

November 11, 2015
BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA
RFP Y16-803-MM / ADDENDUM #1
DESIGN SERVICES FOR THE ORANGE COUNTY CONVENTION CENTER NORTH /
SOUTH BUILDING SHOW POWER UPGRADES

PROPOSAL DUE BY: December 1, 2015 at 2:00 PM

This addendum is hereby incorporated into the RFP documents of the project referenced above. The following items are clarifications, corrections, additions, deletions and/or revisions to and shall take precedence over the original documents. Underlining indicates additions, deletions are indicated by ~~strikethrough~~.

- A. The Proposal due date remains the same.
- B. **A site visit is scheduled for November 24, 2015 at 1:00 p.m. Attendees should meet at the second floor of the South Concourse entrance, on the east side, in front of the Facilities Office Room 231.**
- C. The following are questions/responses/clarifications:
- Q1: Is the study that was completed for the OCCC North/South Building Show Power Upgrade public information?
- A1: See attached 26 page study titled: Orange County Convention Center North / South Building Show Power Upgrades, prepared by Milan Engineering, dated July 20, 2015.
- Q2: Is the Consultant that completed the study precluded from pursuing the A&E portions as a prime?
- A2: No. The consultant that completed the study may compete as a prime or a sub consultant.
- D. THE FOLLOWING ARE CHANGES TO RFP:
- CHANGES TO SECTION 8, paragraph C (Page no. 5)
Effective August 1, 2003, the County has implemented a graduation program whereby M/WBE firms designated as graduates can participate in the M/WBE program only on specified projects. All professional service solicitations for which the County has estimated the overall contractual fees to be awarded to the prime in excess of \$500,000 are eligible for graduate M/WBE participation. The

prime consultant will receive full M/WBE credit for the use of graduate MWBE's that meet all other requirements. The contract solicited through this RFP is estimated to be valued ~~over~~ **under** \$500,000 and therefore, graduate M/WBE's are **ineligible** to participate. It is the proposing firm's responsibility to insure that graduate M/WBE's are not listed in proposals to meet M/WBE participation requirements on projects in which they are not eligible to participate.

E. ALL OTHER TERMS AND CONDITIONS OF THE RFP REMAIN THE SAME.

The Proposer shall acknowledge receipt of this addendum by completing the applicable section in the solicitation or by completion of the acknowledgement information on the addendum. Either form of acknowledgement must be completed and returned not later than the date and time for receipt of the proposal.

Receipt acknowledged by:

Authorized Signature

Date Signed

Title

Name of Firm



Orlando
**Orange County
Convention Center**

North/ South Building Show Power Upgrades



July 20, 2015

Prepared by:

MILAN
ENGINEERING
■■■

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1.0 Introduction

The intent of this project is to upgrade the current power system at the North-South building to accommodate "Show" or Event power. Currently, OCCC event and utilities staff does not feel they have sufficient power in the buildings' existing electrical infrastructure to accommodate "show power". During some shows, such as the "plastics" show, heavy electrical usage occurs which sometimes causes over current tripping.

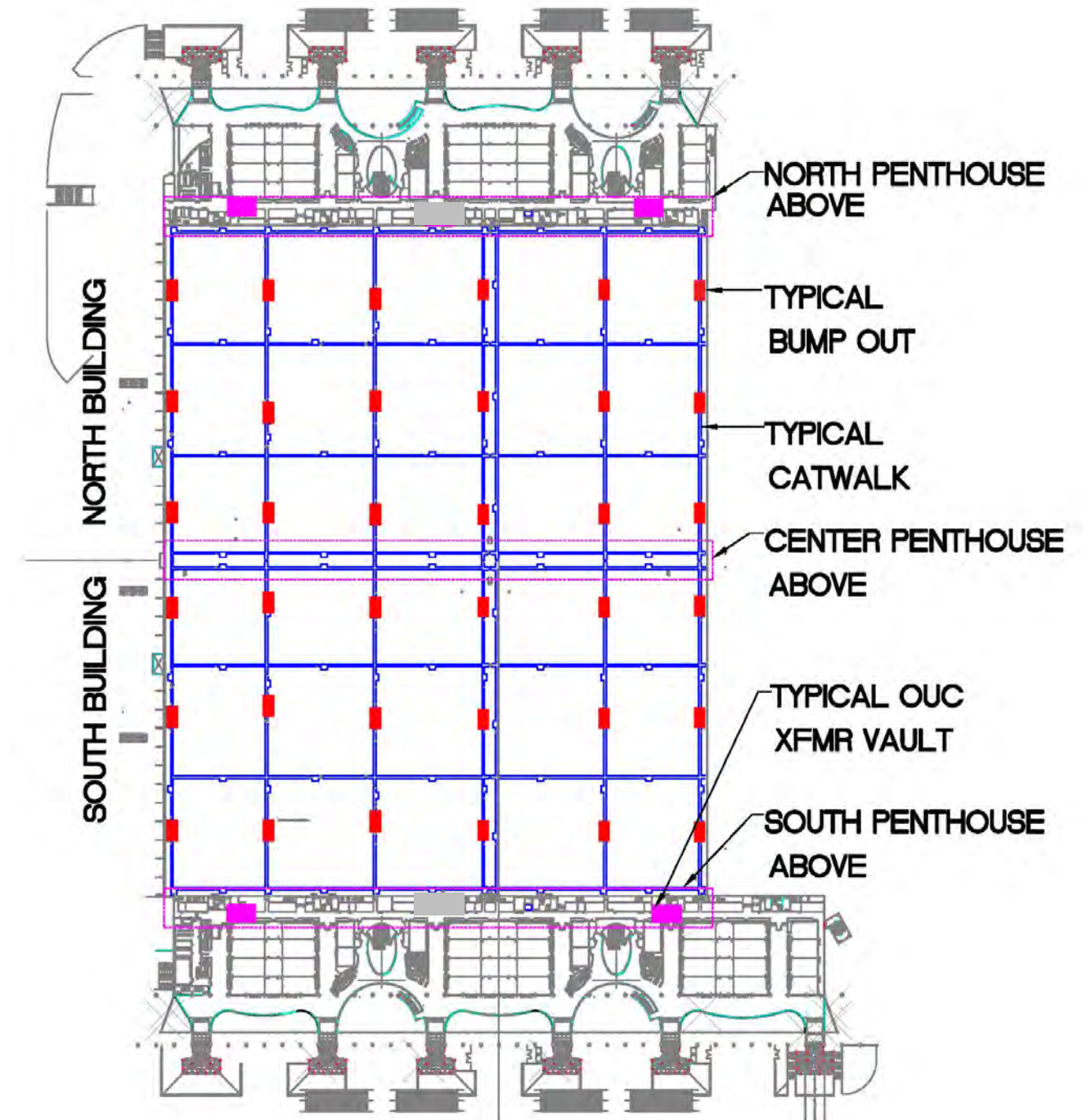
To accommodate these situations, the events staff has determined the following requirements for additional "new" power:

At 36 bump-out locations within the catwalk level (as shown on sketch to the side), the following additional power components are required:

- A. 480V/3phase, 3-wire+ground, 400A fused disconnect.
- B. 120/208/3phase, 4-wire+ground, 200A fused disconnect (separate power from item-A)
- C. Every 90' on center along the catwalks, add 120/208V/3Ph (5-wire) 30A twist-lock outlet for "par-can lighting". The 30A twist-lock outlets shall be connected into a new power panel at each bump out location. All outlets can be controlled simultaneously through a single new contactor. The contactor shall be controlled via existing lighting controls/relay panel. (separate from item-A & B)

OCCC Capital Planning staff has engaged Milan Engineering to perform a detailed study to verify the concepts, constructability, phasing, utility power upgrades required, and estimated cost to allow for the show power upgrades.

This report shall serve as the document to convey the results of the analysis.



2.0 Existing Electrical Infrastructure

The North/South building is served from (4) OUC vaults, labeled A, B, C, and D. Each vault contains six (6) 750 kVA 12.47kV/277V single phase transformers. The vaults are located at the east and west corners of the north and south penthouses. Each vault serves (4) 3000A, 277/480V customer switchboards.

- A. OUC Vault A (SE): Switchboards MSCA, MSFA, MSIA, MSLA
- B. OUC Vault B (SW): Switchboards MSCB, MSFB, MSIB, MSLB
- C. OUC Vault C (NE): Switchboards MSOA, MSRA, MSUA, MSXA
- D. OUC Vault D (NE): Switchboards MSOB, MSRB, MSUB, MSXB

In addition, there are (2) generator power transformer vaults in the center of north and south penthouse for emergency power distribution. The center penthouse has several electrical rooms with switchboards and distribution panels that are fed by feeder duct from main switches in the north and south penthouse. These are switchboards, MSRA, MSFA on the east and MSRB, MSFB on the west.



