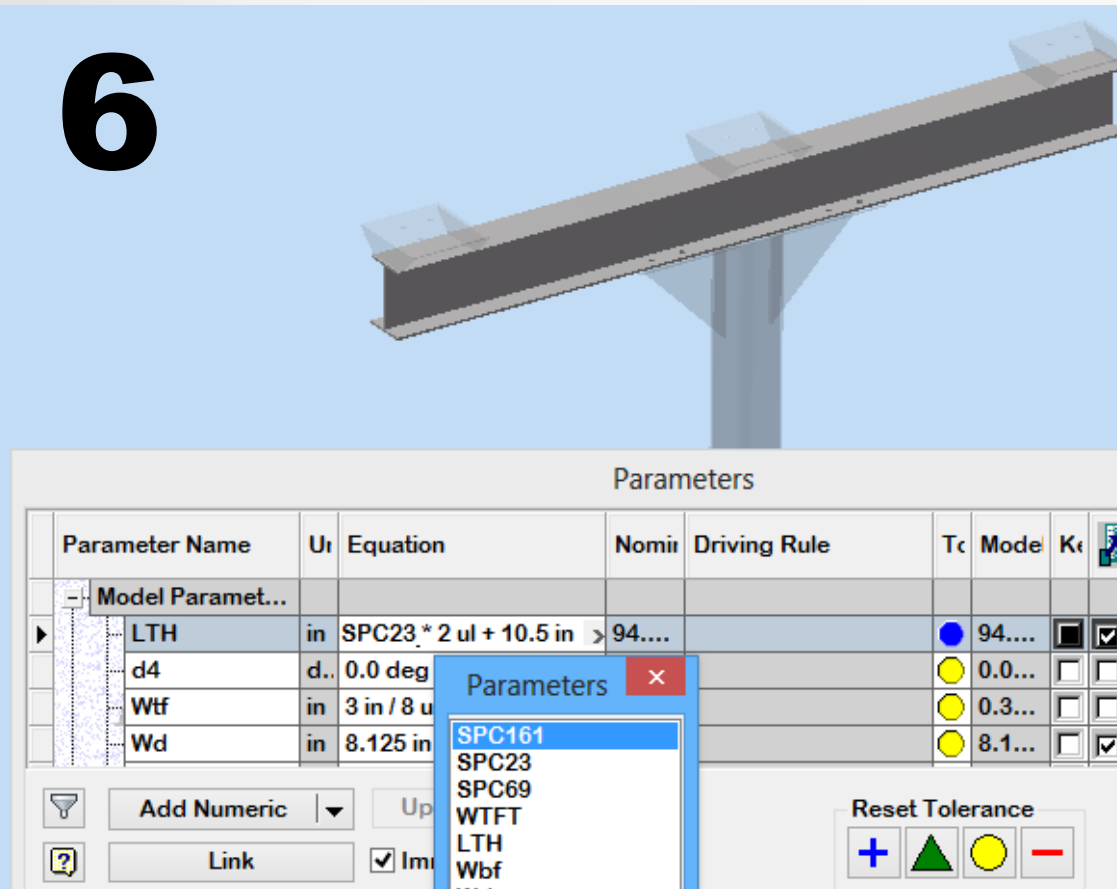
Replace Independent  
PL-02 with PL-04



# Standard Structural Models

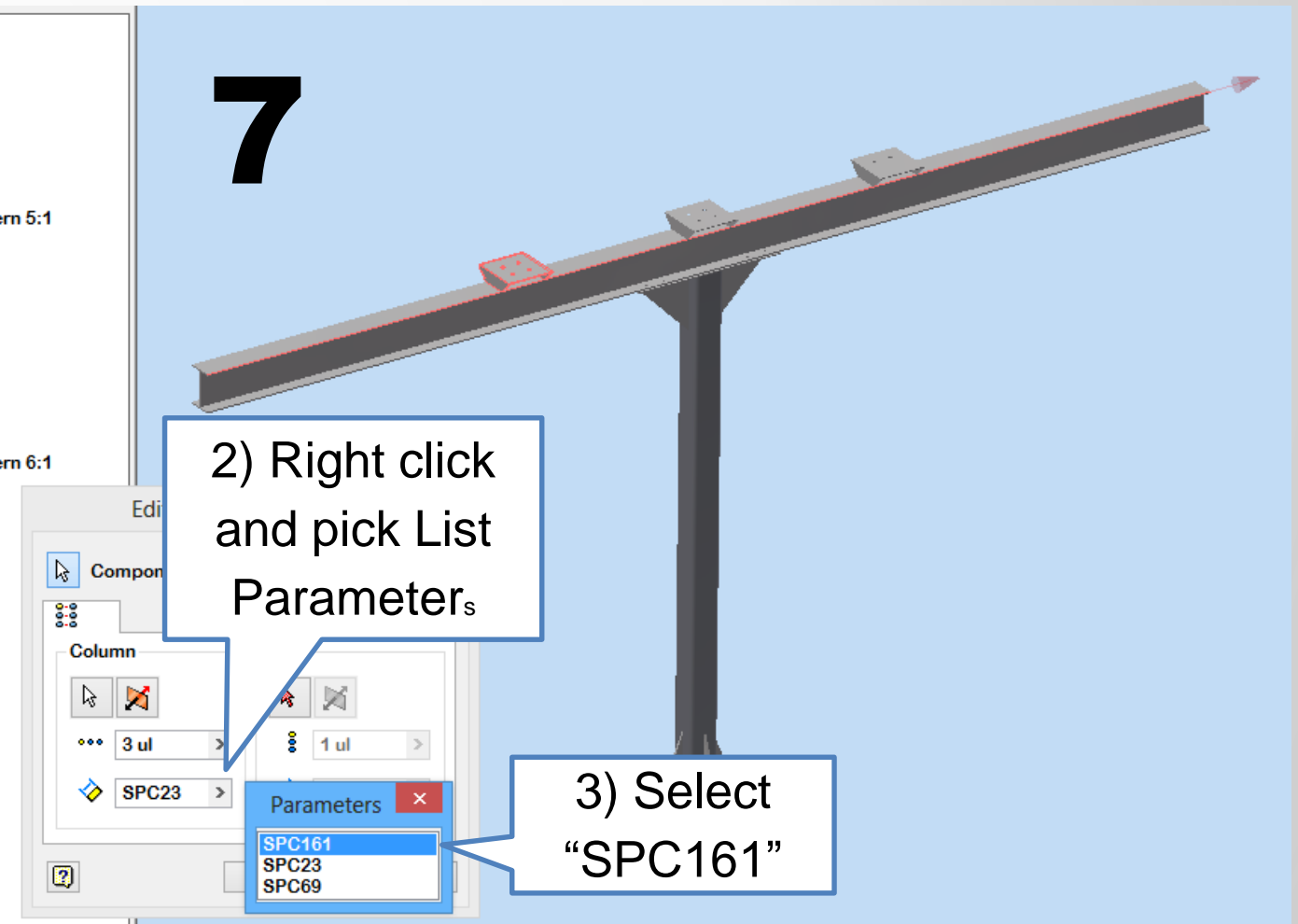


6



1) Double Click on Component Pattern6 to Edit

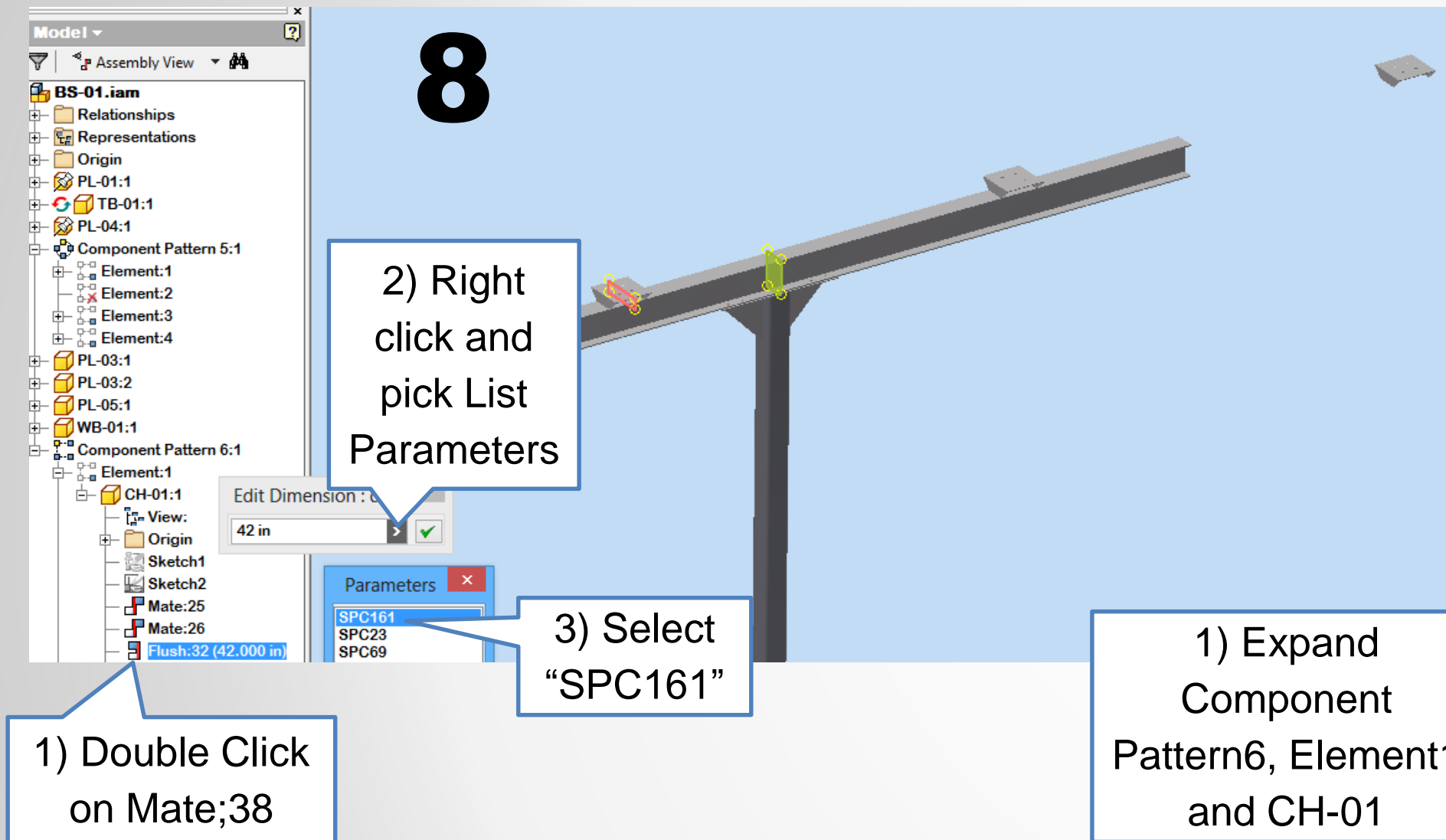
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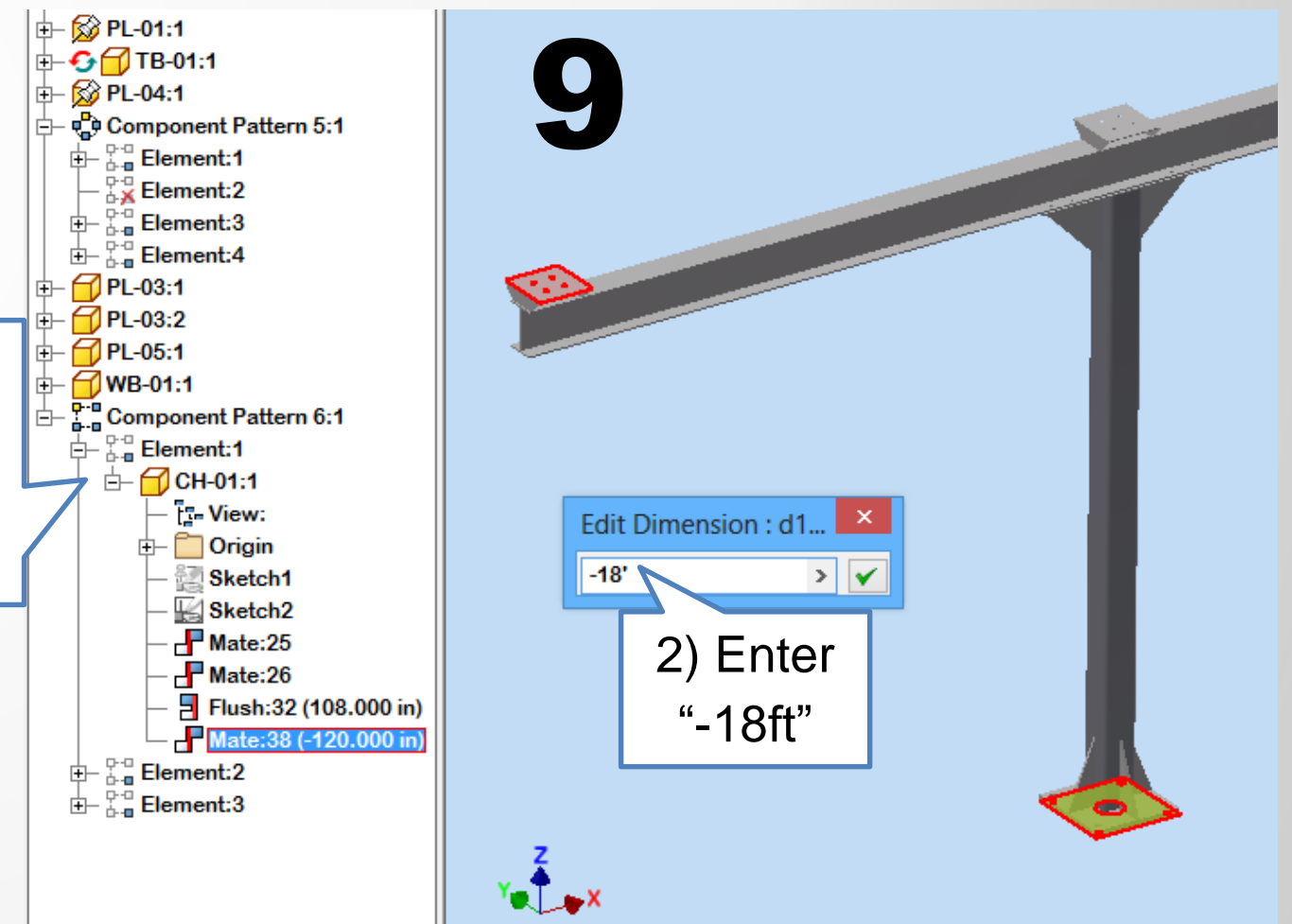
2) Right click and pick List Parameters

