Eastside III

East Liberty, Pittsburgh, PA

Nina Italiano | Lighting + Electrical

Advisors | Kevin Houser, John Reese

Tech Report 2 | Electrical Systems Existing Conditions + Load Summary

October 26, 2016

Image courtesy of PJ Dick, Inc.

Executive Summary

Eastside III is the final phase of a revitalization project in the heart of the East Liberty neighborhood of Pittsburgh, PA. The 221,000 sf building is a mixed-use development comprised of 43,000 sf of mixed-commercial spaces, 175 luxury apartments, and multiple parking spaces below grade. The new market-rate housing and host of amenities to the area includes a new pool and fitness center within the building and contributes the final portion of the 15-acre development that began in 2001. The entire development is broken up into three separate buildings, constructed in different phases: Buildings A, B and C. The information regarding this thesis study will focus only on Building B of Eastside III, highlighted below in Figure 1. Eastside III was developed jointly with a multi-modal transit hub to reconnect East Liberty to its surrounding neighborhoods and to redefine the residential experience in this trendy Pittsburgh community.

This technical report analyzes the electrical design criteria compared with the existing electrical system of the Eastside III building. Part 1 of this report will cover the design criteria and code analysis for the different occupant types of Eastside III's mixed-use development, using the National Electric Code (NEC) 2011 and the International Building Code (IBC) 2012. Part 2 of the report analyzes the designed electrical system utilized in Eastside III, per the construction drawings and specifications. Lastly, Part 3 will compare the design criteria to the designed system.

Overall, Eastside III has a well designed electrical system that complies with the NEC and IBC codes studied. An electrical redesign will be implemented in further technical reports to continue to reduce energy consumption and cost.

Figure 1 | Aerial view of Eastside III site

| Table of Contents

| Building Overview

- Building Name | Eastside III Building B
- Location + Site | East Liberty, Pittsburgh, PA
- Building Occupant Name | Eastside Bond
- Occupancy or Function Type | Mixed Use Development

  Mixed Commercial Spaces

  175 Apartments

  Parking Facility
- Size | 221,000 total sf
- Number of Stories | 5 stories above grade + 2 stories below grade
- Primary Project Team

  Owner | The Mosites Company http://mosites.net/

  General Contractor | PJ Dick, Inc. http://www.pjdick.com/

  Architect | The Design Collective http://www.designcollective.com/

  MEP + FP | Allen & Shariff Engineering http://www.allenshariff.com/

  Structural | Structural Consultants Associates, Inc. http:/www.scaengineers.com/

  Interior Designer | RD Jones http://www.rdjones.com/
- Dates of Construction | June 2014 - June 2016

Preliminary Non-Dwelling Unit Load Calculation:

This preliminary calculation represents the estimated loads and their appropriate demand factors for the different occupancy types of Eastside III according to NEC 2011 Article 220 for Non-Dwelling Units. The following assumptions were made to identify the occupancy types, seen in Table 1.1, for the general lighting loads based on Table 220.12 of NEC 2011:

NEC 2011 Space Types	Eastside III Space Types
Stores	Retail
Halls, Corridors, Closets, Stairways	Circulation (Corridors + Storage)
Lodge Rooms	Amenity Space

Table 1.1 | Preliminary Non-Dwelling Unit Load Calculation

Occupancy Type	Load Type	VA/SF	Area (SF)	Demand Factor	Allowable Load (VA)
Retail	Lighting	3	21,010	100%	63,030
	Receptacle	3			
	First 10kVA			100%	10,000
	Remainder			50%	26,515
	Mechanical	8			168,080
Circulation	Lighting	0.5	32,951	100%	16,476
	Receptacle	3			
	First 10kVA			100%	10,000
	Remainder			50%	44,427
	Mechanical	8			263,608
Amenity Space	Lighting	1.5	14,173	100%	21,260
	Receptacle	3			
	First 10kVA			100%	10,000
	Remainder			50%	16,260
	Mechanical	8			113,384
	Special Equipment	2			28,346
				Total	**791,384 VA**

The demand factor for lighting loads was determined from Table 220.42 of NEC 2011, that states that occupancy types other than dwelling units, hospitals, hotels, and warehouses use a 100% demand factor. The demand loads for receptacles were taken from Table 220.44 of NEC 2011, which states that the first 10kVA has a demand factor of 100% and the remaining loads have a factor of 50%.

Preliminary Dwelling Unit Load Calculation without Mechanical Loads:

This preliminary calculation represents the estimated loads and their appropriate demand factors for the Dwelling Units of Eastside III according to NEC 2011 Article 220. The calculation is based on the *largest apartment unit* size of 1,340 SF. The unit load of 3 VA/SF, according to Table 220.12 of NEC 2011, was used to calculate the general apartment Lighting + Receptacle loads seen in Table 1.2. Table 1.3 represents the calculation for the total dwelling unit loads using an optional demand factor method, according to section 220.82 (B): Dwelling Units General Loads of NEC 2011 *before* mechanical loads were accounted for.

Table 1.2 | Preliminary Dwelling Unit Load Calculation

Appliance Type	Load Type	Equipment Load (VA)	# of Equipment	Allowable Load (VA)
General Apartment	Lighting + Receptacle	4,020		4,020
	Small Appliances	1,500	2	3,000
	Washer	1,500	1	1,500
	Dryer	5,000	1	5,000
	Range	8,000	1	8,000
Fastened Appliances	Disposal	900	1	900
	Microwave	1,200	1	1,200
	Dishwasher	1,200	1	1,200
	Water Heater	4,500	1	4,500
			Total*	**29,320 VA**

* Total allowable load before demand factor calculation (see Table 1.3)

Table 1.3 | Dwelling Unit Load Calculation - Optional Method

Allowable Load	Load (VA)	Demand Factor	Adjusted Load (VA)
First 10kVA	10,000	100%	10,000
Remainder	19,320	40%	7,728
		Total	**17,729 VA**

Preliminary Dwelling Unit Load Calculation with Mechanical Loads:

Each apartment unit in Eastside III utilizes a heat pump. An estimated 1,500 VA was used to account for the mechanical load of the heat pump. The **total dwelling unit load** calculation was determined by adding the mechanical load to the calculated total load, found in Table 1.3. The final load, calculated and highlighted in yellow below, was used to size the feeders and circuit breaker serving the dwelling units' panelboards.

Eq. 1 | 17,729 VA + **1,500 VA** (*heat pump)* = **19,229 VA**

Dwelling Unit Panelboard Sizing Calculation:

The dwelling units are being served with a 208/120 V, single-phase power. Equation 2 was used to size the feeder and circuit breaker size for the panelboards:

Eq. 2 | 19,229 VA / 208 V = 92 Amps → **100 A Circuit Breaker**

A **100 A circuit breaker** with **three #2 AWG** copper wire is estimated to serve the dwelling unit power loads, according to Table 310.15(B)(16) in NEC 2011 for sizing conductors. The temperature rating of 60° C was assumed for this estimate.

Dwelling Unit Switchboard Sizing Calculation:

The utilities of the 175 apartment units of Eastside III are submetered onto four separate meters, Meters A, B, C, D - which all serve the individual dwelling unit panelboards and the residential switchboard located in the main electrical room on the ground level. Table 1.4 below calculates the total loads on each meter. The *total dwelling unit load* value seen in Table 1.4 was calculated *without* the optional method demand factors accounted for but *with* mechanical loads accounted for. Equation 3 shows how this value was determined:

Eq. 3 | 29,320 VA + 1,500 VA (*heat pump load*) = **30,820 VA**

The demand factors in Table 1.4 were determined from Table 220.84: Demand Factors for Multifamily Dwelling Units in NEC 2011.

