

# Technical Report 2

## Electrical Systems Existing Conditions and Building Load Summary Report



**Smeal College of Business Building**  
University Park, PA

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Lighting/Electrical Option  
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# EXECUTIVE SUMMARY

The Smeal College of Business Building utilizes on-campus resources to provide its utility needs, including normal and emergency power, and communications. At 210,000 SF, the building is too large to have a single electric room so there are multiple closets spread throughout the building. The power is distributed from the Main Distribution panel to smaller distribution panels at 480/277 V to minimize voltage drop, then transformed down to 120/208 V as necessary at the respective Electrical Closets. Fluorescent luminaires provide the majority of the lighting that are controlled by occupancy sensors, multi-scene lighting controls, and a building timeclock.

# POWER DISTRIBUTION SYSTEMS

## DRAWINGS

The following original drawings were used to create the single-line diagram shown in Appendix A at the end of this report.

- E401 – Electrical Power Riser Diagram
- E501 – Electrical Schedules #1

These drawings are included in Appendix A as well.

Disclaimer: AutoCAD 2009 was not available for my use so AutoCAD 2007 was utilized to prepare all CAD drawings instead. Also, the single-line diagram symbols class handout did not have any actual symbols on it so the original drawings’ symbols were used instead.

## TRANSFORMER SCHEDULE

Note: All transformers are 480/208Y

| TAG | SIZE [kVA] | TYPE | AMPS |     | MOUNTING     | FEEDER SIZES             |                          |
|-----|------------|------|------|-----|--------------|--------------------------|--------------------------|
|     |            |      | PRI  | SEC |              | 480 V                    | 208 V                    |
| T3  | 30         | Dry  | 36   | 83  | Pad on floor | 3-#4 & 1-#10G, 1”C       | 4-#1 & 1-#8G, 1½”C       |
| T4  | 45         | Dry  | 54   | 125 | Pad on floor | 3-#3 & 1-#8G, 1¼”C       | 4-#1/0 & 1-#6G, 2”C      |
| T5  | 75         | Dry  | 90   | 208 | Pad on floor | 3-#1/0 & 1-#6G, 1½”C     | 4-250 kcmil & 1-#4G, 3”C |
| T7  | 150        | Dry  | 181  | 417 | Pad on floor | 3-350 kcmil & 1-#4G, 3”C | 4-250 kcmil & 2-#2G, 3”C |

Table A – Transformer Schedule

**FEEDER SCHEDULE**

| FEEDER SCHEDULE |       |       |             |                   |      |                      |          |         |                    |          |         |                   |        |         |                                |                      |         |
|-----------------|-------|-------|-------------|-------------------|------|----------------------|----------|---------|--------------------|----------|---------|-------------------|--------|---------|--------------------------------|----------------------|---------|
| TAG             | FROM  | TO    | NO. OF SETS | CONDUIT (PER SET) |      | CONDUCTORS (PER SET) |          |         |                    |          |         |                   |        |         | SIZE OF OVERCURRENT PROTECTION | FRAME OR SWITCH SIZE | REMARKS |
|                 |       |       |             | SIZE              | TYPE | PHASE CONDUCTORS     |          |         | NEUTRAL CONDUCTORS |          |         | GROUND CONDUCTORS |        |         |                                |                      |         |
|                 |       |       |             |                   |      | No.                  | SIZE     | TYPE    | No.                | SIZE     | TYPE    | No.               | SIZE   | TYPE    |                                |                      |         |
| 1               | DP*** | p**** | 1           | 1"                |      | 3                    | 4AWG     | CU THWN |                    |          |         | 1                 | 10AWG  | CU THWN | 60                             | 100A/3P              |         |
| 2               | DP*** | p**** | 1           | 1 1/4"            |      | 3                    | 4AWG     | CU THWN | 1                  | 4AWG     | CU THWN | 1                 | 10AWG  | CU THWN | 60                             | 100A/3P              |         |
| 3               |       |       | 1           | 1"                |      | 3                    | 4AWG     | CU THWN |                    |          |         | 1                 | 8AWG   | CU THWN | 70                             |                      |         |
| 4               |       |       | 1           | 1 1/4"            |      | 3                    | 4AWG     | CU THWN | 1                  | 4AWG     | CU THWN | 1                 | 8AWG   | CU THWN | 70                             |                      |         |
| 5               | DP*** | p**** | 1           | 1 1/2"            |      | 3                    | 1AWG     | CU THWN |                    |          |         | 1                 | 8AWG   | CU THWN | 100                            | 100A/3P              |         |
| 6               | DP*** | p**** | 1           | 1 1/2"            |      | 3                    | 1AWG     | CU THWN | 1                  | 1AWG     | CU THWN | 1                 | 8AWG   | CU THWN | 100                            | 100A/3P              |         |
| 7               |       |       | 1           | 1 1/2"            |      | 3                    | 1/0AWG   | CU THWN |                    |          |         | 1                 | 8AWG   | CU THWN | 125                            |                      |         |
| 8               |       |       | 1           | 2"                |      | 3                    | 1/0AWG   | CU THWN | 1                  | 1/0AWG   | CU THWN | 1                 | 6AWG   | CU THWN | 125                            |                      |         |
| 9               |       |       | 1           | 1 1/2"            |      | 3                    | 1/0AWG   | CU THWN |                    |          |         | 1                 | 6AWG   | CU THWN | 150                            |                      |         |
| 10              | DP*** | p**** | 1           | 2"                |      | 3                    | 1/0AWG   | CU THWN | 1                  | 1/0AWG   | CU THWN | 1                 | 6AWG   | CU THWN | 150                            | 225A/3P              | 5       |
| 11              |       |       | 1           | 2"                |      | 3                    | 2/0AWG   | CU THWN |                    |          |         | 1                 | 6AWG   | CU THWN | 175                            |                      |         |
| 12              | DP2L  | UPS   | 1           | 2"                |      | 3                    | 2/0AWG   | CU THWN | 1                  | 2/0AWG   | CU THWN | 1                 | 6AWG   | CU THWN | 175                            | 225A/3P              |         |
| 13              |       |       | 1           | 2"                |      | 3                    | 3/0AWG   | CU THWN |                    |          |         | 1                 | 6AWG   | CU THWN | 200                            |                      |         |
| 14              |       |       | 1           | 2"                |      | 3                    | 3/0AWG   | CU THWN | 1                  | 3/0AWG   | CU THWN | 1                 | 6AWG   | CU THWN | 200                            |                      |         |
| 15              |       |       | 1           | 2"                |      | 3                    | 4/0AWG   | CU THWN |                    |          |         | 1                 | 4AWG   | CU THWN | 225                            |                      |         |
| 16              |       |       | 1           | 2 1/2"            |      | 3                    | 4/0AWG   | CU THWN | 1                  | 4/0AWG   | CU THWN | 1                 | 4AWG   | CU THWN | 225                            |                      |         |
| 17              |       |       | 1           | 2 1/2"            |      | 3                    | 250KCMIL | CU THWN |                    |          |         | 1                 | 4AWG   | CU THWN | 250                            |                      |         |
| 18              | MDP   | DP*** | 1           | 3"                |      | 3                    | 250KCMIL | CU THWN | 1                  | 250KCMIL | CU THWN | 1                 | 4AWG   | CU THWN | 250                            | 800A/3P              | 4       |
| 19              |       |       | 1           | 3"                |      | 3                    | 350KCMIL | CU THWN |                    |          |         | 1                 | 4AWG   | CU THWN | 300                            |                      |         |
| 20              |       |       | 1           | 3"                |      | 3                    | 350KCMIL | CU THWN | 1                  | 350KCMIL | CU THWN | 1                 | 4AWG   | CU THWN | 300                            | 800A/3P              | 5       |
| 21              |       |       | 1           | 3 1/2"            |      | 3                    | 500KCMIL | CU THWN |                    |          |         | 1                 | 3AWG   | CU THWN | 350                            |                      |         |
| 22              |       |       | 1           | 4"                |      | 3                    | 500KCMIL | CU THWN | 1                  | 500KCMIL | CU THWN | 1                 | 3AWG   | CU THWN | 350                            |                      |         |
| 23              |       |       | 1           | 3 1/2"            |      | 3                    | 600KCMIL | CU THWN |                    |          |         | 1                 | 3AWG   | CU THWN | 400                            |                      |         |
| 24              | MDP   | DP*** | 1           | 4"                |      | 3                    | 600KCMIL | CU THWN | 1                  | 600KCMIL | CU THWN | 1                 | 3AWG   | CU THWN | 400                            | 800A/3P              | 4       |
| 25              |       |       | 2           | 2 1/2"            |      | 3                    | 250KCMIL | CU THWN |                    |          |         | 1                 | 2AWG   | CU THWN | 500                            |                      |         |
| 26              | MDP   | DP*** | 2           | 3"                |      | 3                    | 250KCMIL | CU THWN | 1                  | 250KCMIL | CU THWN | 1                 | 2AWG   | CU THWN | 500                            | 800A/3P              |         |
| 27              |       |       | 2           | 3"                |      | 3                    | 350KCMIL | CU THWN |                    |          |         | 1                 | 1AWG   | CU THWN | 600                            |                      |         |
| 28              |       |       | 2           | 3"                |      | 3                    | 350KCMIL | CU THWN | 1                  | 350KCMIL | CU THWN | 1                 | 1AWG   | CU THWN | 600                            |                      |         |
| 29              |       |       | 2           | 3 1/2"            |      | 3                    | 600KCMIL | CU THWN |                    |          |         | 1                 | 1/0AWG | CU THWN | 800                            |                      |         |
| 30              | MDP   | DP*** | 2           | 4"                |      | 3                    | 600KCMIL | CU THWN | 1                  | 600KCMIL | CU THWN | 1                 | 2/0AWG | CU THWN | 800                            |                      |         |
| 31              |       |       | 3           | 3"                |      | 3                    | 400KCMIL | CU THWN |                    |          |         | 1                 | 2/0AWG | CU THWN | 1000                           |                      |         |
| 32              |       |       | 3           | 3"                |      | 3                    | 400KCMIL | CU THWN | 1                  | 400KCMIL | CU THWN | 1                 | 2/0AWG | CU THWN | 1000                           |                      |         |
| 33              |       |       | 3           | 3 1/2"            |      | 3                    | 600KCMIL | CU THWN |                    |          |         | 1                 | 3/0AWG | CU THWN | 1200                           |                      |         |
| 34              |       |       | 3           | 3"                |      | 3                    | 600KCMIL | CU THWN | 1                  | 600KCMIL | CU THWN | 1                 | 3/0AWG | CU THWN | 1200                           |                      |         |
| 35              |       |       | 4           | 3 1/2"            |      | 3                    | 600KCMIL | CU THWN |                    |          |         | 1                 | 4/0AWG | CU THWN | 1600                           |                      |         |
| 36              |       |       | 4           | 4"                |      | 3                    | 600KCMIL | CU THWN | 1                  | 600KCMIL | CU THWN | 1                 | 4/0AWG | CU THWN | 1600                           |                      |         |

NOTES:  
 1. REFER TO RISER DIAGRAM FOR FEEDER TAGS  
 2. SEE MOTOR WIRING SCHEDULE FOR MOTOR WIRING SIZES.  
 3. ASTERISKS REFER TO VARIOUS NAMES; SAME FEEDER TYPE USED IN MULTIPLE AREAS.  
 4. FEEDER ALSO USED FROM EMERGENCY/LIFE SAFETY ATS TO RESPECTIVE DISTRIBUTION PANELS.  
 5. FEEDER ALSO USED FROM EMERGENCY/LIFE SAFETY XFMR TO RESPECTIVE ATS.

AL=ALUMINUM  
 CU=COPPER

**Table B – Feeder Schedule**

**MOTOR WIRING SCHEDULE**

Note: For single speed, 480 V motors only.

| HP  | FEEDER - 480 V, 3Ø, 3W |
|-----|------------------------|
| ½   | 3#12 & 1#12G - ¾"C     |
| ¾   | 3#12 & 1#12G - ¾"C     |
| 1   | 3#12 & 1#12G - ¾"C     |
| 1½  | 3#12 & 1#12G - ¾"C     |
| 2   | 3#12 & 1#12G - ¾"C     |
| 3   | 3#12 & 1#12G - ¾"C     |
| 5   | 3#12 & 1#12G - ¾"C     |
| 7½  | 3#10 & 1#10G - ¾"C     |
| 10  | 3#10 & 1#10G - ¾"C     |
| 15  | 3#8 & 1#10G - ¾"C      |
| 20  | 3#6 & 1#8G - ¾"C       |
| 25  | 3#6 & 1#8G - ¾"C       |
| 30  | 3#4 & 1#6G - 1"C       |
| 40  | 3#3 & 1#6G - 1¼"C      |
| 50  | 3#1 & 1#6G - 1½"C      |
| 60  | 3#1/0 & 1#6G - 1½"C    |
| 75  | 3#2/0 & 1#4G - 2"C     |
| 100 | 3#3/0 & 1#3G - 2"C     |
| 125 | 3#4/0 & 1#3G - 2"C     |

**Table C – Motor Wiring Schedule**

**SYSTEMS SUMMARY**

The Smeal College of Business Building taps into Penn State’s campus electrical distribution system at manhole EMH-304, located just southeast of the building’s terrace. This manhole provides access to both the normal and emergency campus power distribution systems at 12,470 volts and 4,160 volts respectively. These medium-voltages are then reduced to low-voltage levels (480-277 V) for distribution within the Business Building by its three primary transformers, one oil-filled exterior transformer for normal power, and two interior dry-type transformers for emergency and stand-by power. Additional transformers are located throughout the building to step the voltage down even further as necessary.

**UTILITY RATE STRUCTURE**

Penn State’s University Park campus is billed for demand and energy (kVA and kWh respectively) on the Pennsylvania electric tariff 37 with Allegheny Power (800 Cabin Hill

Drive, Greensburg, PA 15601-1689). The demand for a month is determined by averaging the weekly maximum demand of the campus’s ten service entrances for that month.