3) Select "SPC161"

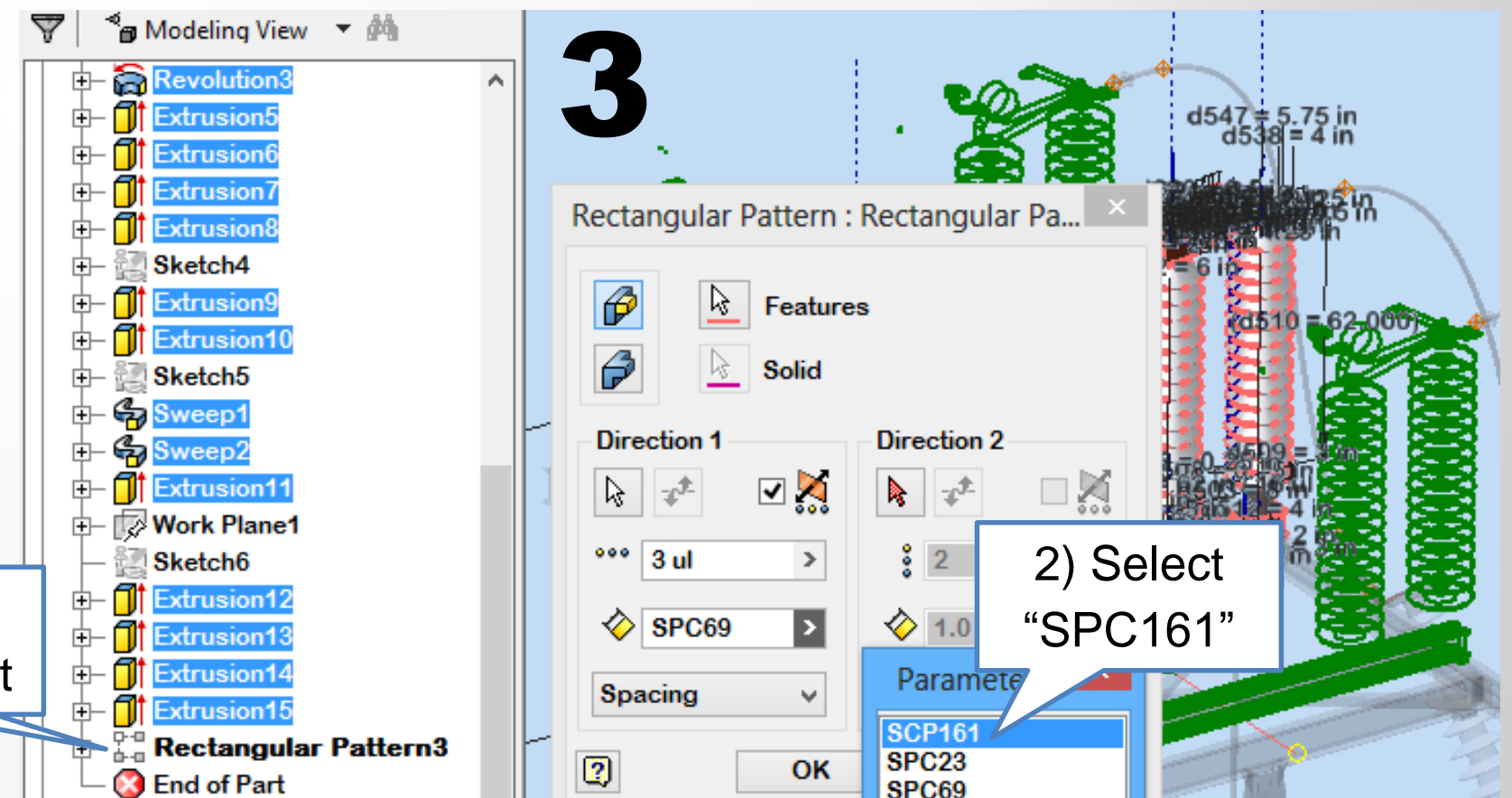
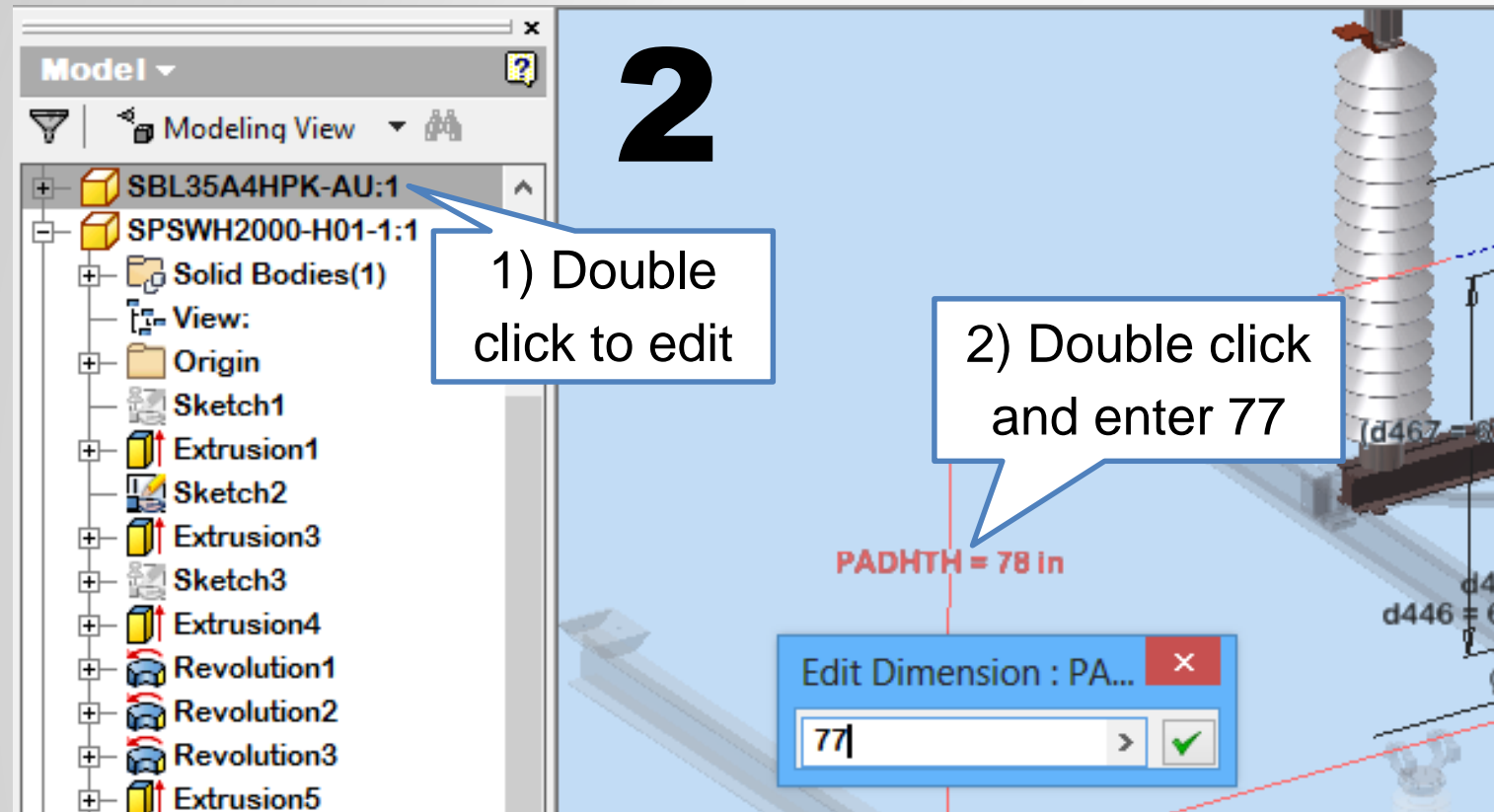
# Standard Structural Models