Fig. 2.1 Typical OUC Primary Switches



Fig. 2.2 Typical OUC 750Kva



Fig. 2.3 Typical 3000A Switchboard

Power from Street

Power to Building

3.0 Power Calculations/ Analysis

The table below indicates the calculated value of power required at each bump out.

Required New Items at Each Bump Out						
	Item	Qty	Amps	Volts	Phase	KVA
1	Disconnect	1	400	480	3	332.2
2	Disconnect	1	200	208	3	72.0
3	Light	3	30	208	1	6.2
Total power at each Bump Out						410.4

Knowing that there are a total of 36 bump outs, and four vaults, the table below has been created to calculate the total power required at each existing OUC vault.

Total Power Requirements per Vault		
Total Number of Bump Outs	36	
Total KVA	14,773.25	KVA
Total Number of Vaults	4	
KVA Per Vault to be Added	3693.312	KVA
Total Power at Each Vault	3700	KVA

4.0 Existing Utility Power Analysis

Currently, the transformer capacity of each vault is 4500kVA. OUC has provided historical peak usage data for the preceding two years. The table below indicates the existing peak (demand) capacity realized at each vault. Based on historical data, it can be seen that the current worst case peak demand has been 35.5% of the OUC transformer rating.

Vault	Vault kVA	Demand KVA
A (SE):	4500	1500
B (NE):	4500	1200
C (SW):	4500	1600
D (NW):	4500	900
Total	18,000	5,200

Connected Load refers to the sum total rating of the gear physically connected to the Vault. Demand Load (which is a more realistic noticed load) is equal to the sum total of the peak load measured at the transformer vault. OUC generally sizes these transformers to be rated 50% of the peak connected load [*connected load diversity*]; however will make exceptions based on a customer's historical load used.

The table below represents the calculated existing connected load diversity along with the anticipated new total connected load.

OUC Vault Load Data							
Vault	Existing Vault Capacity	Existing Connected Load	Peak Use	Connected Load Diversity for Vault	Demand Load Diversity for Vault	Added Capacity	New Total Connected Load
A (SE):	4500	9965	1500	45%	300%	3700	13665
B (NE):	4500	9965	1200	45%	375%	3700	13665
C (SW):	4500	9965	1600	45%	281%	3700	13665
D (NW):	4500	9965	900	45%	500%	3700	13665

* All Load Numbers are in KVA

- Connected Load Diversity = Existing Vault Capacity / Existing Connected Load x 100%
- Demand Load Diversity = Existing Vault Capacity / Peak Use x 100%

Based on this information, it seems as if some upgrade of utility power would be required. OUC also allows a primary metering option where the customer connects to the high voltage side and provides their own transformers.

5.0 Electrical Upgrades Concepts

Based on the analysis and investigation of feasible solutions, the following four options have been analyzed.

OPTION-1 - 12.47kV primary voltage service to customer owned MV distribution (3-1600A switchboards with integral customer owner transformers).

OPTION-2 - 12.47kV primary voltage service to customer owned MV distribution (2-2500A switchboards with integral customer owner transformers)

OPTION-3 - 480V service from upgraded 833kVA utility transformers (2-2500A switchboards).

OPTION-4 -480V service from existing utility 750 kVA utility transformers serving only 2 catwalks per quadrant (2-1600A switchboards) This option reduces the original requirement from OCCC Event Utilities; however would allow a reduced connected load on the existing transformer vaults.

Note: Please refer to Appendix sections 1 through 4 for each option's intended layout and distribution riser diagrams.

The analysis below is a summary of the analysis which was performed over the duration of the study. The analysis includes findings from several meetings with the convention center, OUC and internally with the design team:

Option #1 and #2, 12.47kV primary service is provided to customer owned switchboards with integral 277-480V step down transformers. The new switchboards would be located in the mechanical room with concrete encased primary service feeder from new switches in the utility vault. The advantage of this approach is that the full rated capacity can be provided. However, new primary switches and fuses will be required. Also, the equipment cost will be significantly higher than retaining the existing service infrastructure. Both option-1 and 2 would allow the existing transformers to remain in place and not be affected. The existing meter which is connected after the existing transformers would be removed and a new primary meter would be located. After further analysis with OUC, it was determined that the primary meter would be required to be mounted outside the building on the ground and a new service cabling would be required to be from outside the building up within new concrete encased enclosures to the new electrical rooms. **Based on this, this option ultimately became unfeasible.** Please refer to Appendix-5 (OUC Primary Metering requirements and details).

For Option-3, with an additional 3700kVA requested for new power at each vault, OUC had determined they would be required to upgrade each existing 750kVA to 833kVA. This is the maximum size transformer that will fit into each vault. With this added load, the total vault capacity will be 5000 KVA versus the existing 4500 KVA. The total cost OUC would charge to the Convention Center for this upgrade would be \$15,000 per vault or approx. \$60,000 total for the project. This solution does not provide quite the OUC normally required peak capacity ratio of 50% of the peak connected load, but OUC has indicated that they feel this load will be acceptable since it is a load that will be seen only at small time periods.

Option-4 was quickly ruled out by the OCCC team during an initial review since it reduced the requirements of Event Utilities. This option has only been included in this report as it was originally studied.

6.0 Constructability Review & Schedule

CONSTRUCTIBILITY REVIEW

Blue Cord & Bright Futures Electric provided a feasibility and constructability review of the installation of the different options. Below is the summary report from the contactors:

After reviewing the details of this proposed project, we have determined that the project will have some challenges that will need further research, but the constructability is achievable for the different scenarios. Safety will be one of the biggest factors to consider. All work done on the catwalks and on any lifts will require 100% tie-off at all times. Any time work is being performed in the air, the perimeter of the work area should be roped off and a spotter provided to ensure that no one enters the work zone. NFPA 70E: Standard for electrical safety in the workplace should be adhered to as well and the proper PPE should be worn any time live parts are encountered.

With each scenario, the down time should be minimal, as the new system can be installed complete in each area, and then brought online as each area is finished. The only real downtime for most of the scenarios can be coordinated with OUC and the Convention Center for the best times for the actual tie-in. Please see the narrative for the individual options below that discuss the pros and cons of each scenario.

Option #1 – The most difficult part of option #1 will be the concrete encasement of the primary conduits. This conduit run from the OUC transformer vault to the new substations will cross an expansion joint. This poses a problem as it would be difficult to install a concrete encased overhead conduit with an expansion fitting. The only feasible method would be to run PVC with an expansion fitting, pour and form one side, and then provide some expansion material in the concrete joint. This will need to be clarified as acceptable with the Authority having jurisdiction. We recommend having a concrete contractor form and pour these runs. The new unit substations will need to be coordinated with the weight rating on the freight elevators to ensure that the weight does not exceed the elevators capacity. There is truck access to the freight elevators at ground level, so logistically getting the new equipment to the penthouse should not be a problem. From each new switchboard to the each Bus duct tap box, will require (4) 4" conduits. The routing of these conduits is accessible so there should be no problems encountered. The bus duct itself is 1600A Aluminum. Being aluminum will make the installation a lot easier as each piece will be lighter than if it were copper. It will have some installation challenges as it is being installed approximately 8' off the side of the catwalk instead of right beside the catwalk as the existing bus duct is. This obviously is more labor intensive. Since the catwalk is 40' above the floor, the installation will most likely require 60-80' snorkel lifts for access. The bus duct sections would be staged on the catwalk, and then transferred to the platform of the lift for installation of each piece. As stated before we recommend the work area be roped off and a spotter be placed on the floor below to ensure everyone remains safe.

Option #2 – This option is very similar to option #1 in that it has the same basic items. This option will not have as many new unit substations, but each one will be larger, possibly impacting the weight capabilities of the freight elevators. This option will face the same challenges with the concrete encasement, but will have (1) less conduit to deal with. Unfortunately this option will require more conduits to run to the bus duct area. Instead of (1) 1600A bus duct at each catwalk as in option #1, this scenario will have (3) 600A bus ducts for each catwalk. This will add a lot more conduit work, and will almost double the overhead work in the high ceiling areas as a result.

Option #3 – This option solves the problem with the concrete encasement associated with options 1 & 2. This option will have a lot higher cost on OUC's end as they will be upgrading each of the transformers. Since OUC will be replacing the transformers this has the potential for the longest downtime. This will need to be coordinated with the convention center to ensure that the outage does not fall on any critical windows. As in option #2, this option will have more conduit work around the catwalks as it utilizes (3) 600A bus ducts for each catwalk area.

Option #4 – This option is in our eyes the most feasible option for constructability, and will most likely be the cheapest route. This option utilizes the existing transformers, thus removing the need for the concrete encasement. This option utilizes (1) 1600A bus duct each for (2) catwalk's in each quadrant section. This reduces a substantial portion of work over the convention floor. This option obviously does not provide the same power or flexibility that the other options include.