Though the power is delivered through the local utility company’s transmission and distribution systems, the energy itself is actually purchased from multiple generating sources. Individual building utility costs are then based on a rate that is provided by the Office of Physical Plant’s (OPP) Utility Services department.

| UTILITY          | RATE          |
|------------------|---------------|
| Electric         | \$0.0388/kWh  |
| Electric Demand  | \$8.47/kW     |
| Steam            | \$15.76/klb   |
| Gas              | \$13.47/MCF   |
| Water/Wastewater | \$7.16/kgal   |
| Chilled Water    | \$0.19/ton-hr |

**Table D: Utility Rates**

The following chart provides a 12-month summary of the Business Building’s Electric Utility Load Data as reported by OPP.

| Period | Year | Start Date | End Date   | Use (KWH) | Cost        | Bill Dem | Act Dem | Flags | Use/Day   | Cost/Day | Unit Cost | Load Factor |
|--------|------|------------|------------|-----------|-------------|----------|---------|-------|-----------|----------|-----------|-------------|
| Feb    | 2007 | 1/15/2007  | 2/19/2007  | 379,000   | \$18,499.76 | 448      |         | ---   | 10,828.57 | \$528.56 | \$0.05    | 100.71      |
| Jan    | 2007 | 12/14/2006 | 1/15/2007  | 313,000   | \$16,481.04 | 512      |         | ---   | 9,781.25  | \$515.03 | \$0.05    | 79.6        |
| Dec    | 2006 | 11/16/2006 | 12/14/2006 | 303,000   | \$15,754.24 | 472      |         | ---   | 10,821.43 | \$562.65 | \$0.05    | 95.53       |
| Nov    | 2006 | 10/17/2006 | 11/16/2006 | 328,000   | \$17,444.19 | 557      |         | ---   | 10,933.33 | \$581.47 | \$0.05    | 81.79       |
| Oct    | 2006 | 9/14/2006  | 10/17/2006 | 362,000   | \$18,416.12 | 516      |         | ---   | 10,969.70 | \$558.06 | \$0.05    | 88.58       |
| Sep    | 2006 | 8/15/2006  | 9/14/2006  | 311,000   | \$16,378.03 | 509      |         | ---   | 10,366.67 | \$545.93 | \$0.05    | 84.86       |
| Aug    | 2006 | 7/14/2006  | 8/15/2006  | 319,000   | \$16,070.12 | 436      |         | ---   | 9,968.75  | \$502.19 | \$0.05    | 95.27       |
| Jul    | 2006 | 6/12/2006  | 7/14/2006  | 311,000   | \$15,157.50 | 448      |         | ---   | 9,718.75  | \$473.67 | \$0.05    | 90.39       |
| Jun    | 2006 | 5/16/2006  | 6/12/2006  | 265,000   | \$14,344.14 | 551      |         | ---   | 9,814.81  | \$531.26 | \$0.05    | 74.22       |
| May    | 2006 | 4/18/2006  | 5/16/2006  | 289,000   | \$14,800.06 | 501      |         | ---   | 10,321.43 | \$528.57 | \$0.05    | 85.84       |
| Apr    | 2006 | 3/16/2006  | 4/18/2006  | 346,000   | \$16,800.72 | 491      |         | ---   | 10,484.85 | \$509.11 | \$0.05    | 88.98       |
| Mar    | 2006 | 2/16/2006  | 3/16/2006  | 294,000   | \$15,421.84 | 553      |         | ---   | 10,500.00 | \$550.78 | \$0.05    | 79.11       |

**Table E: 12-Month Electric Utility Load Data Summary**

**EMERGENCY POWER SYSTEM**

The Business Building’s emergency power is provided by tapping into the campus Life Safety grid at manhole EMH-304 as mentioned above. This emergency electricity is generated by Penn State’s West Campus Steam Plant, which has the ability to operate autonomously when utility power is lost. If normal power does become unavailable, the building loads are then shifted from the normal to the emergency feeders by two automatic transfer switches,

ATS-EM (150 A) and ATS-LR (400 A). All emergency branch circuit conductors run in conduits that are separate from all other wiring.

Emergency exit signs as well as fire alarm strobes are provided where required by code. Some of the emergency lighting is provided by normal luminaires by way of lighting transfer panels; when normal power is lost, these transfer panels will switch those luminaires designated for emergency lighting from their normal panelboards to emergency panelboards. However, the branch circuits for emergency egress lighting in all egress spaces, including corridors, stairwells, and lobbies, are connected to the life safety panels and are constantly on with no toggle switch control unless required, which then would have bypass relays integrated into those fixtures.

## **OVERCURRENT PROTECTIVE DEVICES**

Overcurrent protection is typically provided by circuit breakers (please refer to the single-line diagram in Appendix A for all frame and trip sizes for distribution equipment; transformer kAIC ratings can be found on the transformer schedule). In general, these are to be toggle-handle type, molded case circuit breakers with inverse time and instantaneous tripping characteristics. Other general characteristics for enclosed circuit breakers are:

UL labeled and listed for use at the full continuous ampere rating

Fully rated for short circuit ratings available from the power sources

- Frame size < 400 A → thermal magnetic or solid state type  
Frame size ≥ 400 A → microprocessor-based with true RMS sensing trip units
- Quick-make, quick-break over-center switching mechanism that is mechanically trip-free
- Nonwelding silver alloy contacts

Other specified protection include lockable fused disconnects or breakers rated at 100 kAIC with electronic instantaneous overcurrent protection for variable frequency drives (VFDs).

### EQUIPMENT LOCATIONS

| TAG   | LOCATION |                    | DESCRIPTION                          |
|-------|----------|--------------------|--------------------------------------|
|       | RM #     | NAME               |                                      |
| MS4L  | PB103    | Electrical Room    | Main Switchboard                     |
| MCC4L | MB101    | Mechanical/Service | Motor Control Center (480 V, 3Ø, 4W) |

**Table F: Distribution Equipment Locations**

| DISTRIBUTION PANELS |          |                         |                                      |
|---------------------|----------|-------------------------|--------------------------------------|
| TAG                 | LOCATION |                         | DESCRIPTION                          |
|                     | RM #     | NAME                    |                                      |
| DP211               | P102     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 600A, 10KAIC |
| DP212               | P103     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 400A, 10KAIC |
| DP221               | P202     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 400A, 10KAIC |
| DP222               | P203     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 400A, 10KAIC |
| DP231               | P302     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 400A, 10KAIC |
| DP232               | P303     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 400A, 10KAIC |
| DP241               | P402     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 400A, 10KAIC |
| DP242               | P403     | Electrical Closet       | 208/120V, 3Ø, 4W. 60HZ, 250A, 10KAIC |
| DP2L                | PB103    | Electrical Room         | 208/120V, 3Ø, 4W. 60HZ, 250A, 10KAIC |
| DP4L1               | PB103    | Electrical Room         | 480/277V, 3Ø, 4W. 60HZ, 600A, 65KAIC |
| DP4L2               | PB102    | Electrical Room         | 480/277V, 3Ø, 4W. 60HZ, 600A, 65KAIC |
| DP4L3               | PB103    | Electrical Room         | 480/277V, 3Ø, 4W. 60HZ, 400A, 65KAIC |
| DP4P1               | M501     | Mechanical              | 480/277V, 3Ø, 4W. 60HZ, 800A, 65KAIC |
| DP4P2               | M502     | Mechanical              | 480/277V, 3Ø, 4W. 60HZ, 800A, 65KAIC |
| DPLR2L              | PB104    | Emergency Electric Room | 208/120V, 3Ø, 4W. 60HZ, 10KAIC       |
| MDPEM4L             | PB104    | Emergency Electric Room | 480/277V, 3Ø, 4W. 60HZ, 225A, 65KAIC |
| MDPLR4L             | PB104    | Emergency Electric Room | 480/277V, 3Ø, 3W. 60HZ, 400A, 65KAIC |

**Table G: Distribution Panelboard Locations**

| POWER PANELS       |       |                   |                   |          |       |                   |                   |
|--------------------|-------|-------------------|-------------------|----------|-------|-------------------|-------------------|
| 208Y/120 V, 3Ø, 4W |       |                   |                   |          |       |                   |                   |
|                    | TAG   | LOCATION          |                   |          | TAG   | LOCATION          |                   |
|                    |       | RM #              | NAME              |          |       | RM #              | NAME              |
| Level 00           | P2L1  | PB102             | Electrical Closet | Level 03 | P2311 | P302              | Electrical Closet |
|                    | P2L2  | PB102             | Electrical Closet |          | P2312 | P301              | Electrical Closet |
|                    | P2L3  | PB101             | Electrical Closet |          | P2313 | P301              | Electrical Closet |
|                    | P2L4  | PB101             | Electrical Closet |          | P2314 | Q309              | Corridor          |
|                    | PR2L1 | PB101             | Electrical Closet |          | PR231 | P302              | Electrical Closet |
|                    | PR2L2 | PB103             | Electrical Room   |          | P2321 | P303              | Electrical Closet |
| Level 01           | P2111 | P102              | Electrical Closet | P2322    | P303  | Electrical Closet |                   |
|                    | P2112 | 113               | A/V Room          | P2323    | Q317  | Corridor          |                   |
|                    | P2113 | P101              | Electrical Closet | PR232    | P303  | Electrical Closet |                   |
|                    | P2114 | P101              | Electrical Closet | Level 04 | P2411 | P402              | Electrical Closet |
|                    | P2115 | 127A              | A/V Room          |          | P2412 | P401              | Electrical Closet |
|                    | PR211 | P102              | Electrical Closet |          | P2413 | P401              | Electrical Closet |
|                    | P2121 | P103              | Electrical Closet |          | P2414 | 465A              | Office Services   |
|                    | P2122 | P103              | Electrical Closet |          | PR241 | P402              | Electrical Closet |
|                    | KP21  | 131               | Servery           |          | P2421 | P403              | Electrical Closet |
| PR212              | P103  | Electrical Closet | P2422             |          | P403  | Electrical Closet |                   |
| Level 02           | P2211 | P202              | Electrical Closet |          | P2423 | Q416              | Corridor          |
|                    | P2212 | P202              | Electrical Closet |          | PR242 | P403              | Electrical Closet |
|                    | P2213 | 244               | Office Services   | PH       | P2P1  | M501              | Mechanical        |
|                    | P2214 | P201              | Electrical Closet |          | P2P2  | M502              | Mechanical        |
|                    | PR221 | P202              | Electrical Closet |          |       |                   |                   |
|                    | P2221 | P203              | Electrical Closet |          |       |                   |                   |
|                    | P2222 | P203              | Electrical Closet |          |       |                   |                   |
|                    | P2223 | 289               | Office Services   |          |       |                   |                   |
|                    | PR222 | P203              | Electrical Closet |          |       |                   |                   |

Table H: Power Panelboard Locations

| EMERGENCY PANELS   |          |                   |                    |          |                    |
|--------------------|----------|-------------------|--------------------|----------|--------------------|
| 480Y/277 V, 3Ø, 4W |          |                   | 208Y/120 V, 3Ø, 4W |          |                    |
| TAG                | LOCATION |                   | TAG                | LOCATION |                    |
|                    | RM #     | NAME              |                    | RM #     | NAME               |
| PEM41              | P101     | Electrical Closet | PEM2L              | PB104    | Emergency Electric |
| PEM44              | P402     | Electrical Closet | PEM211             | P101     | Electrical Closet  |

Table I: Emergency Panelboard Locations

| STAND-BY POWER PANELS<br>480Y/277 V, 3Ø, 4W |          |                         |
|---|----------|-------------------------|
| TAG   | LOCATION |                         |
|   | RM #     | NAME                    |
| PLR2L                                       | PB104    | Emergency Electric Room |
| PLR21                                       | P102     | Electrical Closet       |
| PLR24                                       | P401     | Electrical Closet       |

**Table J: Stand-By Power Panelboard Locations**

| LIGHTING PANELS<br>480Y/277 V, 3Ø, 4W |          |                   |
|---------------------------------------|----------|-------------------|
| TAG                                   | LOCATION |                   |
|                                       | RM #     | NAME              |
| LCP4L                                 | PB101    | Electrical Closet |
| LCP411                                | P101     | Electrical Closet |
| LCP421                                | P201     | Electrical Closet |
| LCP431                                | P301     | Electrical Closet |
| LCP441                                | P401     | Electrical Closet |

**Table K: Lighting Panelboard Locations**

**LIGHTING SYSTEM**

A great majority of the lighting is non-dimming fluorescent, though there are some exceptions. All ballasts (if applicable) are high power factor ballasts, mostly electronic. Spaces are separated into “zones” for lighting control, with multiple switches being required for all rooms greater than 500 ft<sup>2</sup>. Classrooms and conference rooms feature multi-scene control capabilities. The operating voltages are as follows:

- General Lighting: 120 V or 277 V
- Exterior Lighting →
  - Mounted < 22'-0" Above Finished Grade: 277 V
  - Mounted ≥ 22'-0" Above Finished Grade: 480 V

The Lighting Fixture Schedule can be found in Appendix B.

**NEC® 2005 BUILDING DESIGN LOADS**

The following is a comparison of the Business Building’s electrical equipment sizes and design loads to that which is required by the NFPA 70: National Electric Code® 2005 Edition (NEC® 2005). General assumptions were made when the actual information was not immediately available or too complicated for the purposes of this report. A list of those assumptions and other required calculation factors that were used are summarized below.

**ASSUMPTIONS AND LOAD FACTORS**

- “School” occupancy type (unless noted otherwise)
- 1.25 growth factor (on final panelboard loads to account for future additions)
- Copper conductors, type THHW

| TYPE                 | PF   |
|----------------------|------|
| Receptacles          | 0.80 |
| Lighting             | 0.95 |
| General Equipment    | 0.85 |
| Mechanical Equipment |      |
| 3Ø motors            | 0.90 |
| 1Ø motors: ≥ 1/10 HP | 0.85 |
| < 1/12 HP            | 0.80 |

**Table L: Power Factor Assumptions**

| LOAD TYPE   | DEMAND FACTOR |
|---|---------------|
| Lighting <sup>a</sup>                             | 1.00          |
| Receptacles <sup>b</sup> :                        |               |
| ≤ 10 kVA  | 1.00          |
| > 10 kVA  | 0.50          |
| Equipment   | 0.50          |
| Feeders <sup>c</sup> :                            |               |
| ≤ 3 VA/ft <sup>2</sup>                            | 1.00          |
| > 3 VA/ft <sup>2</sup> to ≤ 20 VA/ft <sup>2</sup> | 0.75          |
| >20 VA/ft <sup>2</sup>                            | 0.25          |

- a Table 220.42 Lighting Load Demand Factors
- b Table 220.44 Demand Factors for Non-dwelling Receptacle Loads
- c Table 220.86 Optional Method – Demand Factors for Feeders and Service-Entrance Conductors for Schools

**Table M: Demand Factors**

**OTHER NOTES**

- Though some receptacles are special types (e.g., GFI; dedicated to a specific load such as a camera; etc.), all receptacles have been treated as general non-dwelling unit receptacles for simplicity purposes.
- All supporting files like Excel spreadsheets that are presented in this report can be found in my P:\ drive.

