AUTODESK **UNIVERSITY** 2015

ES9768

Putting Intelligence in Electrical Cable and Conduits

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Learning Objectives

- Learn how to extract data from Revit to select electrical cables
- Discover hot to calculate a bill of material based on exact raceway lengths
- Discover how to create pull tickets
- Discover the tools to assist tracking pull tickets, cable inventory, and installation status

Description

Developing a construction workflow for electrical systems in Revit software can be time consuming and inaccurate. This session will explore new tools to assist in electrical cable routing, cable selection, and construction management. You can extract intelligent data from the design model and use it to calculate exact requirements and bill of material for electrical systems. This session will also show you new tools to assist creating pull tickets, cable inventory, and installation status. Come see how electrical contractors can finally begin to use the intelligence that is built into the design model.

Your AU Experts

Mike Massey *graduated from Texas A&M University with a degree in Architecture. He has 25 plus years of experience working in the AEC industry. He has worked on various types of projects including residential, commercial, retail, educational, and healthcare. Mike's roles in architectural firms have ranged from drafter, designer, project architect, project manager, CADD Manager, and Director of I.T. Since joining Applied Software, Mike specializes in BIM implementation for architects and MEP engineers. In addition, Mike has been responsible for providing customer demonstrations, implementation, training and support for the Autodesk AEC products for architects, engineers, and contractors.*

Mike has spoken at various AIA functions on the benefits of BIM (Building Information Modeling), conducted regional CAD Camp seminars, and is a repeated speaker at Autodesk University. Mike is a contributing author for Autodesk Official Training Courseware.

Contents

Introduction

This session will introduce to you Southwire's BEM tools to assist in electrical design process. As we dive into these tools, the following chart will assist in explaining what tasks can be automated and eliminated. This will allow for a better designed and coordinated electrical project.

	Automates	Eliminates	Delivers
Owners	Planning, Tracking, Change Management, Estimating, Material Procurement, Progress Reporting including Visual Review of Installation Progress	Duplicate Data Entry and Surprises	Intelligent BIM Database that represents an accurate as-built
Engineers	One Line Production, Sizing of Cables, Breakers-starters and Trip Settings, Specifying Cables, Control Wiring Diagrams, Estimating, Race Way Design, Cable Routing, Cable and Raceway Bills of Material, Ampacity and Voltage Drop Calculations	Duplicate Data Entry, Disparate Product Information, Cable and Raceway rework, Calculation Errors	Consistent Data for One Lines, Equipment Schedules, Feeder Schedules, 3D Raceway Model that includes Cable Routing with all Information in the Database, Current Product Data Sheets
Electrical Contractor	One Line and Load Data Entry, Value Engineering Options, Procurement, Accurate Bills of Material		Current Product Data Sheets
Estimator	Quick Bid Estimating with Auto routing, Value Engineering, Dynamic Bills of Material that show the Impact of Changes	Flipping through Plans, Reworking Estimate as the Design Changes	Quick and Accurate Bills of Material
CAD Guy	Tracking Engineer Changes, Sizing Raceways, Extracting Cable Lengths, Incorporation of Revit Tools	Raceway Sizing Rework, Value Engineering Rework, Searching for data for raceway design	3D Raceway and Cable Routing Model with all information in the database
Field Guy	Cable Pull Calculations, Voltage Drop Calculations, Raceway Sizing, Reel Configuration, Progress Tracking, Feeder Schedules, Inventory Reports	Flipping Through Plans, Rework based on slow or inaccurate Communication	Plan Work and Track Progress based on real and up to date Information straight from the 3D Model, QA Records

Current Revit Workflow

Using Revit for the electrical design process will assist in the branch circuiting of electrical fixtures and devices. The tools will allow you to ensure that everything is circuited and that the circuits are not overloaded. Revit also allows for annotation to call out circuit information, and this annotation is always coordinated with the electrical panel schedules.

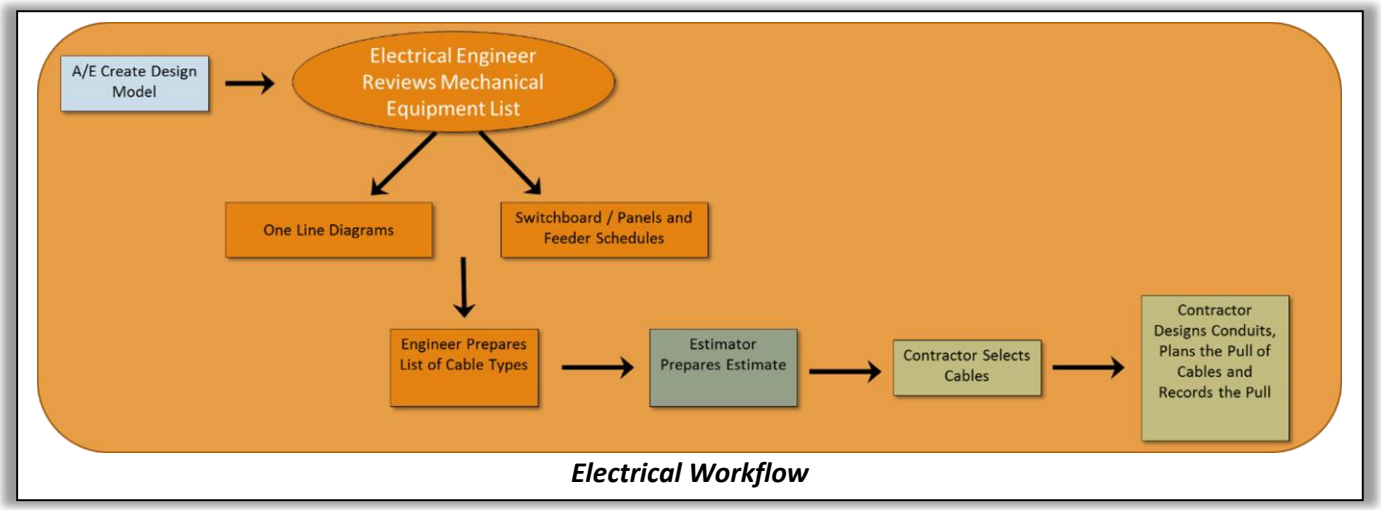
The following is a typical Revit workflow that electrical designers follow.

- Place electrical fixtures and devices.
- Locate and place electrical equipment.
- Create circuits for electrical fixtures and devices
- Draw symbolic wires
- Create Panel schedules
- Place tags and annotation to call out the circuit information
- Model cable tray and conduit
- Manually creates one-line diagrams

Two areas that are lacking in this process is the design of the actual wires, cable tray, and conduit. Revit does not allow you to specify what is actually in the conduit or allow you to select the specific wires in the design process.

In the construction arena, electrical contractors are typically stuck with having figure out all the particulars of the electrical system. The tools are limited to assist the contractors. Most are using custom spreadsheets to assist in the wiring selection process.

The following diagram illustrates the typical workflow of an electrical project. This session will show tools that will assist when following this workflow. Electrical designers and contractors are lacking these tools currently.

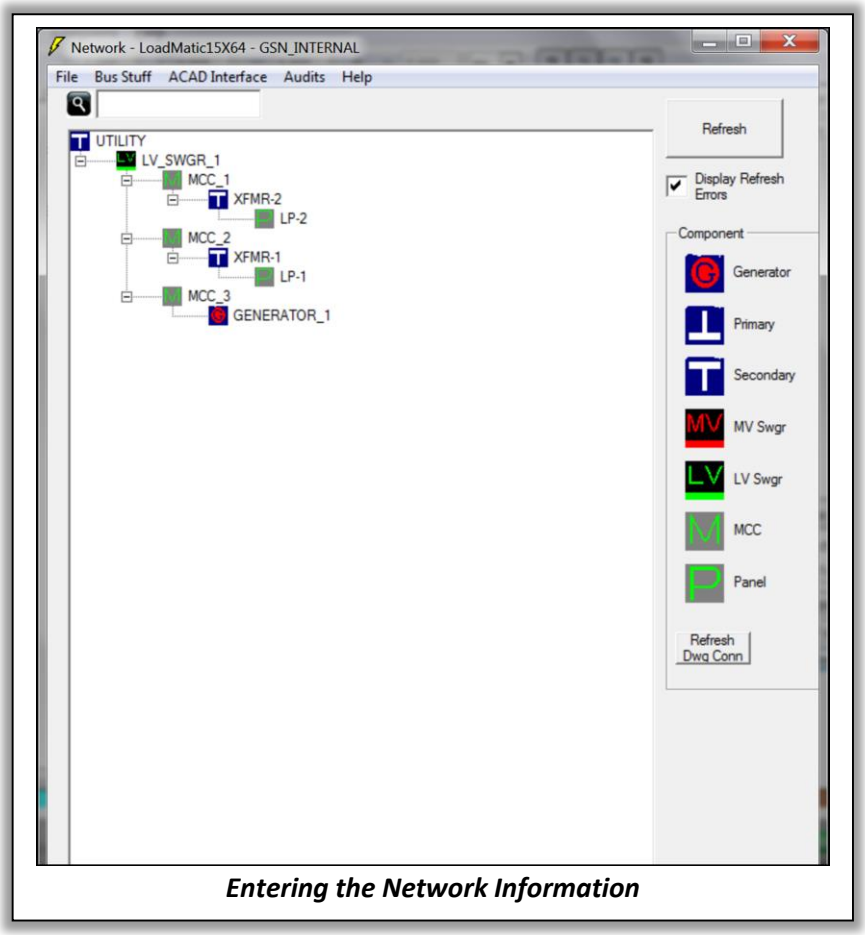


Electrical Workflow

Planning and Setup

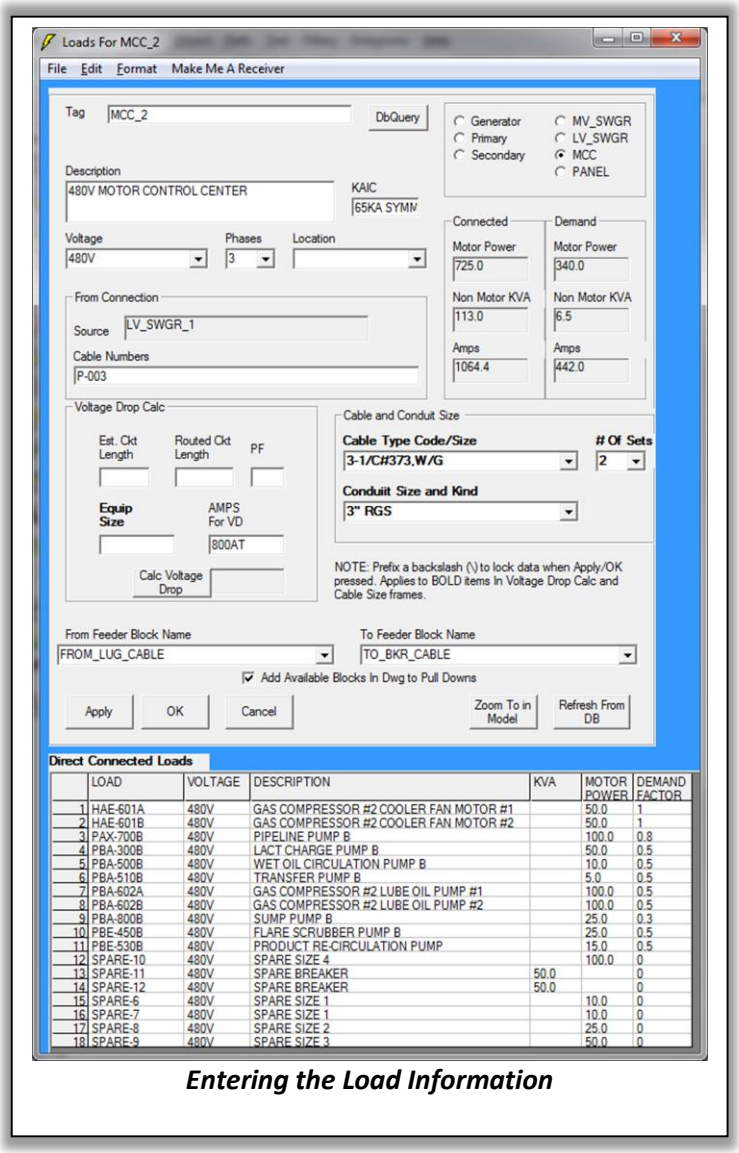
Entering the Network Information

The network information is entered using a simple drag and drop interface. A commodity type (e.g. Panel, Motor Control Center, Switchgear) is selected from the right and dropped at the root, or onto an existing commodity in the Bus Tree. This process creates the Bus Network's hierarchy, which will be used later in the creation of the cable schedules; showing source and destination equipment for each individual cable.

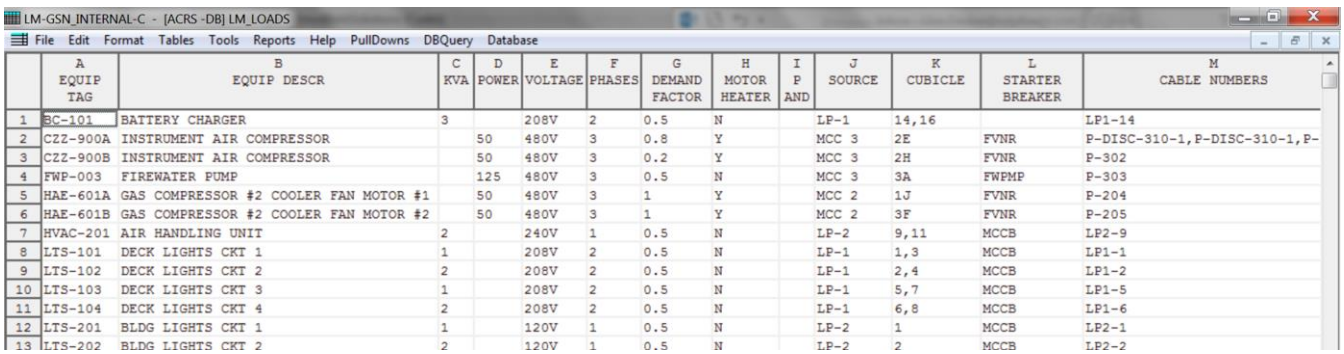


Entering the Network Information

Entering the Load Information:
Load information is assigned in the program using one of two methods, by spreadsheet or through the property window. Load information can be considered, cable type, number of sets, voltage, phases, trip setting, equipment size, minimum conduit size, KAIC, and a variety of other data. This information is used in the program in order to automate breaker sizing, trip settings, cable sizing, conduit sizing, and other calculations.



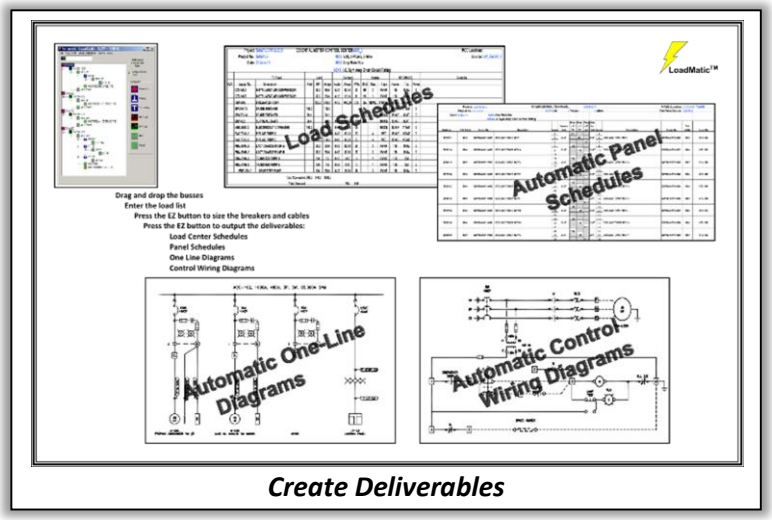
Entering the Load Information



Entering the Load Information

Create Deliverables

The BEM Software solution is designed to automate the processes involved with creating electrical deliverables such as panel schedules, load schedules, one-line diagrams, control wiring diagrams, raceway drawings, bills of material, cable schedules, installation tickets, and many other required reports for the electrical engineering, design, and construction work flows.



