#### **MEP Virtual Construction:** When the Design Gloves Come Off

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#### **Class Summary**

In today's fast-paced world it is becoming increasingly important to know how to utilize the design information received to create the most efficient and accurate plan for the construction of the designed systems. We'll talk about how we work with design models outside of Building Information Modeling (BIM) coordination to get more accurate information to estimators, foremen, and electricians. There will also be a brief overview of how we approach the subject of prefabrication from an electrical view.



### **Learning Objectives**

At the end of this class, you will:

- Learn how to better communicate needs to the design team, as well as internal construction team
- Discover additional ways to utilize design models
- Gain some tips and tricks in Revit MEP for construction
- Explore some additional MEP technology for electrical construction

# 🕻 Watts Up Las Vegas! 🎾-

#### SUNNY (CASSANDRA) WATTS



- Worked in the ski industry as a snowmaker from 2001 2008  $\succ$
- Last 5 years in the industry worked as a snowmaking technician for one of the largest snow gun manufactures in the world
- Left the ski industry to pursue an electrical career  $\succ$
- Started working at Taylor Electric in 2009 as an electrician.  $\succ$
- Has been an expeditor, on site electrician, robotic total station  $\succ$ operator and currently is the manager of the Layout Department

Started in the industry of Interior Design

 $\geq$ 

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- Worked for local Electrical Engineering firms for several years  $\geq$
- Specializes in Revit MEP and Family Building  $\succ$ 
  - Started work at Taylor Electric in 2014 to help develop the Virtual Design department.
- Teaches at a local Autodesk Training Center  $\succ$





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#### NIKKI DIVERS

### **TAYLOR ELECTRIC**



Taylor Electric has been handling projects with skilled hands and a thorough eye since 1975.

Completed over \$500,000,000 worth of quality electrical construction.

Over 250 dedicated quality production and office personal.

Always using state-of-the-art products for cost effective installation & construction







### **Challenges in Electrical Construction**

Communication

# Documentation

Material

# Labor





# **Communicate needs to the design team,** as well as internal construction team





### **Communicate needs to the design team, as well** as internal construction team

"You can have brilliant ideas, but if you can't get them across, your ideas won't get you anywhere."— Lee Iacocca

#### START and Start Early –

Utilize in-house kick-off meetings to discuss model information and project needs.

- Gather Key Players
  - Operation Manager, Project Manager, Safety Manger, Virtual Design Team and Foreman
- Establish design parameters and practices:
- Set deadlines and formats for requests:



### **Communicate needs to the design team, as well** as internal construction team

#### Communication with BIM Coordination

- Communicate finale in-house use for BIM models
- Build Schedule for coordination and pre-fabrication with job foreman

Set a standard for document sharing and distribution:

- Explore available technology for document sharing
- Give tools and set expectations for information sharing
- Train, Train.... And RETRAIN!











Revit as a construction tool:

- Information Intuitively linked to dynamic geometry
- Easier to retrieve information through details and scheduling
- Possible to enter the space before ground is ever broken

The power of Revit schedules for construction

- Utilizing schedules to obtain counts of equipment and material
  - Revit Schedules read information from parameters either existing in the engineered models, or added by the virtual design team.







	<electrical fixture="" sched<="" th=""><th>ule&gt;</th><th></th><th></th></electrical>	ule>		
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Family	Туре	GFC	- YES	Coun
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zEX - Duplex - Hospital Grade	HG GFCI Above Counter	Yes		9





#### The power of Revit schedules for construction

Utilizing Schedules to generate labels for receptacles on the site 

<electrical fixture="" schedule=""></electrical>					
А	В	С			
Family	Panel	Circuit Number			
P-Fourplex Receptacle	1L1	3			
P-Fourplex Receptacle	1L1	3			
P-Fourplex Receptacle	1L1	4			
P-Duplex Receptacle	1L1	5			
P-Fourplex Receptacle	1L1	5			
P-Fourplex Receptacle	1L1	5			
P-Special Purpose	1L1	6,8			
P-Special Purpose	1L1	7,9			
P-Duplex Receptacle	1L1	12			

Export Schedule	
Schedule appearance	
Export title	
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Include grouped o	column headers
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Output options	
Field delimiter:	(tab) 👻
Text qualifier:	
	OK Cancel



The power of Revit schedules for construction

Utilizing Schedules to generate labels for receptacles on the site 

1L1-3	1L1-3	1L1-4
1L1-5	1L1-5	1L1-6,8
1L1-12	-	-



# 1L1-5 1L1-7,9

"Of all of our inventions for mass communication, pictures still speak the most universally understood language."