**CALCULATIONS**

GENERAL PANELBOARD LOADS

| PANEL  | VOLTAGE | LTG    | RECEPTACLE |       | EQUIPMENT |       | SPARE | TOTAL LOADS |        |         |      |
|--------|---------|--------|------------|-------|-----------|-------|-------|-------------|--------|---------|------|
|        |         |        | CONN       | DEM   | CONN      | DEM   |       | TOTAL       | DEM    | PANEL   | AMPS |
| LCP4L  | 480/277 | 17,100 | -          | -     | -         | -     | -     | 17,100      | 17,100 | 21,375  | 25.7 |
| LCP411 | 480/277 | 31,000 | -          | -     | -         | -     | -     | 31,000      | 31,000 | 38,750  | 46.6 |
| LCP421 | 480/277 | 78,300 | -          | -     | -         | -     | 3,000 | 81,300      | 81,300 | 101,625 | 122  |
| LCP431 | 480/277 | 52,900 | -          | -     | -         | -     | -     | 52,900      | 52,900 | 66,125  | 79.5 |
| LCP441 | 480/277 | 57,200 | -          | -     | -         | -     | -     | 57,200      | 57,200 | 71,500  | 86.0 |
| KP21   | 208/120 | 1,600  | 55,102     | 32551 | 14,000    | 7,000 | -     | 70,702      | 41,151 | 51,439  | 143  |
| P2111  | 208/120 | -      | 25,510     | 17755 | 1,400     | 700   | -     | 26,910      | 18,455 | 23,069  | 64.0 |
| P2112  | 208/120 | -      | 37,600     | 23800 | 2,600     | 1,300 | -     | 40,200      | 25,100 | 31,375  | 87.1 |
| P2113  | 208/120 | -      | 60,150     | 35075 | 9,100     | 4,550 | 6,000 | 75,250      | 45,625 | 57,031  | 158  |
| P2114  | 208/120 | -      | 40,800     | 25400 | 10,400    | 5,200 | -     | 51,200      | 30,600 | 38,250  | 106  |
| P2115  | 208/120 | -      | 84,800     | 47400 | 6,400     | 3,200 | -     | 91,200      | 50,600 | 63,250  | 176  |
| P2121  | 208/120 | -      | 50,150     | 30075 | 10,200    | 5,100 | -     | 60,350      | 35,175 | 43,969  | 122  |
| P2122  | 208/120 | -      | 47,000     | 28500 | 5,600     | 2,800 | -     | 52,600      | 31,300 | 39,125  | 109  |
| P2211  | 208/120 | -      | 28,150     | 19075 | 2,000     | 1,000 | -     | 30,150      | 20,075 | 25,094  | 69.7 |
| P2212  | 208/120 | 2,000  | 31,100     | 20550 | 4,600     | 2,300 | -     | 37,700      | 24,850 | 31,063  | 86.2 |

| PANEL | VOLTAGE | LTG   | RECEPTACLE |       | EQUIPMENT |       | SPARE | TOTAL LOADS |        |        |      |
|-------|---------|-------|------------|-------|-----------|-------|-------|-------------|--------|--------|------|
|       |         |       | CONN       | DEM   | CONN      | DEM   |       | TOTAL       | DEM    | PANEL  | AMPS |
| P2213 | 208/120 | 1,200 | 15,600     | 12800 | 2,000     | 1,000 | -     | 18,800      | 15,000 | 18,750 | 52.0 |
| P2214 | 208/120 | -     | 36,000     | 23000 | 1,400     | 700   | -     | 37,400      | 23,700 | 29,625 | 82.2 |
| P2221 | 208/120 | -     | 19,200     | 14600 | 2,000     | 1,000 | -     | 21,200      | 15,600 | 19,500 | 54.1 |
| P2222 | 208/120 | 1,200 | 21,400     | 15700 | 2,800     | 1,400 | -     | 25,400      | 18,300 | 22,875 | 63.5 |
| P2223 | 208/120 | 1,200 | 28,200     | 19100 | 4,600     | 2,300 | -     | 34,000      | 22,600 | 28,250 | 78.4 |
| P2311 | 208/120 | 400   | 25,400     | 17700 | 2,000     | 1,000 | -     | 27,800      | 19,100 | 23,875 | 66.3 |
| P2312 | 208/120 | -     | 12,200     | 11100 | -         | -     | -     | 12,200      | 11,100 | 13,875 | 38.5 |
| P2313 | 208/120 | -     | 32,200     | 21100 | -         | -     | -     | 32,200      | 21,100 | 26,375 | 73.2 |
| P2314 | 208/120 | 1,200 | 20,400     | 15200 | 400       | 200   | -     | 22,000      | 16,600 | 20,750 | 57.6 |
| P2321 | 208/120 | -     | 16,600     | 13300 | -         | -     | -     | 16,600      | 13,300 | 16,625 | 46.1 |
| P2322 | 208/120 | 800   | 22,000     | 16000 | 1,800     | 900   | -     | 24,600      | 17,700 | 22,125 | 61.4 |
| P2323 | 208/120 | -     | 14,000     | 12000 | 1,600     | 800   | -     | 15,600      | 12,800 | 16,000 | 44.4 |
| P2411 | 208/120 | -     | 31,000     | 20500 | -         | -     | -     | 31,000      | 20,500 | 25,625 | 71.1 |
| P2412 | 208/120 | -     | 14,600     | 12300 | -         | -     | -     | 14,600      | 12,300 | 15,375 | 42.7 |
| P2413 | 208/120 | -     | 32,600     | 21300 | -         | -     | -     | 32,600      | 21,300 | 26,625 | 73.9 |
| P2414 | 208/120 | -     | 19,800     | 14900 | -         | -     | -     | 19,800      | 14,900 | 18,625 | 51.7 |
| P2421 | 208/120 | -     | 17,400     | 13700 | -         | -     | -     | 17,400      | 13,700 | 17,125 | 47.5 |
| P2422 | 208/120 | -     | 25,000     | 17500 | -         | -     | -     | 25,000      | 17,500 | 21,875 | 60.7 |
| P2423 | 208/120 | -     | 28,600     | 19300 | -         | -     | -     | 28,600      | 19,300 | 24,125 | 67.0 |
| P2L1  | 208/120 | -     | 30,400     | 20200 | 1,400     | 700   | -     | 31,800      | 20,900 | 26,125 | 72.5 |
| P2L2  | 208/120 | -     | 29,130     | 19565 | 7,000     | 3,500 | -     | 36,130      | 23,065 | 28,831 | 80.0 |
| P2L3  | 208/120 | -     | 44,070     | 27035 | 3,600     | 1,800 | 800   | 48,470      | 29,635 | 37,044 | 103  |
| P2L4  | 208/120 | -     | 41,220     | 25610 | 4,800     | 2,400 | -     | 46,020      | 28,010 | 35,013 | 97.2 |
| P2P1  | 208/120 | -     | 13,200     | 11600 | -         | -     | -     | 13,200      | 11,600 | 14,500 | 40.2 |
| P2P2  | 208/120 | 6,000 | 4,400      | 4400  | 400       | 200   | -     | 10,800      | 10,600 | 13,250 | 36.8 |
| PR211 | 208/120 | -     | 35,010     | 22505 | 1,400     | 700   | -     | 36,410      | 23,205 | 29,006 | 80.5 |
| PR212 | 208/120 | -     | 28,000     | 19000 | 5,600     | 2,800 | -     | 33,600      | 21,800 | 27,250 | 75.6 |
| PR221 | 208/120 | -     | 2,000      | 2000  | 2,000     | 1,000 | -     | 4,000       | 3,000  | 3,750  | 10.4 |
| PR222 | 208/120 | -     | 3,000      | 3000  | 1,800     | 900   | -     | 4,800       | 3,900  | 4,875  | 13.5 |
| PR231 | 208/120 | -     | 9,400      | 9400  | 1,600     | 800   | -     | 11,000      | 10,200 | 12,750 | 35.4 |
| PR232 | 208/120 | -     | 11,000     | 10500 | 1,600     | 800   | -     | 12,600      | 11,300 | 14,125 | 39.2 |
| PR241 | 208/120 | -     | 5,000      | 5000  | -         | -     | -     | 5,000       | 5,000  | 6,250  | 17.3 |
| PR242 | 208/120 | -     | 8,400      | 8400  | -         | -     | -     | 8,400       | 8,400  | 10,500 | 29.1 |
| PR2L1 | 208/120 | -     | 10,400     | 10200 | -         | -     | -     | 10,400      | 10,200 | 12,750 | 35.4 |
| PR2L2 | 208/120 | -     | 14,600     | 12300 | 800       | 400   | -     | 15,400      | 12,700 | 15,875 | 44.1 |
| C2L1  | 120     | 6,030 | -          | -     | -         | -     | -     | 6,030       | 6,030  | 7,538  | 20.9 |
| C2L2  | 120     | 5,400 | -          | -     | -         | -     | -     | 5,400       | 5,400  | 6,750  | 18.7 |
| C2111 | 120     | 3,230 | -          | -     | -         | -     | -     | 3,230       | 3,230  | 4,038  | 11.2 |

| PANEL               | VOLTAGE | LTG   | RECEPTACLE |     | EQUIPMENT |     | SPARE | TOTAL LOADS  |              |              |                |
|---------------------|---------|-------|------------|-----|-----------|-----|-------|--------------|--------------|--------------|----------------|
|                     |         |       | CONN       | DEM | CONN      | DEM |       | TOTAL        | DEM          | PANEL        | AMPS           |
| C2112               | 120     | 5,640 | -          | -   | -         | -   | -     | 5,640        | 5,640        | 7,050        | 19.6           |
| C2121               | 120     | 2,280 | -          | -   | -         | -   | -     | 2,280        | 2,280        | 2,850        | 7.9            |
| C2122               | 120     | 5,580 | -          | -   | -         | -   | -     | 5,580        | 5,580        | 6,975        | 19.4           |
| D2L1                | 120     | 4,170 | -          | -   | -         | -   | -     | 4,170        | 4,170        | 5,213        | 43.4           |
| D2L2                | 120     | 4,600 | -          | -   | -         | -   | -     | 4,600        | 4,600        | 5,750        | 47.9           |
| D2L3                | 120     | 4,800 | -          | -   | -         | -   | -     | 4,800        | 4,800        | 6,000        | 50.0           |
| D2121               | 120     | 3,780 | -          | -   | -         | -   | -     | 3,780        | 3,780        | 4,725        | 39.4           |
| D2122               | 120     | 3,780 | -          | -   | -         | -   | -     | 3,780        | 3,780        | 4,725        | 39.4           |
| D2111               | 120     | 3,660 | -          | -   | -         | -   | -     | 3,660        | 3,660        | 4,575        | 38.1           |
| D2112               | 120     | 3,470 | -          | -   | -         | -   | -     | 3,470        | 3,470        | 4,338        | 36.1           |
| D2113               | 120     | 7,120 | -          | -   | -         | -   | -     | 7,120        | 7,120        | 8,900        | 74.2           |
| D2114               | 120     | 6,350 | -          | -   | -         | -   | -     | 6,350        | 6,350        | 7,938        | 66.1           |
| <b>TOTALS [kVA]</b> |         |       |            |     |           |     |       | <b>1,630</b> | <b>1,192</b> | <b>1,490</b> | <b>3,956 A</b> |

Table N: General Loads

| UNIT LOAD <sup>a</sup> | TOTAL AREA              | DEMAND FACTOR <sup>b</sup> | TOTAL LOAD | DESIGN LOAD |         |
|------------------------|-------------------------|----------------------------|------------|-------------|---------|
|                        |                         |                            |            | TOTAL       | ≤ NEC®? |
| 3.0 VA/ft <sup>2</sup> | 210,000 ft <sup>2</sup> | 1.00                       | 630,000 VA | 321,990 VA  | OK      |

<sup>a</sup> Table 220.12 General Lighting Loads by Occupancy

<sup>b</sup> Table 220.42 Lighting Load Demand Factors

Table O: Lighting Load Compliance Check

MECHANICAL

| EQUIPMENT TYPE          | TAG   | VOLTS | PHAS E | HZ | AMPS   | TOTAL LOAD |       |
|-------------------------|-------|-------|--------|----|--------|------------|-------|
|                         |       |       |        |    |        | kW         | kVA   |
| Fan Coil Unit           | FCU-1 | 115   | 1      | 60 | 1.7    | 0.166      | 0.196 |
|                         | FCU-2 | 115   | 1      | 60 | 2.1    | 0.205      | 0.242 |
|                         | FCU-3 | 115   | 1      | 60 | 1/2 HP | 0.671      | 0.789 |
|                         | FCU-4 | 115   | 1      | 60 | 1 HP   | 1.341      | 1.578 |
|                         | FCU-5 | 115   | 1      | 60 | 1/2 HP | 0.671      | 0.789 |
|                         | FCU-6 | 115   | 1      | 60 | 2.6    | 0.254      | 0.299 |
| Air Handling Unit (CHW) | AHU-A | 480   | 3      | 60 | 75     | 101        | 112   |
|                         | AHU-B | 480   | 3      | 60 | 40     | 53.6       | 59.6  |
|                         | AHU-C | 480   | 3      | 60 | 75     | 101        | 112   |
|                         | AHU-D | 480   | 3      | 60 | 75     | 101        | 112   |
|                         | AHU-E | 480   | 3      | 60 | 75     | 101        | 112   |
|                         | AHU-F | 480   | 3      | 60 | 40     | 53.6       | 59.6  |
|                         | AHU-G | 480   | 3      | 60 | 50     | 67.1       | 74.5  |
|                         | AHU-H | 480   | 3      | 60 | 50     | 67.1       | 74.5  |
|                         | AHU-I | 480   | 3      | 60 | 50     | 67.1       | 74.5  |
|                         | AHU-J | 480   | 3      | 60 | 20     | 26.8       | 29.8  |

| EQUIPMENT TYPE                    | TAG    | VOLTS | PHASE | HZ  | MHP  | TOTAL LOAD |       |
|-----------------------------------|--------|-------|-------|-----|------|------------|-------|
|                                   |        |       |       |     |      | kW         | kVA   |
| Fan                               | RF-1   | 480   | 3     | 60  | 30   | 40.2       | 44.7  |
|                                   | RF-2   | 480   | 3     | 60  | 15   | 20.1       | 22.4  |
|                                   | RF-3   | 480   | 3     | 60  | 30   | 40.2       | 44.7  |
|                                   | RF-4   | 480   | 3     | 60  | 30   | 40.2       | 44.7  |
|                                   | RF-5   | 480   | 3     | 60  | 30   | 40.2       | 44.7  |
|                                   | RF-6   | 480   | 3     | 60  | 20   | 26.8       | 29.8  |
|                                   | RF-7   | 480   | 3     | 60  | 30   | 40.2       | 44.7  |
|                                   | RF-8   | 480   | 3     | 60  | 25   | 33.5       | 37.3  |
|                                   | RF-9   | 480   | 3     | 60  | 25   | 33.5       | 37.3  |
|                                   | RF-10  | 480   | 3     | 60  | 10   | 13.4       | 14.9  |
|                                   | EX-3   | 480   | 3     | 60  | 10   | 13.4       | 14.9  |
|                                   | EX-4   | 480   | 3     | 60  | 5    | 6.71       | 7.45  |
|                                   | EX-7   | 480   | 3     | 60  | 2 ½  | 3.35       | 3.73  |
|                                   | EX-8   | 480   | 3     | 60  | 2 ½  | 3.35       | 3.73  |
|                                   | SF-1   | 480   | 3     | 60  | 5    | 6.71       | 7.45  |
| Packaged Heating/Ventilating Unit | HVU-1  | 460   | 3     | 60  | 5    | 6.71       | 7.45  |
|                                   | HVU-2a | 460   | 3     | 60  | 5    | 6.71       | 7.45  |
|                                   | HVU-2b | 460   | 3     | 60  | 5    | 6.71       | 7.45  |
| Water Pump                        | CHP-1  | 480   | 3     | 60  | 75   | 101        | 112   |
|                                   | CHP-2  | 480   | 3     | 60  | 75   | 101        | 112   |
|                                   | HWP-1  | 480   | 3     | 60  | 15   | 20.1       | 22.4  |
|                                   | HWP-2  | 480   | 3     | 60  | 15   | 20.1       | 22.4  |
|                                   | HWP-3  | 480   | 3     | 60  | 1 ½  | 2.01       | 2.24  |
|                                   | HWP-4  | 480   | 3     | 60  | 1 ½  | 2.01       | 2.24  |
|                                   | HWP-5  | 480   | 3     | 60  | 1 ½  | 2.01       | 2.24  |
|                                   | HWP-6  | 480   | 3     | 60  | 1 ½  | 2.01       | 2.24  |
|                                   | HWP-7  | 480   | 3     | 60  | 1 ½  | 2.01       | 2.24  |
| HWP-8                             | 480    | 3     | 60    | 1 ½ | 2.01 | 2.24       |       |
| Cabinet & Unit Heater             | CUH-1  | 120   | 1     | 60  | 1/6  | 0.224      | 0.263 |
|                                   | CUH-2  | 120   | 1     | 60  | 1/6  | 0.224      | 0.263 |
|                                   | UH-1   | 120   | 1     | 60  | 1/6  | 0.224      | 0.263 |
|                                   | CUH-3  | 120   | 1     | 60  | 1/6  | 0.224      | 0.263 |