Table 1.4 | Meter Loads

Meter Type	Total Dwelling Unit Load (VA)	# of Apartment Units per Meter	Demand Factor	Total Load per Meter (VA)
A	**30,820**	36	30%	316,656
B		48	26%	365,914
C		55	25%	403,150
D		36	30%	316,656

The total dwelling unit load, calculated in Equation 3, was used to size the residential switchboard. Equation 4 was used to size the 208/120 V, 3-phase residential switchboard. The demand factor was also determined per NEC Table 220.84.

Eq. 4 | $\frac{30{,}820 \text{ VA} * 175 \text{ Units} * 0.23}{208 \text{ V} * \sqrt{3}}$ = 3443 Amps → **4000 A Switchboard**

Utility Company:

The electrical services for Eastside III are supplied by Duquesne Light Company. Duquesne Light Co. serves approximately 584,000 customers in Pennsylvania's Allegheny and Beaver counties.

Preliminary Utility Rate Schedule:

The following Table 1.5 shows the **average price to compare (PTC)** by rate class in *cents per kilowatt hour* for Residential buildings. Table 1.6 shows the **PTC** by rate class for Businesses in *cents per kilowatt hour .*

Table 1.5 | Duquesne Light Co. - Residential Rates

Rate	Name	PTC Effective (9/01/2016)	PTC Estimate (12/01/2016)	Description
RS	Residential Service	8.07	7.83	For standard low-voltage for lighting, appliance operation, and general household purposes and for commercial or professional activity where associated consumption represents less than 25% of the total monthly usage at the premise
RH	Residential Service Heating	7.04	6.80	For same low-voltage standards as RS + is used as the primary method of space heating except that the space heating system may be supplemented with renewable energy sources such as solar, wind, wood or hydro
RA	Residential Service Add On Heat Pump	7.78	7.54	For same low-voltage standards as RS + has an add-on heat pump for space heating

Table 1.6 | Duquesne Light Co. - Business Rates

Rate	Name	PTC Effective (9/01/2016)	PTC Estimate (12/01/2016)	Description
GS	General Service Small	6.78	6.60	For standard electric service taken on a small general service
GM <25 kW	General Service Medium	6.85	6.67	For standard electric service taken on a medium general service, demand metered - less than 25 kW
GM >25kW	General Service Medium	5.37	6.35	For standard electric service taken on a medium general service, demand metered - greater than/ equal to 25 kW
GMH <25 kW	General Service Medium Heating	6.44	6.26	Same as GM <25 kW + the company's service is the sole method of space heating, and the calculated heat loss is converted into kilowatt-hour
GMH >25kW	General Service Medium Heating	5.30	6.28	Same as GM >25 kW + the company's service is the sole method of space heating, and the calculated heat loss is converted into kilowatt-hour

Building Utilization Voltage:

Duquesne Lighting Co. is expected to provide the building with 480/277V, three-phase power into the retail and amenity spaces to account for large electrical, mechanical, and special equipment loads. A 480/277V to 208/120V transformer should be utilized to account for small loads such as lighting and receptacles.

The utility company should provide 208/120V, single-phase power into the dwelling units of Eastside III from their individual meters to supply the apartment's electrical and mechanical loads. The power supplied into the residential switchboard from the apartment meters would be 208/120V, three-phase power.

Emergency Power Requirements:

Eastside III is classified into two different occupancy types according to the 2012 International Building Code (IBC): *Mercantile Group M* and *Residential Group R-2*.

The information below has been directly documented based on the information provided by IBC 2012. The Emergency and Standby requirements should be installed in accordance to the International Fire Code. The following Emergency and Standby requirements have been considered, per IBC 2012, Section 2702, based on Eastside III's occupancy types:

> **2702.1.1 Stationary generators |** Stationary emergency and standby power generators required by this code shall be listed in accordance with UL 2200.
>
> **2702.2.2 Smoke control systems |** Standby power shall be provided for smoke control systems in
>
> > ***909.11 Power systems |*** The smoke control system shall be supplied with two sources of power. Primary power shall be from the normal building power systems. Secondary power shall be from an approved standby source complying with Chapter 27 of this code. The standby power source and its transfer switches shall be in a room separate from the normal power transformers and switch gears and ventilated directly to and from the exterior. The room shall be enclosed with not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both. The transfer to full standby power shall be automatic and within 60 seconds of failure of the primary power.
>
> **2702.2.3 Exit signs |** Emergency power shall be provided for exit signs in accordance with *Section 1011.6.3.*
>
> > ***1011.6.3 Power source |*** Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Chapter 27.

Emergency Power Requirements Continued:

2702.2.4 Means of egress illumination | Emergency power shall be provided for means of egress illumination in accordance with *Section 1006.3.*

> ***1006.3 Emergency power for illumination |*** The power supply for means of egress illumination shall normally be provided by the premises' electrical supply. In the event of power supply failure, an emergency electrical system shall automatically illuminate all of the following areas:
>
> 1. Aisles and unenclosed egress stairways in rooms and spaces that require two or more means of egress.
> 2. Corridors, interior exit stairways and ramps and exit passageways in buildings required to have two or more exits.
> 3. Exterior egress components at other than their levels of exit discharge until exit discharge is accomplished for buildings required to have two or more exits.
> 4. Interior exit discharge elements, as permitted in *Section 1027.1*, in buildings required to have two or more exits.
> 5. Exterior landings as required by *Section 1008.1.6* for exit discharge doorways in buildings required to have two or more exits.
>
> The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an on-site generator. The installation of

2702.2.5 Accessible means of egress elevators | Standby power shall be provided for elevators that are part of an accessible means of egress in accordance with *Section 1007.4.*

> ***1007.4 Elevators |*** In order to be considered part of an accessible means of egress, an elevator shall comply with emergency operation and signaling device requirements of *Section 2.27 of ASME A17.1*. Standby power shall be provided in accordance with *Chapter 27 and Section 3003.* The elevator shall be accessed from either an area of refuge complying with *Section 1007.6* or a horizontal exit.

2702.2.19 Elevators | Standby power for elevators shall be provided as set forth in *Sections 3003.1, 3007.9 and 3008.9.*

> ***3003.1 Standby power |*** In buildings and structures where standby power is required or furnished to operate an elevator, the operation shall be in accordance with *Sections 3003.1.1* through *3003.1.4*
>
> ***3007.9 Electrical power |*** The following features serving each fire service access elevator shall be supplied by both normal power and Type 60/Class 2/Level 1 standby power:
>
> 1. Elevator equipment
> 2. Elevator hoistway lighting
> 3. Elevator machine room ventilation and cooling equipment
> 4. Elevator controller cooling equipment.

Emergency Power Requirements Continued:

> ***3008.9 Electrical power |*** The following features serving each occupant evacuation elevator shall be supplied by both normal power and Type 60/Class 2/Level 1 standby power:
>
> 1. Elevator equipment
> 2. Elevator machine room ventilation and cooling equipment
> 3. Elevator controller cooling equipment

2702.2.20 Smoke-proof enclosures | Standby power shall be provided for smoke-proof enclosures as required by *Section 909.20.6.2.*

> ***909.20.6.2 Standby power |*** Mechanical vestibule and stair shaft ventilation systems and automatic fire detection systems shall be powered by an approved standby power system conforming to *Section 403.4.8 and Chapter 27.*

Emergency Power Source Estimations:

There is expected to be a 480/277 V, three-phase emergency generator serving Eastside III in case of a power outage. This generator would serve the code-required emergency systems within the retail, residential, circulation, and amenity spaces. It will be transformed into 277/120 V to serve the residential areas of the building and the lighting of the non-dwelling unit spaces. These required emergency systems include egress lighting loads and the fire pump system, according to the International Building Code for Group M and Group R-2 buildings. The estimated loads for these systems:

> **Emergency Lighting Load Assumption |** The emergency lighting load assumption is calculated assuming 10% of the lighting load that serves the circulation spaces of the building. For Eastside III, 10% of the circulation space lighting load would be **1,648 VA.**
>
> **Emergency Fire Pump Load Assumption |** The fire pumps of Eastside III is estimated to have a load of 100 HP, which is approximately **75kVA**.