#### The power of Revit visualization



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# - Walt Disney





Generating 3D views and details of the model in conjunction with construction documents to increase understanding.



#### **Remember:**

The model is not the contracted information. Official construction documents should always be referred to

Plans change! Not just in the design process, but clear through construction. Proposal Requests, Requests for Information, and Change Orders may not be reflected in the design model. Utilize the information provided in the model, and update the information that wasn't final when the model was created.



#### The power of Revit visualization: **CULTURE CHANGES – PREFABRICATION**











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# AUTODESK® REVIT®





Replacing simple models with complex assemblies and systems for use in Prefabrication



















#### (1) BOX TYPE 1

BOX BOX Gran



TYPE	BOXES AND LENGTHS	BOX DEPTH	PIGTAILS	P-RING TYPES	P-RING DEPTH	PLUGTAILS PER ASSEMBLY	TOTAL PLUGTAILS	ASSEMBLY COUNT
X TYPE #1	BOX 1 - 4 in, NO BOX 2, BOX 3 - 4 in	DEEP	BOX 3 PIGTAIL	BOX 1 SINGLE GANG, BOX 3 TWO GANG	0' - 1 1/4"	2	16	8
)X TYPE #3	BOX 1 - 4 in, BOX 2 - 4 in, BOX 3 - 4 in	DEEP	BOX 3 PIGTAIL	BOX 1 SINGLE GANG, BOX 2 SINGLE GANG, BOX 3 TWO GANG	0' - 1 1/4"	2	48	24
and total: 32							64	

ASSEMBLY	WIRE COLOR	TOTAL LENGTH
2021		•
21-1 (21-2)	BLACK	15' - 0"
21-1 (21-5) B	BLUE	49' - 0"
21-1 (21-6) B	RED	36' - 0"
21-1 (21-7)	BLACK	11' - 0"
21-5 (21-4)	BLUE	12' - 0"
21-6 (21-3)	RED	54' - 0"













### View Filters

bility/Graphic Overrides for Floor Plan: LEVEL 03(1)

Model Categories Annotation Categories Analytical Model Categories Imported Categories Filters Worksets Revit Links

	Ι.							
	Name Visibility -		P	Projection/Surface			Cut	
			Lines	Patterns	Transparen	Lines	Patterns	
		Panel 3L3-1	✓					
		Panel 3L3-2	✓					





		×
		_
_	Halftone	
		-
		-

Categories	-Filter Rule	s
Select one or more categories to be included in the filter. Parameters	Filter by:	Panel 🔻
common to these categories will be available for defining filter rules.		equals 🔻
Filter list: <show all=""> -</show>		3L3-1 🔻
Hide un-checked categories	And:	(none) 🔻
Duct Accessories		
Duct Insulations     Duct Linings		
Duct Placeholders     Duct Systems	And:	(none) 🔻
Ducts		
Electrical Equipment		
Elevations		
Flex Ducts		
Furniture Systems		
Generic Models		
Check All Check None		
OK Car	ncel	Apply Help
		th.





# Orient 3D view to established plan view



# View Templates

View Templates	View Properties
Discipline filter:	
<all></all>	Paramete
View type filter:	View Scale Scale Value 1:
<al></al>	Display Model
Names:	Detail Level
overall floorplan	Parts Visibility
Section	V/G Overrides M
	V/G Overrides A
	V/G Overrides A
	V/G Overrides In
	V/G Overrides Fi
	V/G Overrides W
	V/G Overrides R
	Model Display
	Shadows
	Sketchy Lines
(r 📧 🎦	Lighting
	Photographic Ex



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Numb	Number of views with this template assigned: 2							
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Model	Edit	<b>V</b>						
Annotati	Edit	<b>V</b>						
Analytica	Edit	<b>V</b>						
Import	Edit	<b>V</b>						
Filters	Edit	<b>V</b>						
Worksets		<b>V</b>						
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Car	Apply Propertie	es Help						
			÷.					