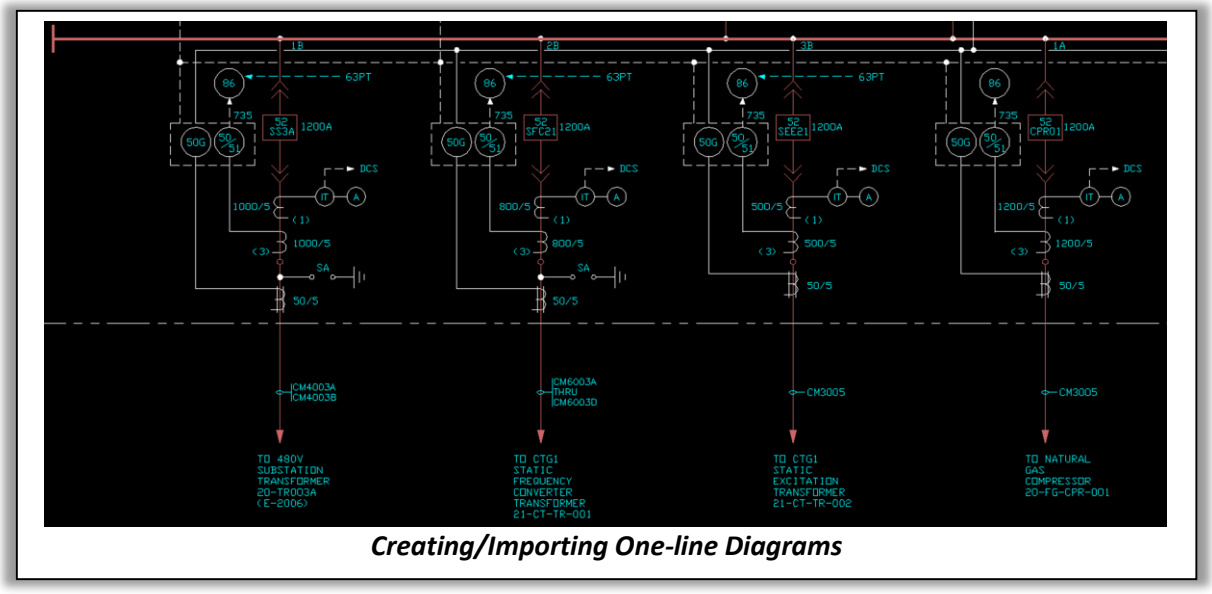
Create Deliverables

Plant design Interfacing:

The BEM Software Solution is compatible with multiple design platforms, such as PDS, PDMS, Microstation, Smart Plant, Navisworks, and more. Data can be imported from, or exported to, these interfaces depending on the specific software. This is useful in the cases that plant review and clash detection are required for the project.

Creating/Importing One-line Diagrams

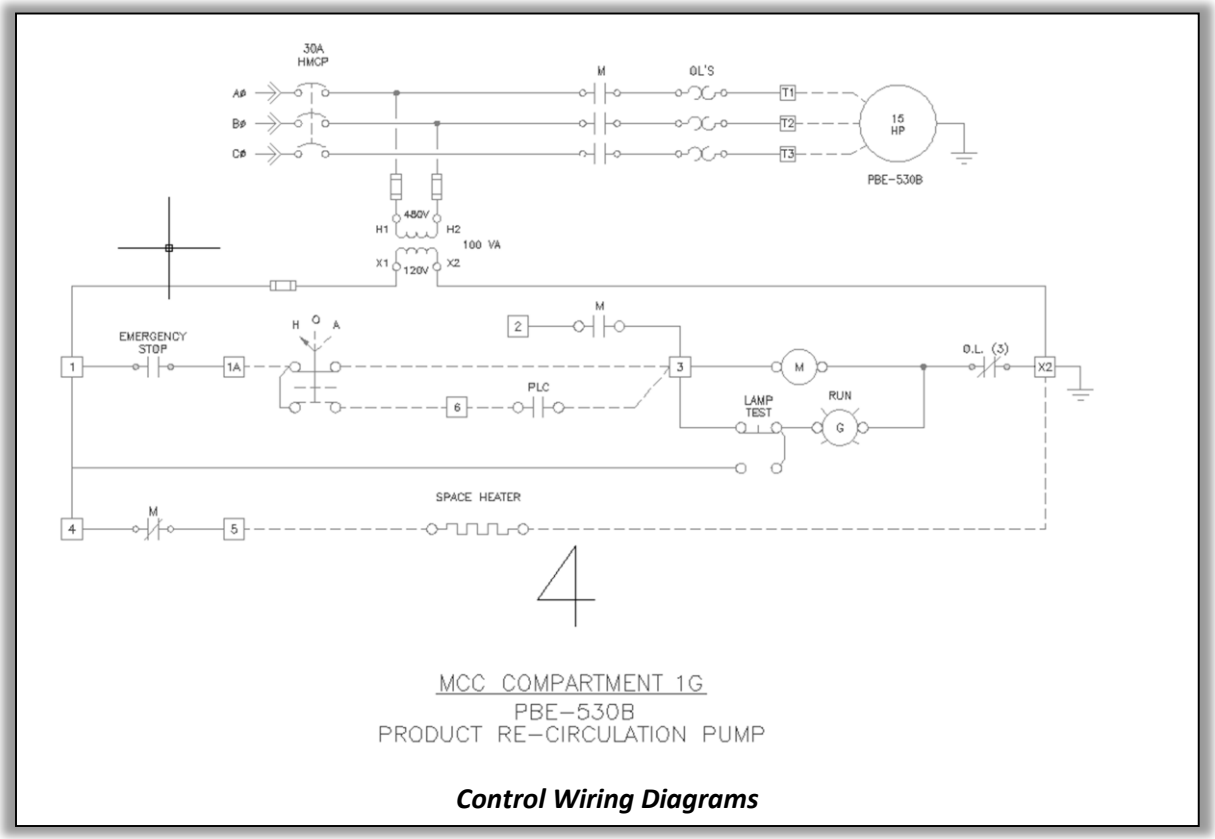
One line diagrams can be created by the program, or the information from an existing one-line diagram could be input. When creating the diagram with the software, the program will utilize a template drawing containing attributed blocks. These blocks are applied to each load within the program. When the function to create the one-line is run, the program will find the specified block, make the necessary calculations, and export the final data to the drawing populating to the respective attribute of the block.



Creating/Importing One-line Diagrams

Control Wiring Diagrams

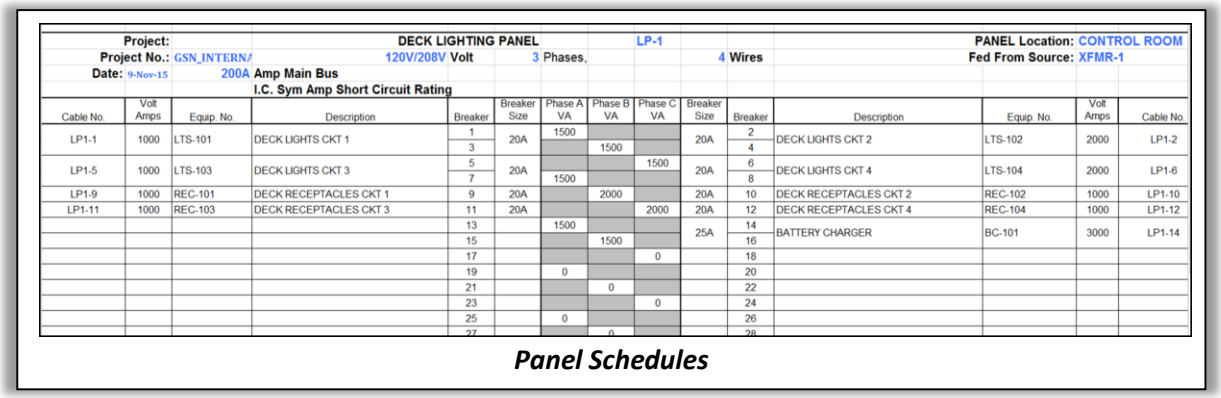
Control wiring diagrams are created in the same manner that one line diagrams are created. The program will utilize a template drawing, separate from the template for the one-line diagrams. This drawing, as was the case with the one-line template, contains attributed blocks. These blocks are applied to each load within the program. When the function to create the control wiring diagrams is run, the program will find the specified block, make the necessary calculations, and export the final data to the drawing populating to the respective attribute of the block.



Control Wiring Diagrams

Panel Schedules

After the load and network information has been input in the solution, panel schedules can be exported to Microsoft Excel™ with the press of a button. In addition, as information is updated or modified in the project, the panel schedules can be updated with the new data. Every schedule in the project is updated with the new data, making revision control a simple process. Panel schedules display associated equipment tags, volt amps, cable numbers, phase, breaker size, descriptions, and project information. These schedules can be output to a customized Excel Template. This allows the user to use their own company templates containing logos and other company specific information for their deliverables.



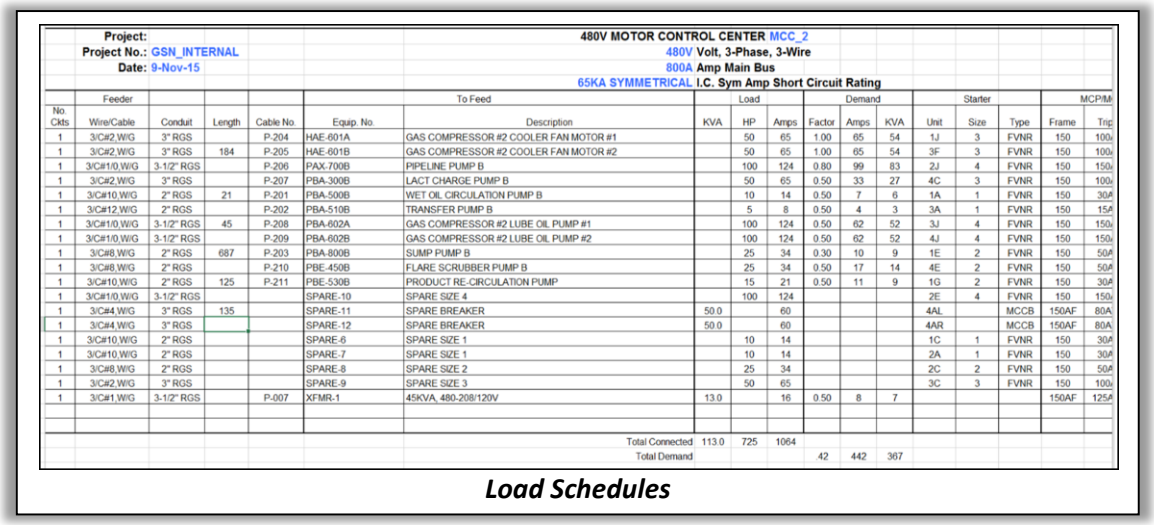
Project: DECK LIGHTING PANEL LP-1 **PANEL Location:** CONTROL ROOM
Project No.: GSN_INTERN/ 120V/208V Volt 3 Phases, 4 Wires **Fed From Source:** XFMR-1
Date: 9-Nov-15 200A Amp Main Bus
I.C. Sym Amp Short Circuit Rating

Cable No.	Volt Amps	Equip. No.	Description	Breaker	Breaker Size	Phase A VA	Phase B VA	Phase C VA	Breaker Size	Breaker	Description	Equip. No.	Volt Amps	Cable No.
LP1-1	1000	LTS-101	DECK LIGHTS CKT 1	1	20A	1500			20A	2	DECK LIGHTS CKT 2	LTS-102	2000	LP1-2
				3			1500			4				
LP1-5	1000	LTS-103	DECK LIGHTS CKT 3	5	20A			1500	20A	6	DECK LIGHTS CKT 4	LTS-104	2000	LP1-6
				7		1500				8				
LP1-9	1000	REC-101	DECK RECEPTACLES CKT 1	9	20A		2000		20A	10	DECK RECEPTACLES CKT 2	REC-102	1000	LP1-10
LP1-11	1000	REC-103	DECK RECEPTACLES CKT 3	11	20A			2000	20A	12	DECK RECEPTACLES CKT 4	REC-104	1000	LP1-12
				13		1500			25A	14	BATTERY CHARGER	BC-101	3000	LP1-14
				15			1500			16				
				17				0		18				
				19		0				20				
				21			0			22				
				23				0		24				
				25		0				26				
				27			0			28				

Panel Schedules

Load Schedules

Similar to the panel schedule functionality of the software, load schedules can also be output directly to Microsoft Excel™. The load schedules can also be updated automatically when information has changed. Load schedules contain load data, demand data, starter and breaker information, number of circuits, cable type, cable length (where applicable), cable numbers, equipment numbers, and various other information.



Project: 480V MOTOR CONTROL CENTER MCC_2
Project No.: GSN_INTERNAL 480V Volt, 3-Phase, 3-Wire
Date: 9-Nov-15 800A Amp Main Bus
65KA SYMMETRICAL I.C. Sym Amp Short Circuit Rating