Special Occupancy Requirements:

After reviewing Chapter 5 of NEC 2011, there were no areas of Eastside III that would be need to follow requirements for special occupancy space types.

Priority Assessment:

The following list of variables were considered as part of the priority assessment for Eastside III, ranked by their importance to this mixed-use building.

High Priority	Medium Priority	Low Priority
Reliability + Quality Having a reliable and high quality power source is crucial for a high-end residential building, like Eastside III. Since occupants are residing in this building, functionality and security are importance factors that rely on the quality of the power system.	**Low Life Cycle Cost + Redundancy** Having a low life cycle cost is important for the residents of a building, since they are paying for their personal utility usage. It is also important for the occupants to have redundancy through emergency power for safety and reliability reasons.	**Flexibility** Flexibility within amenity spaces such as the entertainment lounges, display kitchen, and fitness center, etc. is important to consider in order to accommodate the needs of different occupant preferences and space functions.

Optional Back-Up Power Source:

Since Eastside III does not include areas of special occupancy requirements, it is expected that the building does not include critical operation equipment that would need to be on back-up power. The main systems that are crucial for occupant safety, like lighting, egress systems, and fire systems, are required to be on emergency power per the International Building Code.

Low Voltage/Communication Systems:

The following list contains low voltage and communication systems that are applicable to the occupancy and function types of Eastside III:

Telephone/Data - For Retail, Residential, and Amenity spaces
CATV/CCTV - For Retail, Residential, and Amenity spaces
Access Control - For private access areas of Residential space
Video Surveillance - For Retail space and common areas of Residential space
Paging/Intercom - For Retail space
Fire Alarm* - For all space types

Low Voltage/Communication Systems Continued:

*Fire Alarm and Detection System requirements are determined by IBC 2012, Section 907. See below for the IBC article description:

907.2 Where Required - new buildings and structures | An approved fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with *Sections 907.2.1* through *907.2.23* and provide occupant notification in accordance with *Section 907.5*, unless other requirements are provided by another section of this code. A minimum of one manual fire alarm box shall be provided in an approved location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or water flow detection devices. Where other sections of this code allow elimination of fire alarm boxes due to sprinklers, a single fire alarm box shall be installed.

Exceptions: The manual fire alarm box is not required for Group R-2 occupancies unless required by the fire code official to provide a means for fire watch personnel to initiate an alarm during sprinkler system impairment event. Where provided, the manual fire alarm box shall not be located in an area that is accessible to the public.

907.2.7 Group M | The manual fire alarm system that activates the occupant notification system in accordance with *Section 907.5* shall be installed in Group M occupancies where one of the following conditions exist:

1. The combined Group M *occupant load* of all floors is 500 or more persons
2. The Group M *occupant load* is more than 100 persons above of below the *level of exit discharge.*

Exceptions: Manual fire alarm boxes are not required where the building is equipped throughout with an *automatic sprinkler system* installed in accordance with *Section 907.1.11* and the occupant notification appliances will automatically activate throughout the notification zones upon sprinkler waterflow.

907.2.7 Group R-2 | Fire alarm systems and smoke alarms shall be installed in Group R-3 occupancies as required in *Sections 907.2.9* through *907.2.9.3.*

907.2.9.1 Manual fire alarm system | shall be installed where: the building contains more than 16 dwelling units or sleeping units. (This applies to Eastside III)

907.2.9.2 Smoke alarms | Single– and multiple-station smoke alarms shall be installed in accordance with *Section 907.2.11.*

Actual Non-Dwelling Unit Load Calculation:

Table 2.1 below represents the actual electrical building loads for the non-dwelling areas of Eastside III, taken from their electrical panel schedules. Every load serving the non-dwelling area is served from the main *House Switchboard* (SWBD#H), located in the Main Electrical Room B on the ground level. The loads serving the *retail* space are not calculated for the non-dwelling unit spaces, since they will be tenant fit outs. The loads are divided into the different load classifications seen below: lighting, motor, power, receptacle, lighting - dwelling unit, and heat pump. The total connected load (in VA) is listed at the bottom of the table, with the appropriate demand factors applied.

Table 2.1 | Actual Non-Dwelling Unit Load Calculation - House Switchboard

Circuit #	Circuit Description	# of Poles	Frame Size (A)	Trip Rating (A)	Load (VA)	Wire Size
1	B-LPG	3	400	300	89,170	3-#500, 1-#500, 1-#4
2	B-EHG	3	250	150	782	3-#3/0, 1-#3/0, 1-#6
3	E-EHQ	3	250	150	4,922	3-#3/0, 1-#3/0, 1-#6
4	B-LP2A	3	100	100	34,780	3-#1, 1-#1, 1-#8
5	B-LP2B	3	250	250	61,605	3-#350, 1-#350, 1-#4
6	RTU-2	3	100	60	24,912	3-#4, 1-#4, 1-#10
7	RTU-1	3	400	25	17,439	3-#8, 1-#8, 1-#8
8	RTU-3	3	400	60	24,912	3-#4, 1-#4, 1-#10
9	Heat Pump	3	400	20	24,912	3-#10, 1-#10, 1-#10
				Total Connected Load (VA)	284,215	

Load Classification	Connected Load (VA)	Demand Factor	Estimated Demand (VA)
Lighting	9,506	100%	9,506
Motor	24,912	80%	19,930
Power	21,720	80%	17,376
Receptacle	180	100%	180
Lighting - Dwelling Unit	14,234	100%	14,234
Heat Pump	213,663	100%	213,663

Total Connected Load	284,215	VA
Total Estimated Demand	274,889	VA

Actual Dwelling Unit Load Calculation without Mechanical Loads:

Table 2.2 and 2.3 below show the actual dwelling unit load calculation for the *largest dwelling unit* of Eastside III, which is 1,340 SF.

Table 2.2 | Actual Dwelling Unit Load Calculation

Appliance Type	Load Type	Equipment Load (VA)	# of Equipment	Allowable Load (VA)
General Apartment	Lighting + Receptacle	4,020		4,020
	Small Appliances	1,500	2	3,000
	Washer	1,500	1	1,500
	Dryer	5,000	1	5,000
	Range	8,000	1	8,000
Fastened Appliances	Disposal	900	1	900
	Microwave	1,200	1	1,200
	Dishwasher	1,200	1	1,200
	Water Heater	4,500	1	4,500
			Total*	**29,320 VA**

* Total allowable load before demand factor calculation (see Table 2.3)

Table 2.3 | Actual Dwelling Unit Load Calculation - Optional Method

Allowable Load	Load (VA)	Demand Factor	Adjusted Load (VA)
First 10kVA	10,000	100%	10,000
Remainder	19,320	40%	7,728
		Total	**17,729 VA**

Actual Dwelling Unit Load Calculation with Mechanical Loads:

Each apartment of Eastside III has a 7,500 VA heat pump. The **total dwelling unit load** calculation below is determined by adding the mechanical load to the calculated total load, found in Table 2.3. The final load, calculated and highlighted in Equation 5, was used to size the feeders and circuit breaker serving the dwelling units' panelboards.

Eq. 5 | 17,729 VA + **7,500 VA** (*heat pump)* = **25,229 VA**

Actual Dwelling Unit Panelboard Sizing Calculation:

The dwelling units are being served with a 208/120 V, single-phase power. Equation 6 was used to size the feeder and circuit breaker size for the panelboard of the 1,340 SF apartment:

Eq. 2 | 25,229 VA / 208 V = 121 Amps → **125 A Circuit Breaker**

Dwelling Unit Switchboard Sizing Calculation:

The utilities of the 175 apartment units of Eastside III are submetered onto four separate meters, Meters A, B, C, D - which all serve the individual dwelling unit panelboards and the *Residential Switchboard* (SWBD#R) located in the Main Electrical Room B on the ground level. Table 2.4 below shows the actual loads on each meter, from *all* apartment units.