1) Expand Component Pattern6, Element1 and CH-01



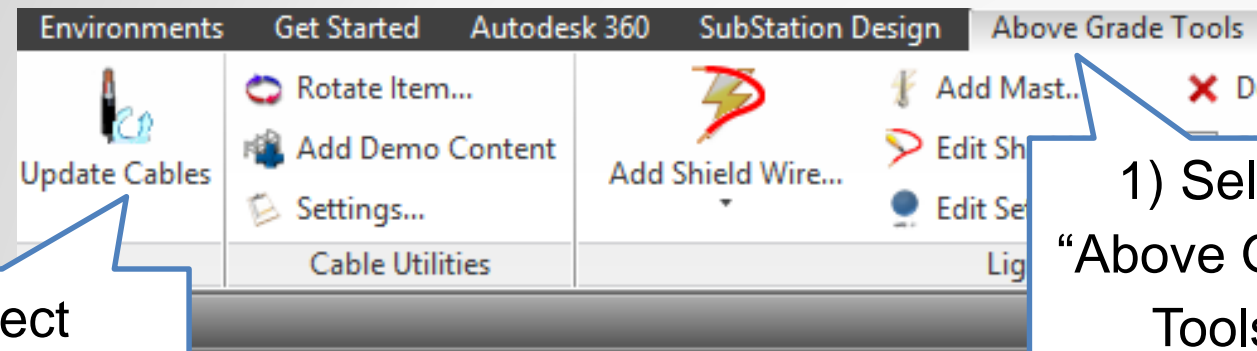
# Standard Electrical Models



# Standard Electrical Models

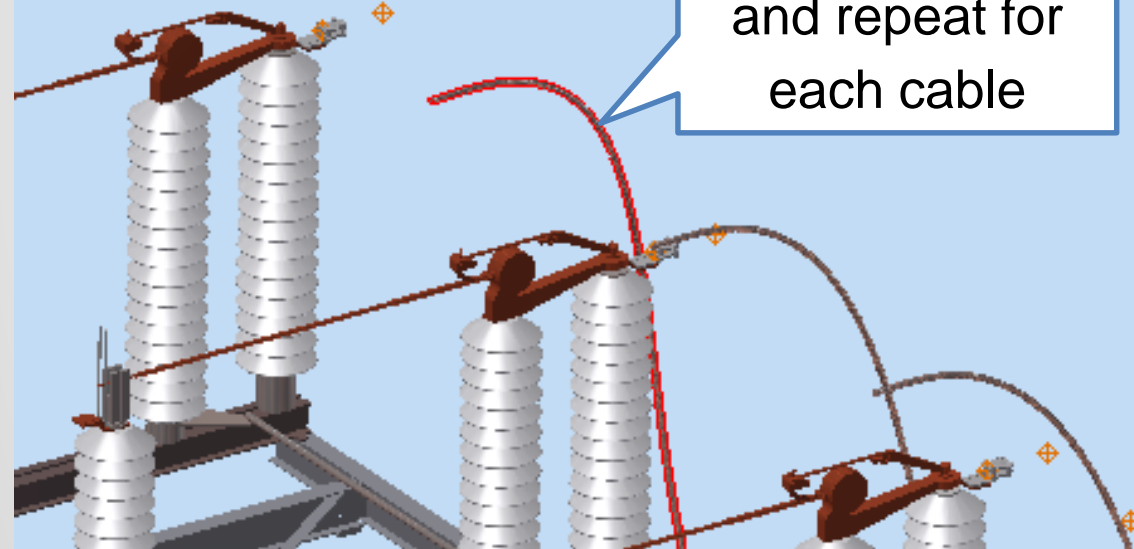
4

2) Select  
"Update Cables"



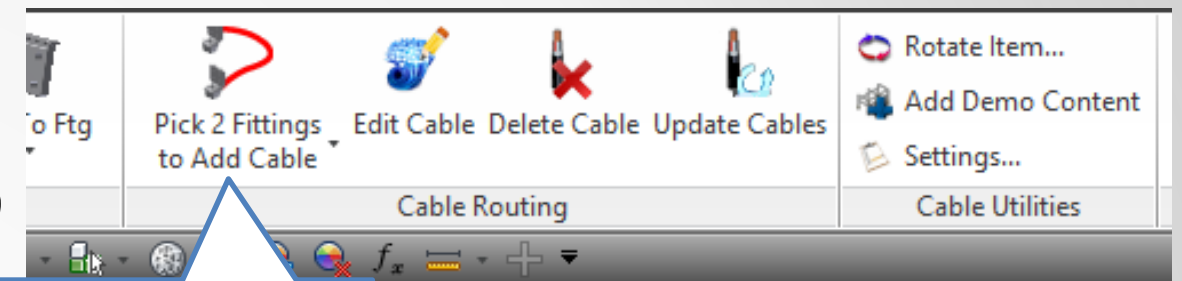
1) Select  
"Above Grade  
Tools"

3) Select Cable  
and repeat for  
each cable



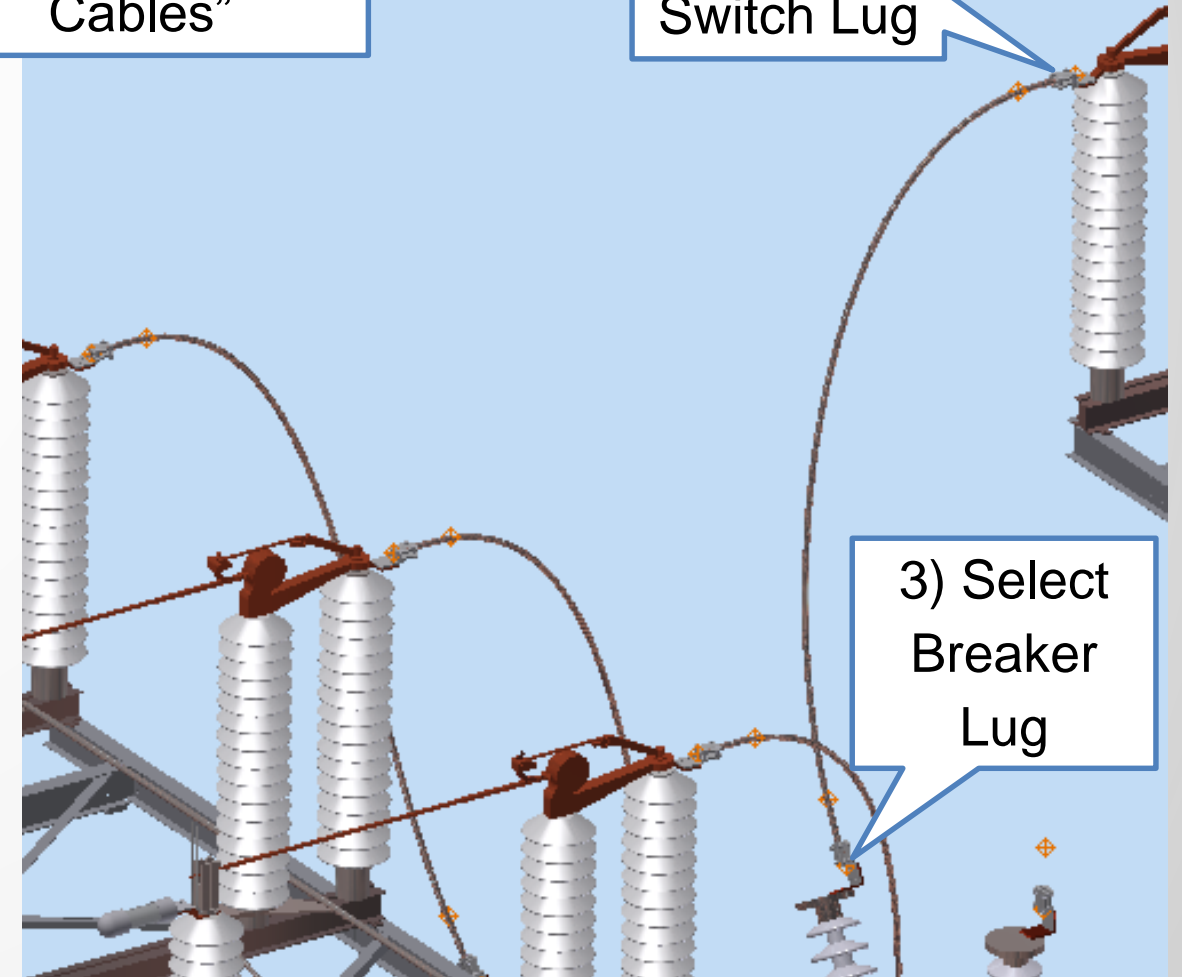
5

1) Select "Pick 2  
fittings to Add  
Cables"



2) Select  
Switch Lug

3) Select  
Breaker  
Lug





# Standard Electrical Models

6

4/0 Bare  
CU Cable

B-001						
Model Data    Structured    Parts Only						
Title	△	Base Unit	Base QTY	QTY	Part Number	Description
B-001		ft	8.92272...	9 ft	SBCC4/0S	CABLE CU BSD 4/0 19S
B-009		ft	*Varies*	42 ft	SBCA1351	CABLE AAC BARE 1351.5 KCM 61
B-02		ft	1 ft	2 ft	SBTA35	TUBING AL 3 1/2
B-03		Each	Each	2	SBL35A4HPK	TERMINAL LUG 3 1/2 AL 4H POWERLOK
B-032		Each	Each	12	SBL1351A4H	TERM LUG 1351.5 AAC 4H
B-04		Each	Each	1		DED
B-05		Each	Each	2		BE POWERLOK
B-130		Each	Each	2		SBC BUS SUPPORT
E-01		Each	Each	2		PORT 161kV 5BC
E-02		Each	Each	2		
M-01A		Each	Each	1	SPACER-AU	SPACER BUS SUPPORT 5BC 2 in
M-01B		Each	Each	1	SPACER-PT	SPACER BUS SUPPORT 5BC 2 in

Bus Support Spacer  
height calculated from  
parameters

1) Pick PT  
Lead to edit

7

2) Choose to  
resize cable

Edit Bare Cable

Cable Size: CABLE CU BSD 4/0 19S

Sag Percent

Add Mid

Flip Cabl

Flip Cabl

\* Enter 0 to re

CABLE CU BSD 4/0 19S

CABLE ACSR BARE 1/0 6

CABLE AAC BARE 1351.5 M 61

CABLE ACSR BARE 2 6/1

CABLE ACSR BARE 4/0 6/1

CABLE ACSR BARE 477 18/1

CABLE ACSR BARE 795 36/1

CABLE CU BHD 1/0 7S

CABLE CU BSD 1000 MCM 61S

CABLE CU BSD 1500 MCM 91S

CABLE CU BHD #2 7S

CABLE CU BHD 300 MCM 19S

CABLE CU BHD 4/0 7S

CABLE CU BSD 4/0 19S

CABLE CU BHD 500 MCM 19S

CABLE CU BMD 500 MCM 37S

CABLE CU BSD 750MCM 61S

CABLE CU BHD 4/0 7S (GROUNDING)