Andrew Heintzelman, Estimating Manager

CONSTRUCTION SCHEDULE

Blue Cord & Bright Futures Electric provided a most probable Construction Schedule review of Option-3. This scheduling review was based on a field walk through review of design drawings, review of past two years of show schedules which would delay work above the show floor, and past experience. The total duration of construction which the contractor has determined is approximately 580 days. Note that this schedule is based on working one quadrant at a time. If a faster schedule was required, the contractor could be released on working more than one quadrant simultaneously with multiple crews. If all four quads were manned simultaneously, the scheduled construction could potentially be accomplished within 200 calendar days; however it is recommended to allow more time for various show schedule delays or unforeseen conditions. Please refer to Appendix-6 – proposed construction schedule.

7.0 Cost Estimate

A cost estimate was provided by Montgomery Consulting for the four separate options. This cost only includes the electrical construction cost. Utility power upgrade costs have been added to each option based on communication with OUC and rough estimates. The table below represents the most probable cost.

OCCC N/S Building Show Power Upgrades Cost Estimate Summary			
Option	Construction Cost	Utility Power Upgrades	Total Cost
1	\$8,884,300	\$2,000,000	\$10,884,300
2	\$5,130,200	\$2,000,000	\$7,130,200
3	\$4,724,600	\$60,000	\$4,784,600
4	\$6,324,500	\$0	\$6,324,500

Please refer to Appendix-7 for a full cost estimate detail of the construction cost section.

8.0 Summary and Recommendations

To accommodate an additional load of approximately 15,000 KVA during large power draw shows (such as the Plastics Show), OCCC has engaged Milan Engineering to perform an analysis of the existing power distribution center at the Orange County Convention Center – North/South Buildings and determine the most feasible option for necessary upgrades.

Based on research of the distribution system, historical power use, utility company coordination and available space, Milan Engineering has determined the most feasible of the four solutions to be:

OPTION-3

- 480V service provided from OUC upgraded 833kVA utility transformers
- Two new 2500A switchboards located in electrical rooms connected from the utility transformers.
- Conduit and Wire to each Bump Out
- Short run of 600A 480V/3ph Bus Duct at each Bump Out to separate loads.
- Locate (2) Transformers At each bump out for step down loads (208/120)
- Bump Out equipment to include 400A 480V disc/ 200A 208V disc/ Lighting panel and 30A twist lock outlets 90' on center

The total expected cost for this solution is estimated at \$4,724,600 [Electrical Construction] + \$60,000 Utility.

The total construction schedule is estimated at a minimum of 200 days and a maximum of 580 days depending on how many quadrants the contractor is allowed to work in simultaneously.

The final recommendation from Milan Engineering is to move forward with design and construction for the project using Option-3.

9.0 Appendix

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A1, A2 removed

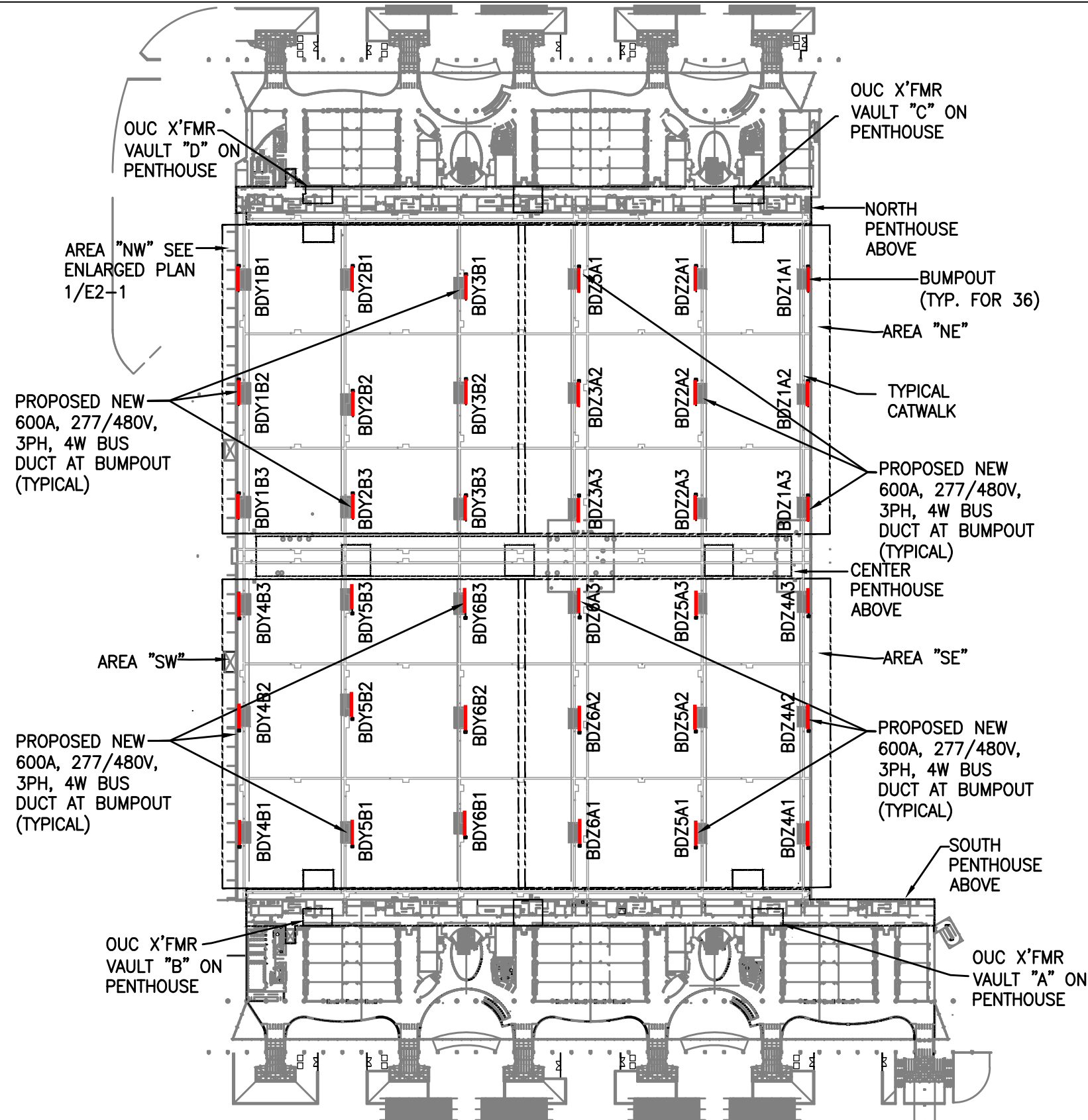
A.3 Option-3 Layout and Distribution Riser Diagram

A4, A5 removed

A.6 Orange County Convention Center Show Power Upgrades
Proposed Schedule

A.7 Cost Estimate Package

Appendix-3
Option-3 Layout and
Distribution Riser
Diagram



OVERALL PLAN
SCALE: 1/200"=1'-0"