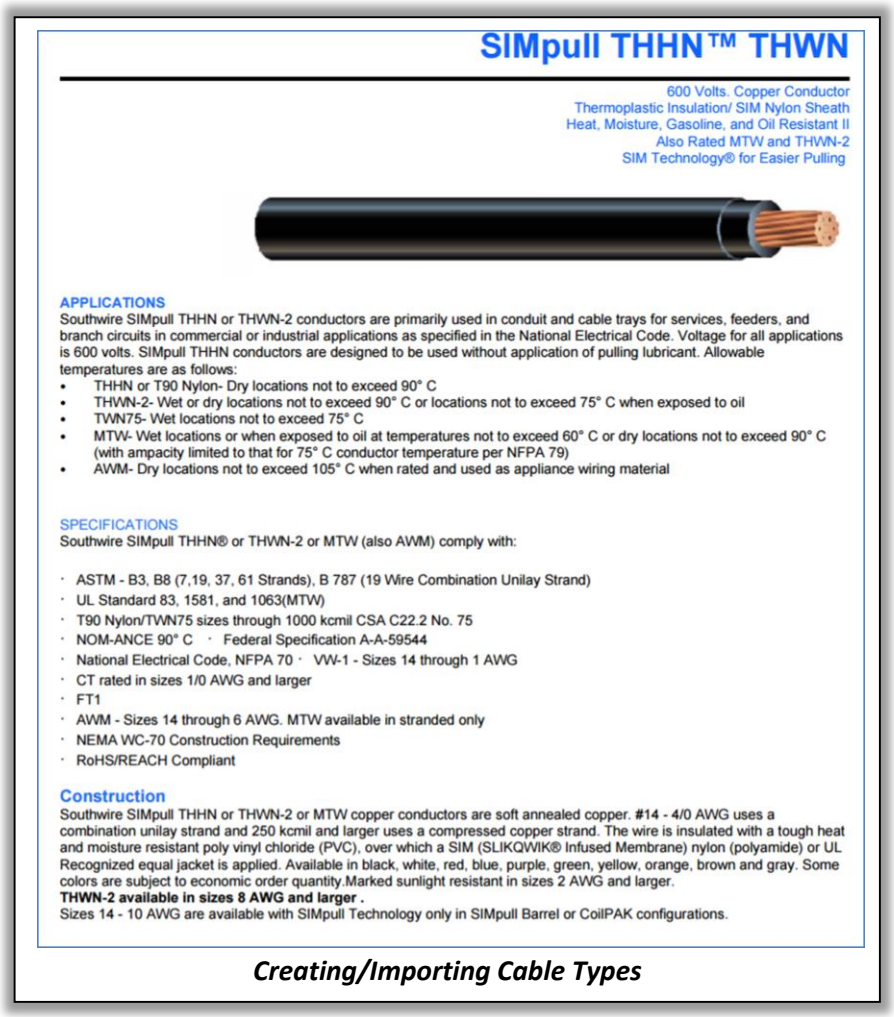
	Feeder				To Feed		Load			Demand			Starter			MCP/M	
No. Ckts	Wire/Cable	Conduit	Length	Cable No.	Equip. No.	Description	KVA	HP	Amps	Factor	Amps	KVA	Unit	Size	Type	Frame	Trip
1	3/C#2,W/G	3" RGS		P-204	HAE-601A	GAS COMPRESSOR #2 COOLER FAN MOTOR #1		50	65	1.00	65	54	1J	3	FVNR	150	100
1	3/C#2,W/G	3" RGS	184	P-205	HAE-601B	GAS COMPRESSOR #2 COOLER FAN MOTOR #2		50	65	1.00	65	54	3F	3	FVNR	150	100
1	3/C#1/0,W/G	3-1/2" RGS		P-206	PAX-700B	PIPELINE PUMP B		100	124	0.80	99	83	2J	4	FVNR	150	150
1	3/C#2,W/G	3" RGS		P-207	PBA-300B	LACT CHARGE PUMP B		50	65	0.50	33	27	4C	3	FVNR	150	100
1	3/C#10,W/G	2" RGS	21	P-201	PBA-500B	WET OIL CIRCULATION PUMP B		10	14	0.50	7	6	1A	1	FVNR	150	30A
1	3/C#12,W/G	2" RGS		P-202	PBA-510B	TRANSFER PUMP B		5	8	0.50	4	3	3A	1	FVNR	150	15A
1	3/C#1/0,W/G	3-1/2" RGS	45	P-208	PBA-602A	GAS COMPRESSOR #2 LUBE OIL PUMP #1		100	124	0.50	62	52	3J	4	FVNR	150	150
1	3/C#1/0,W/G	3-1/2" RGS		P-209	PBA-602B	GAS COMPRESSOR #2 LUBE OIL PUMP #2		100	124	0.50	62	52	4J	4	FVNR	150	150
1	3/C#8,W/G	2" RGS	687	P-203	PBA-800B	SUMP PUMP B		25	34	0.30	10	9	1E	2	FVNR	150	50A
1	3/C#8,W/G	2" RGS		P-210	PBE-450B	FLARE SCRUBBER PUMP B		25	34	0.50	17	14	4E	2	FVNR	150	50A
1	3/C#10,W/G	2" RGS	125	P-211	PBE-530B	PRODUCT RE-CIRCULATION PUMP		15	21	0.50	11	9	1G	2	FVNR	150	30A
1	3/C#1/0,W/G	3-1/2" RGS			SPARE-10	SPARE SIZE 4		100	124				2E	4	FVNR	150	150
1	3/C#4,W/G	3" RGS	135		SPARE-11	SPARE BREAKER	50.0		60				4AL		MCCB	150AF	80A
1	3/C#4,W/G	3" RGS			SPARE-12	SPARE BREAKER	50.0		60				4AR		MCCB	150AF	80A
1	3/C#10,W/G	2" RGS			SPARE-6	SPARE SIZE 1		10	14				1C	1	FVNR	150	30A
1	3/C#10,W/G	2" RGS			SPARE-7	SPARE SIZE 1		10	14				2A	1	FVNR	150	30A
1	3/C#8,W/G	2" RGS			SPARE-8	SPARE SIZE 2		25	34				2C	2	FVNR	150	50A
1	3/C#2,W/G	3" RGS			SPARE-9	SPARE SIZE 3		50	65				3C	3	FVNR	150	100
1	3/C#1,W/G	3-1/2" RGS		P-007	XFMR-1	45KVA, 480-208/120V	13.0		16	0.50	8	7				150AF	125A
						Total Connected	113.0	725	1064								
						Total Demand				42	442	367					

Load Schedules

Creating/Importing Cable Types

Cable types can be imported from an existing spreadsheet to the Wintab section of the solution and updated to the database, or they can be created using the BEM Software Solution Tools. When creating cable types, the BEM software suite has tools built into the program that will help to streamline the process. The BEM Software Solution comes defaulted with the Southwire cable catalog built in. Using the tools provided, the user is given the ability to narrow down the available choices using properties that are associated with the cable. For instance, insulation, voltage, conductor size, material, and a wide array of additional properties. Once the necessary cables have been added to the project, the user is also able to be sent directly to the cable type's spec sheet from the Southwire server. This helps to verify information.

Additional functions allow the user to create their own cable bundles (e.g. Three 1 conductor cables of a 1/0 size and a #4 AWG ground) in order to feed loads. Once the data has been input, the software will bundle these cables for you and create a cable type based on the information entered.



SIMpull THHN™ THWN

600 Volts. Copper Conductor
Thermoplastic Insulation/ SIM Nylon Sheath
Heat, Moisture, Gasoline, and Oil Resistant II
Also Rated MTW and THWN-2
SIM Technology® for Easier Pulling

APPLICATIONS

Southwire SIMpull THHN or THWN-2 conductors are primarily used in conduit and cable trays for services, feeders, and branch circuits in commercial or industrial applications as specified in the National Electrical Code. Voltage for all applications is 600 volts. SIMpull THHN conductors are designed to be used without application of pulling lubricant. Allowable temperatures are as follows:

- THHN or T90 Nylon- Dry locations not to exceed 90° C
- THWN-2- Wet or dry locations not to exceed 90° C or locations not to exceed 75° C when exposed to oil
- TWN75- Wet locations not to exceed 75° C
- MTW- Wet locations or when exposed to oil at temperatures not to exceed 60° C or dry locations not to exceed 90° C (with ampacity limited to that for 75° C conductor temperature per NFPA 79)
- AWM- Dry locations not to exceed 105° C when rated and used as appliance wiring material

SPECIFICATIONS

Southwire SIMpull THHN® or THWN-2 or MTW (also AWM) comply with:

- ASTM - B3, B8 (7,19, 37, 61 Strands), B 787 (19 Wire Combination Unilay Strand)
- UL Standard 83, 1581, and 1063(MTW)
- T90 Nylon/TWN75 sizes through 1000 kcmil CSA C22.2 No. 75
- NOM-ANCE 90° C · Federal Specification A-A-59544
- National Electrical Code, NFPA 70 · VW-1 - Sizes 14 through 1 AWG
- CT rated in sizes 1/0 AWG and larger
- FT1
- AWM - Sizes 14 through 6 AWG. MTW available in stranded only
- NEMA WC-70 Construction Requirements
- RoHS/REACH Compliant

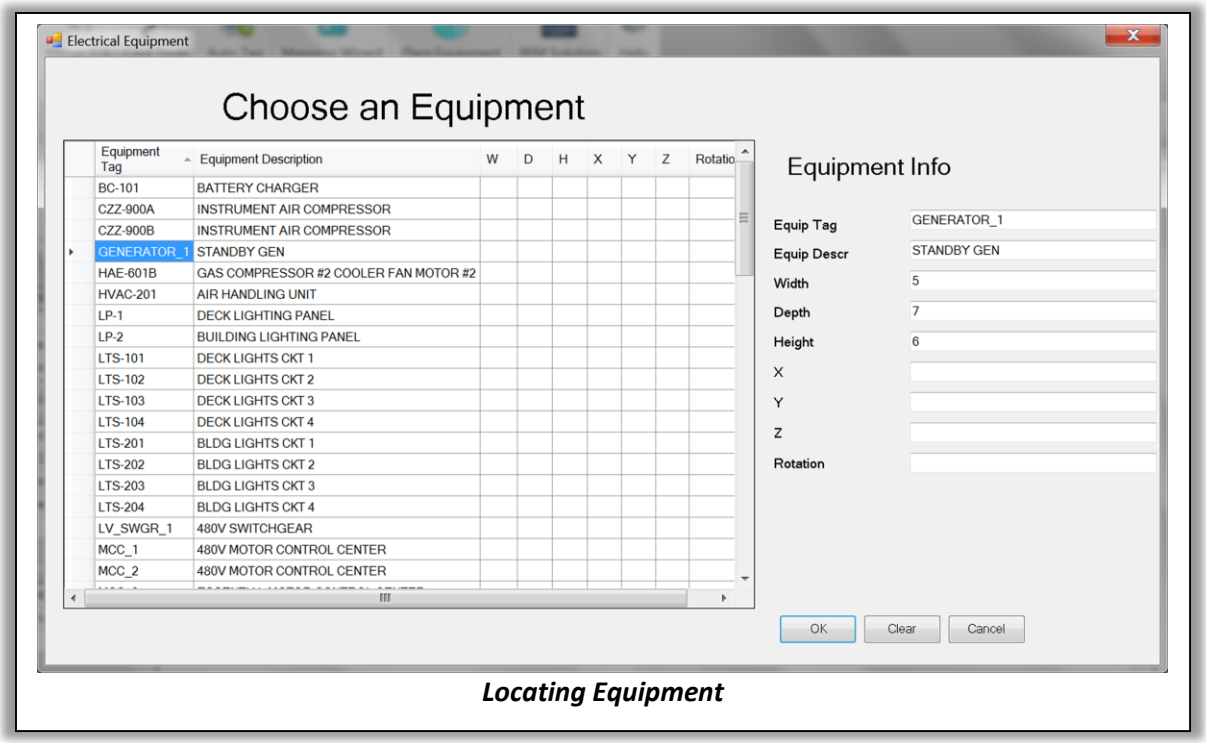
Construction

Southwire SIMpull THHN or THWN-2 or MTW copper conductors are soft annealed copper. #14 - 4/0 AWG uses a combination unilay strand and 250 kcmil and larger uses a compressed copper strand. The wire is insulated with a tough heat and moisture resistant poly vinyl chloride (PVC), over which a SIM (SLIKQWIK® Infused Membrane) nylon (polyamide) or UL Recognized equal jacket is applied. Available in black, white, red, blue, purple, green, yellow, orange, brown and gray. Some colors are subject to economic order quantity.Marked sunlight resistant in sizes 2 AWG and larger.
THWN-2 available in sizes 8 AWG and larger .
Sizes 14 - 10 AWG are available with SIMpull Technology only in SIMpull Barrel or CoilPAK configurations.

Creating/Importing Cable Types

Locating Equipment

After an equipment list has been created, each individual equipment must be assigned an X,Y,Z value in the model. This is done using AutoCAD or Revit, depending on your CAD platform. When an equipment avatar is placed in the model, the XYZ is stored in the database. This allows the solution to find an accurate length of cable when automatically routing by using the raceway geometry stored and the locations of the equipment being used.

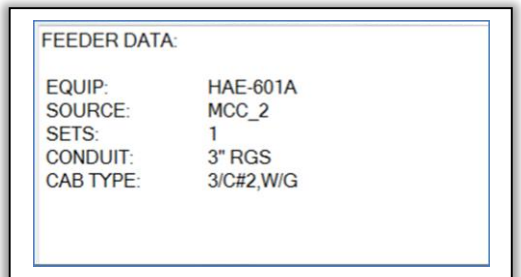


Locating Equipment

Routing Conduit, Tray and Cables

Using the Feeder Data Panel

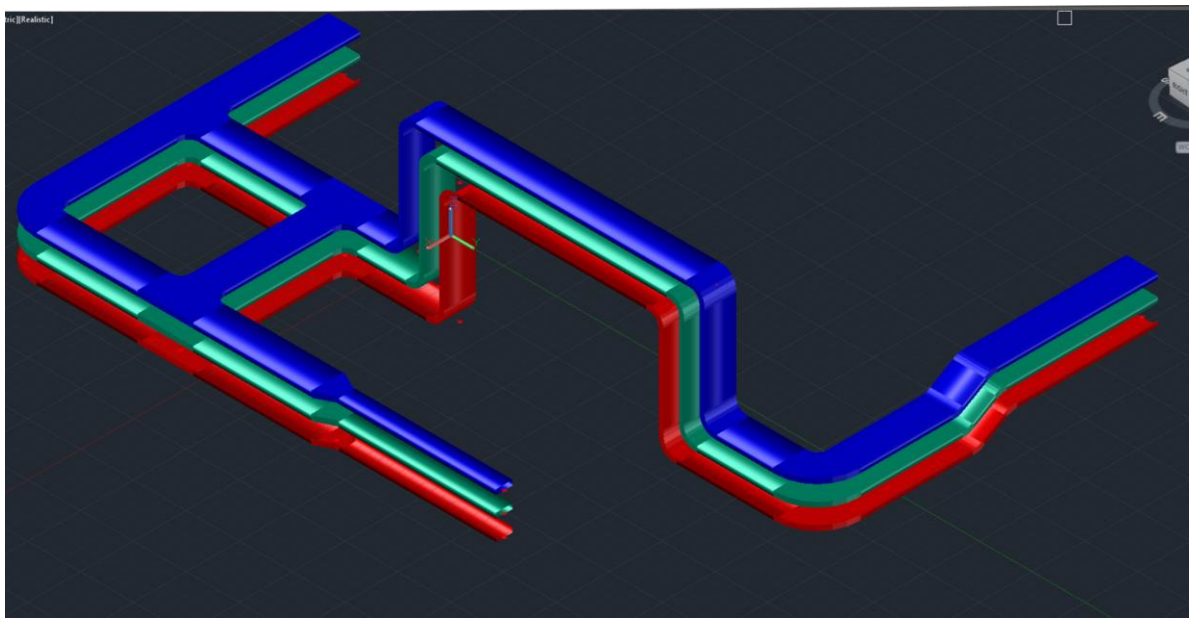
The 'Feeder Data Panel' is a functionality built into the 'Cool Tools' area of the Raceway design modules. When an equipment is selected in the 'Equipment Window' the 'Feeder Data Panel' is automatically updated to reflect the information that is needed to connect associated equipment. The 'Feeder Data Panel' displays the number of sets, the conduit size required, the cable type, and the connecting equipment.



Using the Feeder Data Panel

Routing Tray

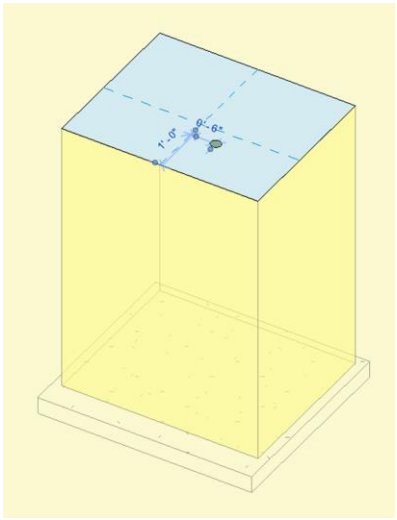
Tray is routed using two different methods, depending on the CAD platform being used at the time. While using Revit, trays are designed using the Cable Tray Design tools built into Revit. The geometric information of the tray is then synchronized with the BEM software solution's database. Once the data is synchronized, cable can be routed using the CARS functionality. When using AutoCAD, the TrayMatic interface (TM GUI) is used to design your cable tray within AutoCAD. Using the TM GUI, the user is afforded the opportunity to create tray runs, perform sloping and stacking operations, and add barriers for industrial applications.