Table P: Mechanical Loads

DISTRIBUTION PANEL LOADS

| DP4L1 |        |                        |          |      |         |              |   |  |   |
|-------|--------|------------------------|----------|------|---------|--------------|---|--|---|
| #     | ITEM   |                        | LOAD     |      |         | BREAKER      |   | FEEDER   |   |
|       | TAG    | DESCRIPTION            | CONN [W] | PF   | A       | DESIGNED     | ✓ | DESIGNED   | ✓ |
| 1     |        | SPACE                  |          |      |         | 100AF/3P     |   |  |   |
| 2     |        | SPACE                  |          |      |         | 100AF/3P     |   |  |   |
| 3     |        | SPARE                  |          |      |         | 225AF/150AT  |   |  |   |
| 4     |        | SPARE                  |          |      |         | 225AF/150AT  |   |  |   |
| 5     | DP241  | 208/120 V panel via T5 | 125,882  | 0.80 | 437 A   | 225AF/150AT  | ✓ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     |   |
| 6     | DP231  | 208/120 V panel via T5 | 114,853  | 0.80 | 398 A   | 225AF/150AT  | ✓ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     |   |
| 7     | LCP441 | 480/277 V              | 38,750   | 0.95 | 49.1 A  | 225AF/150AT  | ✓ | 10 (150 A)*  | ✓ |
| 8     | DP221  | 208/120V panel via T5  | 127,390  | 0.80 | 49 A    | 225AF/150AT  | ✓ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     |   |
| 9     | DP211  | 208/120 V panel via T7 | 377,816  | 0.80 | 1,311 A | 400AF/300AT  | ✓ | PRI 3-350 kcmil & 1-#4G, 3"C<br>SEC 4-250 kcmil & 2-#2G, 3"C |   |
|       |        |                        |          |      |         | TYPE         |   | ✓  |   |
|       |        |                        |          |      |         | Total Load   |   | 2,244 A  |   |
|       |        |                        |          |      |         | Main Breaker |   | 800AF / 600AT  |   |
| DP4L2 |        |                        |          |      |         |              |   |  |   |
| #     | ITEM   |                        | LOAD     |      |         | BREAKER      |   | FEEDER   |   |
|       | TAG    | DESCRIPTION            | CONN     | PF   | A       | DESIGNED     | ✓ | DESIGNED   | ✓ |
| 1     | LCP421 | 480/277 V              | 101,625  | 0.95 | 129 A   | 225AF/150AT  | ✓ | 10 (150 A)*  | ✓ |
| 2     | LCP4L  | 480/277 V              | 21,375   | 0.95 | 27.1 A  | 100AF/60AT   | ✓ | 2 (60 A)*  | ✓ |
| 3     | DP212  | 208/120 V panel via T5 | 239,063  | 0.80 | 829 A   | 225AF/150AT  | ✗ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     | ✗ |
| 4     | DP222  | 208/120 V panel via T5 | 88,824   | 0.80 | 308 A   | 225AF/150AT  | ✗ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     | ✗ |
| 5     | DP232  | 208/120V panel via T5  | 81,029   | 0.80 | 281 A   | 225AF/150AT  | ✗ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     | ✗ |
| 6     | DP242  | 208/120V panel via T5  | 102,206  | 0.80 | 355 A   | 225AF/150AT  | ✗ | PRI 3-#1/0 & 1-#6G, 1½"C<br>SEC 4-250 kcmil & 1-#4G, 3"C     | ✓ |
| 7     |        | Mech Lift              | 5 hp     |      |         | 100AF/20AT   | ✓ | 4-#12 & 1-#14G, ¾"C  | ✓ |
| 8     |        | SPARE                  |          |      |         | 100AF/100AT  |   |  |   |
| 9     |        | SPARE                  |          |      |         | 100AF/100AT  |   |  |   |
| #     |        | SPACE                  |          |      |         | 100AF/3P     |   |  |   |
| #     |        | SPACE                  |          |      |         | 100AF/3P     |   |  |   |
|       |        |                        |          |      |         | TYPE         |   | ✓  |   |
|       |        |                        |          |      |         | Total Load   |   | 1,929 A  |   |

| DP4L3 |       |                        |          |      |        |             |   |                       |                       |
|-------|-------|------------------------|----------|------|--------|-------------|---|-----------------------|-----------------------|
| #     | ITEM  |                        | LOAD     |      |        | BREAKER     |   | FEEDER                |                       |
|       | TAG   | DESCRIPTION            | CONNCTD  | PF   | A      | DESIGNED    | ✓ | DESIGNED              |                       |
| 1     | CHP-1 | Water Pump             | 75 hp    | 0.90 | 233 A  | 225AF/200AT | ✗ | 3-#2/0 & 1-#4G, 2"C   |                       |
| 2     | CHP-2 | Water Pump             | 75 hp    | 0.90 | 233 A  | 225AF/200AT | ✗ | 3-#2/0 & 1-#4G, 2"C   |                       |
| 3     | HWP-1 | Water Pump             | 15 hp    | 0.90 | 46.6 A | 100AF/50AT  | ✓ | 3-#8 & 1-#10G, 3/4"C  |                       |
| 4     | HWP-2 | Water Pump             | 15 hp    | 0.90 | 46.6 A | 100AF/50AT  | ✓ | 3-#8 & 1-#10G, 3/4"C  |                       |
| 5     | PR2L2 | 208/120 V panel via T3 | 15,875 W | 0.85 | 51.8 A | 100AF/60AT  | ✓ | PRI                   | 3-#4 & 1-#10G, 1"C    |
|       |       |                        |          |      |        |             |   | SEC                   | 4-#1 & 1-#8G, 1 1/2"C |
| 6     | MCC4L | Motor Control Center   | 38,410 W | 0.85 | 54.4 A | 100AF/100AT | ✓ | 5 (100 A)*            |                       |
| 7     |       | Trash Compactor        |          |      |        | 100AF/30AT  |   | 4-#10 & 1-#10G, 3/4"C |                       |
| 8     |       | Kitchen Water Heater   |          |      |        | 100AF/50AT  |   | 4-#6 & 1-#10G, 1"C    |                       |
| 9     |       | SPARE                  |          |      |        | 100AF/20AT  |   |                       |                       |
| 10    |       | Water Booster Pumps    |          |      |        | 100AF/20AT  |   |                       |                       |
| 11    |       | SPARE                  |          |      |        | 100AF/100AT |   |                       |                       |
| 12    |       | SPACE                  |          |      |        |             |   |                       |                       |

| TYPE         |               |
|--------------|---------------|
| Total Load   | 665 A         |
| Main Breaker | 800AF / 600AT |

| DP2L |       |                    |          |      |        |             |   |             |  |
|------|-------|--------------------|----------|------|--------|-------------|---|-------------|--|
| #    | ITEM  |                    | LOAD     |      |        | BREAKER     |   | FEEDER      |  |
|      | TAG   | DESCRIPTION        | CONNCTD  | PF   | A      | DESIGNED    | ✓ | DESIGNED    |  |
| 1    | P2L1  | 208/120 V          | 26,125 W | 0.85 | 85 A   | 225AF/150AT | ✓ | 10 (150 A)* |  |
| 2    | P2L2  | 208/120 V          | 28,831 W | 0.85 | 94 A   | 225AF/150AT | ✓ | 10 (150 A)* |  |
| 3    | P2L3  | 208/120 V          | 37,044 W | 0.85 | 121 A  | 225AF/150AT | ✓ | 10 (150 A)* |  |
| 4    | P2L4  | 208/120 V          | 35,013 W | 0.85 | 114 A  | 225AF/150AT | ✓ | 10 (150 A)* |  |
| 5    | PR2L1 | 208/120 V          | 12,750 W | 0.85 | 42 A   | 100AF/60AT  | ✓ | 2 (60 A)*   |  |
| 6    | D2L1  | 120 V              | 4,170 VA |      | 34.8 A | 100AF/60AT  | ✓ | 1 (60 A)*   |  |
| 7    | D2L2  | 120 V              | 4,600 VA |      | 38.3 A | 100AF/60AT  | ✓ | 1 (60 A)*   |  |
| 8    | D2L3  | 120 V              | 4,800 VA |      | 40.0 A | 100AF/60AT  | ✓ | 1 (60 A)*   |  |
| 9    | C2L1  | 120 V              | 6,030 VA |      | 50.3 A | 100AF/60AT  | ✓ | 1 (60 A)*   |  |
| 10   | C2L2  | 120 V              | 5,400 VA |      | 45.0 A | 100AF/60AT  | ✓ | 1 (60 A)*   |  |
| 11   |       | TO RACK 1 (UPS) IN |          |      |        | 225AF/175AT |   | 12 (175 A)* |  |
| 12   |       | SERVER ROOM (LL)   |          |      |        | 225AF/175AT |   | 12 (175 A)* |  |
| 13   |       | SPACE              |          |      |        | 100AF/3P    |   |             |  |
| 14   |       | SPACE              |          |      |        | 100AF/3P    |   |             |  |

| TYPE         |               |
|--------------|---------------|
| Total Load   | 665 A         |
| Main Breaker | 800AF / 600AT |

| DP211 |       |             |          |      |        |              |                     |               |
|-------|-------|-------------|----------|------|--------|--------------|---------------------|---------------|
| #     | ITEM  |             | LOAD     |      |        | BREAKER SIZE |                     | FEEDER SIZE   |
|       | TAG   | DESCRIPTION | CONNCTD  | PF   | A      | DESIGNED     | ✓                   | DESIGNED      |
| 1     |       | SPACE       |          |      |        | 100AF/3P     |                     |               |
| 2     |       | SPACE       |          |      |        | 100AF/3P     |                     |               |
| 3     |       | SPARE       |          |      |        | 100AF/100AT  |                     |               |
| 4     |       | SPARE       |          |      |        | 100AF/100AT  |                     |               |
| 5     | C2112 | 120 V       | 5,640 W  | 0.95 | 49.5 A | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 6     | C2111 | 120 V       | 3,230 W  | 0.95 | 28.3 A | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 7     | D2114 | 120 V       | 6,350 W  | 0.95 | 55.7 A | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 8     | D2113 | 120 V       | 7,120 W  | 0.95 | 62.5 A | 100AF/60AT   | ✗                   | 1 (60 A)*     |
| 9     | D2112 | 120 V       | 3,470 W  | 0.95 | 30.4 A | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 10    | D2111 | 120 V       | 3,660 W  | 0.95 | 32.1 A | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 11    | PR211 | 208/277 V   | 29,006 W | 0.85 | 94.7 A | 100AF/100AT  | ✓                   | 6 (100 A)*    |
| 12    | P2115 | 208/277 V   | 63,250 W | 0.85 | 207 A  | 225AF/150AT  | ✗                   | 10 (150 A)*   |
| 13    | P2114 | 208/277 V   | 38,250 W | 0.85 | 125 A  | 225AF/150AT  | ✓                   | 10 (150 A)*   |
| 14    | P2113 | 208/277 V   | 57,031 W | 0.85 | 186 A  | 225AF/150AT  | ✗                   | 10 (150 A)*   |
| 15    | P2112 | 208/277 V   | 31,375 W | 0.85 | 102 A  | 225AF/150AT  | ✓                   | 10 (150 A)*   |
| 16    | P2111 | 208/277 V   | 23,069 W | 0.85 | 75.3 A | 100AF/100AT  | ✓                   | 6 (100 A)*    |
|       |       |             |          |      |        |              | <b>TYPE</b>         |               |
|       |       |             |          |      |        |              | <b>Total Load</b>   | 1,049 A       |
|       |       |             |          |      |        |              | <b>Main Breaker</b> | 800AF / 600AT |

| DP212 |           |             |          |      |         |              |                     |               |
|-------|-----------|-------------|----------|------|---------|--------------|---------------------|---------------|
| #     | DIRECTORY |             | LOAD     |      |         | BREAKER SIZE |                     | FEEDER SIZE   |
|       | TAG       | DESCRIPTION | CONNCTD  | PF   | A       | DESIGNED     | ✓                   | DESIGNED      |
| 1     | P2121     | 208/277 V   | 43,969 W | 0.85 | 143.6 A | 225AF/150AT  | ✓                   | 10 (150 A)*   |
| 2     | P2122     | 208/277 V   | 39,125 W | 0.85 | 127.8 A | 225AF/150AT  | ✓                   | 10 (150 A)*   |
| 3     | KP21      | 208/277 V   | 51,439 W | 0.85 | 168 A   | 225AF/150AT  | ✗                   | 10 (150 A)*   |
| 4     | PR212     | 208/277 V   | 27,250 W | 0.85 | 89.0 A  | 225AF/150AT  | ✓                   | 8 (125 A)*    |
| 5     | D2121     | 120 V       | 3,780 VA | 0.95 | 33.2 A  | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 6     | D2122     | 120 V       | 3,780 VA | 0.95 | 33.2 A  | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 7     | C2121     | 120 V       | 2,280 VA | 0.95 | 20.0 A  | 100AF/60AT   | ✓                   | 1 (60 A)*     |
| 8     | C2122     | 120 V       | 5,580 VA | 0.95 | 48.9 A  | 100AF/100AT  | ✓                   | 1 (60 A)*     |
| 9     |           | Mech Lift   |          |      |         | 100AF/20AT   |                     |               |
| 10    |           | SPARE       |          |      |         | 100AF/100AT  |                     |               |
| 11    |           | SPACE       |          |      |         | 100AF/3P     |                     |               |
| 12    |           | SPACE       |          |      |         | 100AF/3P     |                     |               |
|       |           |             |          |      |         |              | <b>TYPE</b>         |               |
|       |           |             |          |      |         |              | <b>Total Load</b>   | 664 A         |
|       |           |             |          |      |         |              | <b>Main Breaker</b> | 800AF / 600AT |