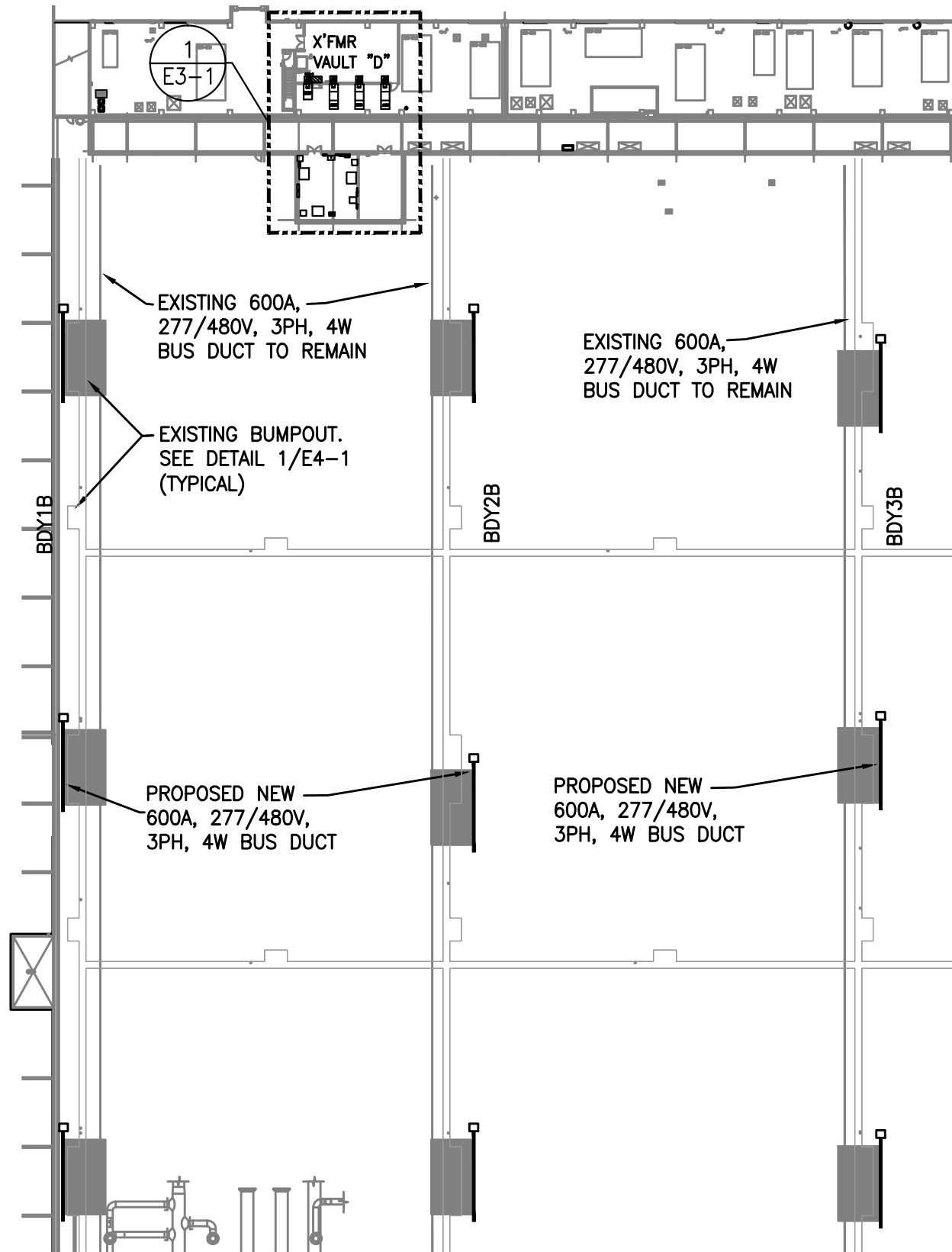
POWER PLAN
5/26/2015



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Winter Park, FL 32792
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Certificate of Authorization #26271
Precise Solutions with Prompt Response

Orange County Convention Center North/South Building
Show Power Upgrades

Overall Catwalk Plan
E1-10 (OPTION 3)



1
E2-1
ENLARGED CATWALK PLAN - "NW"
 SCALE: 1/64"=1'-0" POWER PLAN

TYPICAL FOR 4
(AREA NE, SE, AND SW ARE SIMILAR)

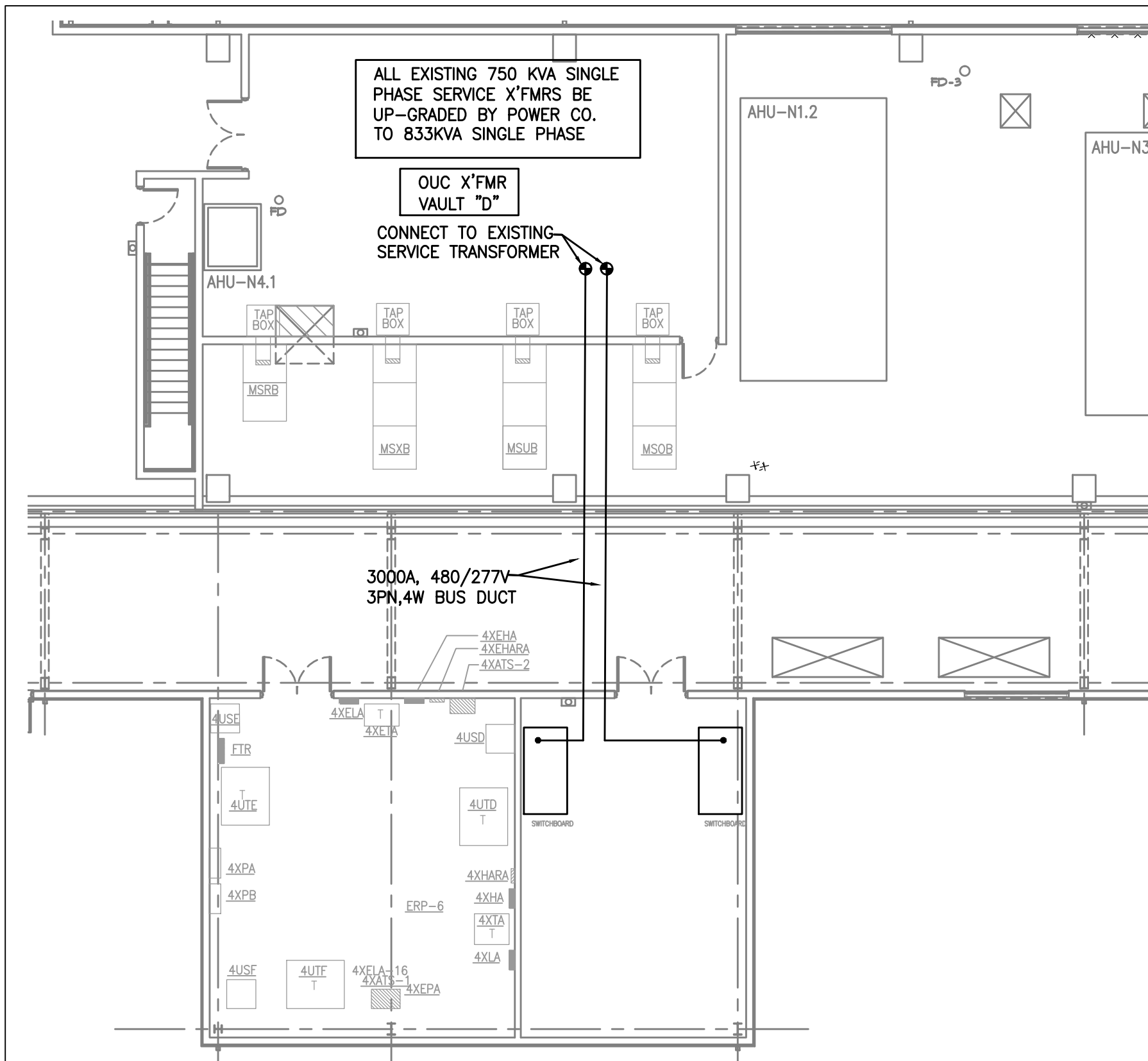
5/26/2015



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Orange County Convention Center North/South Building
 Show Power Upgrades

Enlarged Catwalk Plan
 E2-1 (OPTION 3)



ENLARGED PLAN
 1
 E3-10
 SCALE: 1/8"=1'-0" OUC X'FMR VAULT "D" AND SWGR ROOM

**TYPICAL FOR 3
 (OUC X'FMR VAULT A, C, + D)**

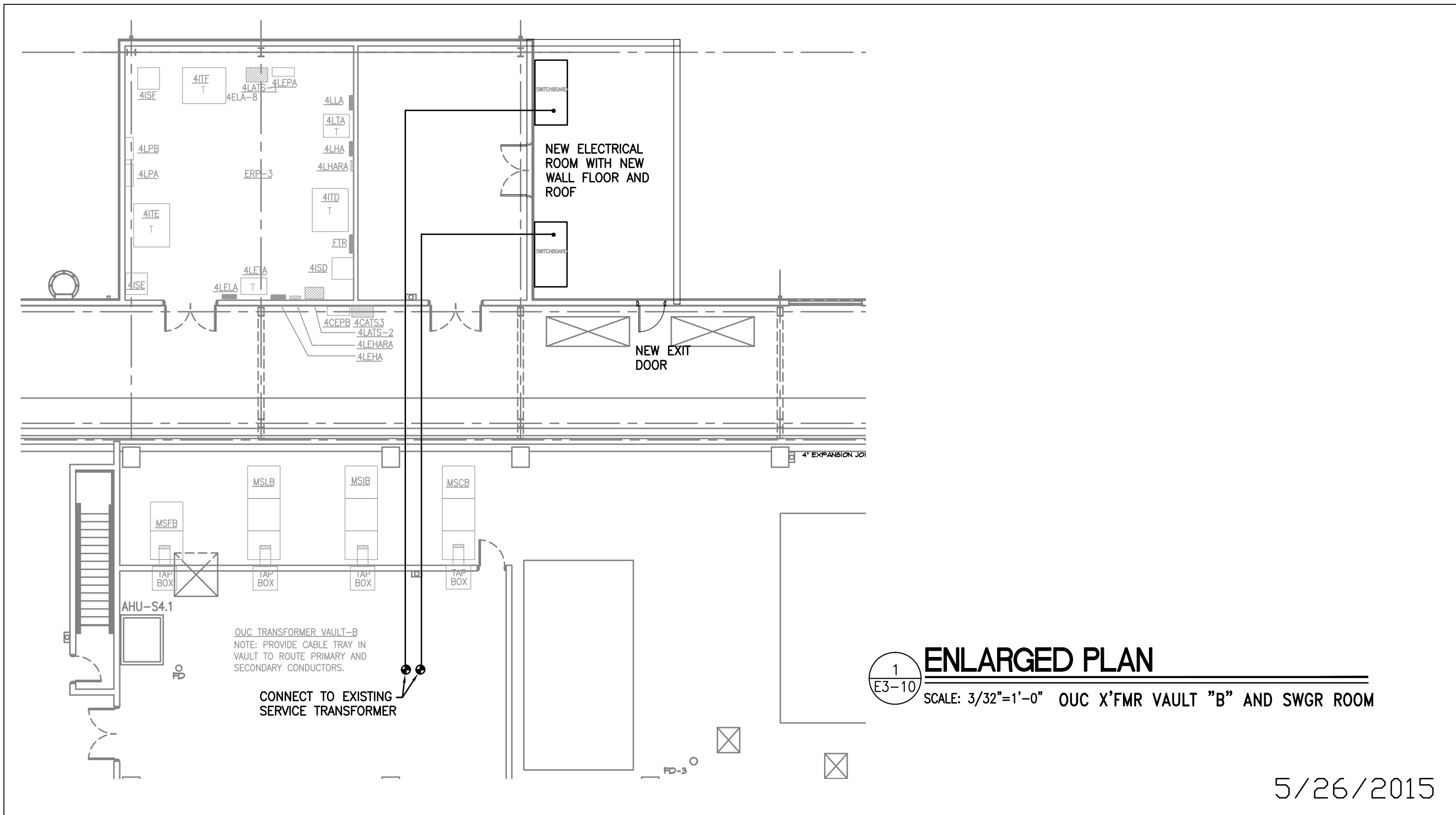
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Orange County Convention Center North/South Building
 Show Power Upgrades