Routing Tray

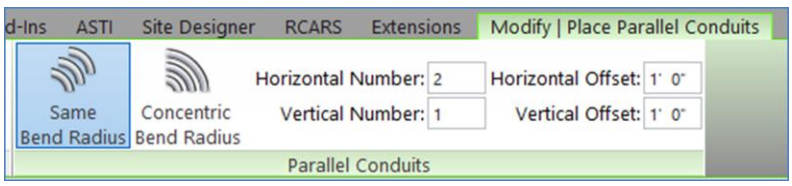
Routing Conduit Manually Through the Revit Interface

The tools inside of Revit to model conduit allows for accurate layout and coordination with other systems. Conduit types can be defined that use specific fittings that are automatically placed as you model the conduit. Special fittings can also be inserted into the model as needed. Parameters can be added to the conduit to assist in defining or visualizing different conduit runs. Condit can be connected to equipment as long as there is a conduit connecter on the surface of the family. Connecting conduit to equipment families will tie the two together so if one moves the other will move with it. When drawing conduit off of a face of a piece of equipment, Revit will allow you to specify exactly where on the face you would like to attach the conduit.



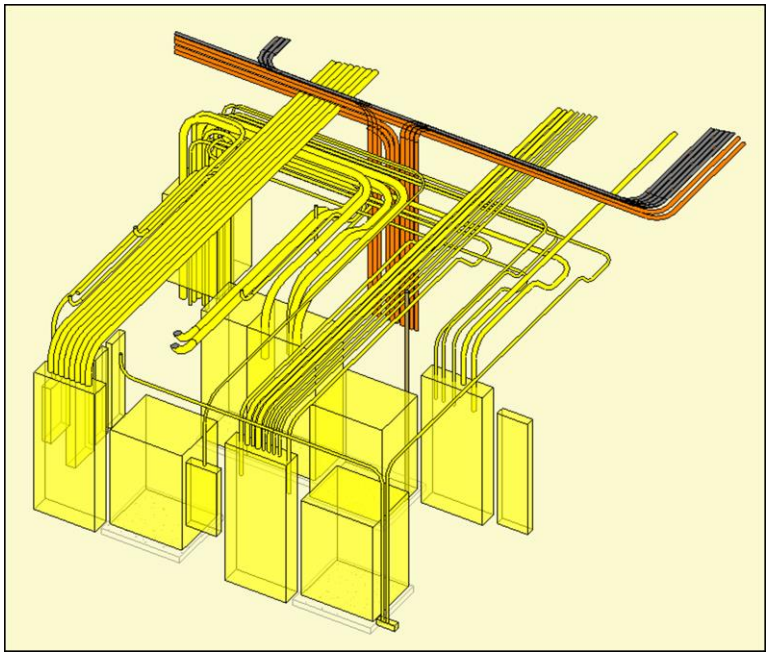
Selecting Connection Point

Revit also has a Parallel Conduit tool to assist in drawing multiple runs or duct banks. This will speed up the model process and allow you to quickly enter in the spacing of the duct bank.



Parallel Conduit Tool

Modeling conduit in tight spaces can be difficult because Revit has a minimum bend radius that is assigned to elbows. Revit will not allow conduit to be model that has smaller bend radius that what is specified in the conduit settings. This provides real world coordination issues as you create the conduit similar to what will be seen in field when the conduit is installed.

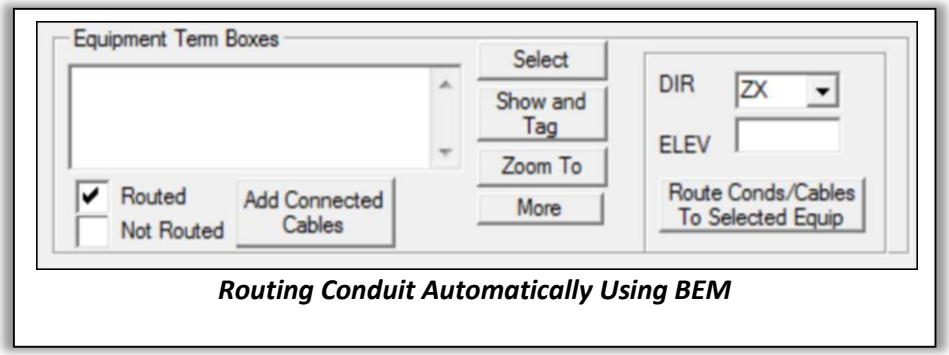


Routing Conduit

Routing Conduit Automatically using the BEM Software Routing Interface

The BEM Software solution will automatically route conduit based on values input by the user through the 'Cool Tools' interface. After placing equipment in the 'Cool Tools' equipment window, the user can elect for the solution to make an estimate on the conduit and cable needed for the pull. Based on the cable schedule, the program will automatically route the conduit rectilinearly from the source equipment to the destination equipment to the height specified by the user using the directions specified. After the conduit has been routed the cable will be automatically routed through the newly designed conduit.

***Note** - The cable and conduit lengths that are cited by the program using the automation feature is only an estimate. These values can be used to begin to procure necessary materials, however, should not be relied on for exact values. Only the design side of the program can ensure precision lengths and BOMs.*

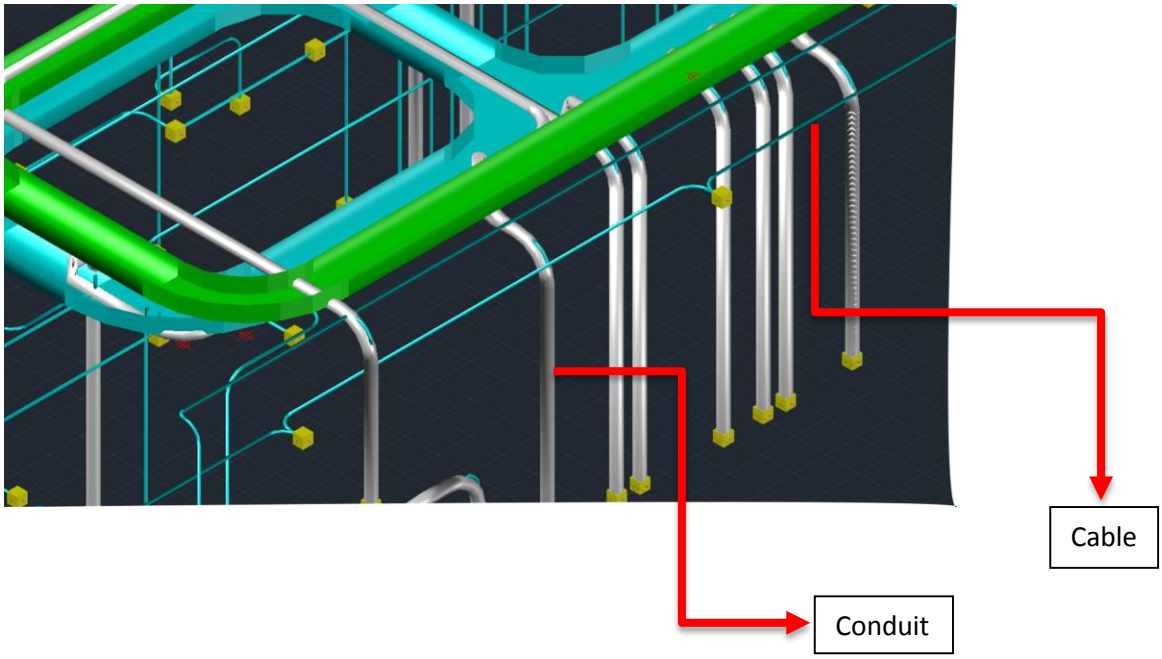


Routing Conduit Automatically Using BEM

Routing Cables

Cable are routed from multiple interfaces using the BEM Software solution. Whether you're in Revit, AutoCAD, or using CableMatic to route your cables, you're provided with a multitude of options to make the process as automated as possible.

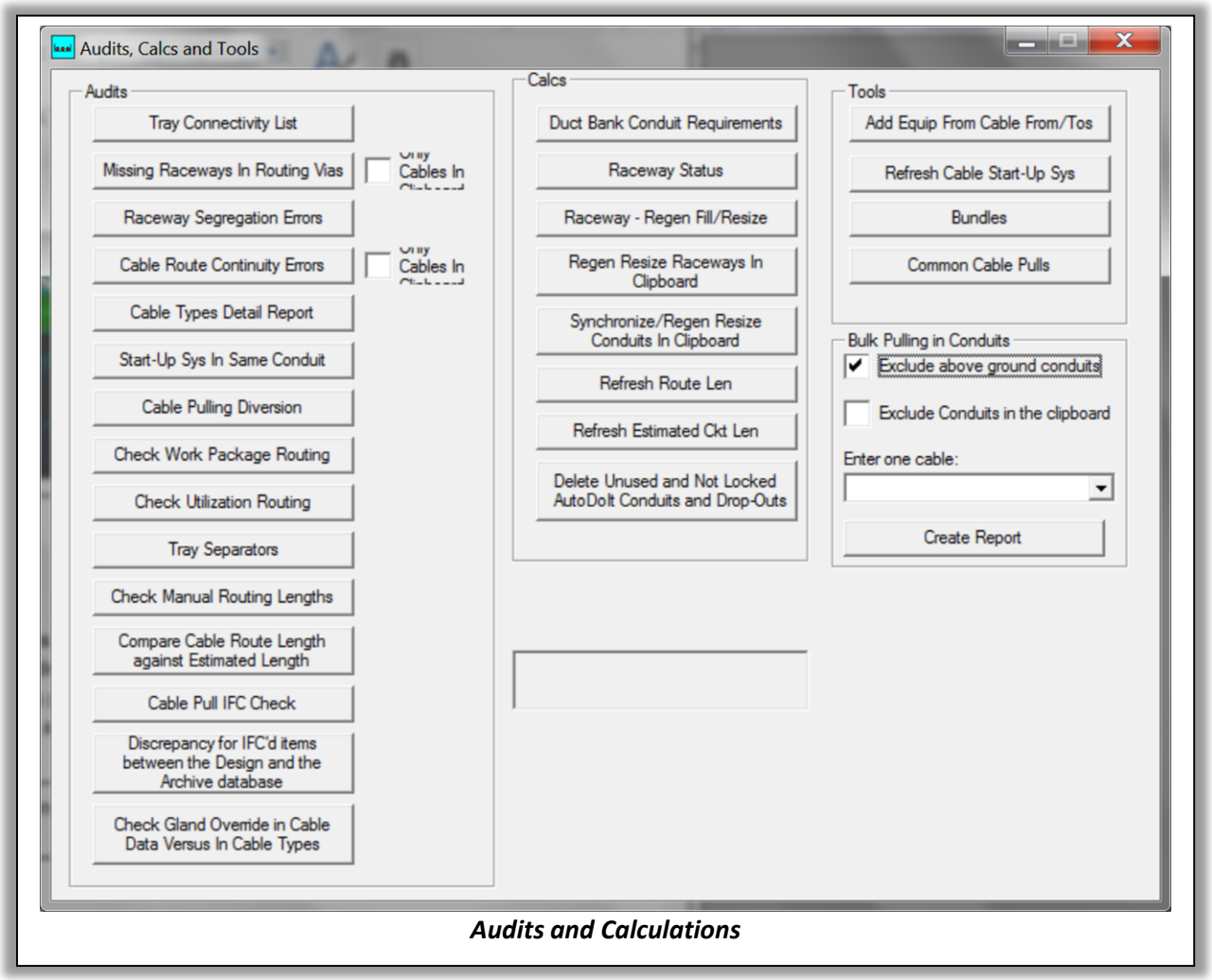
Cables can be routed singularly, in groups by area or cable type, by project, or by a list of specific cables. When routing cables, the program will use the shortest distance from the source equipment to the destination equipment while respecting fill and separators based on the NEC. The automatic routing feature can be overridden by the user at any time by selecting the entire route manually, or choosing only a portion of the route specifically.



Routing Cables:

Audits and Calculations

There are a wide variety of audits that can be performed by the software to ensure that your design is as accurate as possible. The user can regenerate the fill of the raceways in the project, check cable route continuity, audit tray separators, and verify raceway segregations and tray connectivity, and much, much more.

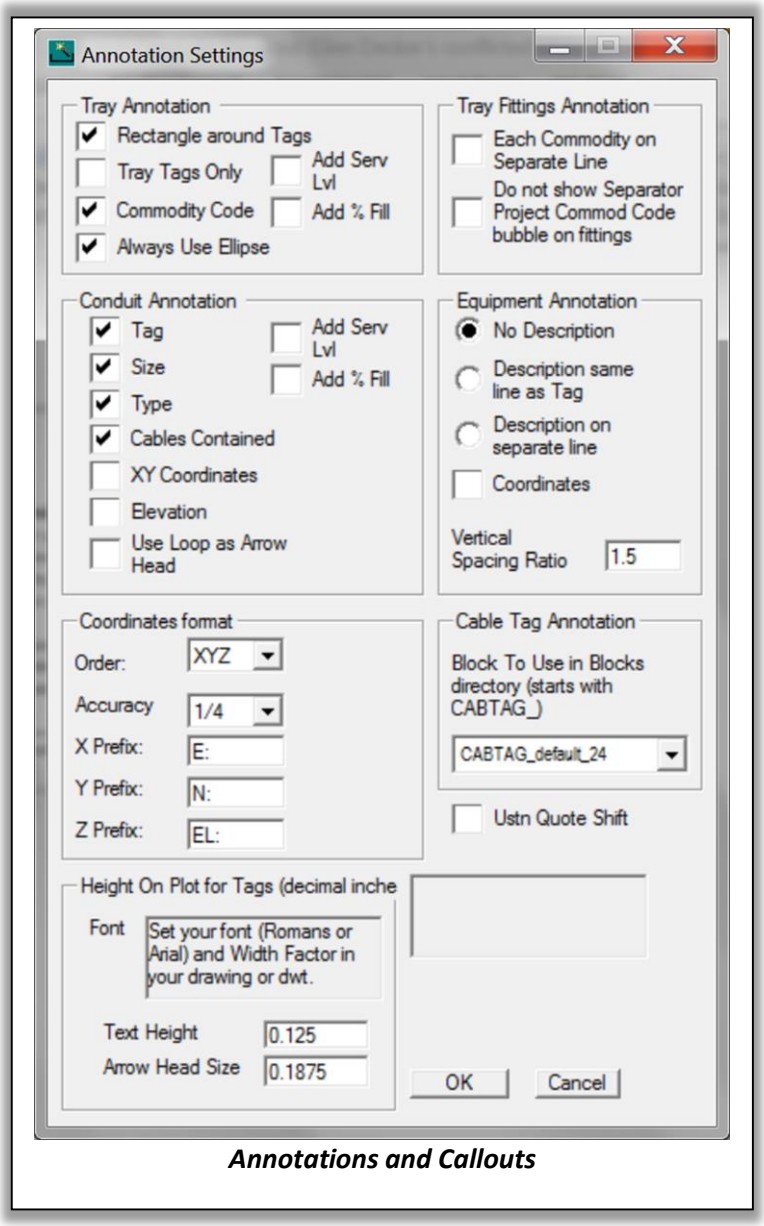


Audits and Calculations

Annotation and Callouts

Whether you're designing with Revit or AutoCAD, the BEM Software Solution provides the intelligence behind the commodities in the model that allows you to annotate your deliverables correctly and efficiently. There are various settings that allow the user to choose the information shown in the annotation including cables contained, elevation, percentage fill, voltage class, and ID.