Table 2.4 | Meter Loads

Meter Type	# of Apartment Units per Meter	Demand Factor	Total Load per Meter (VA)
A	36	30%	383,115
B	48	26%	461,230
C	55	25%	466,372
D	36	30%	383,357

A total dwelling unit load from *all* units was used to size the Residential Switchboard. The Residential Switchboard (SWBD#R) is a **4000 A** switchboard, with 208/120 V, 3-phase power.

Part 2

Existing Designed Electrical System

Utility Company + Service Voltage:

The electrical services for Eastside III are supplied by Duquesne Light Company. There are two existing main electrical Duquesne transformers located on the ground level on Eastside III. One provides secondary 480/277 V power into the non-dwelling area and the other provides secondary 208/120 V power into the

Actual Utility Company Rate Schedule:

The following tables, Table 2.5 and 2.6, provide the expected utility rates of Duquesne Light Co. for the different building functions of Eastside III. Since Eastside III is a mixed-use building, there are different utility rates for the residential and retail areas of the building. They are divided into the following categories:

Residential Building Category + Assumed Service:

Residential Service, Heating, and Add-on Heat Pump (RS, RH, RA)

Business Building Category + Assumed Service:

General Service Medium and Heating

Table 2.5 shows the **average price to compare (PTC)** by rate class in *cents per kilowatt hour* for Eastside III's *residential* area. Table 2.6 shows the **PTC** by rate class for the building's *business* utility rate in *cents per kilowatt hour* .

Table 2.5 | Duquesne Light Co. - Residential Rates

Rate	Name	PTC Effective (9/01/2016)	PTC Estimate (12/01/2016)	Description
RS	Residential Service	8.07	7.83	For standard low-voltage for lighting, appliance operation, and general household purposes and for commercial or professional activity where associated consumption represents less than 25% of the total monthly usage at the premise
RH	Residential Service Heating	7.04	6.80	For same low-voltage standards as RS + is used as the primary method of space heating except that the space heating system may be supplemented with renewable energy sources such as solar, wind, wood or hydro
RA	Residential Service Add On Heat Pump	7.78	7.54	For same low-voltage standards as RS + has an add-on heat pump for space heating

Table 2.6 | Duquesne Light Co. - Business Rates

Rate	Name	PTC Effective (9/01/2016)	PTC Estimate (12/01/2016)	Description
GM >25kW	General Service Medium	5.37	6.35	For standard electric service taken on a medium general service, demand metered - greater than/equal to 25 kW
GMH >25kW	General Service Medium Heating	5.30	6.28	Same as GM >25 kW + the company's service is the sole method of space heating, and the calculated heat loss is converted into kilowatt-hour

Part 2

Existing Designed Electrical System

Building Utilization Voltage:

The utility provider for Eastside III is Duquesne Lighting Company. Duquesne Light Co. provides the building with 480/277V power into the commercial and common spaces (non-dwelling unit areas) and 208/120V power into the residential portion (dwelling unit area) of Eastside III.

The 208/120V existing main electrical transformer, located on the ground floor, serves the residential 4000A, 208/120V, 3-phase switchboard and feeds into the dwelling units' meters and individual submeters. The apartment units are being served with 208/120V, single-phase power into their submeters.

The 480/277V existing transformer serving the commercial spaces, also located on the ground floor, feeds into a 2500A, 480/277V, 3-phase switchboard. This switchboard serves the loads of the retail and amenity spaces' corridors, common spaces, and rooftop cooling and heating units on the above floors. The new lighting and electrical power is transformed through a 45kVA transformer to provide 208/120V secondary power to the lighting and receptacle loads of the non-dwelling units.

The Main Electrical Room B is located on the ground level of Eastside III and holds both the residential and

Emergency Power System:

There is a 450kW, 480/277V, 3-phase existing emergency diesel generator, with two disconnect switches, located on the first level of parking below grade that serves Eastside III in the event of a power outage. The generator provides emergency power for egress lighting and fire pumps of the building. The emergency power is transformed from 480/277V power to 208/120V secondary power to supply the emergency lighting loads. The actual *lighting load* that is on emergency power is approximately **1,564 VA.**

The 480/277V generator directly serves the fire pump of Eastside III. The actual *fire pump load* on emergency power is approximately **100 Gallons per Minute (GPM).**

Special Occupancy Requirements:

There are no areas of Eastside III that would be need to follow requirements for special occupancy space types in accordance with Chapter 5 of the NEC.

Electrical Equipment Ratings:

Main Service

The Duquesne Lighting Co. utility service enters Eastside III through a transformer vault located on the ground level of the building. The incoming service is provided by two existing utility transformers - 480/277V secondary power and 208/120V secondary power. The incoming 480/277V secondary power serves into the main *house* switchboard and disperses throughout the non-dwelling unit areas. The incoming 208/120V secondary power serves the *residential* switchboard and disperses into the dwelling unit area of Eastside III.

Step Down Transformers

There are several step-down transformers located in the Main Electrical Room B on the ground floor and in the electrical closets on Levels 2 and 5. The transformers allow for the incoming 480/277V power to be adjusted in order to serve the lighting and power needs (208/120V) of the non-dwelling unit spaces. Refer to Table 2.7 below for the existing transformer schedule.

Table 2.7 | Transformer Schedule

XFMR Name	XFMR Location	kVA Rating	Phase	Primary Feeder	Secondary Feeder	Grounding Electrode Conductor	Feeds (Panel)
	NE Elec Closet - 5th FL	30	3	3#6 + 1#10G in 3/4"C	4#3, 1#8G in 1 1/4"C	1#6	B-RP5A
	SW Elec Closet - 5th FL	30	3	3#6 + 1#10G in 3/4"C	4#3, 1#8G in 1 1/4"C	1#6	B-RP5B
	NE Elec Closet - 2nd FL	30	3	3#6 + 1#10G in 3/4"C	4#3, 1#8G in 1 1/4"C	1#6	B-RP2A
NEW LTG/ PWR	Main Elec Rm B	45	3	3#4 + 1#8G in 1"C	4#2/0, 1#4G in 2"C	1#4	B-RPG
NEW STAND-BY	Main Elec Rm B	45	3	3#4 + 1#8G in 1"C	4#2/0, 1#4G in 2"C	1#4	B-EQG
NEW EMERGENCY	Main Elec Rm B	45	3	3#4 + 1#8G in 1"C	4#2/0, 1#4G in 2"C	1#4	B-EMG
	SW Elec Closet - 2nd FL	75	3	3#1 + 1#6G n 1"C	4#300, 1#2G in 2"C	1#1/0	B-RP2B

Electrical Equipment Ratings:

Switchboards + Panelboards

There are two switchboards within Eastside III that serve all of the non-dwelling and dwelling unit loads and their branch devices - SWBD#H and SWBD#R, which represent the *house* and *residential* switchboards. The house switchboard runs on a nominal voltage of 480/277V, 2500A. The residential switchboard runs on a 4000A, 208/120V nominal voltage. The switchboards are rated to withstand seismic forces, as defined by Division 26, and are steel, NEMA 250, Type 1 devices for indoor enclosures. The panelboards are surface-mounted cabinets, rated for indoor dry and clean environments in accordance with NEMA 250, Type 1. Refer to Table 2.8 for the switchboard and branch panelboard rating and voltage system information.