CABLE CU BSD 4/0 19S (GROUNDING)

CABLE CU BMD 500MCM 37S (GROUNDING)

CABLE AL 25KV EPR 4/0 W/CN 3CP

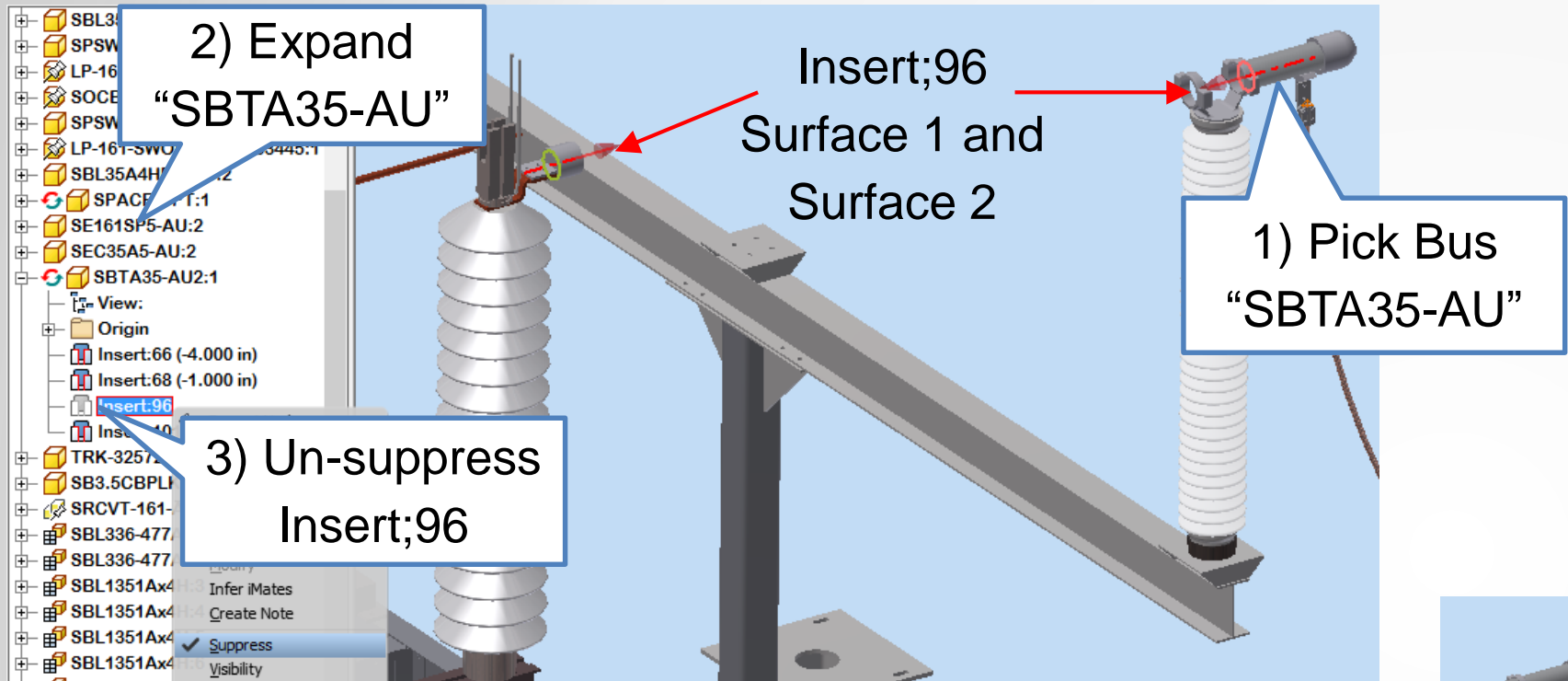
CABLE CU 25KV 2000 1/C

CABLE CU 25KV RIAB KE 4/0 1/C

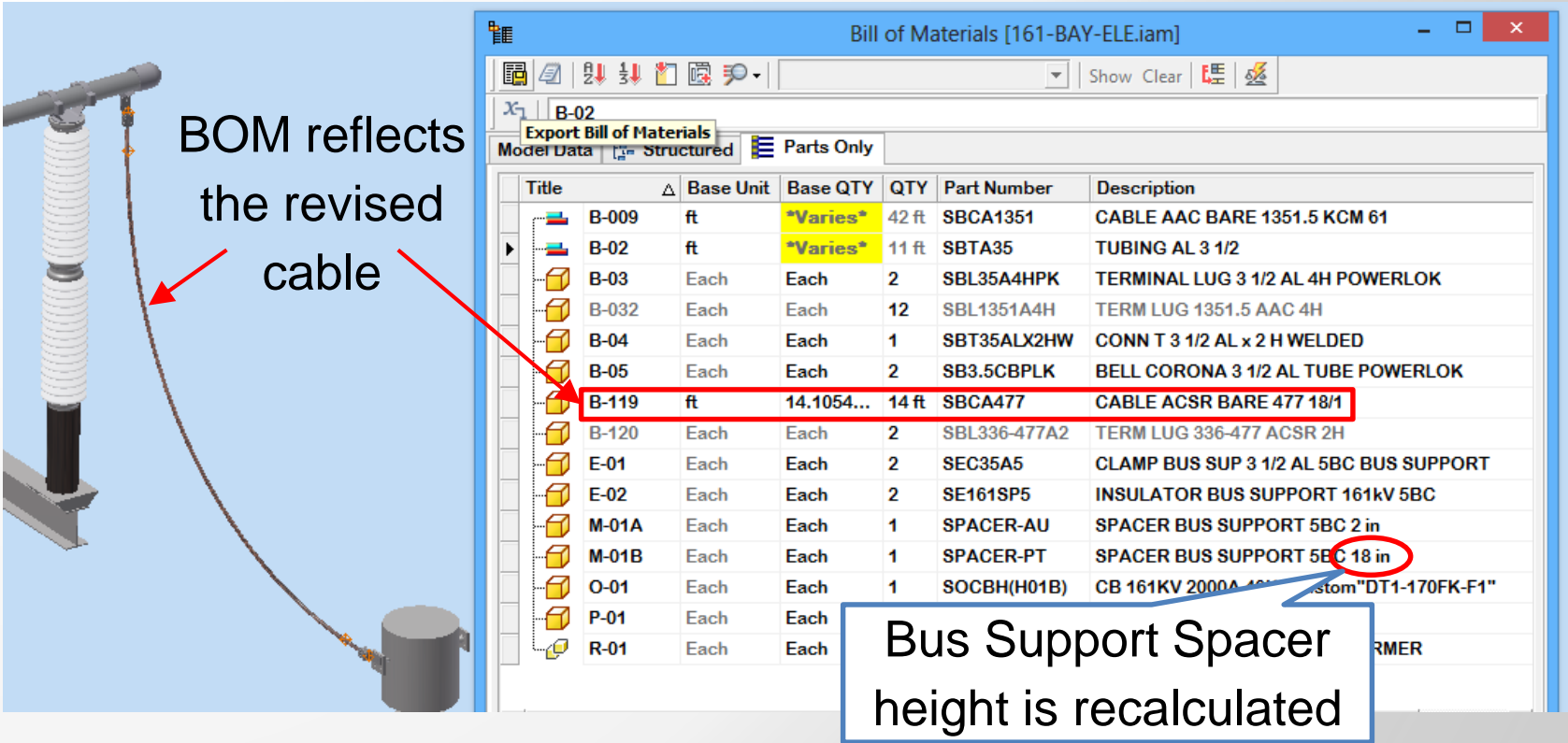
CABLE CU 25KV EPR 4/0 W/CN 3CP KE