While using Revit, the BEM shared parameter file gives the user access to values in the database that may be needed when annotating the deliverable; whether it be cable tray, conduit, equipment, or the cables themselves. Within AutoCAD, the user is afforded the same opportunity using the TM GUI.

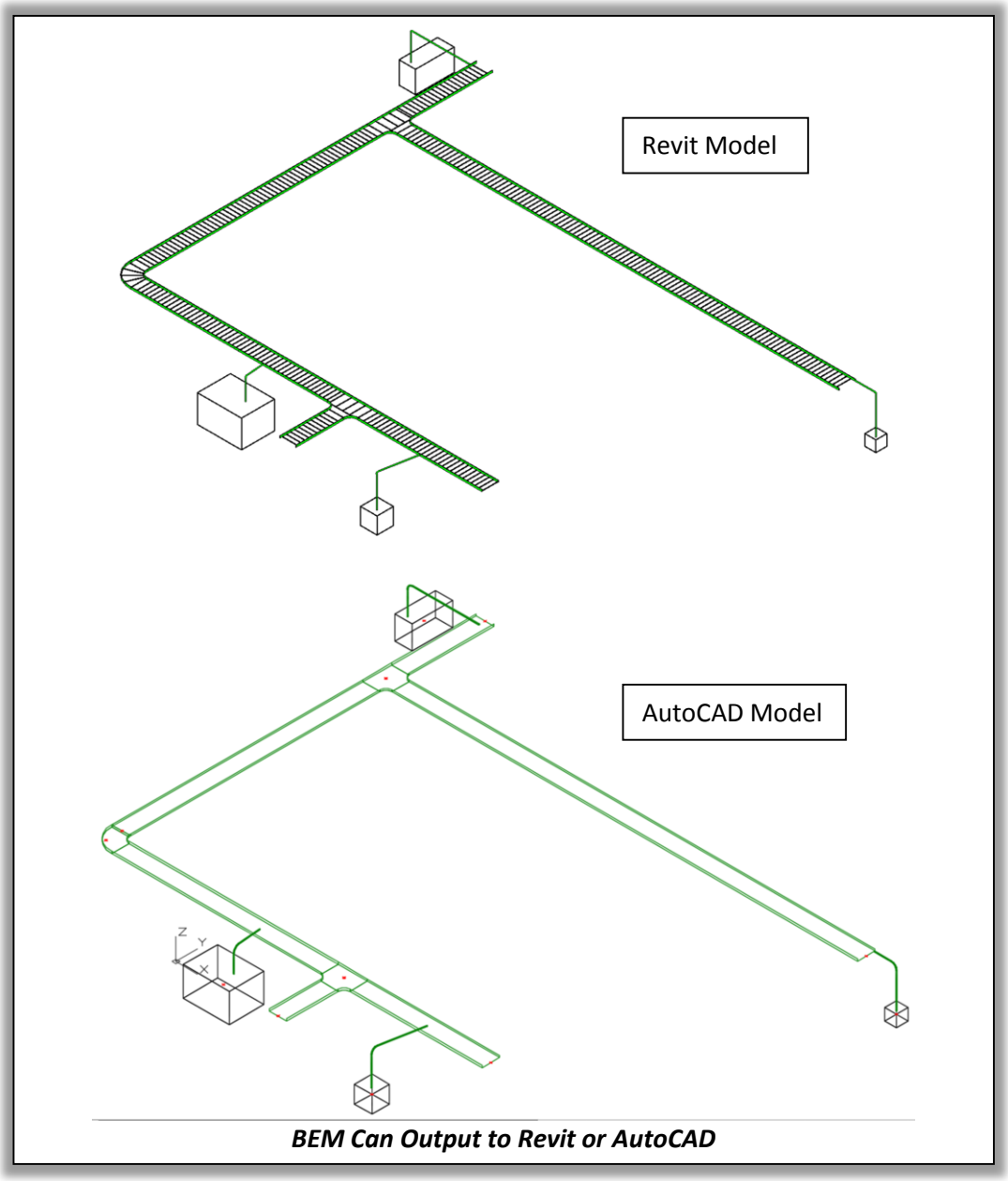


Annotations and Callouts

Parallel Platform Communication

BEM can output to Revit or AutoCAD

Because the BEM software solution is fed from a database, the model can be re-created in AutoCAD or Revit simultaneously, while keeping its intelligence. The bi-directional communication between AutoCAD and Revit allow multiple users to add to the model at the same time while using different CAD platforms. The moment that commodities are added and synchronized to the database, they can be re-created by 'Importing' the geometry from the database.



BEM Can Output to Revit or AutoCAD

Planning for Installation

Work Packages

As the project is designed the user has the ability to group commodities by like parameters and create work packages for the field. This can be done by the engineering team, the design team, and the contractor.

With work packages assigned, the user gains the ability to print installation media and create reports based on the work package criteria. This allows for better organization in the field, which can help to improve the efficiency of the project.

Bill of Material

A BOM can be generated using AutoCAD, Revit, or CableMatic. This function uses information in the database to output to the users specified medium; whether it be notepad, their default browser, Microsoft Word™, or Microsoft Excel™. A BOM can be generated for cable tray, aboveground and underground conduit, equipment, and cables. The Southwire cable catalog is built into the program as well as the Cooper B-Line catalog for cable tray.

Cable BOM

Cable Type	Cable Description	Manuf	Stock Number	UPC Code	Length	UNITS
1/C #4/0	1/C #4/0 AWG	SOUTHWIRE	37-102-119		55	FT
2/C #14	2/C #14 AWG	SOUTHWIRE	37-102-507		90	FT
2-1/C#250,W/G	(2) 1C 250 KCMIL W/GND	SOUTHWIRE	112-31-3511		88	FT
3/C #1 W/G	3/C #1 AWG W/GND	SOUTHWIRE	37-102-315G		92	FT
3/C #1/0 W/G	3/C #1/0 AWG W/GND	HWC	37-102-316G		97	FT
3/C #10 W/G	3/C #10 AWG W/GND	SOUTHWIRE	37-102-308G		77	FT
3/C #10 W/G-MC	3/C #10 AWG W/GND	SOUTHWIRE	546-31-3503		25	FT
3/C #12	3/C #12 AWG	SOUTHWIRE	37-102-516		413	FT
3/C #12 W/G-MC	3/C #12 AWG W/GND	SOUTHWIRE	546-31-3453		424	FT
3/C #2 W/G	3/C #2 AWG W/GND	HWC	37-102-314G		42	FT
3-1/C#10	(3) 1C #10 AWG	SOUTHWIRE			243	FT
3-1/C#12	(3) 1C #12 AWG	SOUTHWIRE	112-31-3111		3586	FT
3-1/C#2,W/G	(3) 1C #2 AWG W/GND	SOUTHWIRE	112-31-3371		212	FT
4-1/C#10	(4) 1C #10	SOUTHWIRE			667	FT
BLACK JACKET ESTIMATE - AS DESIGNED						
	Cable Description	Manuf	Stock Number	UPC Code	Length	UNITS
	1/C #4/0 AWG	SOUTHWIRE	37-102-119		55	FT
	2/C #14 AWG	SOUTHWIRE	37-102-507		90	FT
	(2) 1C 250 KCMIL W/GND	SOUTHWIRE	112-31-3511		88	FT
	3/C #1 AWG W/GND	SOUTHWIRE	37-102-315G		92	FT
	3/C #1/0 AWG W/GND	HWC	37-102-316G		97	FT
	3/C #10 AWG W/GND	SOUTHWIRE	37-102-308G		77	FT
	3/C #10 AWG W/GND	SOUTHWIRE	546-31-3503		25	FT
	3/C #12 AWG	SOUTHWIRE	37-102-516		413	FT
	3/C #12 AWG W/GND	SOUTHWIRE	546-31-3453		424	FT
	3/C #2 AWG W/GND	HWC	37-102-314G		42	FT
	(3) 1C #10 AWG	SOUTHWIRE	3-1/C#10		243	FT
	(3) 1C #12 AWG	SOUTHWIRE	112-31-3111		3586	FT
	(3) 1C #2 AWG W/GND	SOUTHWIRE	112-31-3371		212	FT
	(4) 1C #10	SOUTHWIRE	4-1/C#10		667	FT
BLACK JACKET ESTIMATE - SUBSTITUTING AL FOR CU WHEN AVAILABLE DOES NOT APPLY						

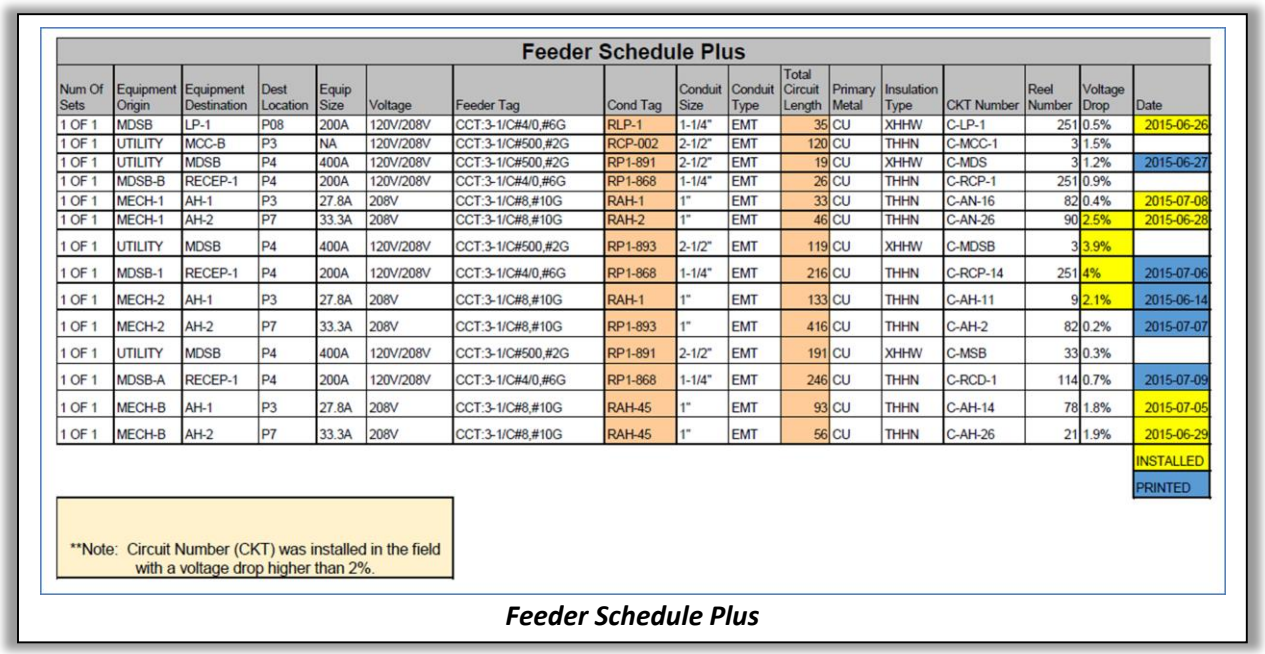
Cable Tray BOM:

PROJ COMMOD CODE	VENDOR	VENDOR CAT NMBR	QTY	UNITS	DESCRIPTION
100	B-LINE	H46A09-12-240	100	FT	12" W ALUM STRAIGHT TRAY, H46 SERIES , LADDER, 6" H, 9" RUNG
504	B-LINE	35A09-12-144	100	FT	12" W ALUM STRAIGHT TRAY, H35 SERIES, LADDER, 5" H, 9" RUNG
150	B-LINE	H46A09-18-240	107	FT	18" W ALUM STRAIGHT TRAY, H46 SERIES , LADDER, 6" H, 9" RUNG
501	B-LINE	35A09-18-144	107	FT	18" W ALUM STRAIGH TRAY, H35 SERIES, LADDER, 5" H, 9" RUNG
120	B-LINE	6A-12-90HB24	4	EA	12" W ALUM TRAY FITTING, LADDER, 90 DEG HORIZ ELBOW, 6" H, 9" RUNG , 24" RAD
502	B-LINE	5A-12-90HB24	4	EA	12" W ALUM 90 DEG HORIZONTAL BEND, LADDER, 5" H, 9" RUNG
184	B-LINE	6A-18-HT24	2	EA	18" W ALUM TRAY FITTING, LADDER, HORIZ TEE, 6" H, 9" RUNG , 24" RAD
170	B-LINE	6A-18-90HB24	4	EA	18" W ALUM TRAY FITTING, LADDER, 90 DEG HORIZ ELBOW, 6" H, 9" RUNG , 24" RAD
500	B-LINE	5A-18-90HB24	4	EA	18" W ALUM 90 DEG HORIZONTAL BEND, LADDER, 5" H, 9" RUNG
			2	EA	TRAY HORZ TEE 18X5, 24(IR), 3(Ext), LADDER OPEN, ALUMINUM

Bill of Material

Feeder Schedule Plus

The 'Feeder Schedule Plus' is a report generated by the BEM software solution. This report contains information concerning nearly every aspect of the cable; including, voltage drop, coefficient of friction, circuit length, origin and destination equipment, feeder tags, sidewall pressure, and installation status. The 'Feeder Schedule Plus' can be generated for any list of equipment and their associated cables or the entire project.



Feeder Schedule Plus

Num Of Sets	Equipment Origin	Equipment Destination	Dest Location	Equip Size	Voltage	Feeder Tag	Cond Tag	Conduit Size	Conduit Type	Total Circuit Length	Primary Metal	Insulation Type	CKT Number	Reel Number	Voltage Drop	Date
1 OF 1	MDSB	LP-1	P08	200A	120V/208V	CCT:3-1/C#4/0,#6G	RLP-1	1-1/4"	EMT	35	CU	XHHW	C-LP-1	251	0.5%	2015-06-26
1 OF 1	UTILITY	MCC-B	P3	NA	120V/208V	CCT:3-1/C#500,#2G	RCP-002	2-1/2"	EMT	120	CU	THHN	C-MCC-1	3	1.5%	
1 OF 1	UTILITY	MDSB	P4	400A	120V/208V	CCT:3-1/C#500,#2G	RP1-891	2-1/2"	EMT	19	CU	XHHW	C-MDS	3	1.2%	2015-06-27
1 OF 1	MDSB-B	RECEP-1	P4	200A	120V/208V	CCT:3-1/C#4/0,#6G	RP1-868	1-1/4"	EMT	26	CU	THHN	C-RCP-1	251	0.9%	
1 OF 1	MECH-1	AH-1	P3	27.8A	208V	CCT:3-1/C#8,#10G	RAH-1	1"	EMT	33	CU	THHN	C-AN-16	82	0.4%	2015-07-08
1 OF 1	MECH-1	AH-2	P7	33.3A	208V	CCT:3-1/C#8,#10G	RAH-2	1"	EMT	46	CU	THHN	C-AN-26	90	2.5%	2015-06-28
1 OF 1	UTILITY	MDSB	P4	400A	120V/208V	CCT:3-1/C#500,#2G	RP1-893	2-1/2"	EMT	119	CU	XHHW	C-MDSB	3	3.9%	
1 OF 1	MDSB-1	RECEP-1	P4	200A	120V/208V	CCT:3-1/C#4/0,#6G	RP1-868	1-1/4"	EMT	216	CU	THHN	C-RCP-14	251	4%	2015-07-06
1 OF 1	MECH-2	AH-1	P3	27.8A	208V	CCT:3-1/C#8,#10G	RAH-1	1"	EMT	133	CU	THHN	C-AH-11	9	2.1%	2015-06-14
1 OF 1	MECH-2	AH-2	P7	33.3A	208V	CCT:3-1/C#8,#10G	RP1-893	1"	EMT	416	CU	THHN	C-AH-2	82	0.2%	2015-07-07
1 OF 1	UTILITY	MDSB	P4	400A	120V/208V	CCT:3-1/C#500,#2G	RP1-891	2-1/2"	EMT	191	CU	XHHW	C-MSB	33	0.3%	
1 OF 1	MDSB-A	RECEP-1	P4	200A	120V/208V	CCT:3-1/C#4/0,#6G	RP1-868	1-1/4"	EMT	246	CU	THHN	C-RCD-1	114	0.7%	2015-07-09
1 OF 1	MECH-B	AH-1	P3	27.8A	208V	CCT:3-1/C#8,#10G	RAH-45	1"	EMT	93	CU	THHN	C-AH-14	78	1.8%	2015-07-05
1 OF 1	MECH-B	AH-2	P7	33.3A	208V	CCT:3-1/C#8,#10G	RAH-45	1"	EMT	56	CU	THHN	C-AH-26	21	1.9%	2015-06-29
																INSTALLED
																PRINTED