Penthouse Electrical Plan
 E3-1 (OPTION 3)
 TIE TO EXIST. SERVICE X'FMR



1
ENLARGED PLAN
 SCALE: 3/32"=1'-0" OUC X'FMR VAULT "B" AND SWGR ROOM

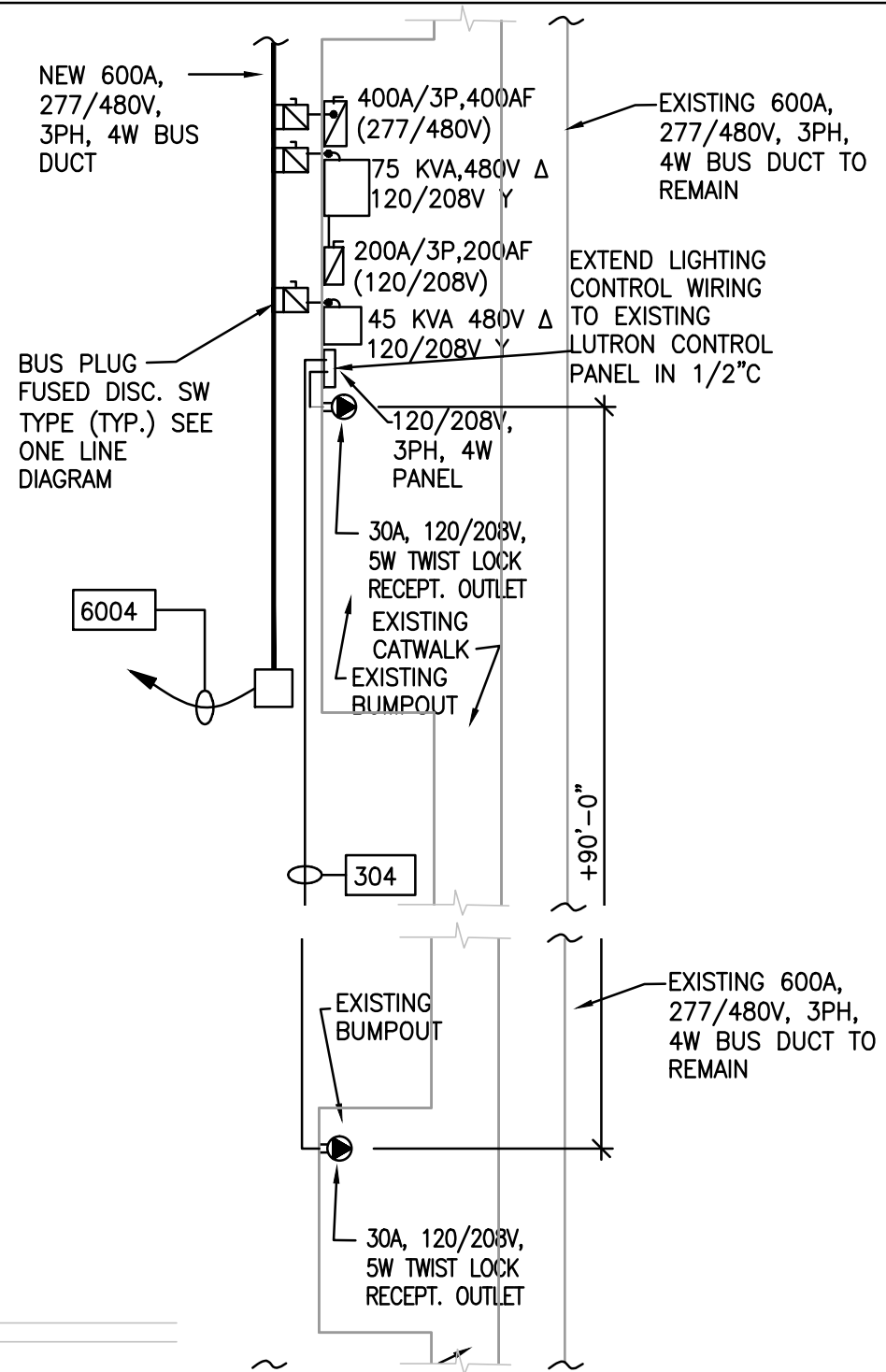
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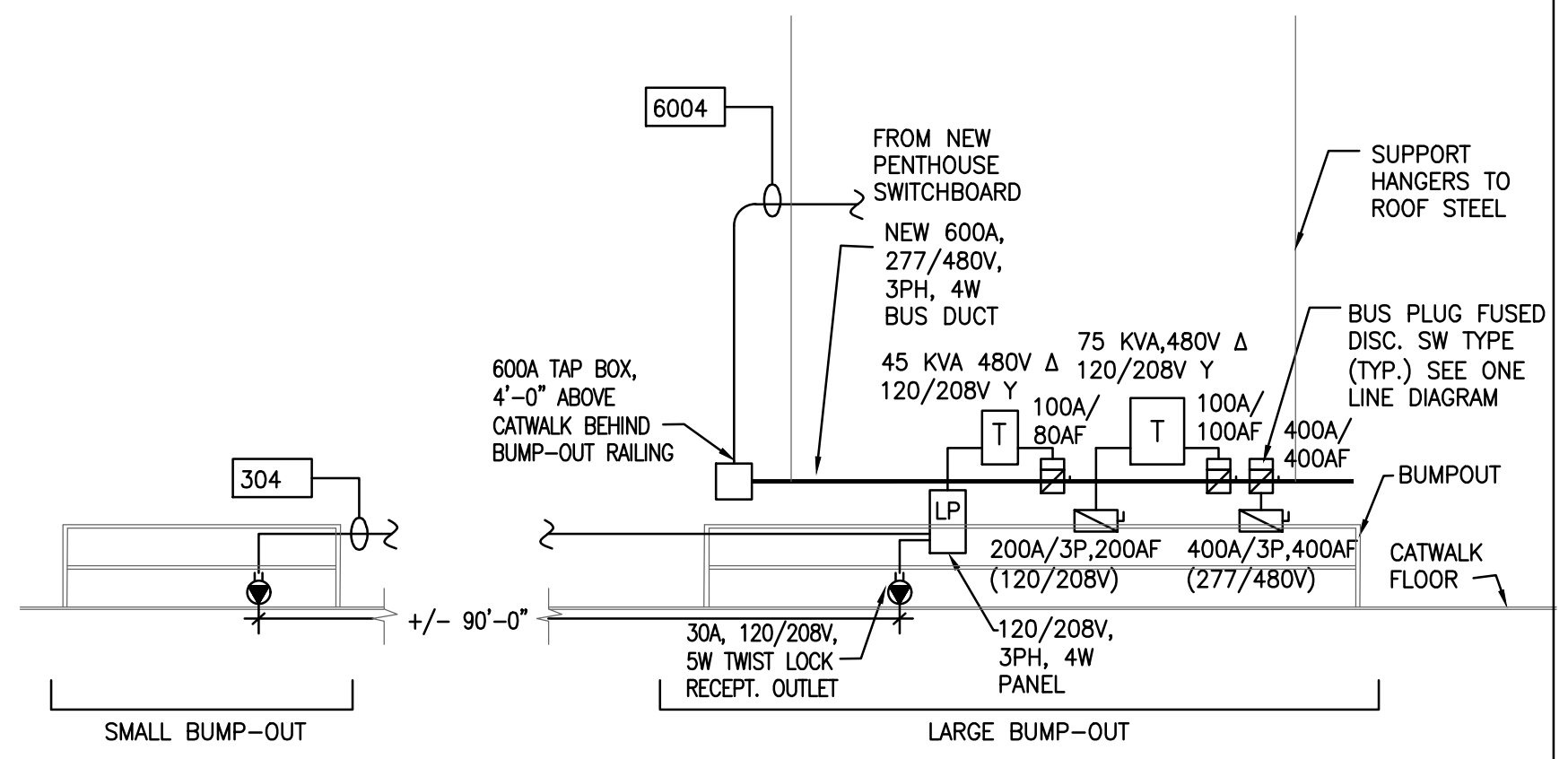
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Orange County Convention Center North/South Building
 Show Power Upgrades