CABLE CU 600V RINC 500 1C

# Standard Electrical Models



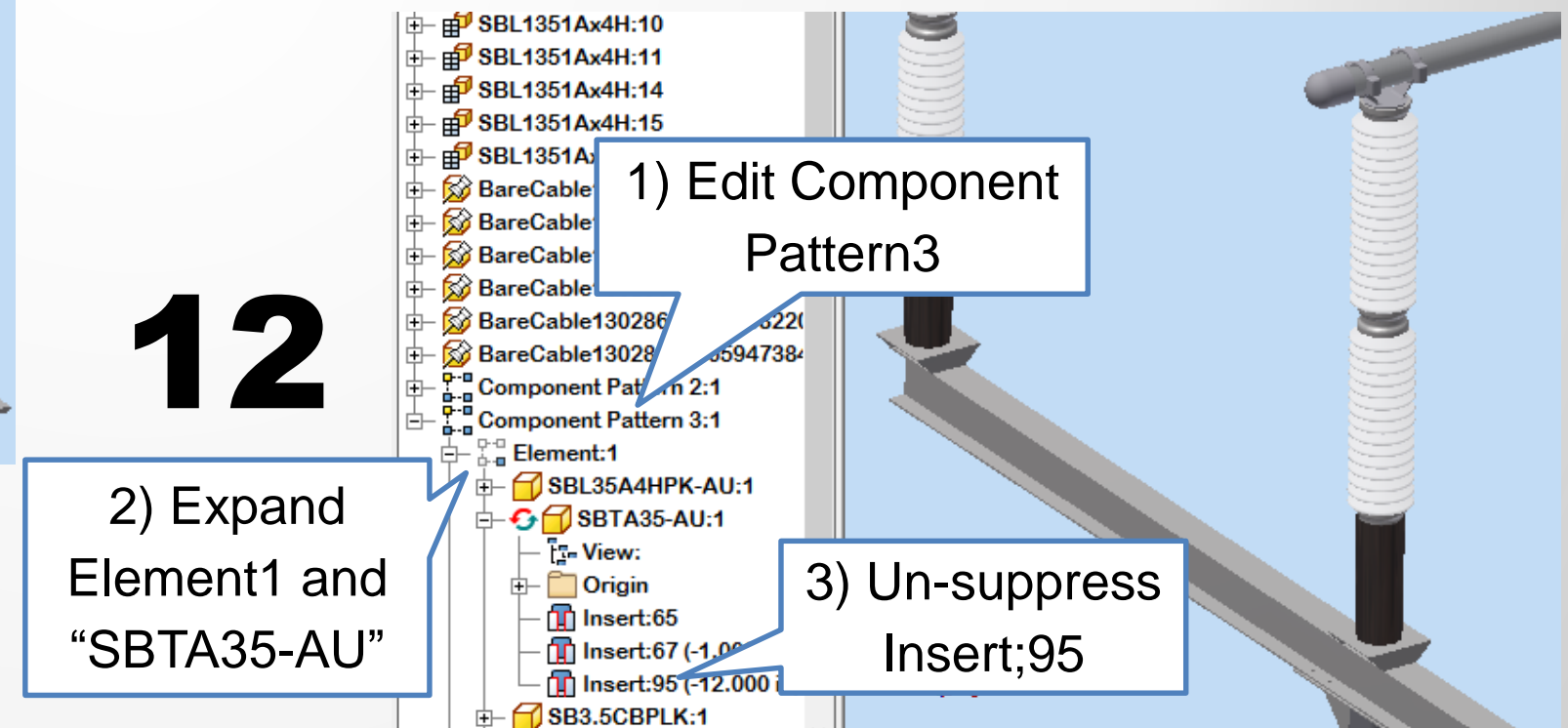
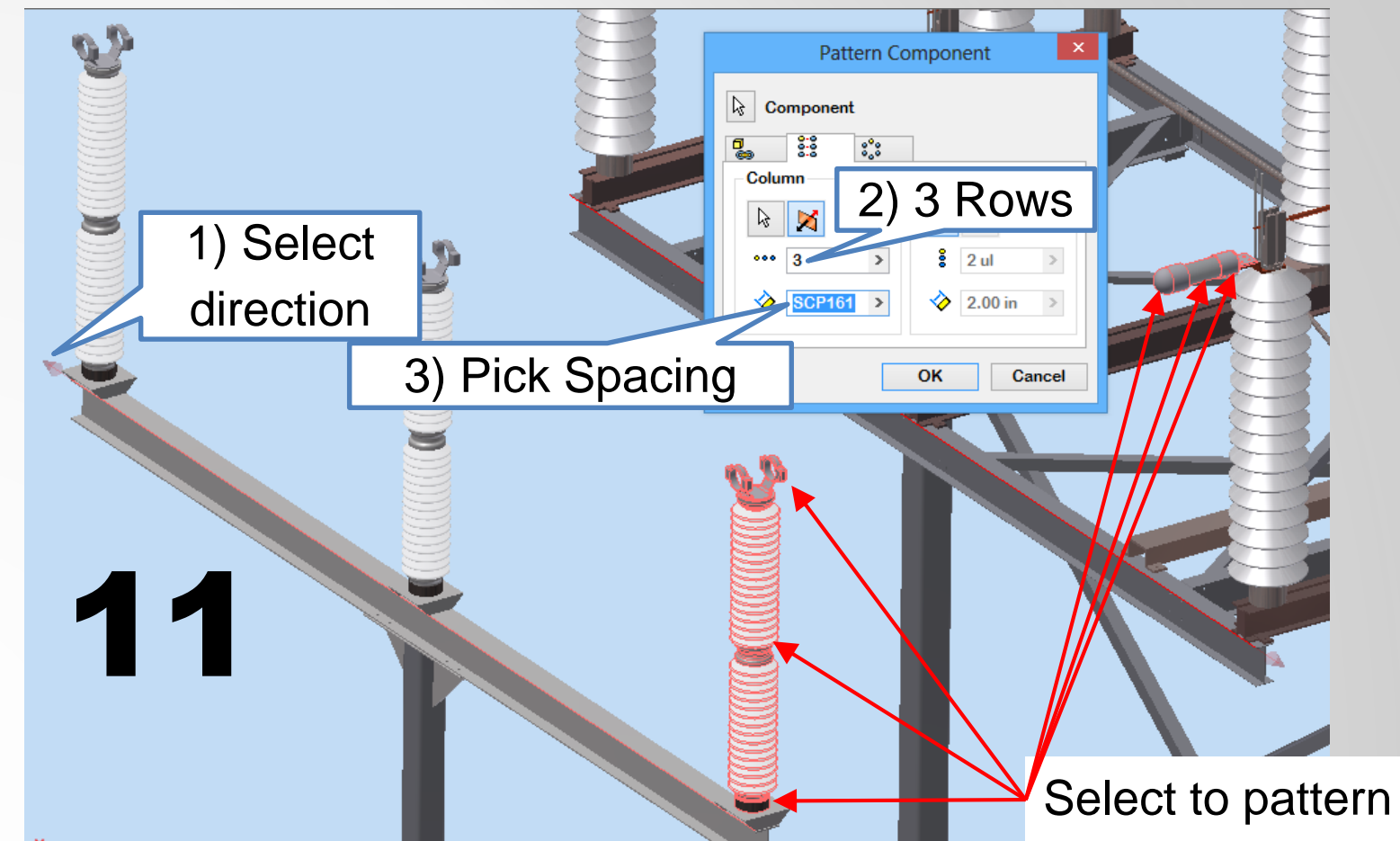
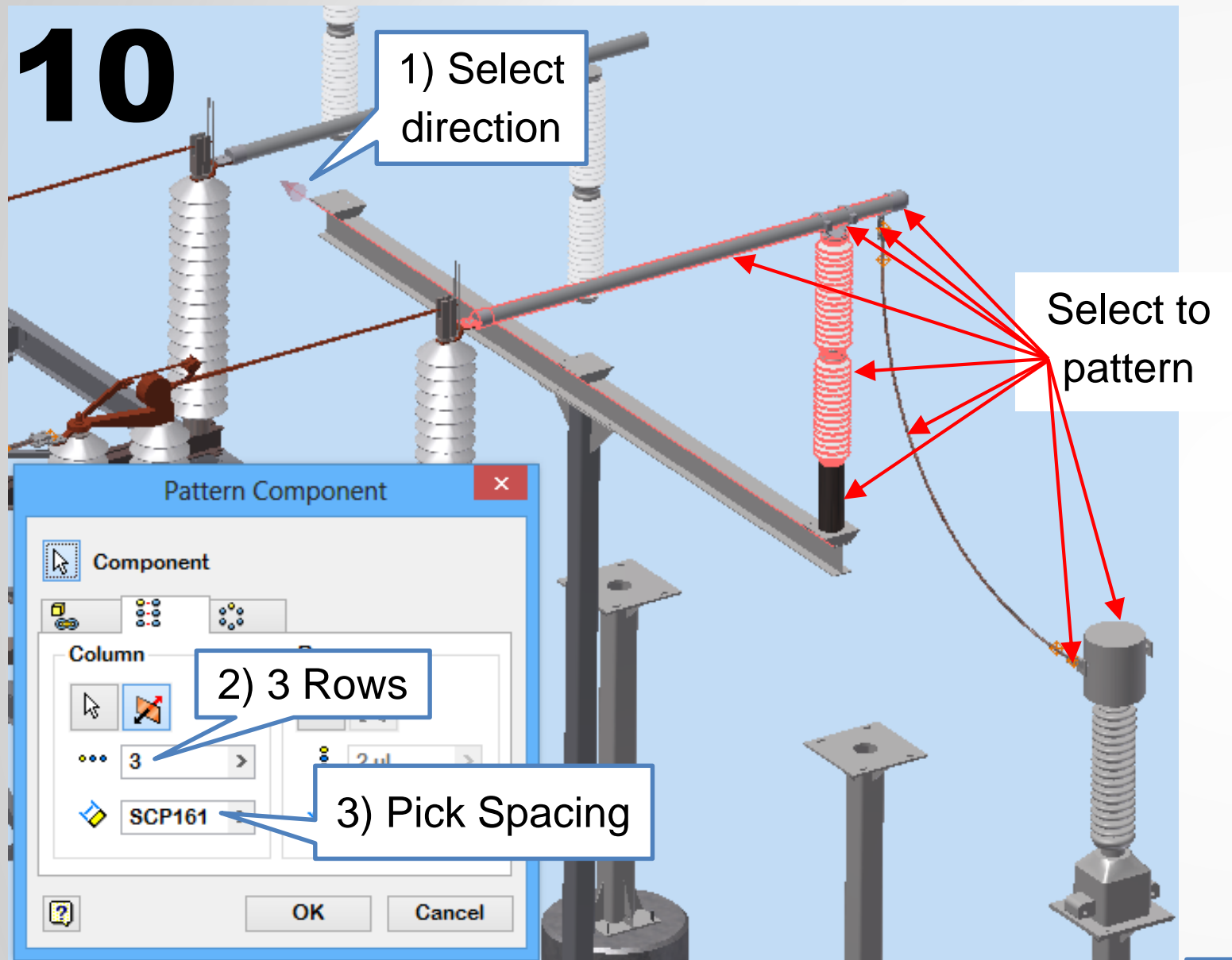
8



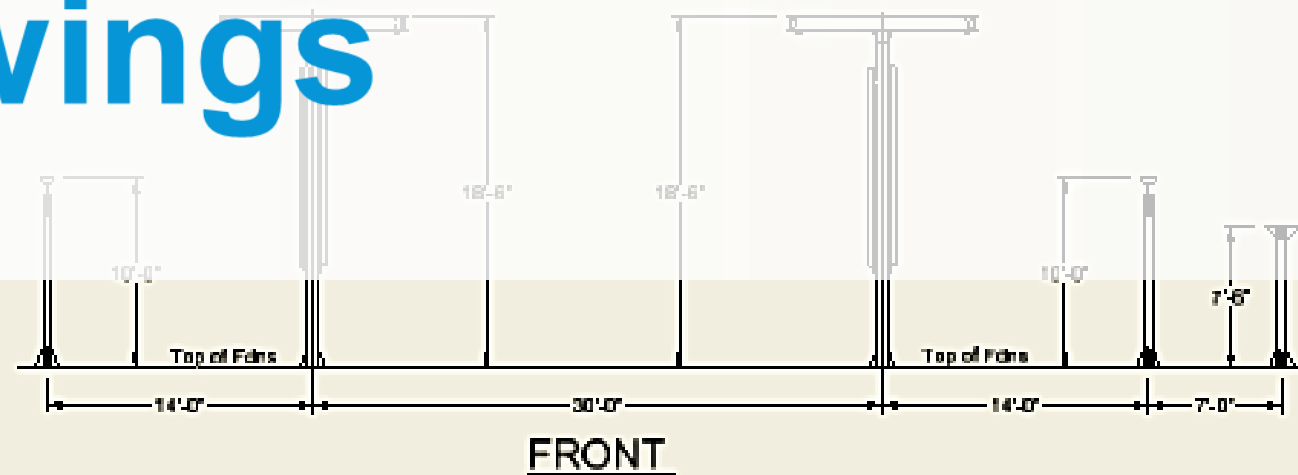
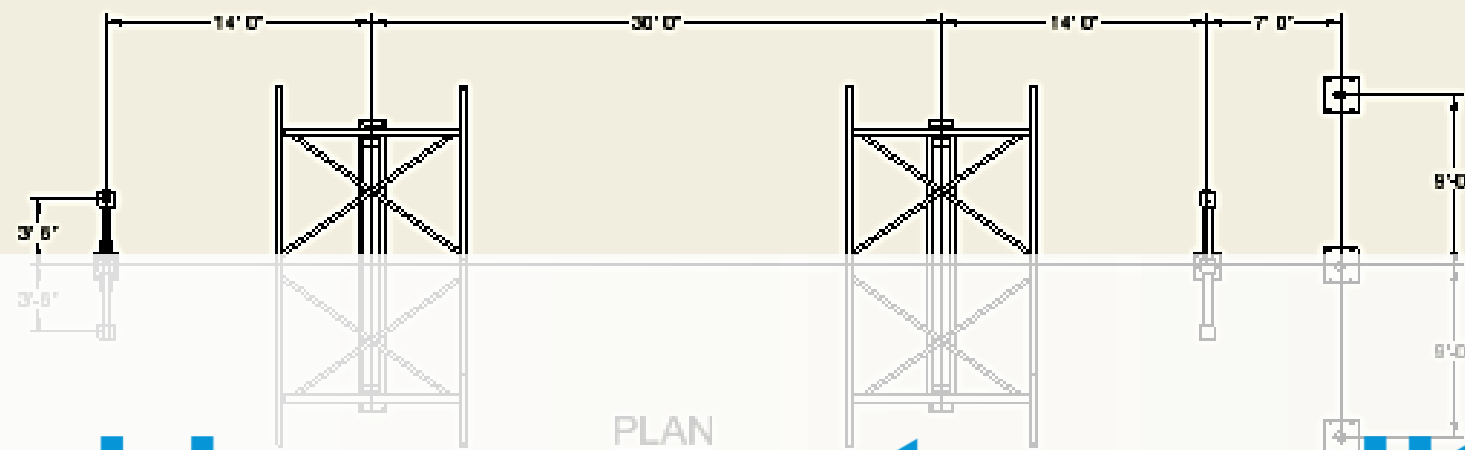
9