**Note: Circuit Number (CKT) was installed in the field with a voltage drop higher than 2%.

Feeder Schedule Plus

Value Engineering

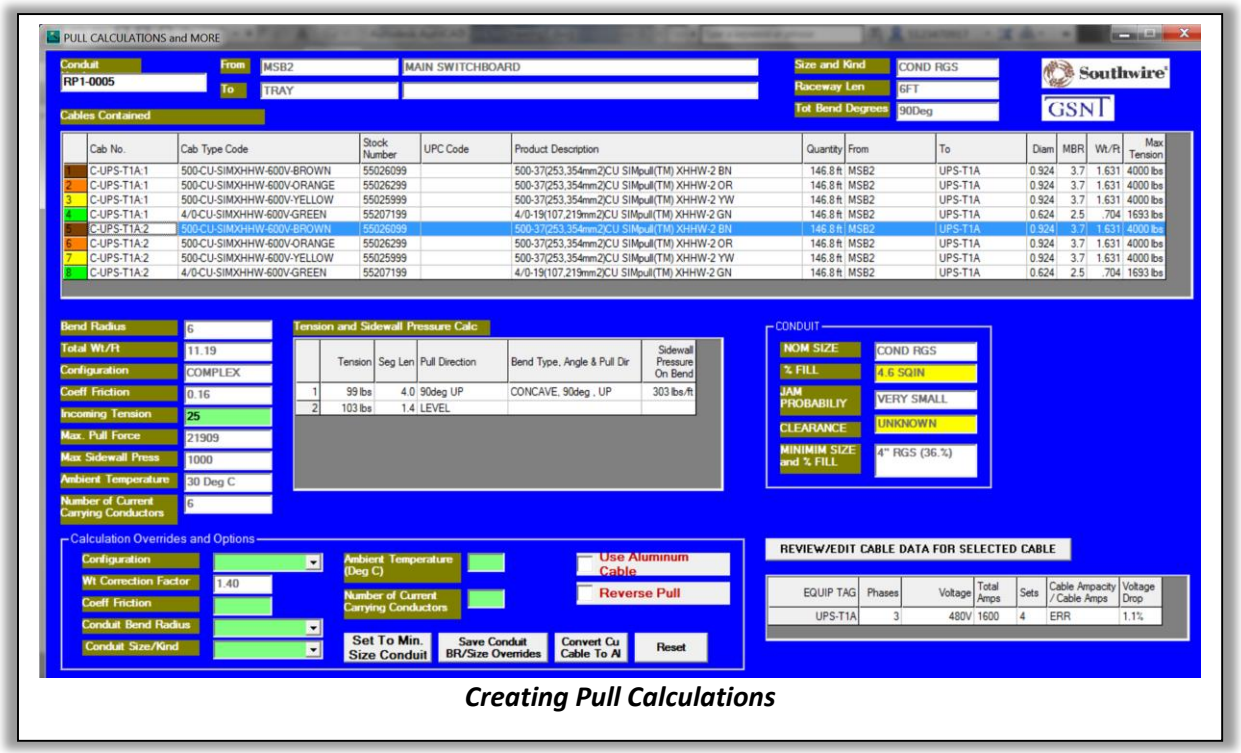
Value engineering can be time consuming and costly when all that must be done is considered. The manual process of changing a copper cable to the aluminum equivalent is also error prone. Using the BEM Software solution, the program gives the user the ability to change any number of cables in the project from copper to aluminum in order to decide if there is going to be an improvement in time or material cost. If the users compares the differences between copper and aluminum and decides it would be best to use aluminum cable in an individual application, the solution will add the aluminum equivalent of the cable to your cable type list and make any necessary changes to raceways that might be affected by the change; for example, the need to upsize the conduit in order to allow a larger diameter cable to pass through while respecting the NEC.

Creating Pull Calculations

After equipment has been located, a raceway system has been designed, and cables have been routed, the solution can be used to evaluate the difficulty of a cable pull using the 'Pull Calculation' form. This form will show you the jam probability, clearance, cables contained in the raceway selected, the properties of the raceway selected (e.g. size, bend radius, type), the coefficient of friction, side wall pressure, maximum pulling tension, and a lot more.

When the software sees that you may have difficulty with a pull, it will highlight the section in question in yellow. The user can then change properties of the pull in order to make the pull easier. For instance, changing the raceway size and bend radius, change the feeder from copper to aluminum, and reverse the pull direction.

With every change made, the software will re-calculate the pull. If the change fixes the issue, the section will un-highlight and the user can proceed.



Creating Pull Calculations

Installation

Pull Tickets

After the database has been issued to the field, it can be used to print cable pull tickets for the purposes of tracking. The pull ticket can be printed in multiple formats and is barcoded for easy retrieval when the tickets are returned as finished. The information displayed is based on selections made by the user; for instance route, cable type, destination and source equipment, estimated pull tension, maximum pull tension, a QAQC checklist, and much more.

$10-TG-DSW-4000A-K-01/P%

CQP - FORM B18.01A **CABLE PULL TICKET**

Page 1 of 1

CABLE NUMBER:	10-TG-DSW-4000A-K-01	REVISION:	01
		CHECKSUM:	97167
CABLE TYPE:	K3C2G	ISSUE FOREMAN:	A. MASON

CABLE OD: .96In MBR: 3.84In WEIGHT: 954.0Lbs/Ft LAY CABLE: RANDOM

CABLE TYPE DESCR:	3/C #2 AWG 600V POWER W/ GND	EST CKT LEN:	501.8
FROM DEVICE:	10-EL-PNL-0002	TO DEVICE:	10-TG-DSW-4000-A
TURB BLDG - SWGR ROOM 1 - SMALL POWER & LIGHT		Disc.Switch for Bolt Heater - Turbine A	
FROM SECTION:	CKT 1/3		
EST. PULL TENSION:	106 LBS	MAX PULL TENSION:	2424 LBS
VOLTAGE DROP:	2.50%	AMPACITY EXCEEDED:	NO
PLAN FROM DRAWING:	125711-10400-E-AGE-011-2	PLAN TO DRAWING:	125711-10400-E-AGE-032-1
DATE PRINTED:	Jul. 14, 2015	START-UP SYS:	40-0.08
		WRK PKG:	

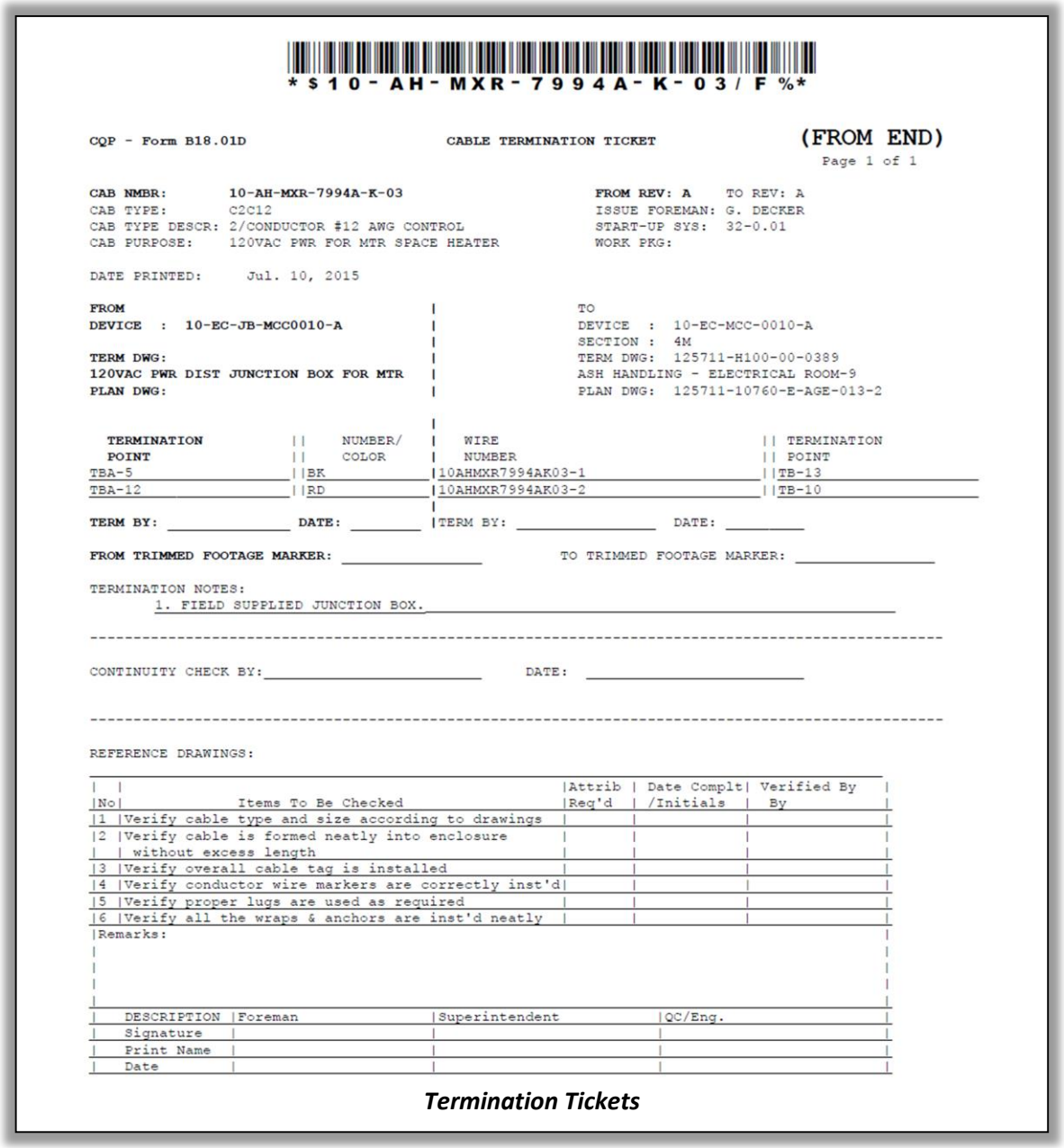
Route: 10CK2013-298:CR03 10TLK2013-009/K 10TLK2013-005/K 10TLK2013-016/K 10TLK2023-020/K 10TK2023-030 10TK2023-031 10TK2023-032 10TK2023-025 10TK2023-019 10TK2023-034 10TLK2023-003/K 10TLK2023-004/K 10TLK2022-001/K 10CK2031-016:CR03 10JBK2031-002 10CK2031-010:CR09

ROUTED THROUGH 10-TG-JB-4003 TO FIELD SIZED JB

Pull Tickets

Termination Tickets

Similar to pull tickets, termination tickets can be printed by the field after the project has been issued. Term tickets, like pull tickets, have different formatting available, and allow for the customization of some of the information on the ticket; for example, source and destination equipment information, cable information, work package and start-up system, termination point, wire number and colors, information on the terminator, and QAQC. Tickets are barcoded, distributed, and return to the administration office giving the user the ability to report on outstanding tickets, update the status of completed work, and create progress reports.



S10-AH-MXR-7994A-K-03/F%

CQP - Form B18.01D CABLE TERMINATION TICKET (FROM END)

Page 1 of 1

CAB NMBR: 10-AH-MXR-7994A-K-03 FROM REV: A TO REV: A
CAB TYPE: C2C12 ISSUE FOREMAN: G. DECKER
CAB TYPE DESCR: 2/CONDUCTOR #12 AWG CONTROL START-UP SYS: 32-0.01
CAB PURPOSE: 120VAC PWR FOR MTR SPACE HEATER WORK PKG:

DATE PRINTED: Jul. 10, 2015

FROM	TO
DEVICE : 10-EC-JB-MCC0010-A	DEVICE : 10-EC-MCC-0010-A
	SECTION : 4M
TERM DWG:	TERM DWG: 125711-H100-00-0389
120VAC PWR DIST JUNCTION BOX FOR MTR	ASH HANDLING - ELECTRICAL ROOM-9
PLAN DWG:	PLAN DWG: 125711-10760-E-AGE-013-2

TERMINATION POINT	NUMBER/ COLOR	WIRE NUMBER	TERMINATION POINT
TBA-5	BK	10AHMXR7994AK03-1	TB-13
TBA-12	RD	10AHMXR7994AK03-2	TB-10

TERM BY: _____ DATE: _____ TERM BY: _____ DATE: _____

FROM TRIMMED FOOTAGE MARKER: _____ TO TRIMMED FOOTAGE MARKER: _____

TERMINATION NOTES:
1. FIELD SUPPLIED JUNCTION BOX._____

CONTINUITY CHECK BY:_____ DATE: _____

REFERENCE DRAWINGS:

No	Items To Be Checked	Attrib Req'd	Date Complt /Initials	Verified By
1	Verify cable type and size according to drawings			
2	Verify cable is formed neatly into enclosure without excess length			
3	Verify overall cable tag is installed			
4	Verify conductor wire markers are correctly inst'd			
5	Verify proper lugs are used as required			
6	Verify all the wraps & anchors are inst'd neatly			

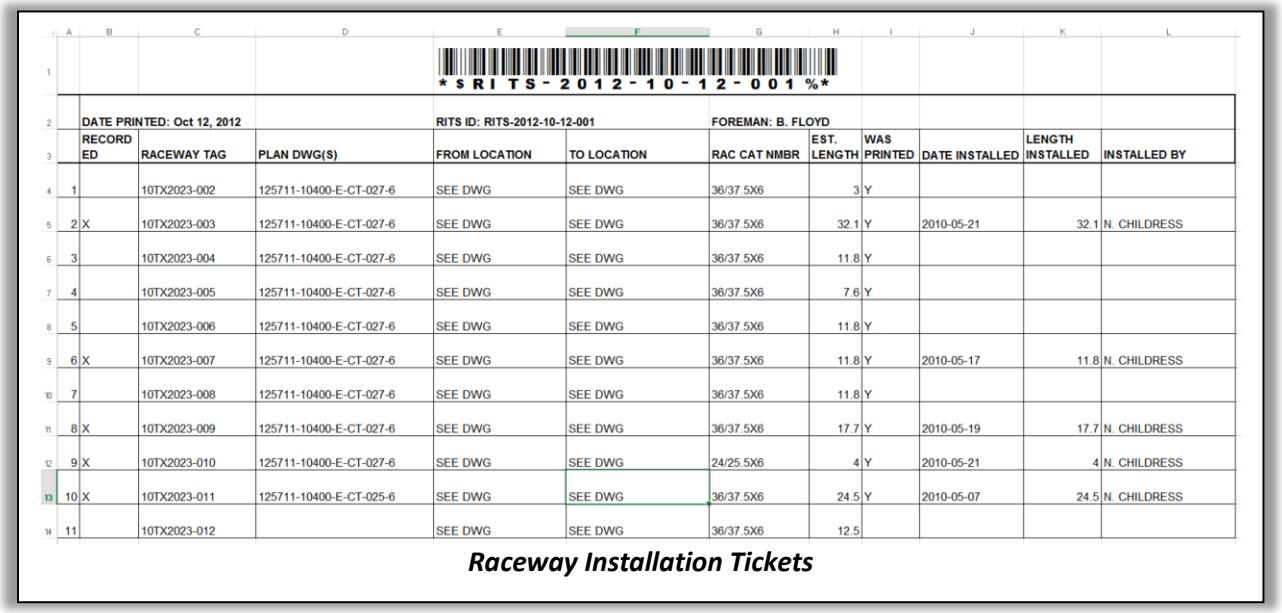
Remarks:

DESCRIPTION	Foreman	Superintendent	QC/Eng.
Signature			
Print Name			
Date			

Termination Tickets

Raceway Installation Tickets

Installation tickets can also be prepared for raceways. A work package can be created by grouping items based on area or system, though it is not required. The Raceway Installation Tracking Spreadsheet (RITS) is exported to Microsoft Excel™ for printing and saved locally. The RITS is barcoded and contains information relative to the raceway installation; such as FROM and TO location, drawing information, raceway ID, length, size and type of raceway, and information regarding the installation itself, such as install date and installer.