| DP221 |           |             |          |      |        |              |                     |               |
|-------|-----------|-------------|----------|------|--------|--------------|---------------------|---------------|
| #     | DIRECTORY |             | LOAD     |      |        | BREAKER SIZE |                     | FEEDER SIZE   |
|       | TAG       | DESCRIPTION | CONNCTD  | PF   | A      | DESIGNED     | ✓                   | DESIGNED      |
| 1     |           | SPACE       |          |      |        | 100AF/3P     |                     |               |
| 2     |           | SPACE       |          |      |        | 100AF/3P     |                     |               |
| 3     |           | SPARE       |          |      |        | 100AF/100AT  |                     |               |
| 4     |           | SPARE       |          |      |        | 100AF/100AT  |                     |               |
| 5     | PR221     | 208/277 V   | 3,750 W  | 0.85 | 12.2 A | 100AF/100AT  | ✓                   | 6 (100 A)*    |
| 6     | P2214     | 208/277 V   | 29,625 W | 0.85 | 96.7 A | 225AF/150AT  | ✓                   | 10 (150 A)*   |
| 7     | P2213     | 208/277 V   | 18,750 W | 0.85 | 61.2 A | 100AF/100AT  | ✓                   | 6 (100 A)*    |
| 8     | P2212     | 208/277 V   | 31,063 W | 0.85 | 101 A  | 225AF/150AT  | ✓                   | 10 (150 A)*   |
| 9     | P2211     | 208/277 V   | 25,094 W | 0.85 | 81.9 A | 225AF/150AT  | ✓                   | 10 (150 A)*   |
|       |           |             |          |      |        |              | <b>TYPE</b>         |               |
|       |           |             |          |      |        |              | <b>Total Load</b>   | 354 A         |
|       |           |             |          |      |        |              | <b>Main Breaker</b> | 800AF / 600AT |

| DP222 |           |             |          |      |        |              |   |               |
|-------|-----------|-------------|----------|------|--------|--------------|---|---------------|
| #     | DIRECTORY |             | LOAD     |      |        | BREAKER SIZE |   | FEEDER SIZE   |
|       | TAG       | DESCRIPTION | CONNCTD  | PF   | A      | DESIGNED     | ✓ | DESIGNED      |
| 1     | P2221     | 208/120 V   | 19,500 W | 0.85 | 63.7 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 2     | P2222     | 208/120 V   | 22,875 W | 0.85 | 74.7 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 3     | P2223     | 208/120 V   | 28,250 W | 0.85 | 92.3 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 4     | PR222     | 208/120 V   | 4,875 W  | 0.85 | 15.9 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 5     |           | SPARE       |          |      |        | 100AF/100AT  |   |               |
| 6     |           | SPARE       |          |      |        | 100AF/100AT  |   |               |
| 7     |           | SPACE       |          |      |        | 100AF/3P     |   |               |
| 8     |           | SPACE       |          |      |        | 100AF/3P     |   |               |
|       |           |             |          |      |        | TYPE         |   |               |
|       |           |             |          |      |        | Total Load   |   | 247 A         |
|       |           |             |          |      |        | Main Breaker |   | 800AF / 600AT |

| DP231 |           |             |          |      |        |              |   |               |
|-------|-----------|-------------|----------|------|--------|--------------|---|---------------|
| #     | DIRECTORY |             | LOAD     |      |        | BREAKER SIZE |   | FEEDER SIZE   |
|       | TAG       | DESCRIPTION | CONNCTD  | PF   | A      | DESIGNED     | ✓ | DESIGNED      |
| 1     |           | SPACE       |          |      |        | 100AF/3P     |   |               |
| 2     |           | SPACE       |          |      |        | 100AF/3P     |   |               |
| 3     |           | SPARE       |          |      |        | 100AF/100AT  |   |               |
| 4     |           | SPARE       |          |      |        | 100AF/100AT  |   |               |
| 5     | PR231     | 208/277 V   | 12,750 W | 0.85 | 41.6 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 6     | P2314     | 208/277 V   | 20,750 W | 0.85 | 67.8 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 7     | P2313     | 208/277 V   | 26,375 W | 0.85 | 86.1 A | 225AF/150AT  | ✓ | 10 (150 A)*   |
| 8     | P2312     | 208/277 V   | 13,875 W | 0.85 | 45.3 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 9     | P2311     | 208/277 V   | 23,875 W | 0.85 | 78.0 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
|       |           |             |          |      |        | TYPE         |   |               |
|       |           |             |          |      |        | Total Load   |   | 319 A         |
|       |           |             |          |      |        | Main Breaker |   | 800AF / 600AT |

| DP232 |           |             |          |      |        |              |   |               |
|-------|-----------|-------------|----------|------|--------|--------------|---|---------------|
| #     | DIRECTORY |             | LOAD     |      |        | BREAKER SIZE |   | FEEDER SIZE   |
|       | TAG       | DESCRIPTION | CONNCTD  | PF   | A      | DESIGNED     | ✓ | DESIGNED      |
| 1     | P2321     | 208/277 V   | 16,625 W | 0.85 | 54.3 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 2     | P2322     | 208/277 V   | 22,125 W | 0.85 | 72.3 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 3     | P2323     | 208/277 V   | 16,000 W | 0.85 | 52.2 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 4     | PR232     | 208/277 V   | 14,125 W | 0.85 | 46.1 A | 100AF/100AT  | ✓ | 6 (100 A)*    |
| 5     |           | SPARE       |          |      |        | 100AF/100AT  |   |               |
| 6     |           | SPARE       |          |      |        | 100AF/100AT  |   |               |
| 7     |           | SPACE       |          |      |        | 100AF/3P     |   |               |
| 8     |           | SPACE       |          |      |        | 100AF/3P     |   |               |
|       |           |             |          |      |        | TYPE         |   |               |
|       |           |             |          |      |        | Total Load   |   | 225 A         |
|       |           |             |          |      |        | Main Breaker |   | 800AF / 600AT |

| DP241 |           |                   |          |      |        |              |                     |                     |               |
|-------|-----------|-------------------|----------|------|--------|--------------|---------------------|---------------------|---------------|
| #     | ITEM      |                   | LOAD     |      |        | BREAKER SIZE |                     | FEEDER SIZE         |               |
|       | TAG       | DESCRIPTION       | CONNCTD  | PF   | A      | DESIGNED     | ✓                   | DESIGNED            | ✓             |
| 1     |           | SPACE             |          |      |        | 100AF/3P     |                     |                     |               |
| 2     |           | SPACE             |          |      |        | 100AF/3P     |                     |                     |               |
| 3     |           | SPARE             |          |      |        | 100AF/100AT  |                     |                     |               |
| 4     | P2P1      | 208/277 V         | 14,500 W | 0.85 | 47.4 A | 100AF/60AT   | ✓                   | 2 (60 A)*           | ✓             |
| 5     | PR241     | 208/277 V         | 6,250 W  | 0.85 | 20.4 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 6     | P2414     | 208/277 V         | 18,625 W | 0.85 | 60.8 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 7     | P2413     | 208/277 V         | 26,625 W | 0.85 | 86.9 A | 225AF/150AT  | ✓                   | 10 (150 A)*         | ✓             |
| 8     | P2412     | 208/277 V         | 15,375 W | 0.85 | 50.2 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 9     | P2411     | 208/277 V         | 25,625 W | 0.85 | 83.7 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
|       |           |                   |          |      |        |              | <b>TYPE</b>         |                     | ✓             |
|       |           |                   |          |      |        |              | <b>Total Load</b>   |                     | 349 A         |
|       |           |                   |          |      |        |              | <b>Main Breaker</b> |                     | 800AF / 600AT |
| DP242 |           |                   |          |      |        |              |                     |                     |               |
| #     | DIRECTORY |                   | LOAD     |      |        | BREAKER SIZE |                     | FEEDER SIZE         |               |
|       | TAG       | DESCRIPTION       | CONNCTD  | PF   | A      | DESIGNED     | ✓                   | DESIGNED            | ✓             |
| 1     | P2421     | 208/277 V         | 17,125 W | 0.85 | 55.9 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 2     | P2422     | 208/277 V         | 21,875 W | 0.85 | 71.4 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 3     | P2423     | 208/277 V         | 24,125 W | 0.85 | 78.8 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 4     | PR242     | 208/277 V         | 10,500 W | 0.85 | 34.3 A | 100AF/100AT  | ✓                   | 6 (100 A)*          | ✓             |
| 5     | P2P2      | 208/277 V         | 13,250 W | 0.85 | 43.3 A | 100AF/60AT   | ✓                   | 2 (60 A)*           | ✓             |
| 6     |           | SPARE             |          |      |        | 100AF/100AT  |                     |                     |               |
| 7     |           | SPACE             |          |      |        | 100AF/3P     |                     |                     |               |
| 8     |           | SPACE             |          |      |        | 100AF/3P     |                     |                     |               |
|       |           |                   |          |      |        |              | <b>TYPE</b>         |                     | ✓             |
|       |           |                   |          |      |        |              | <b>Total Load</b>   |                     | 284 A         |
|       |           |                   |          |      |        |              | <b>Main Breaker</b> |                     | 800AF / 600AT |
| DP4P1 |           |                   |          |      |        |              |                     |                     |               |
| #     | ITEM      |                   | LOAD     |      |        | BREAKER SIZE |                     | FEEDER SIZE         |               |
|       | TAG       | DESCRIPTION       | CONNCTD  | PF   | A      | DESIGNED     | ✓                   | DESIGNED            | ✓             |
| 1     | RF-1      | Fan               | 30 hp    | 0.9  | 93.1 A | 100AF/90AT   | ✗                   | 3-#4 & 1-#6G, 1"C   | ✓             |
| 2     | RF-2      | Fan               | 15 hp    | 0.9  | 46.6 A | 100AF/50AT   | ✓                   | 3-#8 & 1-#10G, ¾"C  | ✓             |
| 3     | RF-3      | Fan               | 30 hp    | 0.9  | 93.1 A | 100AF/90AT   | ✗                   | 3-#4 & 1-#6G, 1"C   | ✓             |
| 4     | RF-4      | Fan               | 30 hp    | 0.9  | 93.1 A | 100AF/90AT   | ✗                   | 3-#4 & 1-#6G, 1"C   | ✓             |
| 5     | RF-5      | Fan               | 30 hp    | 0.9  | 93.1 A | 100AF/90AT   | ✗                   | 3-#4 & 1-#6G, 1"C   | ✓             |
| 6     |           | SPARE             |          |      |        | 100AF/20AT   |                     |                     |               |
| 7     | AHU-A     | Air Handling Unit | 75 hp    | 0.9  | 233 A  | 225AF/200AT  | ✗                   | 3-#2/0 & 1-#4G, 2"C | ✓             |
| 8     | AHU-B     | Air Handling Unit | 40 hp    | 0.9  | 124 A  | 225AF/125AT  | ✓                   | 3-#3 & 1-#6G, 1½"C  | ✓             |
| 9     | AHU-C     | Air Handling Unit | 75 hp    | 0.9  | 233 A  | 225AF/200AT  | ✗                   | 3-#2/0 & 1-#4G, 2"C | ✓             |
| 10    | AHU-D     | Air Handling Unit | 75 hp    | 0.9  | 233 A  | 225AF/200AT  | ✗                   | 3-#2/0 & 1-#4G, 2"C | ✓             |
| 11    | AHU-E     | Air Handling Unit | 75 hp    | 0.9  | 233 A  | 225AF/200AT  | ✗                   | 3-#2/0 & 1-#4G, 2"C | ✓             |
| 12    |           | SPARE             |          |      |        | 100AF/60AT   |                     |                     |               |
| 13    | EX-9      | Fan               | 1.5 hp   | 0.9  | 2.24 A | 100AF/20AT   | ✓                   | 3-#12 & 1-#12G, ¾"C | ✓             |
| 14    | EX-8      | Fan               | 2.5 hp   | 0.9  | 7.76 A | 100AF/20AT   | ✓                   | 3-#12 & 1-#12G, ¾"C | ✓             |
| 15    |           | SPARE             |          |      |        | 100AF/100AT  |                     |                     |               |
| 16    |           | SPARE             |          |      |        | 100AF/100AT  |                     |                     |               |
| 17    |           | SPACE             |          |      |        | 100AF/3P     |                     |                     |               |
| 18    |           | SPACE             |          |      |        | 100AF/3P     |                     |                     |               |
|       |           |                   |          |      |        |              | <b>TYPE</b>         |                     | ✓             |
|       |           |                   |          |      |        |              | <b>Total Load</b>   |                     | 1,484 A       |
|       |           |                   |          |      |        |              | <b>Main Breaker</b> |                     | 800AF / 600AT |