# Standard Electrical Models



# Quickly generate quality construction drawings



SUBSTATION DESIGN  
NASHVILLE  
ELECTRIC SERVICE  
NASHVILLE, TENNESSEE

SHEET 2 OF 3 SHEETS

FINAL PLOT: 9/15/2013

161kV BREAKER BAY  
STRUCTURAL ASSEMBLY

WORK REQUEST  
AU2013

SCALE  
NONE

DRAWING NO.  
STR-H-BAY

REV  
A



# Generate Drawings

- Use a standard assembly to place Views, populate the Title Block, place Dimensions, Balloons and the Parts List.
- Replace the standard assembly using the Replace Model Reference tool. The Views, Title Block, Dimensions, Balloons and Parts List update to the values of the new model automatically

# Standard Drawings

1) Browse to BS-00 and open

2) Change scale to  $\frac{1}{2}''=1'$

3) Turn off View Label visibility

4) Drag up to create top view

File: C:\Users\Terri\Dropbox\UT2388-L\_Part\XPart-WORKING-DataSet\Wor

Representation: View Position

Master Default

View / Scale Label: Scale .5=1'

View Identifier: PLAN9

Projection: [Target Icon]

Style: [Icons]

OK Cancel

SUBSTATION DESIGN  
NASHVILLE  
ELECTRIC SERVICE  
NASHVILLE, TENNESSEE

SHEET 3 OF 3 SHEETS FINAL PLOT: 9/15/2013

WORK REQUEST SCALE  $\frac{1}{8}''=1'-0''$  DRAWING NO. REV.

1) Place dimensions

2

2) Pick beam WB-00

3) Select Structured

The diagram illustrates the steps to create a BOM for a beam. It shows a top view of a beam with dimensions (3'-6" and 3'-6") and a side view of the beam being selected. A callout box indicates '2) Pick beam WB-00'. A screenshot of the 'BOM Properties' dialog box is shown, with the 'BOM View' dropdown set to 'Structured'. A callout box indicates '3) Select Structured'.

# Standard Drawings

3

1) Place "Leader Text" to TB-00

2) Pick "Properties-Model"

4) Click to add Text Parameter

3) Pick "Description"

4

1) Pick Parts List icon

2) Select View

3) Pick STR DIAGRAM PList Style

# Standard Drawings

5

1) Click BS-00

2) Pick Browse icon

3) Double click on BS-01

Replace Model Reference

FileName	Path
161-BAY-ELE.iam	C:\Users\Terri\Dropbox\UT2388-L_WORK
161-BAY-STR.iam	C:\Users\Terri\Dropbox\UT2388-L_WORK
BS-00.iam	C:\Users\Terri\Dropbox\UT2388-L_WORK

OK Cancel

Open

Workspace

Libraries

Content Center Files

Look in: WorkspaceAU13

Electrical

Foundations

Libraries

OldVersions

Structures

161-BAY-ELE.iam

161-BAY-STR.iam

BS-00.iam

BS-01.iam

STANDARD-BUS-SUP.iam

STR-161-BAY.iam

File name: BS-01.iam

Files of type: Assembly Files (\*.iam)

Project File: ELECTRICAL.ipj

Find ...

Options...

Open

Cancel

6

Auto updated Dimensions

Auto updated Parts List

Auto updated Leader Text

Auto updated Title Block

Auto updated Balloons

CH-01

CH-01

CH-01

WB-01

PL-01

SqT 5 x 5 x 1/4 x 9

10'-0"

18'-0"

SqT 6 x 6 x 1/4 x 17

PL-03

PL-04

PL-01

BILL OF MATERIAL

Mk No	QTY	DESCRIPTION	DWG NO	WT/PC	TOT WT
PL-01	1	PL 1 x 16 x 1'-4"	S-31234	66.1	66.1
TS-01	1	SqT 6 x 6 x 1/4 x 17'	S-31234	317.1	317.1
PL-04	1	PL 1/2 x 5 x 1'-0"	S-33816 SH11	4.2	4.2
PL-03	3	PL 1/2 x 5 x 1'-0"	S-31234	4.2	12.7
PL-02	2	PL 1/2 x 12 x 1'-0"	S-31234	10.2	20.4
PL-05	1	PL 1/4 x 6 x 2'-0"	S-31234	13.4	13.4
WB-01	1	WB 6 @ 16 6 x 16'-10 1/2"	S-31234	330.9	330.9
CH-01	3	C 10 @ 15.3 x 0'-10"	S-31234	8.8	26.7

SUBSTATION DESIGN

NASHVILLE

ELECTRIC SERVICE

NASHVILLE, TENNESSEE

SHEET 3 OF 3 SHEETS

FINAL PLOT: 9/15

BS-01

BUS SUPPORT ASSEMBLY

WORK REQUEST

SCALE

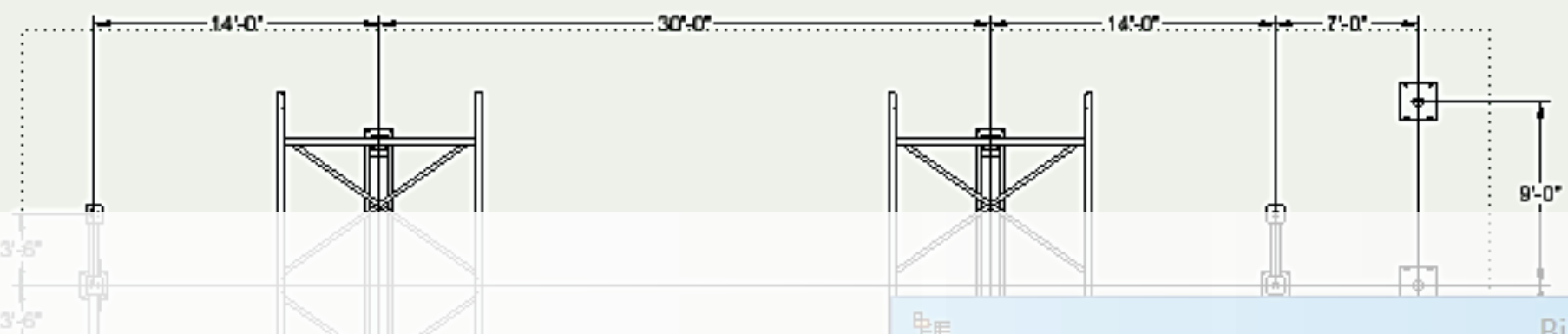
NONE

DRAWING NO

BS-01

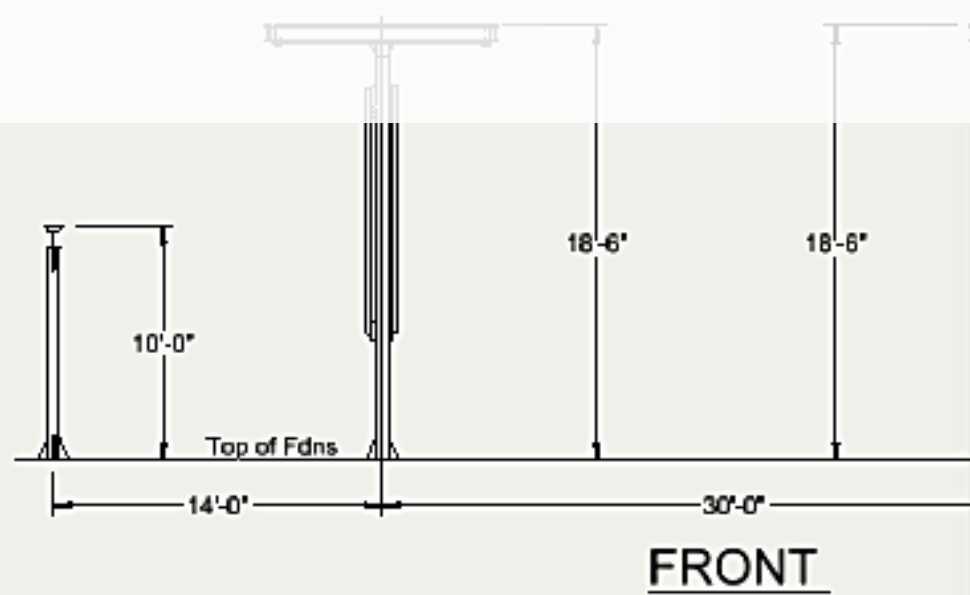






BILL OF MATERIAL					
Mk No	QTY	DESCRIPTION	DWG NO	WT/PC	TOT WT
PL-01	1	PL 1 x 16 x 1'-4"	S-31234	66.1	66.1
CH-01	3	C 10 @ 15.3 x 0'-10"	S-31234	8.6	25.7
WB-01	1	W 8 @ 18.0 x 7'-10 1/2"	S-31234	137.9	137.9
PL-05	1	PL 1/4 x 6 x 2'-8"	S-31234	13.4	13.4
PL-02	2	PL 1/2 x 12 x 1'-0"	S-31234	10.2	20.4
PL-03	4	PL 1/2 x 5 x 1'-0"	S-31234	4.2	16.9
TB-01	1	SqT 5 x 5 x 1/4 x 9'	S-31234	137.3	137.3

Create an accurate parts list using intelligent 3D models



Bill of Materials [161-BAY-STR.iam]

Model Data Structured Parts Only

			QTY	Description	Mass	Total	Dwg#
			3	PT STRUCTURE	302.220 lbmass	Total	S-22712
	BS-01	BS-01	2	BUS SUPPORT ASSEMBLY	417.781 lbmass	Total	S-31234
	PL-01	PL-01	1	PL 1 x 16 x 1'-4"	66.142 lbmass	Total	S-31234
	CH-01	CH-01	3	C 10 @ 15.3 x 0'-10"	8.559 lbmass	Total	S-31234
	WB-01	WB-01	1	W 8 @ 18.0 x 7'-10 1/2"	137.925 lbmass	Total	S-31234
	PL-05	PL-05	1	PL 1/4 x 6 x 2'-8"	13.402 lbmass	Total	S-31234
	PL-02	PL-02	2	PL 1/2 x 12 x 1'-0"	10.210 lbmass	Total	S-31234
	PL-03	PL-03	4	PL 1/2 x 5 x 1'-0"	4.236 lbmass	Total	S-31234
	TB-01	TB-01	1	SqT 5 x 5 x 1/4 x 9'	137.270 lbmass	Total	S-31234
	SW-01	SW-01	2	SWITCH STRUCTURE ASSEMBLY	1853.66005 lbmass	Total	S-33432

Import... Export... Done

# 3D Model to BOM to Parts List

- Balloons, Parts List Styles, Bill of Material (BOM) and Parts List work together to present the information about the parts contained in an assembly
- Customize the display of data in the Parts List using Parts List Styles
- The BOM Structure affects the display of data
- Correct information in the BOM vs. correcting information in the Parts List.