Table 2.8 | Switchboard + Panelboard Schedule

Panelboard	Voltage System	Main Type	Bus Rating (A)
Non-Dwelling Unit Panelboards			
SWBD#H	480/277V, 3PH, 4W	-	-
B-EHG	480/277V, 3PH, 4W	MLO	150
B-EHQ	480/277V, 3PH, 4W	MLO	150
B-EMG	208/120V, 3PH, 4W	MCB	150
B-EQG	208/120V, 3PH, 4W	MCB	150
B-LPG	480/277V, 3PH, 4W	MLO	300
B-RPG	208/120V, 3PH, 4W	MCB	150
B-RPG2	208/120V, 3PH, 4W	MLO	60
B-BC1	208/120V, 3PH, 4W	MLO	60
B-FR1	208/120V, 3PH, 4W	MLO	60
B-RP2A	208/120V, 3PH, 4W	MCB	100
B-RP2B	208/120V, 3PH, 4W	MCB	225
B-LP2A	480/277V, 3PH, 4W	MLO	100
B-LP2B	480/277V, 3PH, 4W	MLO	250
B-EQ3	208/120V, 3PH, 4W	MLO	60
B-EH3	208/120V, 3PH, 4W	MLO	60
B-RP5A	208/120V, 3PH, 4W	MCB	100
B-RP5B	208/120V, 3PH, 4W	MCB	100
B-LP5A	480/277V, 3PH, 4W	MLO	100
B-LP5B	480/277V, 3PH, 4W	MLO	100
Dwelling Unit Panelboards			
LC0	208/120V, 1PH, 3W	MCB	125
LC0A	208/120V, 1PH, 3W	MCB	125
LC1	208/120V, 1PH, 3W	MCB	125
LC1A	208/120V, 1PH, 3W	MCB	125
LC2	208/120V, 1PH, 3W	MCB	125
LC2A	208/120V, 1PH, 3W	MCB	125
LC2B	208/120V, 1PH, 3W	MCB	125
LC2C	208/120V, 1PH, 3W	MCB	150
LC2D	208/120V, 1PH, 3W	MCB	125

Electrical Equipment Ratings:

Main Risers + Feeders

Main Feeders:

- *Copper* for feeders smaller than No. 4 AWG
- *Copper* or *Aluminum* for feeders No. 4 AWG or larger
- *Solid* for No. 10 AWG and smaller
- *Stranded* for No. 8 AWG and larger

Service Entrance:

- Type *THHN-THWN,* single conductors in raceway
  Type XHHW, single conductors in raceway

Exposed Feeders + Concealed in Ceilings & Walls:

- Type *THHN-THWN,* single conductors in raceway
  Metal-clad cable, *Type MC*

Feeders Concealed in Concrete (below grade):

- Type *THHN-THWN,* single conductors in raceway

Conductors

The primary conductor type in Eastside III is *copper* wire rated for 600V or less. An exception where aluminum wire would be implemented is listed above - for feeders No. 4 AWG or larger. Both aluminum and copper conductors, and their insulation, comply with NEMA WC 70 for Types THW, THHN-THWN, XHHW.

Conduit

The multiple type of conduit used in Eastside III are listed and defined below.

***Metallic Conduit, Tubing, + Fittings*:**

- GRC: Galvanized Rigid Steel Conduit - Comply with ANSI C80.1 and UL 6
- ARC: Aluminum Rigid Conduit - Comply with ANSI C80.5 and UL 6A
- IMC: Intermediate Metal Conduit - Comply with ANSI C80.6 and UL 1242
- EMT: Electric Metallic Tube Conduit - Comply with ANSI C80.3 and UL 797
- FMC: Flexible Metal Conduit - Comply with UL 1 (zinc-coated or aluminum)

***Non-Metallic Conduit + Tubing*:**

- LFNC: Liquid Tight Flexible Nonmetallic Conduit - Comply with UK 1660
- Rigid HDPE: High Density Polyethylene Conduit - Comply with UL 651A
- Continuous HDPE: High Density Polyethylene Conduit - Comply with UL 651B

Electrical Equipment Ratings:

***Non-Metallic Conduit + Tubing* Continued:**

- Coilable HDPE: High Density Polyethylene Conduit - Preassembled with conductors or cables, and comply with ASTM D 3485
- RTRC: Reinforced Thermosetting Resin Conduit - Comply with EL 1684A and NEMA TC 14

Wiring Devices

The following wiring devices used in this building are listed and labeled as defined in NFPA 70 as well as comply with NFPA 70.

Straight-Blade Receptacles:

- 125 V, 20 A Convenience Receptacles
- Equipment grounding contacts are connected only to the green grounding screw terminal of the device

GFCI Receptacles (Ground-Fault Circuit Interrupter):

- 125 V, 20A Straight-blade, feed-through receptacle type
- Includes light that shows when the GFCI has malfunctioned and no longer provides protection

TVSS Receptacles (Transient Voltage Surge Suppressor):

- 125 V, 20 A Straight-Blade Duplex TVSS Convenience Receptacle
- 125 V, 20 A Straight-Blade Isolated-Ground, Duplex Convenience Receptacle

Twist-Locking Receptacles:

- 125 V, 20 A Single Convenience Receptacles

Toggle Switches:

- 277/120 V, 20 A
- Single Pole, Two Pole, Three Way, and Four Way switches

Decorator-Style Devices

- 125 V, 15 A Square Face Convenience Receptacles (and GFCI type)
- 125 V, 15 A Square Face Tamper-Resistant Convenience Receptacles (and GFCI type)
- 125 V, 15 A Square Face Tamper-Resistant Convenience Receptacles and Weather-Resistant

Part 2

Existing Designed Electrical System

Electrical Equipment Ratings:

Wiring Devices Continued

Residential Devices:

- 125 V, 15 A Residential-Grade, Tamper-Resistant Convenience Receptacles
- 120 V Fan Speed Controls
- Telephone Outlets
- Combination TV and Telephone Outliets

Wall-Box Dimmers:

- Modular, full-wave, solid state on-off dimmer switches
- 120 V, 600 W Incandescent lamp dimmers
- Fluorescent lamp dimmers

Floor Service Fittings:

- Modular, flush-type, dual-service units suitable for wiring method used

Prefabricated Multi-Outlet Assemblies:

- Two-piece surface metal raceway with factory-wired multi-outlet harness

Faceplate Type

Single and Combination Types - Match corresponding wiring devices:

- Plate-Securing Screws: Metal with head color to match plate finish
- Material for Finished Spaces: Steel with white baked enamel, suitable for field painting
- Material for Unfinished Spaces: Galvanized Steel
- Material for Damp Locations: Cast aluminum with spring-loaded life cover

Wet-Location, Weatherproof Cover Plates:

- NEMA 250, comply with Type 3R, weather-resistant, die-cast aluminum with lockable cover

Part 2

Existing Designed Electrical System

Electrical Equipment Ratings:

Motor Starters

There are three types of enclosed motor controllers in Eastside III, rated at 600V or less: Full-voltage Manual, Full-Voltage Magnetic, and Reduced-Voltage Magnetic. Details of these controllers are listed below.

Full-Voltage Manual Controller:

- Comply with NEMA ICS 2, general purpose, Class A
- Motor-starter switches: marked to show whether it is off or on
- Fractional horsepower manual controllers: marked to show if off, on, or tripped with overload relays
- Integral horsepower manual controller: marked to show if off, on, or tripped with overload relays

Full-Voltage Magnetic Controller:

- Magnetic controller: full-voltage, across the line, electrically held
- Combination magnetic controller: factory-assembled combination of magnetic controller, OCPD, and disconnecting means

Reduced-Voltage Magnetic Controller:

- Comply with NEMA ICS 2, general purpose, Class A
- Closed –transition, adjustable time delay on transition
- Magnetic controller: reduced voltage, electrically held
- Combination magnetic controller: factory-assembled combination of reduced voltage magnetic

UPS System

There is no Uninterruptible Power Supply (UPS) system in Eastside III.

Optional Back-Up Power:

Eastside III is not designed to include additional back-up power systems.

Low Voltage/Communication Systems:

The following list contains the existing low voltage and communication systems installed in Eastside III as listed in the drawings and specifications.