Penthouse Electrical Plan
 E3-2 OPTION 3
 TIE TO EXIST. SERVICE X'FMR

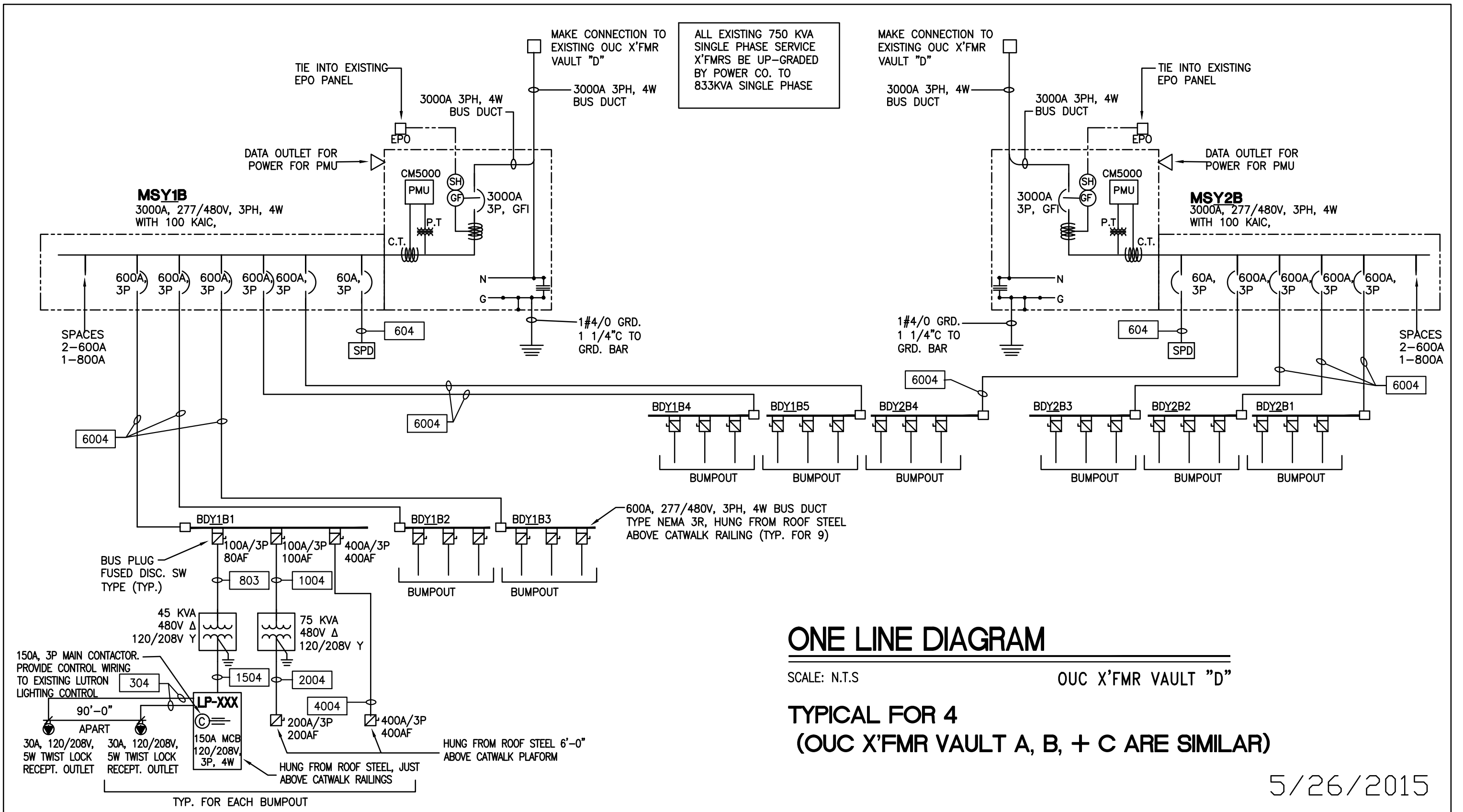


1
E4-10
TYPICAL BUMPOUT ENLARGED PLAN
SCALE: 1/8"=1'-0"
ELECTRICAL EQUIPMENT LAYOUT



2
E4-10
TYPICAL BUMPOUT ELEVATION
SCALE: 1/8"=1'-0"
ELECTRICAL EQUIPMENT LAYOUT

5/26/2015



FEEDER SCHEDULE						
FEEDER TAG	NOMINAL AMP	NO. OF CONDUIT SETS	CONDUIT SIZES (INCHES)	PHASE CONDUCTORS SIZE PER SET	NEUTRAL CONDUCTORS SIZE PER SET	EQPT GRD. CONDUCTORS SIZE PER SET
20X	20	1	3/4"	3#12	1#12	1#12
30X	30	1	3/4"	3#10	1#10	1#10
40X	40	1	3/4"	3#8	1#8	1#8
50X	50	1	3/4"	3#8	1#8	1#8
60X	60	1	1"	3#6	1#6	1#8
70X	70	1	1"	3#4	1#4	1#8
80X	80	1	1"	3#3	1#3	1#8
90X	90	1	1 1/4"	3#3	1#3	1#8
100X	100	1	1 1/4"	3#2	1#2	1#8
125X	125	1	1 1/4"	3#1	1#1	1#6
150X	150	1	1 1/2"	3#1/0	1#1/0	1#6
175X	175	1	2"	3#2/0	1#2/0	1#6
200X	200	1	2"	3#3/0	1#3/0	1#6
225X	225	1	2 1/2"	3#4/0	1#4/0	1#4
250X	250	1	3"	3#250kcmil	1#250kcmil	1#4
300X	300	1	3"	3#350kcmil	1#350kcmil	1#4
350X	350	1	3 1/2"	3#500kcmil	3#500kcmil	1#2
400X	400	1	4"	3#600kcmil	1#600kcmil	1#2
500X	500	2	2 1/2"	3#250kcmil	1#250kcmil	1#1
600X	600	2	3"	3#350kcmil	1#350kcmil	1#1
700X	700	2	3"	3#500kcmil	1#500kcmil	1#1
800X	800	2	4"	3#600kcmil	1#600kcmil	1#1/0
1000X	1000	3	4"	3#400kcmil	1#400kcmil	1#2/0
1200X	1200	3	4"	3#600kcmil	1#600kcmil	1#3/0
1600X	1600	4	4"	3#600kcmil	1#600kcmil	1#4/0
2000X	2000	5	4"	3#600kcmil	1#600kcmil	1#250kcmil
2500X	2500	6	4"	3#600kcmil	1#600kcmil	1#350kcmil
3000X	3000	8	4"	3#500kcmil	1#500kcmil	1#400kcmil
4000X	4000	10	4"	3#600kcmil	1#600kcmil	1#500kcmil

NOTES:

1. FEEDER LEGEND

100/X

- "S" DENOTE: 3PH, 4W (WITH 100% NEUTRAL) NO GRD. (SERVICE FEEDER)
- "4" DENOTE: 3PH, 4W (WITH 100% NEUTRAL) + GRD.
- "3" DENOTE: 3PH, 3W (W/O NEUTRAL) + GRD.
- "2" DENOTE: 1PH, 2W (W/O NEUTRAL) + GRD.
- "1" DENOTE: 1PH, 3W (WITH NEUTRAL) + GRD.