**Edit Shared Parameters** 

Shared parameter file:

C: \Users \swatts \Desktop \One

Parameter group:

GROUPING

Parameters:

MARK (bend) SECTION TEMPLATE NUMBER UNIT RUN

# Shared Parameters



Parameters   New   Properties   Move   Delete     Groups   New   Rename   Delete		
<ul> <li>Parameters</li> <li>New</li> <li>Properties</li> <li>Move</li> <li>Delete</li> <li>Groups</li> <li>New</li> <li>Rename</li> <li>Delete</li> </ul>		
Parameters   New   Properties   Move   Delete   Groups   New   Rename   Delete	Drive_Busir Browse	Create
New         Properties         Move         Delete         Groups         New         Rename         Delete	•	
Properties Properties Move Delete Groups New Rename Delete OK Cancel Help		Parameters
Move Delete Groups New Rename Delete OK Cancel Help		New
Delete Groups New Rename Delete OK Cancel Help		Properties
Groups New Rename Delete OK Cancel Help		Move
New Rename Delete OK Cancel Help		Delete
New Rename Delete OK Cancel Help		Groups
OK Cancel Help		
OK Cancel Help		Rename
		Delete
	OK Cancel	

Parameter Properties	X			
<ul> <li>Parameter Type</li> <li>Project parameter <ul> <li>(Can appear in schedules but not in tags)</li> </ul> </li> <li>Shared parameter <ul> <li>(Can be shared by multiple projects and families, exported to ODBC, and appear in schedules and tags)</li> </ul> </li> </ul>	Categories Filter list: <show all="">  Filter list: <show all=""> Hide un-checked categories Air Teminals Analytical Beams Analytical Braces Analytical Braces</show></show>			
Select Export Parameter Data Name:  Discipline:  Common	Analytical Columns     Analytical Floors     Analytical Foundation Slabs     Analytical Isolated Foundations     Analytical Links     Analytical Nodes     Analytical Wall Foundations     Analytical Walls     Areas     Assemblies			
Type of Parameter:       Image: Constraint of the second sec	Cable Tray Fittings Cable Tray Runs Cable Trays Casework Ceilings Columns Columns Communication Devices			
Edit Tooltip     Check All     Check None       Add to all elements in the selected categories     OK     Cancel     Help				





# Project Parameters

S	chedule Properties		X
	Fields Filter Sorting/Groupin	ng Formatting Appearance	
	Available fields: Diameter(Trade Size) Family Family and Type IfcGUID Image Inside Diameter Outside Diameter Phase Created Phase Demolished Demolished	Add> < Remove Add Parameter	Scheduled fields (in order): Comments Length LENGTH - ROUNDED WIRE COLOR LENGTH WITH 24" ADDED Count AREA
Calculated Value	Room Number	Calculated Value	
Formula Discipline: Common	Percentage	te	Edit Delete
Type: Number		•	Move Up Move Down
Formula:			
OK Cance	el Help		OK Cancel Help

# Calculated Value



#### Non Native Plug-Ins for Revit Coins Auto Section Box Plug-In VS Revit Native View

- Name the 3D View while creating it, to make it easier to locate in the future.
- Select Distance around the object selected for 3D View.

#### Palladio X BIM Windows Layout

- Efficiently utilize screen real-estate
- Organize multiple open views in Revit to panels across multiple screens.
- No need to toggle between views.





# **Explore some additional MEP technology** for Electrical Construction





## **Explore some additional MEP technology for Electrical Construction**

#### Point Creator and Robotic Total Station for layout

No longer need tape measures, strings and multiple electricians.

- Easily isolate components and clean up views.
- Gain a better understanding of the construction of each space.





### **Explore some additional MEP technology for Electrical Construction**

#### Tablets for document sharing, and Viewing

Faster up-to-date information for everyone In the office and in the field













### **Explore some additional MEP technology for Electrical Construction**

#### Tablets for document sharing, and Viewing

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### **In Conclusion**

Communicate Ideas and Concepts Utilize Design Tools Plug-ins Robotic Total Stations

Moving forward as a community:

- AU
- Local User Groups
- Online Forums
- **Research with Software companies**





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- Give instructors feedback in real-time.





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