Telephone/Data
CATV/CCTV
Fire Alarm

Additional communication systems were installed in Eastside III by the owner, and are not shown in the construction drawings for specifications. These technology systems were installed by an AV consultant and include the following systems:

Audiovisual System
Security System (access control, video surveillance, intercom, etc.)
Digital Signage

These systems were installed to support the many employees, residents, and business owners that occupy the many spaces of the building. These spaces include: amenity communal spaces, activity spaces, business center, conference rooms, fitness center, exterior swimming pool, and residential apartments. The AV consultant focused their technology on the mobility, durability and flexibility within Eastside III. The AV system, digital signage, and security systems allow for the owner and occupants to utilize the available technology to adjust for multiple uses within Eastside III's unique space types.

Electrical and Telecommunications Floor Space:

The electrical and telecommunication areas of Eastside III total approximately 2,844 SF This area represents about **1.3%** of the total building size, which totals 221,000 SF. Table 2.9 on the following page indicates the square footage breakdown of each electrical space.

Electrical and Telecommunications Floor Space Continued:

Table 2.9 | Electrical Room Floor Space		
Level	**Room Label**	**Area (SF)**
Ground Level	Main Elec Rm B	538
	Retail Elec Rm (G07)	375
	Transformer Rm	905
	Generator Rm	109
Level 1	E110	44
Level 2	E201	90
	E202	88
	E203	21
	E204	20
Level 3	E301	90
	E302	20
	E303	88
	E304	20
Level 4	E401	90
	E402	20
	E403	88
	E404	20
Level 5	E501	90
	E502	20
	E503	88
	E504	20
	Total Area (SF)	**2,844**

Energy Reduction Methods:

Eastside III's project goal was to achieve a LEED gold rating under LEED for Homes 2009. Design features that contribute to the LEED certification goal are listed below.

- **Low-absorbing Roofing Material** | The roofing system will consist of a white-colored thermoplastic polyolefin (TPO) membrane used to decrease the amount of heat absorbed by the material
- **Thermally Insulating Glazing** | The thermally insulated glazing for the new window system will reduce the amount of heat gain within the building from natural daylighting
- **Reduced Envelope Air Leakage** | This requires specific air sealing guidelines to be met including proper sealing of all penetrations in ceilings, walls, and floors
- **LED Lighting** | most energy-efficient lighting technologies
- **High Efficiency Appliances** | Used high efficiency appliance to reduce water and energy usage
- **Low-emitting Materials** | used materials with low VOC levels
- **Efficient Hot Water Distribution** | used efficient hot water tanks in all apartment units & common spaces
- **Water Efficient Fixtures** | used efficient hot water tanks in all apartment units & common spaces

Single Line/Riser Diagram of Electrical Distribution System:

The residential and house electrical riser diagrams for Eastside III can be found in the appendix of this report.

Part 3

Comparison of Design Criteria and Designed System

Existing Conditions:

When comparing the actual building load of the *non-dwelling units* to my estimated load, there are many discrepancies. The actual demand building load, as calculated in Part 2 of this report, is **274,889 VA** whereas my estimated demand load, calculated in Part 1, was **634,867 VA** - this accounts for a ***130% error.*** One of the main reasons for such a large difference in load may be that the actual calculated load *does not* account for the retail area of Eastside III, since this will be part of a tenant fit-out and will have loads calculated for once the spaces are occupied. Taking the retail space out of my estimate, the total estimated demand load now becomes **367,242 VA** compared to the calculated **274,889 VA** - which is only a ***34% error.***

Table 3.1 below summarizes the load values and % errors in their specific categories, comparing the estimated demand load *without* the retail space and the actual calculated demand load.

Table 3.1 | Non-Dwelling Unit Load Calculation Comparison

Load	Lighting	Receptacle + Power	Mechanical	Special Equipment	Total Load (VA)
Estimated Demand Load	37,735	55,973	245,188	28,346	367,242
Calculated Demand Load	23,740	21,900	238,575		274,889
% Error (difference/ calculated)	59%	156%	3%		**34%**

The largest % error, seen in Table 3.1, is in the receptacle/power category. A reason for such a large discrepancy may be because of the different demand factors being used. The estimated value was determined by taking the first 10,000 VA times a demand factor of 100% and the remaining VA by 50% - whereas the actual load was calculated with 100% for receptacles and 80% for power. Some of the load types between the two calculations were defining the loads in different categories, which leads to differing demand loads and ultimately differing load results.

Existing Conditions Continued:

When comparing the actual building load of the *non-dwelling units* to my estimated load, after mechanical loads were accounted for, there was a ***24% error.*** This discrepancy did not make a difference when the overall **4000 A** *residential switchboard* was sized, but it did make a difference when sizing the dwelling unit's circuit breakers. An estimated **100 A** breaker was sized in Part 1 of this report and an actual **125 A** circuit breaker was sized in Part 2.

The reason for this difference is solely because of the estimated load for the dwelling unit *heat pumps.* The actual load calculation applied a **7,500 VA** heat pump, whereas the estimated calculation only accounted for a **1,500 VA** heat pump load. The actual calculated load for the heat pump, and ultimately the circuit breaker size, is overestimated compared to the original estimate in Part 1 but overall, the difference between calculations is quite small.

Utility Rate Schedule:

The utility rates provided by Duquesne Lighting Co. for residential and medium business size buildings are standard rates. Since there are two existing Duquesne Lighting transformers supplying Eastside III, it would not be feasible to supply power from another utility provider.

Building Utilization Voltage:

The predicted building utilization voltage and the actual utilization voltage directly compare to one another. There are two separate transformers supplying the building to serve the different functions Eastside III - which is ideal in a mixed-use building. As expected, 208/120 V power is serving the dwelling units and 480/277 V power is entering the non-dwelling unit spaces.

Electrical Equipment:

The electrical equipment and overall electrical systems are well designed for Eastside III. The main electrical equipment, like the switchboards, are located in one room on the ground level. This suggests strategic placement to keep unwanted noise away from the residents of the building and provides maintenance ease. The small electrical rooms are in the same locations on each floor and are close to the loads they are supplying, which reduces wire distances and overall cost.

Emergency Power + Back-Up Power System:

The designed emergency power system only serves the fire pumps and emergency lighting loads, which meets the code requirements for Type M and Type R-2 buildings. These preliminary assumptions were made based on the IBC code analysis in Part 1 and directly compare to the actual emergency power systems in Part 2. Since the emergency generator is not supplying power to the elevator, a back-up power system would be suggested to serve the elevators in case of a power outage. The elevators may be on individual battery back-up power, and therefore would not need additional emergency power, but information on this could not be found in the drawings or specifications.

Energy Reduction Strategies:

Eastside III has taken many energy reducing design strategies into consideration in order to achieve LEED gold for LEED Homes. However, a more extensive lighting control system could be implemented to continue to save on energy consumption cost. For example, daylight photosensors could be installed into the main lobby areas, where daylight is plentiful, to dim the fixtures during peak hours and reduce energy usage. Also, the dwelling units could utilize vacancy sensors to avoid excess energy usage when the units are unoccupied.