FEEDER AMPS. SEE FEEDER SCHEDULE ABOVE FOR CONDUITS AND CONDUCTOR SIZES

2. WIRE TYPE: DUAL-RATED, THHM/THWN, COPPER, STRANDED UNLESS OTHERWISE NOTED.

FEEDER SCHEDULE

SCALE: N.T.S

5/26/2015



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Orange County Convention Center North/South Building
Show Power Upgrades

Feeder Schedule
E6-10

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**Orange County, Florida
 Cost Estimate Package**
 Convention Center
 N/S Building
 Show Power Upgrades
 June 4, 2015

Owner: Orange County Government
 The Orange County Courthouse
 425 N. Orange Ave.
 Orlando, FL 32801



Engineer: Milan Engineering
 925 S Semoran Blvd, Ste 100
 Winter Park, Florida 32792
 Tel: 407.678.2055
 Fax: 407.678.2088
 Web: www.milan-engineering.com



Cost Consulting: Montgomery Consulting Group, Inc.
 501 S. New York Avenue, Suite 210
 Winter Park, FL 32789
 Tel: 407.539.7030
 Fax: 407.539.7035
 Web: www.mcgi-us.com



ORANGE COUNTY, FL
ORANGE COUNTY CONVENTION CENTER
NORTH/SOUTH BUILDING SHOW POWER UPGRADES
ASSESSMENT ESTIMATE
JUNE 4, 2015
ESTIMATE SUMMARY - OPTION #3

CSI	DESCRIPTION	SUBTOTAL
01	GENERAL REQUIREMENTS	\$ 158,512
26	ELECTRICAL - OPTION #3	\$ 3,170,243
SUBTOTAL CONSTRUCTION		\$ 3,328,755
	TAXES 6.5%	\$ 94,306
	SUBTOTAL	\$ 3,423,061
	LOGISTICS/PHASING PREMIUM 10.0%	\$ 342,306
	SUBTOTAL	\$ 3,765,367
	CONTRACTOR ALLOWANCES \$25,000	\$ 25,000
	SUBTOTAL	\$ 3,790,367
	GENERAL CONDITIONS 5.0%	\$ 189,518
	SUBTOTAL	\$ 3,979,886
	PRIME CONTRACTOR FEE 4.5%	\$ 179,095
	SUBTOTAL	\$ 4,158,981
	BONDS & INSURANCE 2.25%	\$ 93,577
	SUBTOTAL	\$ 4,252,558
	CONSTRUCTION PERMITS 1.0%	\$ 42,526
	SUBTOTAL	\$ 4,295,083
	DESIGN CONTINGENCY 10.0%	\$ 429,508
	SUBTOTAL	\$ 4,724,592
	ESCALATION 0.0%	\$ -
TOTAL BURDENED COST:		\$ 4,724,592
ROUNDED:		\$ 4,724,600

ORANGE COUNTY, FLORIDA
ORANGE COUNTY CONVENTION CENTER
NORTH/SOUTH BUILDING SHOW POWER UPGRADES
PRELIMINARY ESTIMATE
JUNE 4, 2015
DETAIL ESTIMATE - OPTION "3"

Line	CSI	Description	Quantity	Unit	Unit Material Cost	Unit Labor Hours	Labor Rate	Extension	Subtotal	Division Subtotal
1	01	GENERAL REQUIREMENTS							\$158,512.16	\$158,512
2		MOBILIZATION / DEMOBILIZATION (5%)	1	LS	\$158,512.16	0	\$0.00	\$158,512.16		
3										
4	26	ELECTRICAL - OPTION #3								\$3,170,243
5										
6		ARC FLASH							\$40,000.00	
7		ARC FLASH STUDY FOR EA LOCATIONS	4	EA	\$10,000.00	0	\$0.00	\$40,000.00		
8										
9		CONDUITS, FITTINGS AND BOXES							\$499,859.88	
10		3/4" EMT	17,000	LF	\$0.35	0.05	\$32.00	\$33,150.00		
11		3/4" EMT COUPLINGS	1,702	EA	\$0.18	0.1	\$32.00	\$5,752.76		
12		3/4" EMT CONNECTORS	588	EA	\$0.15	0.12	\$32.00	\$2,346.12		
13		3/4" EMT STRAPS AND ANCHORS	80	EA	\$0.15	0.1	\$32.00	\$268.00		
14		3/4" U CHANNEL CONDUIT SUPPORTS	1,620	EA	\$0.35	0.12	\$32.00	\$6,787.80		
15		U CHANNEL WITH PIPE CLAMPS	324	EA	\$6.00	0.4	\$32.00	\$6,091.20		
16		1" EMT NIPPLES	20	LF	\$0.60	0.06	\$32.00	\$50.40		
17		1" EMT CONNECTORS	24	EA	\$0.20	0.25	\$32.00	\$196.80		
18		3" EMT	31,440	LF	\$2.92	0.2	\$32.00	\$293,020.80		
19		3" EMT ELBOWS	136	EA	\$18.00	0.25	\$32.00	\$3,536.00		
20		3" EMT COUPLINGS	3,280	EA	\$25.00	0.05	\$32.00	\$87,248.00		
21		3" EMT CONNECTORS	400	EA	\$22.00	0.35	\$32.00	\$13,280.00		
22		3" BUSHINGS	400	EA	\$0.75	0.1	\$32.00	\$1,580.00		
23		3" EMT U CHANNEL STRAPS	3,128	EA	\$1.80	0.1	\$32.00	\$15,640.00		
24		U CHANNEL RACKS WITH ALL THREAD AND HANGERS	232	EA	\$55.00	1	\$32.00	\$20,184.00		
25		CORE DRILL ELECTRIC ROOM FLOORS AND FIRE SEAL	72	EA	\$85.00	2	\$32.00	\$10,728.00		
26										
27		FLEXIBLE CONDUIT AND FITTINGS							\$14,355.36	
28		1" FLEXIBLE CONDUIT	144	LF	\$1.85	0.08	\$32.00	\$635.04		
29		1" FLEXIBLE CONDUIT CONNECTORS	72	EA	\$2.50	0.25	\$32.00	\$756.00		
30		1 1/4" FLEXIBLE CONDUIT	144	LF	\$2.25	0.09	\$32.00	\$738.72		
31		1 1/4" FLEXIBLE CONDUIT CONNECTORS	72	EA	\$3.80	0.3	\$32.00	\$964.80		
32		1 1/2" FLEXIBLE CONDUIT	144	LF	\$2.65	0.1	\$32.00	\$842.40		
33		1 1/2" FLEXIBLE CONDUIT CONNECTORS	72	EA	\$4.10	0.35	\$32.00	\$1,101.60		

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34		2" FLEXIBLE CONDUIT	144	LF	\$3.50	0.12	\$32.00	\$1,056.96		
35		2" FLEXIBLE CONDUIT CONNECTORS	72	EA	\$6.00	0.45	\$32.00	\$1,468.80		
36		4" FLEXIBLE CONDUIT	144	LF	\$12.00	0.18	\$32.00	\$2,557.44		
37		4" FLEXIBLE CONDUIT CONNECTORS	72	EA	\$38.00	0.65	\$32.00	\$4,233.60		
38										
39		JUNCTION AND PULL BOXES							\$19,370.70	
40		4'SQ BOXES	30	EA	\$0.52	0.15	\$32.00	\$159.60		
41		4'SQ BOX BLANK COVERS	30	EA	\$0.25	0.1	\$32.00	\$103.50		
42		4 11/15" JUNCTION BOXES	60	EA	\$0.75	0.15	\$32.00	\$333.00		
43		4 11/15" JUNCTION BOX RS COVERS (30AMP RECEPTACLES)	60	EA	\$0.45	0.18	\$32.00	\$372.60		
44		PIPE SUPPORTS FOR BOXES	90	EA	\$1.80	0.15	\$32.00	\$594.00		
45		24" X 24" X 10" PULL BOX WITH SCREW COVER	112	EA	\$35.00	2	\$32.00	\$11,088.00		
46		PULL BOX HANGERS	112	EA	\$28.00	1	\$32.00	\$6,720.00		
47										
48		CONDUCTORS AND CABLE (ALL CABLES ARE STRANDED)							\$873,627.40	
49		#12 THHN/THWN	7,200	LF	\$0.10	0.006	\$32.00	\$2,102.40		
50		#10 THHN/THWN	81,000	LF	\$0.15	0.007	\$32.00	\$30,294.00		
51		#8 THHN/THWN	860	LF	\$0.25	0.008	\$32.00	\$435.16		
52		#6 THHN/THWN	1,200	LF	\$0.35	0.009	\$32.00	\$765.60		
53		#3 THHN/THWN	1,440	LF	\$0.74	0.007	\$32.00	\$1,388.16		
54		#2 THHN/THWN	1,800	LF	\$0.93	0.008	\$32.00	\$2,134.80		
55		#1 THHN/THWN	34,000	LF	\$1.18	0.009	\$32.00	\$49,912.00		
56		#1/0 THHN/THWN	1,440	LF	\$1.40	0.012	\$32.00	\$2,568.96		
57		#3/0 THHN/THWN	1,440	LF	\$2.20	0.014	\$32.00	\$3,813.12		
58		#350 THHN/THWN	127,000	LF	\$4.83	0.035	\$32.00	\$755,650.00		
59		#400 THHN/THWN	640	LF	\$5.50	0.035	\$32.00	\$4,236.80		
60		#500 THHN/THWN	2,560	LF	\$6.82	0.035	\$32.00	\$20,326.40		
61										
62		CABLE CONNECTORS TAP BOXES							\$42,224.00	
63		#1 LUGS WITH BOLTS AND NUTS	72	EA	\$18.00	1	\$32.00	\$3,600.00		
64		#350 LUGS WITH BOLT AND NUTS	288	EA	\$35.00	1.5	\$32.00	\$23,904.00		
65		#400 LUGS WITH BOLT AND NUTS	32	EA	\$40.00	1.5	\$32.00	\$2,816.00		
66		#500 LUGS WITH BOLT AND NUTS	128	EA	\$45.00	1.5	\$32.00	\$11,904.00		