| DP4P2 |       |                   |         |      |        |              |   |                     |   |
|-------|-------|-------------------|---------|------|--------|--------------|---|---------------------|---|
| #     | ITEM  |                   | LOAD    |      |        | BREAKER SIZE |   | FEEDER SIZE         |   |
|       | TAG   | DESCRIPTION       | CONNCTD | PF   | A      | DESIGNED     | ✓ | DESIGNED            | ✓ |
| 1     | AHU-F | Air Handling Unit | 40 hp   | 0.90 | 124 A  | 225AF/125AT  | ✓ | 3-#3 & 1-#6G, 1¼"C  | ✓ |
| 2     | AHU-G | Air Handling Unit | 50 hp   | 0.90 | 155 A  | 225AF/150AT  | ✓ | 3-#1 & 1-#6G, 1½"C  | ✓ |
| 3     | AHU-H | Air Handling Unit | 50 hp   | 0.90 | 155 A  | 225AF/150AT  | ✗ | 3-#1 & 1-#6G, 1½"C  | ✗ |
| 4     | AHU-I | Air Handling Unit | 50 hp   | 0.90 | 155 A  | 225AF/150AT  | ✗ | 3-#1 & 1-#6G, 1½"C  | ✗ |
| 5     | AHU-J | Air Handling Unit | 20 hp   | 0.90 | 62.1 A | 225AF/60AT   | ✓ | 3-#6 & 1-#8G, ¾"C   | ✓ |
| 6     | RF-6  | Fan               | 20 hp   | 0.90 | 62.1 A | 100AF/60AT   | ✓ | 3-#6 & 1-#8G, ¾"C   | ✓ |
| 7     | EX-7  | Fan               | 2.5 hp  | 0.90 | 7.76 A | 100AF/20AT   | ✓ | 3-#12 & 1-#12G, ¾"C | ✓ |
| 8     | RF-8  | Fan               | 25 hp   | 0.90 | 77.6 A | 100AF/70AT   | ✓ | 3-#6 & 1-#8G, ¾"C   | ✓ |
| 9     | RF-9  | Fan               | 25 hp   | 0.90 | 77.6 A | 100AF/70AT   | ✓ | 3-#6 & 1-#8G, ¾"C   | ✓ |
| 10    | RF-10 | Fan               | 10 hp   | 0.90 | 31.0 A | 100AF/30AT   | ✓ | 3-#10 & 1-#10G, ¾"C | ✓ |
| 11    | SPARE |                   |         |      |        | 100AF/100AT  |   |                     |   |
| 12    | EX-4  | Fan               | 5       | 0.90 | 15.5 A | 100AF/20AT   | ✓ | 4-#12 & 1-#12G, ¾"C | ✓ |
| 13    | EX-10 | Fan               | 1.5 hp  | 0.90 | 2.24 A | 100AF/20AT   | ✓ | 3-#12 & 1-#12G, ¾"C | ✓ |
| 14    | SPARE |                   |         |      |        | 100AF/20AT   |   |                     |   |
| 15    | SPARE |                   |         |      |        | 100AF/100AT  |   |                     |   |
| 16    | SPACE |                   |         |      |        | 100AF/3P     |   |                     |   |
| 17    | SPACE |                   |         |      |        | 100AF/3P     |   |                     |   |
|       |       |                   |         |      |        | TYPE         |   |                     | ✓ |
|       |       |                   |         |      |        | Total Load   |   | 926 A               |   |
|       |       |                   |         |      |        | Main Breaker |   | 800AF / 600AT       |   |

\* Feeder size is to be read from the feeder schedule (Table B). The value in the parenthesis indicates the feeder's nominal ampacity rating.

\*\* An assumption was made based on the pattern of other similar loads. Feeder size is to be read from the feeder schedule (Table B). The value in the parenthesis indicates the feeder's nominal ampacity rating.

**Table Q: Distribution Panel Loads**

**SERVICE FEEDER SIZES**

| TOTAL LOAD   | TOTAL AREA              | CONNECTED LOAD         | DEMAND FACTORS <sup>a</sup> |                                |                         | ADJUSTED LOAD          |
|--------------|-------------------------|------------------------|-----------------------------|--------------------------------|-------------------------|------------------------|
|              |                         |                        | ≤ 3 VA/ft <sup>2</sup>      | > 3 to ≤ 20 VA/ft <sup>2</sup> | > 20 VA/ft <sup>2</sup> |                        |
| 1,490,000 VA | 210,000 ft <sup>2</sup> | 7.1 VA/ft <sup>2</sup> | 100%                        | 75%                            | 25%                     | 6.1 VA/ft <sup>2</sup> |

<sup>a</sup> Table 220.86 Optional Method - Demand Factors for Feeders and Service-Entrance Conductors for Schools

**Table R: Service Feeder Size Calculation**

**ENVIRONMENTAL STEWARDSHIP DESIGN**

LEED certification was not attempted for this building and no special efforts were made to create a “green” electrical system that are out of the norm for Penn State. For example, the electricity is generated on campus through the steam plant, but that is not unusual for the campus. The only other potential “green design” effort that was made applies to lighting and controls.

**ASHRAE/IESNA 90.1 SHUTOFF REQUIREMENTS**

All offices, classrooms, and corridors are equipped with an occupancy sensor (motion and/or sound) and some, particularly those in offices, also come with a photocell bi-level

daylight override option. Though more detailed information was unavailable, the Business Building will not fully meet ASHRAE/IESNA 90.1's requirements if we assume it was only designed to the university's minimum requirements for general classroom and technology design and construction (per the version that was in place at the time of the Business Building's construction, but it has been updated twice since then). ASHRAE/IESNA 90.1, Article 9.4.1.1(b) states that automatic lighting shutoff control that is fulfilled by way of occupancy sensors must shut off all lights within 30 minutes of the space being vacated by the occupant; Penn State's minimum requirements state that the sensors in all instructional/classroom areas must shut off lights after about an hour of sensing no activity.

According to the limited amount of lighting controls specification information that was available, the other spaces seem to meet the requirements by using a schedule-based type of control. The exterior lighting panel is shown on the drawings as being equipped with a time clock as well as having network capabilities to allow control from the building's management system. The café signage light also had a note on the drawings as being controlled by a 24-hour time switch programmed to come on at 5:00 AM and turn off at 1:00 AM.

## **POWER FACTOR CORRECTIONS**

No special power factor correction methods could be found however, all motors smaller than 1/2 hp are specified to be capacitor-start or split-phase type, and all lighting ballasts are high power factor ballasts. These are not necessarily corrections, but they do help to bring the overall power factor closer to unity than if, for example, regular lighting ballasts had been used instead of the high power factor type.

## **DESIGN REQUIREMENTS**

The large size of the building automatically creates voltage drop concerns. To minimize this problem, power is fed to distribution panels scattered throughout the building at a relatively high voltage, then stepped down at each individual floor. The floors themselves are large also however, so significant voltage drops could still occur at the reduced voltage. This is alleviated by spreading three electrical closets across each floor to provide for different areas of that respective floor, thereby decreasing the distances that the reduced voltage would otherwise have had to cover if there were only one closet.

## **COMMUNICATION SYSTEMS**

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Telecommunications service is provided through the campus system at manhole TMH-1, located along Shortlidge Road just south of the Business Building's west entrance. Entrance to the building occurs in the mechanical/service area on the lower level and the main audio/visual (A/V) room is located just above the Emergency Electric Room.

Cable trays, both ceiling mounted and basket type, are in place for routing cables throughout the building from the individual IDF/BDF and A/V rooms that serve each floor. Computer and research labs, card access points, Ethernet infrastructure with secure wireless internet provisions, and videoconferencing are some of features of this building. Some rooms such as classrooms and the auditorium, use systems furniture that have data jacks built into the workstations.

# APPENDIX A

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Drawings





| DISTRIBUTION PANEL "DP4L3" SCHEDULE (NORMAL POWER) (LOWER LEVEL) |                               |                    |                       |        |                                 |                        |
|--|-------------------------------|--------------------|-----------------------|--------|---------------------------------|------------------------|
| 480/277 VOLTS  |                               | 3 PHASE            |                       | 3 WIRE |                                 |                        |
| MAIN BUS SIZE: 400 AMPS  |                               |                    | GROUND BUS: FULL SIZE |        |                                 |                        |
| MAIN DEVICE: M.L.O.  |                               |                    | MOUNTING: SURFACE     |        |                                 |                        |
| CIRCUIT NUMBER   | LOAD ITEM                     | OVERCURRENT DEVICE |                       |        | FEEDER SIZE                     | REMARKS                |
|  |                               | FRAME              | TRIP                  | POLE   |                                 |                        |
| 1  | CHP-1 (75HP)                  | 225                | 200                   | 3      | SEE MOTOR WIRING SCHEDULE       |                        |
| 2  | CHP-2 (75HP)                  | 225                | 200                   | 3      | SEE MOTOR WIRING SCHEDULE       | STB-BY                 |
| 3  | HWP-1 (15HP)                  | 100                | 50                    | 3      | SEE MOTOR WIRING SCHEDULE       |                        |
| 4  | HWP-2 (15HP)                  | 100                | 50                    | 3      | SEE MOTOR WIRING SCHEDULE       | STB-BY                 |
| 5  | PANEL PR2L2 VIA T3            | 100                | 60                    | 3      | SEE TRANSFORMER WIRING SCHEDULE |                        |
| 6  | MCC4L                         | 100                | 100                   | 3      | SEE RISER DIAGRAM               |                        |
| 7  | TRASH COMPACTOR               | 100                | 30                    | 3      | 4#10 & 1#10G, 3/4"C             |                        |
| 8  | KITCHEN WATER HEATER          | 100                | 50                    | 3      | 4#6 + 1#10G, 1"C                |                        |
| 9  | HOT WATER CIRCULATION PUMP #1 | 100                | 20                    | 3      | 4#12 & 1#12G, 3/4"C             |                        |
| 10   | WATER BOOSTER PUMPS           | 100                | 20                    | 3      | 4#12 & 1#12G, 3/4"C             |                        |
| 11   | HOT WATER CIRCULATION PUMP #2 | 100                | 20                    | 3      | 4#12 & 1#12G, 3/4"C             |                        |
| 12   | SPACE                         | 100                | -                     | 3      |                                 | PROVIDE BUS + HARDWARE |

| DISTRIBUTION PANEL "MDPLR4L" SCHEDULE (STANDBY POWER) (LOWER LEVEL) |                       |                    |                       |        |                                 |                        |
|---|-----------------------|--------------------|-----------------------|--------|---------------------------------|------------------------|
| 480/277 VOLTS   |                       | 3 PHASE            |                       | 3 WIRE |                                 |                        |
| MAIN BUS SIZE: 400 AMPS   |                       |                    | GROUND BUS: FULL SIZE |        |                                 |                        |
| MAIN DEVICE: M.L.O.   |                       |                    | MOUNTING: SURFACE     |        |                                 |                        |
| CIRCUIT NUMBER  | LOAD ITEM             | OVERCURRENT DEVICE |                       |        | FEEDER SIZE                     | REMARKS                |
|   |                       | FRAME              | TRIP                  | POLE   |                                 |                        |
| 1   | RF-7 (30HP)           | 100                | 90                    | 3      | SEE MOTOR WIRING SCHEDULE       |                        |
| 2   | PANEL "DPLR2L" VIA T4 | 100                | 80                    | 3      | SEE TRANSFORMER WIRING SCHEDULE |                        |
| 3   | SPARE                 | 100                | 80                    | 3      |                                 |                        |
| 4   | SPARE                 | 100                | 20                    | 3      |                                 |                        |
| 5   | ELEVATOR #1           | 225                | 150                   | 3      | SEE MOTOR WIRING SCHEDULE       | (1)(2)                 |
| 6   | ELEVATOR #2           | 225                | 150                   | 3      | SEE MOTOR WIRING SCHEDULE       | (1)(2)                 |
| 7   | ELEVATOR #3           | 225                | 150                   | 3      | SEE MOTOR WIRING SCHEDULE       | (1)(2)                 |
| 8   | SPARE                 | 100                | 100                   | 3      |                                 |                        |
| 9   | SPACE                 | 100                | -                     | 3      |                                 | PROVIDE BUS + HARDWARE |

- 1 UNDER EMERGENCY POWER ACTIVATION ONLY ONE ELEVATOR WILL WORK AT A TIME.  
2 PROVIDE CIRCUIT BREAKER WITH SHUNT TRIP WIRING. PROVIDE SHUNT TRIP WIRING TO FACP AND ELEVATOR MACHINE ROOMS.

| DISTRIBUTION PANEL "DP4P1" SCHEDULE (PENTHOUSE) |                |                    |                   |        |                           |                        |
|---|----------------|--------------------|-------------------|--------|---------------------------|------------------------|
| 480/277 VOLTS                                   |                | 3 PHASE            |                   | 4 WIRE |                           |                        |
| MAIN BUS SIZE: 800 AMPS                         |                |                    | NEUTRAL: 800AMPS  |        |                           |                        |
| MAIN DEVICE: M.L.O.                             |                |                    | MOUNTING: SURFACE |        |                           |                        |
| CIRCUIT NUMBER                                  | LOAD ITEM      | OVERCURRENT DEVICE |                   |        | FEEDER SIZE               | REMARKS                |
|   |                | FRAME              | TRIP              | POLE   |                           |                        |
| 1   | RF-1 (30HP)    | 100                | 90                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 2   | RF-2 (15HP)    | 100                | 50                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 3   | RF-3 (30HP)    | 100                | 90                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 4   | RF-4 (30HP)    | 100                | 90                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 5   | RF-5 (30HP)    | 100                | 90                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 6   | SPARE          | 100                | 20                | 3      |                           |                        |
| 7   | SFAHU-A (75HP) | 225                | 200               | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 8   | SFAHU-B (40HP) | 225                | 125               | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 9   | SFAHU-C (75HP) | 225                | 200               | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 10  | SFAHU-D (75HP) | 225                | 200               | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 11  | SFAHU-E (75HP) | 225                | 200               | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 12  | SPARE          | 100                | 60                | 3      |                           |                        |
| 13  | EX-9 (1.5HP)   | 100                | 20                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 14  | EX-8 (2.5HP)   | 100                | 20                | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 15  | SPARE          | 100                | 100               | 3      |                           |                        |
| 16  | SPARE          | 100                | 100               | 3      |                           |                        |
| 17  | SPACE          | 100                | -                 | 3      |                           | PROVIDE BUS + HARDWARE |
| 18  | SPACE          | 100                | -                 | 3      |                           | PROVIDE BUS + HARDWARE |