References

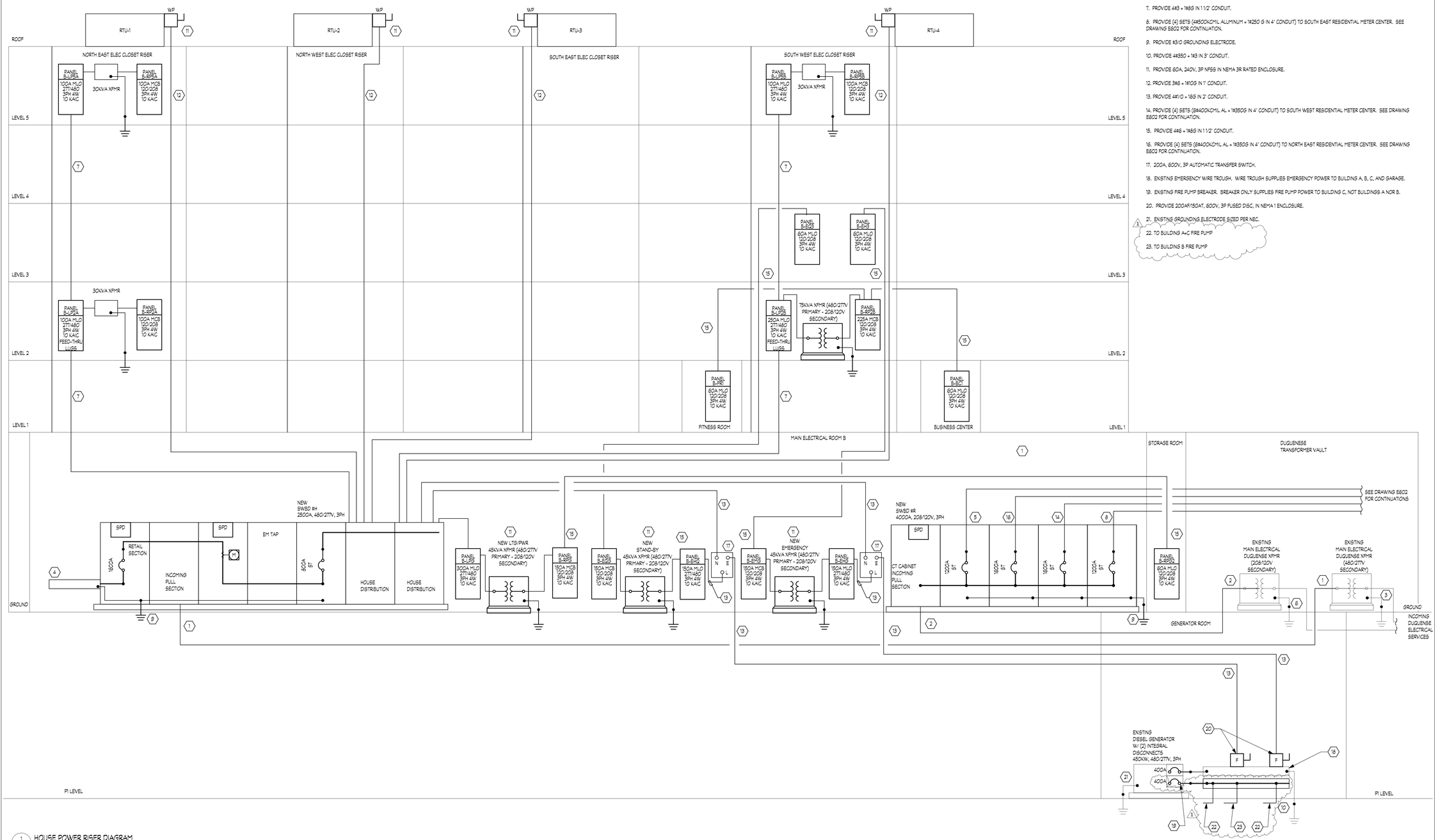
The Following references were used throughout the extent of this Tech 2 Report:

"Chapter 27- Electrical." International Code Council. International Building Code 2012. Web. http://publicecodes. cyberregs.com/icod/ibc/2012/ icod_ibc_2012_27_section.htm.

NEC: 2011. (2011 ed.). (2010). Quincy, Mass.: National Fire Protection Association.

6/2/2015 4:55:05 PM

TRANSFORMER SCHEDULE						
XFMR	KVA RATING	PHASE	PRIMARY FEEDER	SECONDARY FEEDER	GROUNDING ELECTRODE CONDUCTOR	MOUNTING
	30	3	3#6 + 1#10G IN 3/4"C	4#3, 1#6G IN 1 1/4"C	1#6	WALL
	45	3	3#4 + 1#8G IN 1"C	4#2/0, 1#4G IN 2"C	1#4	FLOOR
	75	3	3#1 + 1#6G IN 1"C	4#3/0, 1#2G IN 2"C	1#1/0	FLOOR



1 E601 HOUSE POWER RISER DIAGRAM
1" = 1'-0"

GENERAL RISER DIAGRAM NOTES:

1. ALL EQUIPMENT AND FEEDERS SHOWN THIN ARE EXISTING.
2. ALL EQUIPMENT AND FEEDERS SHOWN THICK ARE NEW.
3. MAIN BREAKERS INCLUDING 2500A FOR RESIDENTIAL, 800A FOR RETAIL, AND 800A FOR HOUSE, SHALL HAVE SHUNT TRIP FEATURE TIED TO EPO IN FIRE COMMAND CENTER. THIS CIRCUIT SHALL BE MONITORED 24/7.
4. CONNECT ALL SHUNT TRIP BREAKERS IN MAIN ELECTRICAL ROOM B TO EMERGENCY POWER OFF BUTTON LOCATED IN FIRE CONTROL ROOM IN BUILDING A.

DETAIL RISER DIAGRAM NOTES: (R)

1. PROVIDE (6) SETS (4#600KCMIL COPPER IN 4" CONDUIT) + (1) 4" SPARE CONDUIT, ALL CONCRETE ENCASED.
2. PROVIDE (10) SETS (4#600KCMIL COPPER IN 4" CONDUIT) + (3) SPARE 4" CONDUIT, ALL CONCRETE ENCASED.
3. EXISTING DUQUENSE LIGHTING COMPANY (DLCO) TRANSFORMER (480/277V SECONDARY). EXISTING GROUNDING ELECTRODE SIZED PER DLCO STANDARDS.
4. PROVIDE 10' LONG, 8' X 8' RETAIL WIRE TROUGH FOR FUTURE RETAIL TENANT(S).
5. PROVIDE (4) SETS (4#500KCMIL AL + 1#250 G IN 4" CONDUIT) TO NORTH WEST RESIDENTIAL METER CENTER. SEE DRAWING E602 FOR CONTINUATION.
6. EXISTING DUQUENESE TRANSFORMER (208/120V SECONDARY). EXISTING GROUNDING ELECTRODE SIZED PER DLCO STANDARDS.
7. PROVIDE 4#3 + 1#8G IN 1 1/2" CONDUIT.
8. PROVIDE (4) SETS (4#500KCMIL ALUMINUM + 1#250 G IN 4" CONDUIT) TO SOUTH EAST RESIDENTIAL METER CENTER. SEE DRAWING E602 FOR CONTINUATION.
9. PROVIDE #3/0 GROUNDING ELECTRODE.
10. PROVIDE 4#350 + 1#3 IN 3" CONDUIT.
11. PROVIDE 60A, 240V, 3P NF55 IN NEMA 3R RATED ENCLOSURE.
12. PROVIDE 3#6 + 1#10G IN 1" CONDUIT.
13. PROVIDE 4#1/0 + 1#6G IN 2" CONDUIT.
14. PROVIDE (4) SETS (6#400KCMIL AL + 1#350G IN 4" CONDUIT) TO SOUTH WEST RESIDENTIAL METER CENTER. SEE DRAWING E602 FOR CONTINUATION.
15. PROVIDE 4#6 + 1#8G IN 1 1/2" CONDUIT.
16. PROVIDE (4) SETS (6#400KCMIL AL + 1#350G IN 4" CONDUIT) TO NORTH EAST RESIDENTIAL METER CENTER. SEE DRAWING E602 FOR CONTINUATION.
17. 200A, 600V, 3P AUTOMATIC TRANSFER SWITCH.
18. EXISTING EMERGENCY WIRE TROUGH. WIRE TROUGH SUPPLIES EMERGENCY POWER TO BUILDING A, B, C, AND GARAGE.
19. EXISTING FIRE PUMP BREAKER. BREAKER ONLY SUPPLIES FIRE PUMP POWER TO BUILDING C, NOT BUILDINGS A NOR B.
20. PROVIDE 200AF/150AT, 600V, 3P FUSED DISC, IN NEMA 1 ENCLOSURE.
21. EXISTING GROUNDING ELECTRODE SIZED PER NEC.
22. TO BUILDING A+C FIRE PUMP
23. TO BUILDING B FIRE PUMP