# Parts List Styles

1

1) Select Parts List icon

2) Pick Plan View

3) Select "ELECTRICAL BOM PList" from the styles drop down menu

Styles Menu

2

Right click and Select to edit Parts List Style

MK NO	INST	REM	TRAN	QTY	CU CODE	STK NO	DESCRIPTION	SOURCE
B-02				59 R	SBTA35	326640000	TUBING AL 3/4"	P UNIT
E-01				8	SEC35A5	320502000	CLAS	MINOR
M-01A				3	SPACER-AU		SPA	SHOP
O-01				1	SOCBH(H01B)	960630000	CB	PURCH
B-03				8	SBL35A4HPK	233620000	TER	MINOR
R-01				3	SRCVT-1B1		CUR	
S-04				3	SBT35ALK2HW	325728000	CON	
P-01				2	SPSWH(001-1)	965780000	DS	
E-02				8	SE161SP5		INSU	
M-01B				3	SPACER-PT		SPA	
B-05				8	SB3.5CBPLK	320410000	BELU	
B-032				12	SBL1351A4H	233640000	TER	
B-009				87 R	SBCA1351	103600000	CAB	P UNIT
B-120				8	SBL336-477A2	233680000	TER	MINOR
B-118				42 R	SBCA477	010140000	CAB	P UNIT



# Parts List Styles

3

2) Remove "INST", "REMV" & "TRAN" from Selected Properties

Parts List Column Chooser

Select available properties:

All Properties

Available Properties:

APPEARANCE  
AUTHOR  
AUTHORITY  
BASE QTY  
BASE UNIT  
CATEGORY  
CHECKED BY  
CHECKED DATE  
COMMENTS  
COMPANY  
COST CENTER  
OPERATION DATE

Add ->  
<- Remove

Delete  
New Property

Selected Properties:

MK NO  
INST  
REMV  
TRAN  
QTY  
CU CODE  
STK NO  
DESCRIPTION  
SOURCE

Move Down  
Move Up

OK  
Cancel

1) Pick Column Chooser

3) Change "Width" to 3.000

Column Chooser

Grouping  
Filter

Property	Width
QTY	0.500
PART NUMBER	1.300
STOCK NUMBER	0.800
DESCRIPTION	3.000

4

Pick Parts List Style to update

By Standard (Syn

ELECTRICAL BOM P

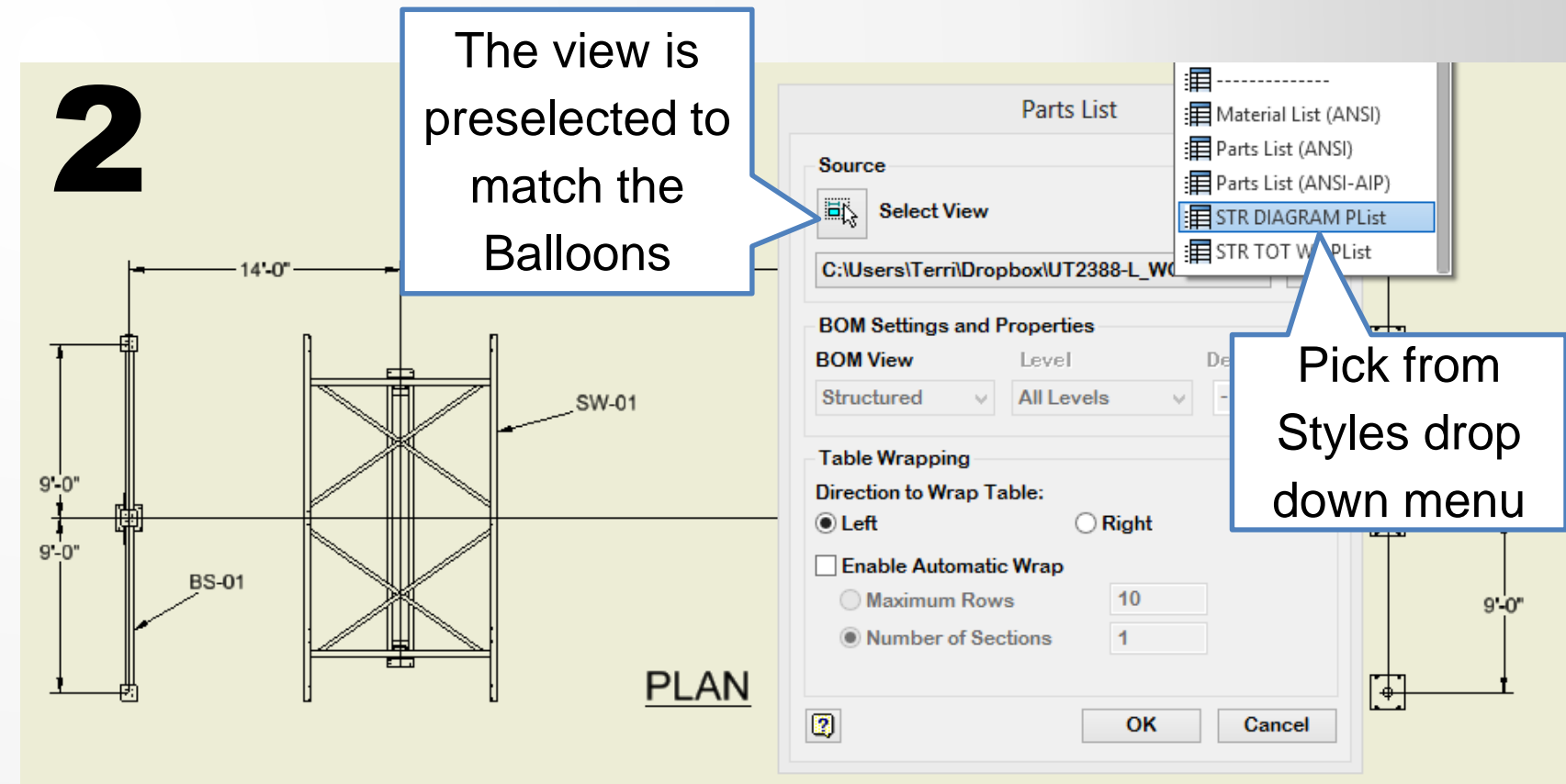
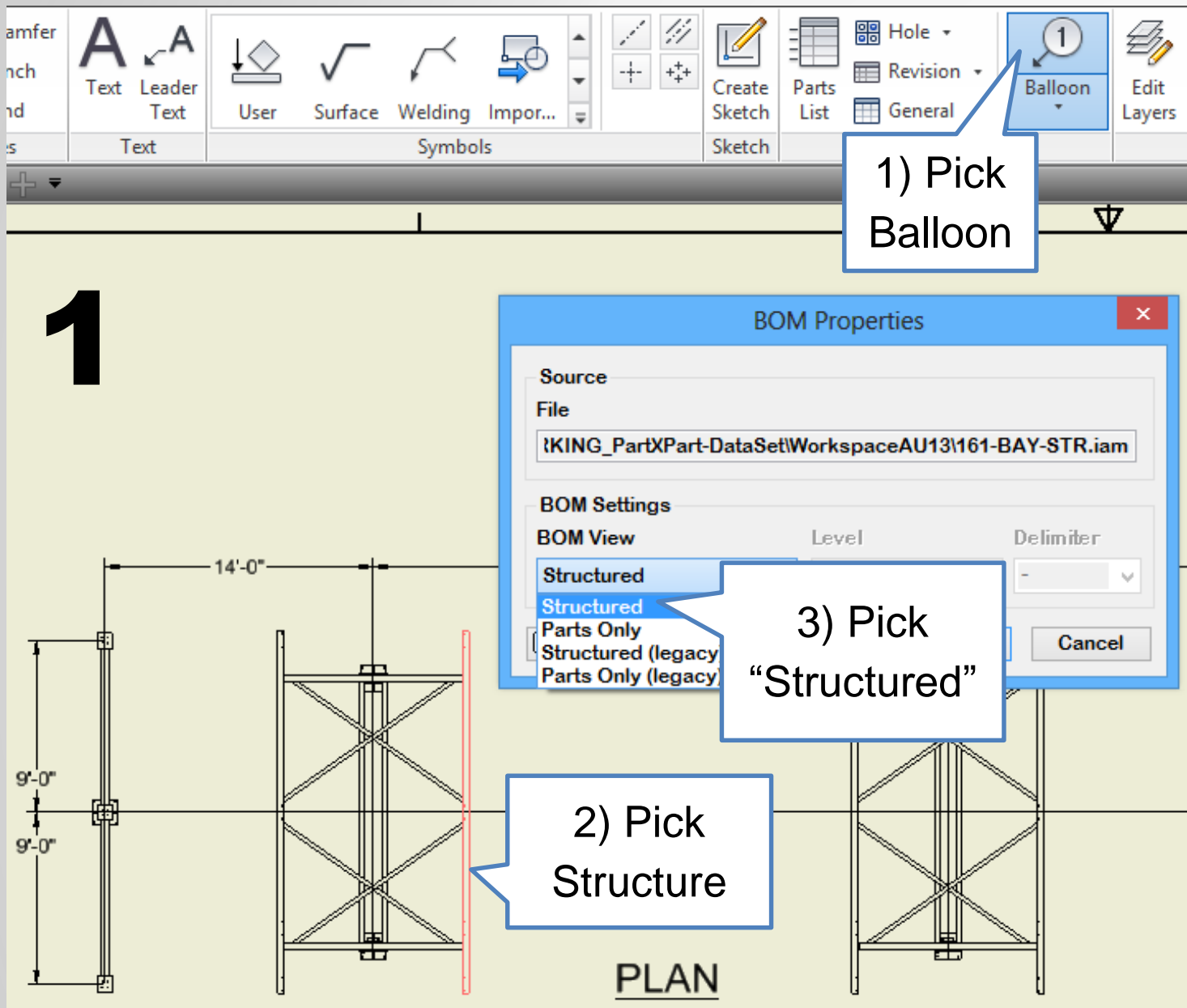
CONDUIT FITTINGS PList  
CONDUIT LAYOUT PList  
ELECTRICAL BOM PList  
EREC DIAGRAM PList  
EREC TOT WT PList  
FDN DETAIL PList  
FDN PLAN PList  
STRUCTURE DET PList  
-----  
Material List (ANSI)  
Parts List (ANSI)  
Parts List (ANSI-AIP)  
STR DIAGRAM PList  
STR TOT WT PList

MK NO	INST	REM	TRAN	QTY	CU CODE	STK NO	
B-02				50 R	SBTA35	320640000	TUBING AL 3 1/2
E-01				8	SEC35A5	320502000	CLAMP BUS SU
M-01A				3	SPACER-AU		SPACER BUS S
O-01	14'-0"			1	SOCBH(H01B)	060630000	CB 151KV 2000
B-03				8	SBL35A4HPK	233620000	TERMINAL LUG
R-01				3	SRCVT-T01		CURRENT VOL
B-04				3	SBT35ALK2HW	325728000	CONN T 3 1/2 A
P-01				2	SPSWH9(001-1)	065780000	DS 151KV 2000
E-02	9'-0"			8	SE161SP5		INSULATOR BU
M-01B				3	SPACER-PT		SPACER BUS S
B-05				8	SB3.5CBPLK	320416000	BELL CORONA 3 1/2 AL TUBE POWERLOK
B-032	9'-0"			12	SBL1351A4H	233640000	TERM LUG 1351.5 AAC 4H
B-009				87 R	SBCA1351	103600000	CABLE AAC BARE 1351.5 KCM 61
B-120				8	SBL336-477A2	233680000	TERM LUG 336-477 ACSR 2H
B-719				42 R	SBCA477	010140000	CABLE ACSR BARE 477 1B/1





# Balloons and the Parts List



# BOM vs. Parts List

1

BILL OF MATERIAL					
Mk No	QTY	DESCRIPTION	DWG NO	WT/PC	TOT WT
PTS-K01	3	PT STRUCTURE	S-22712	302.2	906.7
SW-01	2	SWITCH STRUCT	S-33432	1853.7	3707.3
BS-01	2	BUS SUPPORT A			1581.2

Right click and pick "Bill of Material"

Repeat Parts List

Copy

Delete

Bill of Materials...