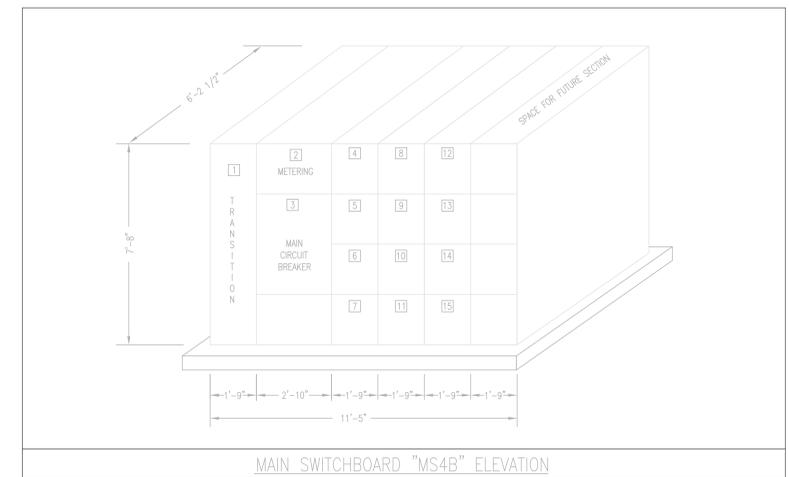
| DISTRIBUTION PANEL "DP4P2" SCHEDULE (PENTHOUSE) |                            |                    |                       |        |                           |                        |
|---|----------------------------|--------------------|-----------------------|--------|---------------------------|------------------------|
| 480/277 VOLTS                                   |                            | 3 PHASE            |                       | 4 WIRE |                           |                        |
| MAIN BUS SIZE: 600 AMPS                         |                            |                    | GROUND BUS: FULL SIZE |        |                           |                        |
| MAIN DEVICE: M.L.O.                             |                            |                    | MOUNTING: SURFACE     |        |                           |                        |
| CIRCUIT NUMBER                                  | LOAD ITEM                  | OVERCURRENT DEVICE |                       |        | FEEDER SIZE               | REMARKS                |
|   |                            | FRAME              | TRIP                  | POLE   |                           |                        |
| 1   | SF-AHU-F (40HP)            | 225                | 125                   | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 2   | SF-AHU-G (50HP)            | 225                | 150                   | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 3   | SH-AHU-H (50HP)            | 225                | 150                   | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 4   | SF-AHU-I (50HP)            | 225                | 150                   | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 5   | SF-AHU-J (20HP)            | 225                | 60                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 6   | RF-6 (20HP)                | 100                | 60                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 7   | EX-7 (2.5HP)               | 100                | 20                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 8   | RF-8 (25HP)                | 100                | 70                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 9   | RF-9 (25HP)                | 100                | 70                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 10  | RF-10 (10HP)               | 100                | 30                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 11  | SPARE                      | 100                | 100                   | 3      |                           |                        |
| 12  | EX-4                       | 100                | 20                    | 3      | 4#12 + 1#12G, 3/4"C       |                        |
| 13  | EX-10 (1.5HP)              | 100                | 20                    | 3      | SEE MOTOR WIRING SCHEDULE |                        |
| 14  | SPARE (FUTURE KITCHEN FAN) | 100                | 20                    | 3      |                           |                        |
| 15  | SPARE                      | 100                | 100                   | 3      |                           |                        |
| 16  | SPACE                      | 100                | -                     | 3      |                           | PROVIDE BUS + HARDWARE |
| 17  | SPACE                      | 100                | -                     | 3      |                           | PROVIDE BUS + HARDWARE |

| MOTOR CONTROL CENTER "MCC4L" SCHEDULE (NORMAL POWER) (LOWER LEVEL) |           |         |                  |        |       |       |                                   |             |                       |                           |                        |
|--|-----------|---------|------------------|--------|-------|-------|-----------------------------------|-------------|-----------------------|---------------------------|------------------------|
| 480 VOLTS  |           | 3 PHASE |                  | 3 WIRE |       |       |                                   |             |                       |                           |                        |
| MAIN BUS SIZE: 100 AMP   |           |         | GROUND BUS: FULL |        |       |       |                                   |             |                       |                           |                        |
| ITEM   | NAMEPLATE | HP      | KW               | FLA    | PHASE | VOLTS | BRANCH CIRCUIT OVERCURRENT DEVICE |             | MOTOR CONTROLLER TYPE | BRANCH CIRCUIT WIRING     | NOTES                  |
|  |           |         |                  |        |       |       | MCP                               | FEEDER C.B. |                       |                           |                        |
| 1  | HWP-3     | 1.5     |                  | 3      | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 2  | HWP-4     | 1.5     |                  | 3      | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 3  | HWP-5     | 1.5     |                  | 3      | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE | STB-BY                 |
| 4  | HWP-6     | 1.5     |                  | 3      | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 5  | HWP-7     | 1.5     |                  | 3      | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 6  | HWP-8     | 1.5     |                  | 3      | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE | STB-BY                 |
| 7  | HV-1      | 5       |                  | 7.6    | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 8  | EX-3      | 10      |                  | 14     | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 9  | SF-1      | 5       |                  | 7.6    | 3     | 480   | SEE SPEC.                         |             | FVNR                  | SEE MOTOR WIRING SCHEDULE |                        |
| 10   | SPARE     | 15      |                  | -      | 3     | 480   | SEE SPEC.                         |             | FVNR                  |                           |                        |
| 11   | SPACE     | -       |                  | -      | 3     | 480   | -                                 |             | -                     |                           | PROVIDE BUS + HARDWARE |
| 12   | SPACE     | -       |                  | -      | 3     | 480   | -                                 |             | -                     |                           | PROVIDE BUS + HARDWARE |

**MOTOR CONTROL CENTER LEGEND**

HP HORSE POWER  
FLA FULL LOAD AMPS  
MCP MOTOR CIRCUIT PROTECTOR  
FVNR FULL VOLTAGE NON-REVERSING TYPE  
2S2W (2) TWO SPEED (2) TWO WINDING TYPE  
2S1W (2) TWO SPEED (1) ONE WINDING TYPE  
2S2W+R (2) TWO SPEED (2) TWO WINDING PLUS REVERSE TYPE  
RVNR REDUCED VOLTAGE NON-REVERSING TYPE

| MAIN SWITCHBOARD "MS4B" SCHEDULE (LOWER LEVEL ELECTRIC ROOM) |   |                            |       |                           |           |                                |                        |
|--|---|----------------------------|-------|---------------------------|-----------|--------------------------------|------------------------|
| HORIZ. BUS: SEE SPEC. 3000A                                  |   | VERT. BUS: SEE SPEC. 3000A |       | S.C.R.: SEE SPEC.         |           | NEUT. BUS: 3000A               |                        |
| GROUND BUS: SEE SPEC.  |   | NEMA CLASS: SEE SPEC.      |       | VOLTAGE: 480/277V, 3A, 4W |           | ENCLOSURE NEMA TYPE: SEE SPEC. |                        |
| COMPT. NO.   | EQUIPMENT DESIGNATION                           | DISCONNECT DEVICE          |       |                           |           | FEEDER                         | REMARKS                |
|  |   | POLES                      | FRAME | TRIP                      | TYPE      |                                |                        |
| 1  | CABLE ENTRY SECTION                             | -                          | -     | -                         | SEE SPEC. |                                |                        |
| 2  | METERING - OWNER'S SOLID STATE METERING         | -                          | -     | -                         | SEE SPEC. |                                |                        |
| 3  | MAIN CIRCUIT BREAKER                            | 4                          | 3200A | 3000A                     | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 4  | PANEL MOPDM4L VIA ATS-EM                        | 4                          | 800A  | 150A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 5  | PANEL MDL4L VIA ATS-LR                          | 3                          | 800A  | 400A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 6  | PANEL DP4P1 (PENTHOUSE HVAC DISTRIBUTION PANEL) | 3                          | 800A  | 800A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 7  | PANEL DP4P2 (PENTHOUSE HVAC DISTRIBUTION PANEL) | 3                          | 800A  | 500A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 8  | PANEL DP4L1                                     | 4                          | 800A  | 600A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 9  | PANEL DP4L2                                     | 4                          | 800A  | 500A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 10   | TVSS UNIT                                       | 4                          | 800A  | 60A                       | SEE SPEC. | SEE SPECIFICATIONS             |                        |
| 11   | PANEL DP4L3 (MECHANICAL LOWER LEVEL)            | 3                          | 800A  | 300A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 12   | PANEL DP2L VIA T7                               | 4                          | 800A  | 300A                      | SEE SPEC. | SEE ONE LINE POWER DIAGRAM     |                        |
| 13   | SPARE   | 4                          | 800A  | 150A                      | SEE SPEC. |                                |                        |
| 14   | SPARE   | 4                          | 800A  | 150A                      | SEE SPEC. |                                |                        |
| 15   | SPACE   | 4                          | -     | -                         | SEE SPEC. |                                | PROVIDE BUS + HARDWARE |
| 16   | SPACE   | 4                          | -     | -                         | SEE SPEC. |                                | PROVIDE BUS + HARDWARE |



| MOTOR WIRING SCHEDULE (FOR SINGLE SPEED, 480 VOLT MOTORS ONLY) |                             |
|--|-----------------------------|
| HORSE POWER  | FEEDER - 480VOLT, 3A, 3WIRE |
| 1/2  | 3#12 & 1#12G - 3/4"C        |
| 3/4  | 3#12 & 1#12G - 3/4"C        |
| 1  | 3#12 & 1#12G - 3/4"C        |
| 1 1/2  | 3#12 & 1#12G - 3/4"C        |
| 2  | 3#12 & 1#12G - 3/4"C        |
| 3  | 3#12 & 1#12G - 3/4"C        |
| 5  | 3#12 & 1#12G - 3/4"C        |
| 7.5  | 3#10 & 1#10G - 3/4"C        |
| 10   | 3#10 & 1#10G - 3/4"C        |
| 15   | 3#8 & 1#8G - 3/4"C          |
| 20   | 3#6 & 1#6G - 3/4"C          |
| 25   | 3#6 & 1#6G - 3/4"C          |
| 30   | 3#4 & 1#6G - 1"C            |
| 40   | 3#3 & 1#6G - 1 1/4"C        |
| 50   | 3#1 & 1#6G - 1 1/2"C        |
| 60   | 3#1/0 & 1#6G - 1 1/2"C      |
| 75   | 3#2/0 & 1#4G - 2"C          |
| 100  | 3#3/0 & 1#3G - 2"C          |
| 125  | 3#4/0 & 1#3G - 2"C          |

# **APPENDIX B**

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## **LIGHTING FIXTURE SCHEDULE**

| TYPE      | LUMINAIRE DESCRIPTION  | MANUFACTURER/<br>CATALOG #  | LAMP<br>QTY<br>(PER<br>FIXTURE) | LAMP TYPE  | VOLTS<br>EE to<br>verify all<br>voltages | NOTES   |
|-----------|--|---|---------------------------------|--|--|---|
| EX1       | Recessed-in-ground T6 metal halide adjustable uplight with 11-11/16" dia. stainless steel trim ring, integral Aromat electronic ballast and cast aluminum housing. Provide with cast aluminum recessed housing (9-1/4" recessing depth) and sculpture lens for 5X55 degree beamsread.  | ERCO<br>Tesis Series<br>#33711.023-33953.000<br><br>Provide 33961.023<br>Recessed Housing<br><br><b>PROPRIETARY</b> | 1                               | T6 39W G8.5<br>2600 lumens<br>Philips- 'Master Color'                  | 277V                                     | <u>Exterior at Lobby Entrance Façade</u><br><i>Non-Dim</i><br>1. See Notes below.   |
| EX1 Notes | <ol style="list-style-type: none"> <li>1. Fixture to be U.L. Listed for "Wet" locations with suitable gasketing to prevent the entrance of moisture.</li> <li>2. Each light fixture, which has a linear spread lens, shall contain lens orientation locking devices to insure that lens orientation is not disturbed during future lamp replacement or cleaning.</li> <li>3. Glass used for lenses, refractors, and diffusers shall be tempered for high impact and heat resistance.</li> <li>4. Ballast shall be electronic by Aromat only.</li> <li>5. The Electrical Contractor to confirm conduit type and size.</li> <li>6. The Electrical Contractor shall aim all adjustable lighting fixtures as directed by Architect or Lighting designer in the intended direction at the time of installation.</li> <li>7. The Electrical Contractor shall provide two electricians to assist the Architect or Lighting Designer at the time aiming and adjustment is to take place, most likely beginning in the late afternoon and continuing through the evening to avoid daylight.</li> <li>8. Manufacturer to provide PVC connection for water drainage from fixture if pea gravel drainage is not available. Architect to review water drainage diagrams to assure the appropriate pitch and locations for all pipes.</li> </ol> |   |                                 |  |  |   |
| EX2       | Surface mounted metal halide cylinder with integral high power factor magnetic ballast, regressed trim with Solite lens and die cast aluminum construction. Dimensions are 7.5" diameter by 12" height by 11.94" projection.   | Gardco<br>#300-DW-L-70MH-277-Finish<br><br><b>Alternates by:<br/>BEGA<br/>Designplan</b>                            | 1                               | MCP70/U/MED/830<br>Sylvania  | 277V                                     | <u>Exterior at exits and above plaza</u>  |
| EX3       | Surface mounted compact fluorescent wall luminaire constructed of die-cast aluminum with fully gasketed tempered clear glass lens dimensions are 15-3/4" wide by 4-3/4" tall by 3-3/4" projection.   | Bega<br>2295P<br><br><b>PROPRIETARY</b>   | 1                               | PL-L27W/830  | 277V                                     | <u>Exterior Building Around Courtyard</u><br>1. Fixture mounts to standard 3-1/2" or 4" octagonal wiring box.<br>2. Architect to select finish. |
| EX4       | Surface mounted compact fluorescent wall luminaire constructed of die-cast aluminum with fully gasketed stippled tempered clear by 4-3/4" tall by 3-3/4" projection.   | Bega<br>2493P<br><br><b>PROPRIETARY</b>   | 1                               | PL-C<br>13W/830/4P/ALTO<br>Twin Tube Compact<br>Fluorescent<br>Philips | 277V                                     | <u>Exterior Buidling At Exits</u><br>1. Fixture mounts to standard 3-1/2" or 4" octagonal wiring box.<br>2. Architect to select finish.         |

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| L1   | Pendant mounted 2 lamp T8 fluorescent indirect/direct open perforated baffle fixture with integral electronic High/Low output ballast (100%/50%). One piece die-formed cold rolled steel housing with die-cast aluminum end caps, high reflectance white painted reflector pan, aircraft cable adjustable suspension. Dimensions: 9"W x 27/8"H | Corelite<br>AB-WB-2T8-<br>B232SR277S50-277-<br>AC-Cable Length-<br>Ceiling Type-Run<br>Length-ET<br><br>Universal Ballast<br>B232SR277S50<br>Ballast Factor:<br>0.88 @ 100%<br>0.48 @ 50%<br>Rapid Start<br><br><b>Alternates by:</b><br><b>Ledalite</b><br><b>Peerless</b> | 2 | FO32/830XPS/ECO<br>Osram Sylvania<br>3150 Lumens<br>20,000 hours at 3 hours<br>per start. | 277V | <u>Offices</u><br><u>Bi-Level</u><br>1. Refer to plans for length of runs.<br>2. Electrical Engineer to provide two wall switches for control of ballast. With either switch ON, light output is at 50%. With both switches ON, light output is 100%.<br>3. Aircraft cable suspension length shall be adjustable on-site to provide mounting height of 7'-6" AFF in rooms with 8'-9" ceiling height and 8'-5" in rooms with 9'-8" ceiling height.<br>4. High/Low Ballast provides two light levels with uniform distribution. |
| L1-A | Same as L1 except with HiLume 1-100% dimming ballast.  | Corelite<br>AB-WB-2T8-HiLume-<br>277-AC-Cable Length-<br>Ceiling Type-Run<br>Length-ET<br><br>Lutron HiLume Ballast<br><br><b>Alternates by:</b><br><b>Ledalite</b><br><b>Peerless</b>  | 2 | FO32/830XPS/ECO<br>Osram Sylvania<br>3150 Lumens<br>20,000 hours at 3 hours<br>per start. | 120V | <u>Conference Rooms, Classrooms</u><br><u>Dimming</u><br>1. Refer to plans for length of runs.<br>2. Aircraft cable suspension length shall be adjustable on-site to provide mounting height of 7'-6" AFF in rooms with 8'-9" ceiling height and 8'-5" in rooms with 9'-8" ceiling height.  |
| L1-B | Same as L1-A except with two circuits per run length. First 8'-0" of run shall be controlled on separate circuit.  | Corelite<br>AB-WB-2T8-2D-HiLume-<br>277-AC-Cable Length-<br>Ceiling Type-Run<br>Length-ET<br><br>Lutron HiLume Ballast<br><br><b>Alternates by:</b><br><b>Ledalite</b><br><b>Peerless</b>   | 2 | FO32/830XPS/ECO<br>Osram Sylvania<br>3150 Lumens<br>20,000 hours at 3 hours<br>per start. | 277V | <u>Labs</u><br><u>Dimming</u><br>1. Refer to plans for length of runs.<br>2. Aircraft cable suspension length shall be adjustable on-site to provide mounting height of 7'-6" AFF in rooms with 8'-9" ceiling height and 8'-5" in rooms with 9'-8" ceiling height.  |