DESIGN COLLECTIVE
ARCHITECTURE, PLANNING, INTERIORS
WWW.DESIGNCOLLECTIVE.COM
312 BLACKWELL STREET, SUITE 100
DURHAM, NORTH CAROLINA 27701
T: 919.381.9322 F: 919.381.9323
601 EAST PRATT STREET, SUITE 300
BALTIMORE, MARYLAND 21202
T: 410.685.6655 F: 410.539.6242

ISSUED FOR	DATE
CD 95%	2014-07-18
BID/ PERMIT SET	2015-01-05
PERMIT SUBMISSION	2015-02-06
1 CONSTRUCTION SET	2015-05-29

CONSULTANT

Allen & Shariff
DESIGN | BUILD | MANAGE
Allen & Shariff Engineering, LLC
7061 Deepage Drive
Columbia, MD 21045
Tel: 410.381.7100
www.AllenShariff.com

OWNER / DEVELOPER

The Mosites Company

2425 Henry W. Oliver Building
535 Smithfield Street
Pittsburgh PA 15222-2321

PROJECT NAME

EastSide 3: Phase 2 Building B

XXXX

PROJECT ADDRESS

Phase II

PROJECT MANAGEMENT

DCI Project No. 764-12
Owner Project No. XXXX
Drawn By: **Checked By:**

SEAL

SHEET TITLE

HOUSE POWER RISER DIAGRAM

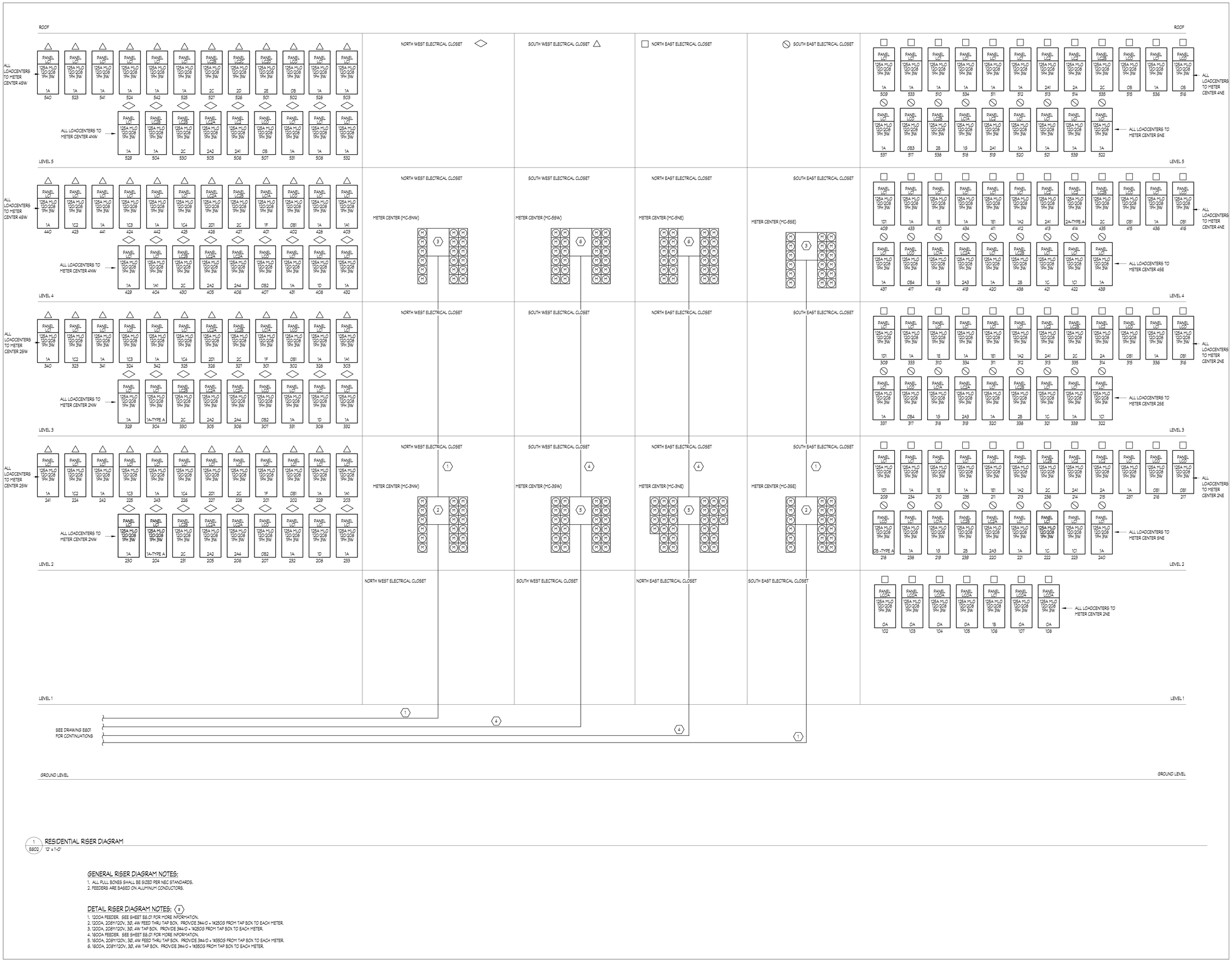
SCALE

As indicated

SHEET NUMBER

E601

6/2/2015 4:55:17 PM



1 E602 RESIDENTIAL RISER DIAGRAM
12" = 1'-0"

GENERAL RISER DIAGRAM NOTES:

1. ALL PULL BOXES SHALL BE SIZED PER NEC STANDARDS.
2. FEEDERS ARE BASED ON ALUMINUM CONDUCTORS.

DETAIL RISER DIAGRAM NOTES: (#)

1. 1200A FEEDER. SEE SHEET E6.01 FOR MORE INFORMATION.
2. 1200A, 208Y/120V, 3Ø, 4W FEED THRU TAP BOX. PROVIDE 3#4/0 + 1#250G FROM TAP BOX TO EACH METER.
3. 1200A, 208Y/120V, 3Ø, 4W TAP BOX. PROVIDE 3#4/0 + 1#250G FROM TAP BOX TO EACH METER.
4. 1600A FEEDER. SEE SHEET E6.01 FOR MORE INFORMATION.
5. 1600A, 208Y/120V, 3Ø, 4W FEED THRU TAP BOX. PROVIDE 3#4/0 + 1#350G FROM TAP BOX TO EACH METER.
6. 1600A, 208Y/120V, 3Ø, 4W TAP BOX. PROVIDE 3#4/0 + 1#350G FROM TAP BOX TO EACH METER.

DESIGN COLLECTIVE
ARCHITECTURE, PLANNING, INTERIORS
WWW.DESIGNCOLLECTIVE.COM

601 EAST PRATT STREET, SUITE 300
BALTIMORE, MARYLAND 21202
T: 410.685.6655 F: 410.539.6242

312 BLACKWELL STREET, SUITE 100
DURHAM, NORTH CAROLINA 27701
T: 919.381.9322 F: 919.381.9323

ISSUED FOR	DATE
CD 95%	2014-07-18
BID/ PERMIT SET	2015-01-05
PERMIT SUBMISSION	2015-02-06
CONSTRUCTION SET	2015-05-29

CONSULTANT

Allen & Shariff
DESIGN | BUILD | MANAGE
Allen & Shariff Engineering, LLC
7061 Deepage Drive
Columbia, MD 21045
Tel: 410.381.7100
www.AllenShariff.com

OWNER / DEVELOPER

The Mosites Company

2425 Henry W. Oliver Building
535 Smithfield Street
Pittsburgh PA 15222-2321

PROJECT NAME

EastSide 3: Phase 2 Building B

XXXX

PROJECT ADDRESS

Phase II

PROJECT MANAGEMENT

DCI Project No.	764-12
Owner Project No.	XXXX
Drawn By:	**Checked By:**

SEAL

SHEET TITLE

RESIDENTIAL POWER RISER DIAGRAM

SCALE

As indicated

SHEET NUMBER

E602