Save Item Overrides to BOM

2

1) Make current

2) Double click

3) Select "Phantom"

Bill of Materials [161-BAY-STR.iam]

Model Data

Struct

BOM Structure

Phantom

Normal

Normal

Inseparable

Purchased

Phantom

Reference

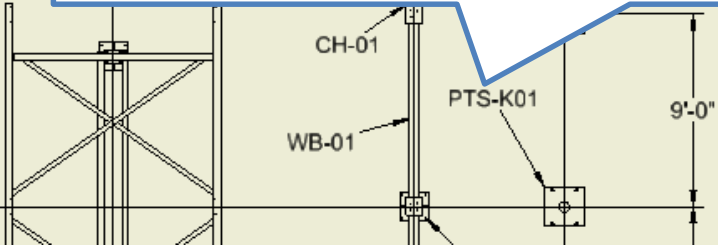
Title	Part Number	QTY	Description	Mass
(3)PTS-K01	(3)PTS-K01	1	PT STRUCTURE (3)	906.660 lbr
BS-01	BS-01	2	BUS SUPPORT ASSEMBLY	790.608 lbr
	FDN_PLAN	1	FOUNDATION ASSEMBLY	N/A
SW-01	SW-01	2	SWITCH STRUCTURE ASSEMBLY	1853.6600!

Done

# BOM vs. Parts List

3

Changing the BOM Structure to Phantom hid the BS-01 assembly and listed the parts



BILL OF MATERIAL					
Mk No	QTY	DESCRIPTION	DWG NO	WT/PC	TOT WT
PTS-K01	3	PT STRUCTURE	S-22712	302.2	906.7
SW-01	2	SWITCH STRUCTURE ASSEMBLY	S-33432	1853.7	3707.3
PL-01	2	PL 1 x 16 x 1'-4"	S-31234	66.1	132.3
CH-01	6	C 10 @ 15.3 x 0'-10"	S-31234	8.6	51.4
WB-01	2	W 8 @ 18.0 x 18'-10 1/2"	S-31234	330.9	661.9
PL-05	2	PL 1/4 x 6 x 2'-8"	S-31234	13.4	26.8
PL-02	4	PL 1/2 x 12 x 1'-0"	S-31234	10.2	40.8
PL-03	6	PL 1/2 x 5 x 1'-0"	S-31234	4.2	25.4
TB-01	2	SqT 6 x 6 x 1/4 x 17'	S-31234	317.1	634.3
PL-04	2	PL 1/2 x 5 x 1'-0"	S-33618 Sht1	4.2	8.3

4

1) Make Parts Only tab active

2) Delete from Description as shown

BILL OF MATERIAL						
MK NO	QTY	CU CODE	STK NO	DESCR	CE	IT
B	5		326940000	TUBING AL 3 1/2		
E			320502000	CLAMP BUS SUP 3 1/2		
M		R-AU		SPACER BUS SUPPORT 5BC		SHOP
O		H01B)	960930000	CB 161KV 2000A 40KA Alstom"DT1-170FK-F1"		PURCH
				RLOK		MINOR
				IER		MINOR
						TRUCK
						PURCH
				5BC		MINOR
						SHOP
				VERLOK		MINOR
						MINOR

Materials [161-BAY-ELE.iam]

CB 161KV 2000A 40KA Alstom"DT1-170FK-F1"

Structured Parts Only

Item	Base Unit	Base QTY	QTY	Part Number	Description	SOURCE
R-01	Each	Each	3	SRCVT-161	CURRENT VOLTAGE TRANSFORMER	MINOR
P-01	Each	Each	2	SPSWH-(H01-1)	DS 161KV 2000A USCO "GT-45"	PURCH
O-01	Each	Each	1	SOCBH(H01B)	CB 161KV 2000A 40KA Alstom"DT1-170FK-F1"	PURCH
M-01B	Each	Each	3	SPACER-PT	SPACER BUS SUPPORT 5BC 18 in	SHOP
M-01A	Each	Each	3	SPACER-AU	SPACER BUS SUPPORT 5BC 18 in	SHOP



# BOM vs. Parts List

5

BILL OF MATERIAL					
MK NO	QTY	CU CODE	STK NO		
B-02	59 ft	SBTA35	326940000	TUBING AL 3 1/2	
E-01	6	SEC35A5	320502000	CLAMP BUS SUP	
M-01A	3	SPACER-AU		SPACER BUS SUPPORT 5BC 18 in	SHOP
O-01	1	SOCBH(H01B)	960930000	CB 161KV 2000A 40KA	PURCH
					MINOR
					MINOR
					TRUCK
					PURCH
					MINOR
					SHOP

Manufacturer is deleted from Description of Parts List

Delete from Parts List

Manufacturer is deleted from Description of the BOM

6

BILL OF MATERIAL					
MK	QTY	CU CODE	STK NO	DESCRIPTION	SOURCE
B-02				TUBING AL 3 1/2	P UNIT
E-01				CLAMP BUS SUP 3 1/2 AL 5BC BUS SUPPORT	MINOR
M-01A	3	ER-AU		SPACER BUS SUPPORT 5BC 18 in	SHOP
O-01	1		960930000	CB 161KV 2000A 40KA	PURCH
				RLOK	MINOR
				IER	MINOR
					TRUCK
					PURCH
				5BC	MINOR
					SHOP
				VERLOK	MINOR
					MINOR

CU Code/Part Number is deleted from the Parts List

CU Code/Part Number is still populated in the BOM





# In Conclusion



# The Same but Different

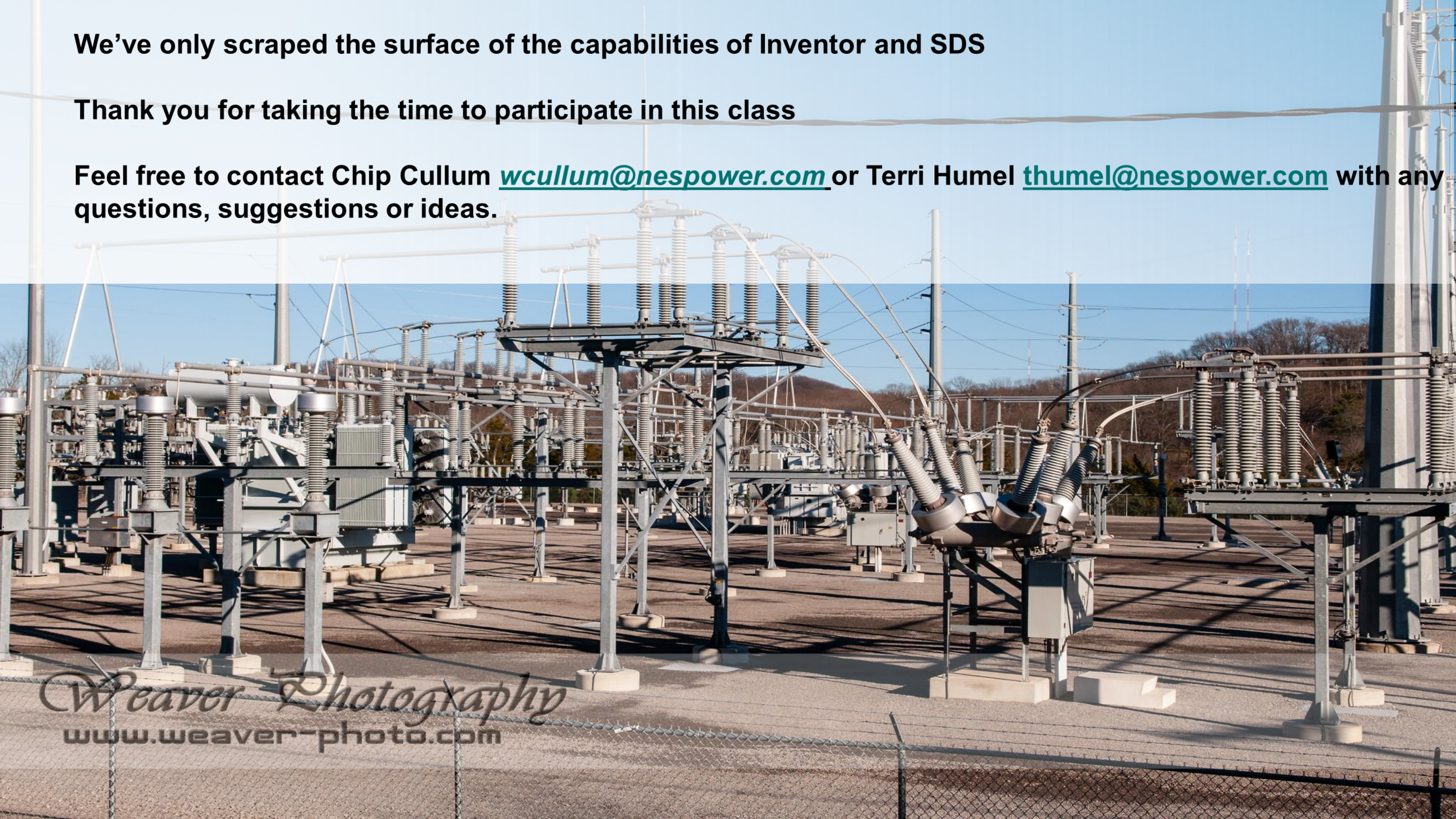
- Inventor is perfect for Substation Design because it seems each job is the same as the last job except...different
- It all starts with a sketch in a template that uses parameters and dimensional constraints adjust the part and information for the Parts List
- When the parts are modeled correctly, the assemblies, drawings and Parts List carry the intelligence to automatically update themselves as design changes to the model are made



**We've only scraped the surface of the capabilities of Inventor and SDS**

**Thank you for taking the time to participate in this class**

**Feel free to contact Chip Cullum [wcullum@nespower.com](mailto:wcullum@nespower.com) or Terri Humel [thumel@nespower.com](mailto:thumel@nespower.com) with any questions, suggestions or ideas.**



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