SRITS-2012-10-12-001%

DATE PRINTED: Oct 12, 2012 | RITS ID: RITS-2012-10-12-001 | FOREMAN: B. FLOYD

	RECORDED	RACEWAY TAG	PLAN DWG(S)	FROM LOCATION	TO LOCATION	RAC CAT NMBR	EST. LENGTH	WAS PRINTED	DATE INSTALLED	LENGTH INSTALLED	INSTALLED BY
1		10TX2023-002	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	3	Y			
2	X	10TX2023-003	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	32.1	Y	2010-05-21	32.1	N. CHILDRESS
3		10TX2023-004	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	11.8	Y			
4		10TX2023-005	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	7.6	Y			
5		10TX2023-006	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	11.8	Y			
6	X	10TX2023-007	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	11.8	Y	2010-05-17	11.8	N. CHILDRESS
7		10TX2023-008	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	11.8	Y			
8	X	10TX2023-009	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	36/37.5X6	17.7	Y	2010-05-19	17.7	N. CHILDRESS
9	X	10TX2023-010	125711-10400-E-CT-027-6	SEE DWG	SEE DWG	24/25.5X6	4	Y	2010-05-21	4	N. CHILDRESS
10	X	10TX2023-011	125711-10400-E-CT-025-6	SEE DWG	SEE DWG	36/37.5X6	24.5	Y	2010-05-07	24.5	N. CHILDRESS
11		10TX2023-012		SEE DWG	SEE DWG	36/37.5X6	12.5				

Raceway Installation Tickets

QA/QC

An optional QA/QC checklist can be added to pull and termination tickets. This helps to keep accountability of the workers, and provides historical records in the case that data are challenged through the project. The installer verifies wire type, pull type, MEG and HIPOT results, wire markings, wraps, anchors, bend radius, proper lugs, and much more. Information. Additional information can be added to the tickets to provide the user fields to input for resistance testing (Phase to Phase, Phase to Earth).

+

TERMINATION NOTES:

CONTINUITY CHECK BY:_____ DATE: _____

REFERENCE DRAWINGS:

125711-B110-00-1820 -LECHLER- JB FOR TRUCK UNLOADING SKID
125711- B110-00-0044 -FOSTER WHEELER- P&ID
125711-B110-00-1782 -LECHLER- TRUCK UNLOADING SKID GA
125711-K810-00-0101 -VC DATABASE

No	Items To Be Checked	Attrib Req'd	Date Complt /Initials	Verified By
1	Verify cable type and size according to drawings			
2	Verify cable is formed neatly into enclosure without excess length			
3	Verify overall cable tag is installed			
4	Verify conductor wire markers are correctly inst'd			
5	Verify proper lugs are used as required			
6	Verify all the wraps & anchors are inst'd neatly			

Remarks:

DESCRIPTION	Foreman	Superintendent	QC/Eng.
Signature			
Print Name			

DATE: _____ PULLED BY: _____ REEL NUMBERS: _____

FROM and TO FOOT MARKERS: _____ _____ OR CKT LEN CUT: _____

No	Items To Be Checked	Attrib Req'd	Date Complt /Initials	Verified By
1	Verify conduit has been internally cleaned and a mandrel pulled through, as required.			
2	Verify that conduit and/or cable tray are free from sharp edges.			
3	Verify the number of bends between pulling points does not exceed requirements.			
4	Verify reel assignments and cutting schedule.			
5	Verify direction of pull and method of pulling.			
6	Inspect cables for jacket damage during and after pull.			
7	Verify megger test on cables prior to pulling.			
8	Monitor pulling tension on critical pulls.			
9	Assure cable spacing is maintained.			
10	Assure cables are correctly identified.			
11	Verify bend radius is not exceeded.			

Remarks:

DESCRIPTION	TEST/INSPECTION CARRIED OUT BY	TEST/INSPECTION APPROVED BY	TEST/INSPECTION ACCEPTED
Signature			Monitoring only by SHAW (See surveillance Reports)
Print Name			
Date			

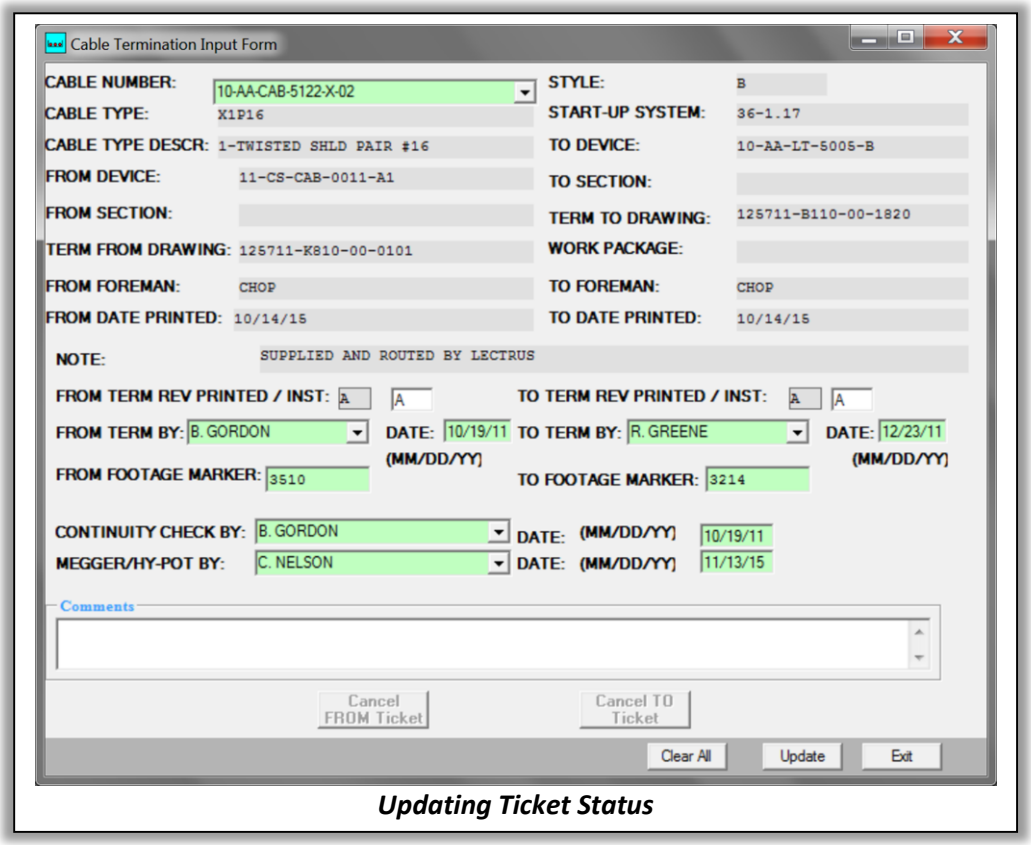
QA/QC – Pull Ticket

Cable/Wire Markers

The BEM software solution is also capable of creating your cable and wire marker when used with the Brady™ labeling system. CARS will automatically create your tags and export into a formatted list the Brady software is able to understand.

Updating Ticket Status

Tickets are updated by the software administrator while in the field. As tickets return to the BEM administrative office, the administrator takes the information written onto the ticket, and updates the respective cable/raceway in the database. This data can be entered through the form created when the ticket's barcode is swiped or the cable tag is entered into the appropriate location, or through the spreadsheets directly by pressing the 'Update' button connected to the raceway installation tracking spreadsheet being updated.



Updating Ticket Status

Revision Control

BEM tracks the revision number of every cable, term, and raceway designed. This number is created when the commodity is created, modified with every update, and tracked within the software to ensure there are no design changes that impacted installation. The BEM solution uses the revision number, and other commodity properties, to compare to previous databases. Once the comparison is complete, the software is able to report on new and old values, what has changed in detail, and create a summary of detected changes.

Cable Change Summary - impacting installation....11/13/2015 - 11/13/2015

File Edit Format

	CABLE NUMBER	PULLED DATE	FROM TERM DATE	TO TERM DATE	PULL CHANGED STATUS	TERM CHANGED STATUS	DESIGN STATUS	TERM
1	10-AA-JB-5123-C-01	2011-10-19	2012-01-09	2011-12-23	NEW	FROM CHANGED	IFC	IFC
2	10-AA-LT-5003A-X-01	2011-12-23	2011-12-23	2011-12-23	NEW	NEW	IFC	IFC
3	10-AA-LT-5003B-X-01	2011-12-23	2011-12-23	2011-12-23	NEW	NEW	IFC	IFC
4	10-AA-PMP-5001-A-K-01	2011-10-14	2011-10-19	2011-12-23	CHANGED	TO CHANGED	IFC	IFC
5	10-AH-AOV-7972A-C-01	2011-10-28	2011-12-05	2011-11-17	NO CHANGE	FROM AND TO CHANGED	IFC	IFC
6	10-AH-AOV-7972B-C-01	2011-10-28	2011-11-21	2011-11-17	CHANGED	FROM AND TO CHANGED	IFC	IFC
7	10-AH-AOV-7972-C-01	2012-01-02	2012-01-07	2012-01-09	NEW	NEW	IFC	IFC
8	10-AH-AOV-7974A5A-C-01	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
9	10-AH-AOV-7974A5A-C-02	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
10	10-AH-AOV-7974A5A-C-03	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
11	10-AH-AOV-7974A5B-C-01	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
12	10-AH-AOV-7974A5B-C-02	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
13	10-AH-AOV-7974A5B-C-03	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
14	10-AH-AOV-7974A5-C-01	2011-09-23	2011-10-05	2011-09-27	CHANGED	FROM AND TO CHANGED	IFC	IFC
15	10-AH-AOV-7974B5A-C-01	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
16	10-AH-AOV-7974B5A-C-02	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
17	10-AH-AOV-7974B5A-C-03	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
18	10-AH-AOV-7974B5B-C-01	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC
19	10-AH-AOV-7974B5B-C-02	2012-10-04	2012-10-04	2012-10-04	NEW	NEW	IFC	IFC

Cable What Changed....11/13/2015 - 11/13/2015

File Edit Format

	CABLE NUMBER	WHAT CHANGED	OLD VALUE			
10725	12-LS-CAB-5020A-C-01	WIRE	OR	|12LSCRS5020AON-4	|4.3.6.8 14 B14	|TB1-14
10726	12-LS-CAB-5020B-L-02A	CAB TYPE CODE	L1C350			
10727	12-LS-CAB-5020B-L-02B	CAB TYPE CODE	L1C350			
10728	12-LS-CAB-5020B-L-02C	CAB TYPE CODE	L1C350			
10729	12-LS-CAB-5020C-L-02A	CAB TYPE CODE	L1C350			
10730	12-LS-CAB-5020C-L-02B	CAB TYPE CODE	L1C350			
10731	12-LS-CAB-5020C-L-02C	CAB TYPE CODE	L1C350			
10732	12-LS-CAB-5021A-C-01	WIRE	RD	|12LSCLA5021AON-3	|4.3.6.8 15 A15	|TB1-13
10733	12-LS-CAB-5021A-C-01	WIRE	OR	|12LSCLA5021AON-4	|4.3.6.8 15 B15	|TB1-14
10734	12-LS-CAB-5053A-C-02	WIRE	BL	|12LSCAB5053AFLT1-1	|4.3.6.7 7 A07	|36
10735	12-LS-CAB-5053A-C-02	WIRE	OR	|12LSCAB5053AFLT1-2	|4.3.6.7 7 B07	|37
10736	12-LS-CAB-5053A-C-02	WIRE	YL	|12LSCAB5053AFLT2-1	|4.3.6.7 8 A08	|39
10737	12-LS-CAB-5053A-C-02	WIRE	BR	|12LSCAB5053AFLT2-2	|4.3.6.7 8 B08	|40

File Edit Format

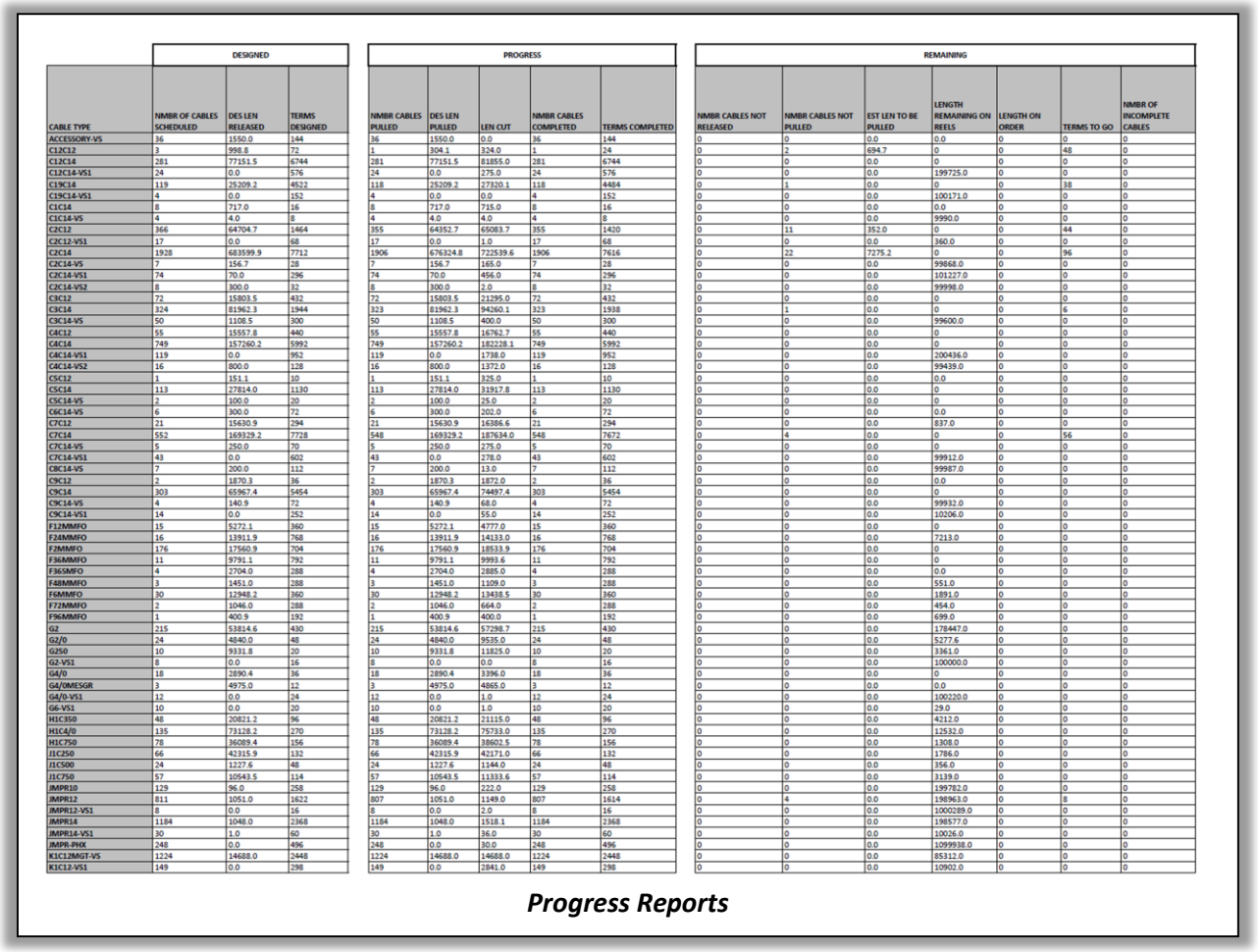
	PULL TICKETS	LENGTH	TERM TICKETS
NEW	1385	319139	1651
DELETED	210	53640	274
CHANGED	1367	-7056	1213

Revision Control:

Status Reports

Progress Reports

A wide variety of progress reports can be created by the solution. These reports can be created based on a specific date range, for the entire project, or for a specific list of commodities. Reports can be grouped together based on like qualities, for instance cable type or start-up system, and exported to Microsoft Excel™. The data exported contains information regarding what's been designed so far, what's been completed, and what's remaining.