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67										
68										
69		BUS DUCT, TAP BOXES, SWITCHES AND FUSES							\$493,372.80	
70		600 AMP BUS DUCT 3 PHASE 4 WIRE WITH GROUND 277/480V N-3R	720	LF	\$350.00	0.5	\$32.00	\$263,520.00		
71		600 AMP TAP BOXES N-3R (INCLUDED IN QUOTE)	36	EA	\$0.00	10	\$32.00	\$11,520.00		
72		600 AMP DUCT HANGERS SINGLE ROD SUPPORT	180	EA	\$12.00	0.25	\$32.00	\$3,600.00		
73		100 AMP FUSED BUS DUCT SWITCHES	72	EA	\$800.00	2	\$32.00	\$62,208.00		
74		400 AMP FUSED BUS DUCT SWITCHES	36	EA	\$3,400.00	6	\$32.00	\$129,312.00		
75		80 AMP FUSES 480V	216	EA	\$15.00	0.15	\$32.00	\$4,276.80		
76		400 AMP FUSES 480V	108	EA	\$45.00	0.25	\$32.00	\$5,724.00		
77		HANGER ROD AND BEAM CLAMPS	180	EA	\$15.00	1	\$32.00	\$8,460.00		
78		ANTI SWING BRACKETS WITH DUCT BOLT DOWN CLIPS (EVERY 20 FEET)	72	EA	\$18.00	1.5	\$32.00	\$4,752.00		
79										
80		FEEDER DUCT							\$365,728.00	
81		3000 AMP FEEDER DUCT	390	LF	\$640.00	0.8	\$32.00	\$259,584.00		
82		3000 AMP FEEDER DUCT 90% ELBOWS	16	EA	\$2,875.00	2	\$32.00	\$47,024.00		
83		3000 AMP FEEDER DUCT PANEL ADOPTERS	8	EA	\$3,075.00	2	\$32.00	\$25,112.00		
84		3000 AMP TAP BOXES	8	EA	\$3,400.00	8	\$32.00	\$29,248.00		
85		FEEDER DUCT RACK SUPPORTS	64	EA	\$25.00	1	\$32.00	\$3,648.00		
86		SLEEVE VAULT, ELECTRIC ROOM WALLS AND FIRE SEAL	8	EA	\$75.00	2	\$32.00	\$1,112.00		
87										
88		ELECTRICAL DISTRIBUTION EQUIPMENT							\$327,024.00	
89		3000 AMP 3 POLE 4 WIRE SWITCHBOARD 277/480V	8	EA	\$37,950.00	28	\$32.00	\$310,768.00		
90		3000/3 480 MCB TERMINATION	8	EA	\$0.00	18	\$32.00	\$4,608.00		
91		600/3 BREAKER TERMINATION	36	EA	\$0.00	4	\$32.00	\$4,608.00		
92		60/3 BREAKER TERMINATION	8	EA	\$0.00	1	\$32.00	\$256.00		
93		SURGE PROTECTION DEVICES	8	EA	\$800.00	1.5	\$32.00	\$6,784.00		
94										
95		TRANSFORMERS DRY TYPE							\$271,728.00	
96		45KVA 480 TO 120/208V	36	EA	\$2,500.00	12	\$32.00	\$103,824.00		
97		75KVA 480 TO 120/208V	36	EA	\$3,800.00	20	\$32.00	\$159,840.00		
98		TRANSFORMER RACKS, ROD AND ANCHOR MATERIAL	72	EA	\$48.00	2	\$32.00	\$8,064.00		

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99										
100		DISCONNECT, FUSES AND CONTACTORS							\$149,846.40	
101		200 AMP FUSED 3 POLE DISCONNECT N-1 250V	36	EA	\$225.00	4	\$32.00	\$12,708.00		
102		400 AMP FUSED 3 POLE DISCONNECT N-1 480V	36	EA	\$800.00	12	\$32.00	\$42,624.00		
103		200 AMP FUSES 250V	108	EA	\$20.00	0.15	\$32.00	\$2,678.40		
104		400 AMP FUSES 480V	108	EA	\$45.00	0.25	\$32.00	\$5,724.00		
105		CONTACTORS 150 AMP MCB 3 PHASE 4 WIRE 120/208V 3P 4W	36	EA	\$1,800.00	8	\$32.00	\$74,016.00		
106		DISCONNECT RACKS, ROD AND ANCHOR MATERIAL	108	EA	\$48.00	2	\$32.00	\$12,096.00		
107										
108		WIRING DEVICES AND CONTROLS							\$4,635.04	
109		30AMP 5 WIRE TWIST LOCK RECEPTACLES	60	EA	\$35.00	0.5	\$32.00	\$3,060.00		
110		EPO BUTTONS IN N-1 ENCLOSURES	8	EA	\$85.00	0.59	\$32.00	\$831.04		
111		EPO WALL LABELS	8	EA	\$20.00	0.5	\$32.00	\$288.00		
112		MODIFY AND CONNECT NEW EPO'S	8	EA	\$25.00	1	\$32.00	\$456.00		
113										
114		GROUNDING							\$34,765.16	
115		3000 AMP SWITCHBOARDS (TO EXISTING GROUND BUS)								
116		1" EMT	360	LF	\$0.60	0.08	\$32.00	\$1,137.60		
117		1" EMT COUPLINGS	36	EA	\$0.24	0.06	\$32.00	\$77.76		
118		1" EMT CONNECTORS	24	EA	\$0.20	0.25	\$32.00	\$196.80		
119		1" EMT STRAPS AND ANCHORS	50	EA	\$0.18	0.12	\$32.00	\$201.00		
120		4/0 LUGS ,BOLTS WASHERS AND NUTS	12	EA	\$8.00	1	\$32.00	\$480.00		
121		4/0 GROUNDS WIRE	500	FT	\$2.80	0.015	\$32.00	\$1,640.00		
122		GROUND 45 KVA TRANSFORMERS ALLOWANCE	36	EA	\$150.00	8	\$32.00	\$14,616.00		
123		GROUND 75 KVA TRANSFORMERS ALLOWANCE	36	EA	\$200.00	8	\$32.00	\$16,416.00		
124										
125		LIGHT CONTROL CABLING (FROM NEW CONTACTORS TO EXISTING PANELS)							\$8,583.88	
126		3/4" EMT	1,800	LF	\$0.35	0.05	\$32.00	\$3,510.00		
127		3/4" EMT COUPLINGS	180	EA	\$0.18	0.1	\$32.00	\$608.40		
128		3/4" EMT CONNECTORS	72	EA	\$0.15	0.12	\$32.00	\$287.28		
129		3/4" EMT STRAPS AND ANCHORS	180	EA	\$0.45	0.12	\$32.00	\$772.20		
130		#12 THHN/THWN	5,500	LF	\$0.10	0.006	\$32.00	\$1,606.00		
131		CONTROL VOLTAGE RELAYS	36	EA	\$18.00	1	\$32.00	\$1,800.00		

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132										
133		COMMUNICATION AND DATA - STILL IN DESIGN - ALLOWANCE							\$4,594.56	
134		DATA OUTLET PLATE WITH 1-CAT 6 JACK DEVICE	12	EA	\$5.00	0.25	\$32.00	\$156.00		
135		CAT 6 JUMPERS	12	EA	\$8.00	0.15	\$32.00	\$153.60		
136		CAT 6 CONNECTOR	12	EA	\$2.00	0.15	\$32.00	\$81.60		
137		CAT 6 CABLE	1,500	LF	\$0.28	0.004	\$32.00	\$612.00		
138		3/4" EMT	1,200	LF	\$0.35	0.05	\$32.00	\$2,340.00		
139		3/4" EMT COUPLINGS	120	EA	\$0.18	0.1	\$32.00	\$405.60		
140		3/4" EMT CONNECTORS	24	EA	\$0.15	0.12	\$32.00	\$95.76		
141		3/4" EMT STRAPS AND ANCHORS	120	EA	\$0.15	0.1	\$32.00	\$402.00		
142		TERMINATE IN EXISTING PATCH PANEL	12	EA	\$0.00	0.5	\$32.00	\$192.00		
143		LABEL CABLE AND PATCH PANEL	12	LF	\$5.00	0.25	\$32.00	\$156.00		
144										
145		RENTAL EQUIPMENT AND MATERIAL HANDLING							\$20,528.00	
146		MAN LIFTS	1	LS	\$12,000.00	2	\$32.00	\$12,064.00		
147		EQUIPMENT LIFTING	1	LS	\$2,000.00	2	\$32.00	\$2,064.00		
148		MATERIAL HANDLING	1	LS	\$0.00	200	\$32.00	\$6,400.00		
149										
150	T	TOTAL CONSTRUCTION COST						\$3,328,755	\$3,328,755	\$3,328,755