	DESIGNED			PROGRESS					REMAINING						
CABLE TYPE	NMBR OF CABLES SCHEDULED	DES LEN RELEASED	TERMS DESIGNED	NMBR CABLES PULLED	DES LEN PULLED	LEN CUT	NMBR CABLES COMPLETED	TERMS COMPLETED	NMBR CABLES NOT RELEASED	NMBR CABLES NOT PULLED	EST LEN TO BE PULLED	LENGTH REMAINING ON REELS	LENGTH ON ORDER	TERMS TO GO	NMBR OF INCOMPLETE CABLES
ACCESSORY-VS	36	1550.0	144	36	1550.0	0.0	36	144	0	0	0.0	0.0	0	0	0
C12C12	3	998.8	72	1	304.1	324.0	1	24	0	2	694.7	0	0	48	0
C12C14	281	77151.5	6744	281	77151.5	81855.0	281	6744	0	0	0	0.0	0	0	0
C12C14-VS1	24	0.0	576	24	0.0	275.0	24	576	0	0	0	0.0	199725.0	0	0
C19C14	119	25209.2	4522	118	25209.2	27320.1	118	4484	0	1	0.0	0	0	38	0
C19C14-VS1	4	0.0	152	4	0.0	0.0	4	152	0	0	0.0	0.0	100171.0	0	0
C1C14	8	717.0	16	8	717.0	715.0	8	16	0	0	0.0	0.0	0.0	0	0
C1C14-VS	4	4.0	8	4	4.0	4.0	4	8	0	0	0	0.0	9990.0	0	0
C2C12	366	64704.7	1464	355	64352.7	65083.7	355	1420	0	11	352.0	0	0	44	0
C2C12-VS1	17	0.0	68	17	0.0	1.0	17	68	0	0	0	0.0	360.0	0	0
C2C14	1928	683599.9	7712	1906	676324.8	722539.6	1906	7616	0	22	7275.2	0	0	96	0
C2C14-VS	7	156.7	28	7	156.7	165.0	7	28	0	0	0	0.0	99868.0	0	0
C2C14-VS1	74	70.0	296	74	70.0	456.0	74	296	0	0	0	0.0	101227.0	0	0
C2C14-VS2	8	300.0	32	8	300.0	2.0	8	32	0	0	0	0.0	99998.0	0	0
C3C12	72	15803.5	432	72	15803.5	21295.0	72	432	0	0	0	0.0	0	0	0
C3C14	324	81962.3	1944	323	81962.3	94260.1	323	1938	0	1	0.0	0	0	6	0
C3C14-VS	50	1108.5	300	50	1108.5	400.0	50	300	0	0	0	0.0	99600.0	0	0
C4C12	55	15557.8	440	55	15557.8	16762.7	55	440	0	0	0	0.0	0	0	0
C4C14	749	157260.2	5992	749	157260.2	182228.1	749	5992	0	0	0	0.0	0	0	0
C4C14-VS1	119	0.0	952	119	0.0	1738.0	119	952	0	0	0	0.0	200436.0	0	0
C4C14-VS2	16	800.0	128	16	800.0	1372.0	16	128	0	0	0	0.0	99439.0	0	0
C5C12	1	151.1	10	1	151.1	325.0	1	10	0	0	0	0.0	0.0	0	0
C5C14	113	27814.0	1130	113	27814.0	31917.8	113	1130	0	0	0	0.0	0	0	0
C5C14-VS	2	100.0	20	2	100.0	25.0	2	20	0	0	0	0.0	0	0	0
C6C14-VS	6	300.0	72	6	300.0	202.0	6	72	0	0	0	0.0	0.0	0	0
C7C12	21	15630.9	294	21	15630.9	16386.6	21	294	0	0	0	0.0	837.0	0	0
C7C14	552	169329.2	7728	548	169329.2	187634.0	548	7672	0	4	0.0	0	0	56	0
C7C14-VS	5	250.0	70	5	250.0	275.0	5	70	0	0	0.0	0	0	0	0
C7C14-VS1	43	0.0	602	43	0.0	278.0	43	602	0	0	0	0.0	99912.0	0	0
C8C14-VS	7	200.0	112	7	200.0	13.0	7	112	0	0	0	0.0	99987.0	0	0
C9C12	2	1870.3	36	2	1870.3	1872.0	2	36	0	0	0	0.0	0.0	0	0
C9C14	303	65967.4	5454	303	65967.4	74497.4	303	5454	0	0	0	0.0	0	0	0
C9C14-VS	4	140.9	72	4	140.9	68.0	4	72	0	0	0	0.0	99932.0	0	0
C9C14-VS1	14	0.0	252	14	0.0	55.0	14	252	0	0	0	0.0	10206.0	0	0
F12MMFO	15	5272.1	360	15	5272.1	4777.0	15	360	0	0	0	0.0	0	0	0
F24MMFO	16	13911.9	768	16	13911.9	14133.0	16	768	0	0	0	0.0	7213.0	0	0
F2MMFO	176	17560.9	704	176	17560.9	18533.9	176	704	0	0	0	0.0	0	0	0
F36MMFO	11	9791.1	792	11	9791.1	9993.6	11	792	0	0	0	0.0	0	0	0
F36SMFO	4	2704.0	288	4	2704.0	2885.0	4	288	0	0	0	0.0	0.0	0	0
F48MMFO	3	1451.0	288	3	1451.0	1109.0	3	288	0	0	0	0.0	551.0	0	0
F6MMFO	30	12948.2	360	30	12948.2	13438.5	30	360	0	0	0	0.0	1891.0	0	0
F72MMFO	2	1046.0	288	2	1046.0	664.0	2	288	0	0	0	0.0	454.0	0	0
F96MMFO	1	400.9	192	1	400.9	400.0	1	192	0	0	0	0.0	699.0	0	0
G2	215	53814.6	430	215	53814.6	57296.7	215	430	0	0	0	0.0	178447.0	0	0
G2/0	24	4840.0	48	24	4840.0	9535.0	24	48	0	0	0	0.0	5277.6	0	0
G250	10	9331.8	20	10	9331.8	11825.0	10	20	0	0	0	0.0	3361.0	0	0
G2-VS1	8	0.0	16	8	0.0	0.0	8	16	0	0	0	0.0	100000.0	0	0
G4/0	18	2890.4	36	18	2890.4	3396.0	18	36	0	0	0	0.0	0	0	0
G4/0MESGR	3	4975.0	12	3	4975.0	4865.0	3	12	0	0	0	0.0	0.0	0	0
G4/0-VS1	12	0.0	24	12	0.0	1.0	12	24	0	0	0	0.0	100220.0	0	0
G6-VS1	10	0.0	20	10	0.0	1.0	10	20	0	0	0	0.0	29.0	0	0
H1C350	48	20821.2	96	48	20821.2	21115.0	48	96	0	0	0	0.0	4212.0	0	0
H1C4/0	135	73128.2	270	135	73128.2	75733.0	135	270	0	0	0	0.0	12532.0	0	0
H1C750	78	36089.4	156	78	36089.4	38602.5	78	156	0	0	0	0.0	1308.0	0	0
J1C250	66	42315.9	132	66	42315.9	42171.0	66	132	0	0	0	0.0	1786.0	0	0
J1C500	24	1227.6	48	24	1227.6	1144.0	24	48	0	0	0	0.0	356.0	0	0
J1C750	57	10543.5	114	57	10543.5	11333.6	57	114	0	0	0	0.0	3139.0	0	0
JMPR10	129	96.0	258	129	96.0	222.0	129	258	0	0	0	0.0	199782.0	0	0
JMPR12	811	1051.0	1622	807	1051.0	1149.0	807	1614	0	4	0.0	0.0	198963.0	0	8
JMPR12-VS1	8	0.0	16	8	0.0	2.0	8	16	0	0	0	0.0	1000289.0	0	0
JMPR14	1184	1048.0	2368	1184	1048.0	1518.1	1184	2368	0	0	0	0.0	198577.0	0	0
JMPR14-VS1	30	1.0	60	30	1.0	36.0	30	60	0	0	0	0.0	10026.0	0	0
JMPR-PHX	248	0.0	496	248	0.0	30.0	248	496	0	0	0	0.0	1099938.0	0	0
K1C12MGT-VS	1224	14688.0	2448	1224	14688.0	14688.0	1224	2448	0	0	0	0.0	85312.0	0	0
K1C12-VS1	149	0.0	298	149	0.0	2841.0	149	298	0	0	0	0.0	10902.0	0	0

Progress Reports

Reel Inventory Report

When the site receives a cable reel, the software provides an opportunity to enter data pertaining to the reel, such as date delivered, date ordered, cable type, reel ID, and related PO. As cables are recorded as installed using the software, the user is asked to enter the reel number that the cable was pulled from. This allows the software to track the amount of cable on remaining on each reel and report on the current status of the entire 'Wire Yard'.

Reel Inventory Report

REEL NMBR	CAB TYPE CODE	DATE RECEIVED	ORIG LEN	DATE RETIRED	LEN REMAINING	PURCHASE ORDER	ORDERED DATE	SHIPPED DATE
10-AH-CMP-7000-X-01	XCAT5-VS	1/20/2012	80	6/7/2015	0	PO-379901	5/30/2011	11/3/2012
10-AH-CPR-7780-C-04	C9C14	6/5/2013	111	3/31/2015	0	PO-970998	1/28/2011	2/7/2012
10-AH-CPR-7780-C-05	C2C14	7/1/2012	115	2/9/2015	115	PO-17538	3/21/2011	7/16/2012
10-AH-CPR-7780-H-01A	H1C4/0	4/17/2012	456	3/25/2015	454	PO-206932	8/9/2011	8/25/2012
10-AH-CPR-7780-H-01B	H1C4/0	7/18/2012	454	1/10/2014	255	PO-841829	8/4/2011	9/13/2012
10-AH-CPR-7780-H-01C	H1C4/0	4/6/2012	450	5/16/2014	450	PO-449050	10/1/2011	12/5/2012
10-AH-CPR-7950-H-01A	H1C4/0	7/9/2013	920	2/2/2014	10	PO-451744	8/9/2011	5/2/2012
10-AH-CPR-7950-H-01B	H1C4/0	1/18/2012	920	6/26/2014	10	PO-396168	3/5/2011	3/3/2012
10-AH-CPR-7950-H-01C	H1C4/0	9/17/2012	920	12/4/2014	140	PO-916216	3/30/2011	1/19/2012
10-CA-CAB-0100A-K-01	K3C8G	8/7/2012	410	3/11/2015	0	PO-588503	7/27/2011	4/12/2012
10-CA-CAB-0100B-K-01	K3C8G	3/14/2013	420	9/2/2014	0	PO-615212	8/24/2011	3/2/2012
10-CA-CPR-0100A-H-01A	H1C4/0	12/29/2012	337	11/16/2014	0	PO-978383	6/8/2011	11/15/2012
10-CA-CPR-0100A-H-01B	H1C4/0	6/18/2012	385	7/7/2014	48	PO-972306	9/16/2011	2/23/2012
10-CA-CPR-0100A-H-01C	H1C4/0	10/19/2012	385	11/18/2014	48	PO-172624	8/30/2011	3/27/2012
10-CA-CPR-0100B-H-01A	H1C4/0	3/16/2012	395	5/4/2014	52	PO-877667	1/9/2011	2/23/2012
10-CA-CPR-0100B-H-01B	H1C4/0	11/9/2012	395	2/7/2014	52	PO-258769	11/6/2011	4/27/2012
10-CA-CPR-0100B-H-01C	H1C4/0	8/22/2012	395	1/24/2014	52	PO-778282	12/28/2011	10/10/2012
10-CA-CPR-0100B-H-01G	G2	10/7/2013	395	12/4/2014	165	PO-959740	7/17/2011	3/5/2012
10-CA-CPR-0100B-X-01	X1P18-VS	7/24/2012	95	3/22/2014	0	PO-879292	4/15/2011	9/5/2012
10-CA-CPR-0100C-H-01A	H1C4/0	6/2/2013	405	6/12/2014	28	PO-207840	9/25/2011	6/11/2012
10-CA-CPR-0100C-H-01B	H1C4/0	12/15/2012	405	10/8/2014	28	PO-37488	2/4/2011	5/18/2012
10-CA-CPR-0100C-H-01C	H1C4/0	2/10/2013	405	3/29/2015	28	PO-211247	8/6/2011	6/22/2012
10-CA-CPR-0100C-H-01G	G2	1/10/2013	405	9/20/2014	170	PO-805919	7/27/2011	7/14/2012
10-CA-CPR-0100C-X-01	X1P18-VS	2/23/2013	80	5/14/2014	0	PO-969342	5/3/2011	6/11/2012
10-CA-DSW-0100A-K-01	K3C2G	8/7/2012	490	3/8/2015	0	PO-65619	2/11/2011	8/10/2012
10-CA-DSW-0100B-K-01	K3C2G	4/21/2012	480	3/24/2015	0	PO-536023	5/2/2011	7/10/2012
10-CC-PMP-0120A-C-01	C9C14	3/8/2013	98.2	1/31/2015	0	PO-291799	3/10/2011	6/18/2012
10-CC-PMP-0120A-C-02	C2C14	7/31/2013	98.2	6/21/2014	98.2	PO-873914	3/30/2011	11/18/2012

Reel Inventory Report

Wrap Up

Building Information Modeling, or B.I.M, is changing the way buildings are designed, constructed and managed. By creating a three dimensional model of the project, contractors are able to coordinate before and during construction to drive down spatial and systemic conflicts, drastically driving down costs and delivery times.

Southwire's BEM™ (Building Electrical Modeling) solution has taken us a step forward and revolutionized this process for the electrical industry. BEM is a unique software solution for electrical engineers and contractors in automating the electrical design workflow; a process that is currently manual and error prone. BEM creates parametric design data that is fully integrated into BIM solutions. The software suite has proven to accelerate the design, estimating and construction speeds while reducing costly errors and overruns.