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| L2  | <p>Recessed 2' X 2' (610mm x 610mm) fluorescent fixture with 3" (115mm) deep 9 cell matte silver parabolic louver. 5-5/8" (143mm) recessing depth. Ceiling type and size to be verified and coordinated by Contractor. Fixture complete with programmed start electronic ballast wired for high/low settings with master/slave ballast configuration. Contractor to order 50% of fixtures with two-lamp ballast and control center lamp in home fixture and center lamp in neighboring fixture. Order 50% of fixtures with four-lamp ballast and control two outer lamps in home fixture and two outer lamps in neighboring fixture.</p> | <p>Metalux #2EP3GX- 3U1-3 5/8-S33I 277</p> <p>Factory modified lamp wiring: Ballast A to control center lamps in master/slave configuration. Ballast B to control two outside lamps home fixture (master) and two outside lamps in slave fixture.</p> <p>Osram Sylvania Ballast A<br/>#QTP2X32T8/277PSN<br/>Ballast B<br/>#QTP4X32T8/277PSN<br/>0.88 Ballast Factor</p> <p><b>Alternates by:<br/>Columbia<br/>Focal Point</b></p> | 3 | <p>FBO31/830/XP<br/>Osram/Sylvania<br/>2775 Lumens<br/>24,000 hours</p> <p>Alternates by: GE</p>      | 277V | <p><u>Interior Offices</u><br/><i>Bi-Level</i></p> <ol style="list-style-type: none"> <li>1. Provide Osram Sylvania Ballast with Osram Sylvania lamp.</li> <li>2. Contractor to match trim condition with ceiling type prior to ordering fixtures.</li> <li>3. Electrical Engineer to provide switching so that switch A controls center lamp in each fixture and switch B controls two outside lamps in each fixture.</li> <li>4. Master/slave configuration to provides 2 light levels with uniform distribution.</li> </ol> |
| L2A | <p>Recessed 2' X 2' (610mm x 610mm) fluorescent fixture with 3" (115mm) deep 9 cell matte silver parabolic louver. 5-5/8" (143mm) recessing depth. Ceiling type and size to be verified and coordinated by Contractor. Fixture complete with programmed start electronic ballast wired for high/low settings with master/slave ballast configuration. Contractor to order 50% of fixtures with two-lamp ballast and control center lamp in home fixture and center lamp in neighboring fixture. Order 50% of fixtures with four-lamp ballast and control two outer lamps in home fixture and two outer lamps in neighboring fixture.</p> | <p>Metalux #2EP3GX- 2U1-2 5/8-S33I 277 EB82</p> <p>Factory modified lamp wiring: Ballast A to control left lamp in master/slave configuration. Ballast B to control right lamp in home (master) and slave fixture.</p> <p>Osram Sylvania Ballast A<br/>#QTP2X32T8/277PSN<br/>Ballast B<br/>#QTP2X32T8/277PSN<br/>0.88 Ballast Factor</p> <p><b>Alternates by:<br/>Columbia<br/>Focal Point</b></p>                                | 2 | <p>FBO31/830/XP<br/>Osram/Sylvania<br/>2775 Lumens<br/>24,000 hours</p> <p>Alternates by: GE</p>      | 277V | <p><u>Interior Offices</u><br/><i>Bi-Level</i></p> <ol style="list-style-type: none"> <li>1. Provide Osram-Sylvania Ballast with Osram Sylvania lamp.</li> <li>2. Contractor to match trim condition with ceiling type prior to ordering fixtures.</li> <li>3. Electrical Engineer to provide switching so that switch A controls center lamp in each fixture and switch B controls two outside lamps in each fixture.</li> <li>4. Master/slave configuration to provides 2 light levels with uniform distribution.</li> </ol> |
| L3  | <p>Recessed T8 linear fluorescent perimeter wall wash system consisting of 16 guage steel continuous support rail, steel housing painted matte white, curved specular aluminum reflector, extruded aluminum ceiling trim with internal aligner splines, and integral high light output instant start electronic ballast. Modified from standard product with flat plenum bracket for 8" maximum recess depth. Fixture dimension are 13.50" wide by 9" aperture by 8" recess depth.</p>   | <p>Litecontrol<br/>Wall Slot 2000<br/>#96-335-018</p> <p><i>MODIFIED FOR FLAT<br/>PLENUM BRACKET</i></p> <p>Osram Sylvania Ballast<br/>#QT2X32T8/277PLUS<br/>1.20 Ballast Factor</p> <p><b>Alternates by:<br/>Neoray<br/>Linear Lighting</b></p>  | 1 | <p>FO32/830XPS/ECO<br/>Osram Sylvania<br/>3150 Lumens<br/>24,000 hours at 12<br/>hours per start.</p> | 277V | <p><u>Corridors</u><br/><i>Non-Dim</i></p> <ol style="list-style-type: none"> <li>1. Finish of wall shall extend 13" above the finished ceiling height.</li> <li>2. Architect to confirm ceiling type compatibility with ceiling trim system.</li> <li>3. Fixture must be installed prior to ceiling installation.</li> <li>4. Manufacturer shall provide the minimum number of ballast for specified run lengths.</li> </ol>  |

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| L4    | Recessed compact fluorescent cross baffle downlight with 8" dia. aperture, white cone and blades, and integral electronic ballast. Fixture Dimensions are 17-15/16" length by 16-1/4" width by 5-1/16" recess depth.  | Prescolite<br>CFCB832THEB-STCB8ACL(White Finish on blades and cone)*GD<br><br><b>Alternates by:<br/>Gotham<br/>Kurt Versen</b> | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact Fluorescent<br>Philips | 277V | <u>Corridors, Circulation</u><br><i>Non-Dim</i>   |
| L5    | Recessed compact fluorescent open downlight with 6" dia. aperture and integral electronic ballast. Fixture Dimensions are 14-3/8" length by 11-3/4" width by 6-1/4" recess depth.   | Prescolite<br>CFT632HEB-STF602H-Trim Finish*GD<br><br><b>Alternates by:<br/>Gotham<br/>Kurt Versen</b>                         | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact Fluorescent<br>Philips | 277V | <u>Corridors, Circulation</u><br><i>Non-Dim</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>   |
| L6    | Recessed compact fluorescent open wall wash downlight with 6" dia. aperture and integral electronic ballast. Fixture Dimensions are 14-3/8" length by 11-3/4" width by 6-1/4" recess depth.   | Prescolite<br>CFT632HEB-STF602HWW-Trim Finish*GD<br><br><b>Alternates by:<br/>Gotham<br/>Kurt Versen</b>                       | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact Fluorescent<br>Philips | 277V | <u>Corridors, Circulation</u><br><i>Non-Dim</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>   |
| L6-CW | Same as type L6 except corner wallwash cone.  | Prescolite<br>CFT632HEB-STF602HCWW-Trim Finish*GD<br><br><b>Alternates by:<br/>Gotham<br/>Kurt Versen</b>                      | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact Fluorescent<br>Philips | 277V | <u>Corridors, Circulation</u><br><i>Non-Dim</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>   |
| L6-DW | Same as type L6 except double wallwash cone.  | Prescolite<br>CFT632HEB-STF602HDWW-Trim Finish*GD<br><br><b>Alternates by:<br/>Gotham<br/>Kurt Versen</b>                      | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact Fluorescent<br>Philips | 277V | <u>Corridors, Circulation</u><br><i>Non-Dim</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>   |
| L7    | Recessed 5-7/8" aperture PAR38 MH adjustable accent light with Soft Glow cone and white flange trim, integral electronic ballast by Aromat, holder for two accessories, 360° lamp assembly rotation and 45° tilt. Unit locks in place to hold aiming angles. Fixture dimensions are 15-1/2" by 18-1/4" by 10-1/4" recess depth. | Kurt Versen<br>7410-SC-WT-EBH100W-277V-FF38-2<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b>                           | 1 | CDM100/PAR38/SP/3K<br>Philips- 'Master Color'                         | 277V | <u>Atrium @ 4th Floor</u><br><i>Non-Dim</i><br>1. Maximum ceiling thickness 7/8".<br>2. Electrical Contractor shall aim fixtures at 10 degrees from nadir upon completion of installation.<br>3. Fixtures shall be aimed to prevent direct beam illumination of structural columns and other architectural elements. Direct beam illumination shall illuminate only the atrium floor. |

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| L8  | Recessed continuous two lamp fluorescent wall slot mounted in continuous lengths with 9-1/8" ceiling opening and 10-1/2" recessing depth, complete with acrylic diffuser lens, parabolic baffle and integral electronic ballast.   | Neoray<br># 70/2T8-S22-S79-Ft.-<br>Osram Sylvania Ballast<br>QTP(#Lamps)XT8UNV-<br>PSX<br>0.74 Ballast Factor<br><br><b>Alternates by:</b><br><b>Litecontrol</b><br><b>Linear Lighting</b> | 2  | FO32(25)/830XPS/ECO<br>Osram Sylvania<br>3150(2250) Lumens<br>24,000 hours at 12<br>hours per start. | 277V | <u>Restrooms</u><br><i>Non-Dim</i><br>1. Contractor to verify length of runs sizing 3'-0" and 4'-0" lamps so lamps terminate 6" from fixture ends.<br>2. If 3'-0" lamps are required, Contractor shall locate them at the ends of the run.   |
| L9  | <b>Surface mounted decorative round compact fluorescent luminaire with gloss white decorative spill rings and white translucent acrylic diffuser. Fixture dimension are 21-3/4" diameter by 4-1/2" projection.</b>   | Lightolier<br>#5543WH326U<br><br><b>PROPRIETARY</b>  | 3  | <b>PL-<br/>C26W/830/4P/ALTO<br/>Quad Tube Compact<br/>Fluorescent<br/>Philips</b>                    | 277V | <u>Restrooms</u><br><i>Non-Dim</i><br>1. Architect to verify finish.   |
| L10 | Surface mounted T8 fluorescent super slim standard strip in architectural cove with integral HiLume 1-100% dimming ballast. Steel housing with hi-gloss baked white enamel finish. Fixture dimensions are 1.875" wide by length by 2.75" height.                                   | A+L:<br>Cat# SS-STD-T8-TW<br>Length: by GC<br><br>Lutron HI-LUME 1%<br>dimming ballast<br><br><b>Alternates by:</b><br><b>Metalux</b><br><b>Lithonia</b>                                   | 1  | FO32(25)/830XPS/ECO<br>Osram Sylvania<br>3150(2250) Lumens<br>24,000 hours at 12<br>hours per start. | 277V | <u>Executive Conference Room</u><br><i>Dimming</i><br>1. Provide minimum number of ballast possible using tandem wiring between units.<br>2. Electrical Contractor to install fixtures w/ 6" overlapping stagger to eliminate socket shadows in cove.<br>3. Electrical Contractor to install fixtures within 4" of the end of the cove to prevent shadows.<br>4. Electrical Contractor shall refer to architectural details for further notes and requirements.<br>5. Inside surfaces of cove to be painted matte white. |
| L11 | DELETED  | NA   | NA | NA   | NA   | NA   |
| L12 | DELETED  | NA   | NA | NA   | NA   | NA   |
| L13 | Decorative compact fluorescent pendant. Glass shade over white glass cylinder suspended from round canopy with stain nickel details and six foot "clear stream" field cuttable cable. Fixture dimensions are 7" diameter by 9" height. Canopy is 5.3" in diameter and 1.2" height. | Tech Lighting<br>700TDECP-C-W<br><br>MODIFIED FOR CF<br>LAMPING<br><br><b>PROPRIETARY</b>  | 1  | PL-T<br>18W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips                             | 277V | <u>Reception area @ 2nd floor UG wing</u><br><i>Non-Dim</i><br>1. Electrical contractor shall install fixtures so that they align with the center of the counter.  |
| L14 | Pendant mounted linear fluorescent direct/indirect pendant with highly specular curved profile louver accessory and remote HiLume 1-100% dimming ballast. Fixture dimensions are 2.2" high by 0.9" wide with 3.1" wide by 1.75" high parabolic reflector.                          | Delray<br>Spina Pendant<br>#S44154+410<br><br><b>PROPRIETARY</b>   | 1  | FP54/835/HO/ECO<br>Osram Sylvania  | 277V | <u>Dean's Suite</u><br><i>Dimming</i><br>1. Refer to plans for length of runs.<br>2. Aircraft cable suspension length shall be adjustable on-site to provide mounting height of XX'-" AFF in rooms with 8'-9" ceiling height and XX'-" in rooms with 9'-8" ceiling height.   |
| L15 | DELETED  | NA   | NA | NA   | NA   | NA   |

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| L16    | Column mounted T6 ceramic metal halide uplight within custom enclosure. Fixture consists of standard floodlight with modified sandblast patterned lens mounted in custom enclosure with adjustable metal front cutoff shield and fixed decorative glass rear shield. Integral electronic ballast by Aromat shall be located in the arm of the enclosure. See concept dwgs for design details. | Stermer<br>Capella-5d Series<br>MOD LENS with<br>Custom Sandblast<br>pattern<br><br>WITH<br><br>Custom Enclosure by:<br>Stermer<br>Charles Loomis<br>Baldinger | 1  | T6 150W G12<br>CDM150/T6/830<br>14000 lumens<br>Philips- 'Master Color'  | 277V | <u>Lobby</u><br><i>Non-Dim</i><br>1.               |
| L17    | Recessed low voltage, lensed wall washer with 4 5/16" dia. aperture, 5-7/16" overlap trim and integral magnetic step down transformer. Fixture dimensions are 16-1/8" length by 13-3/4" width by 6 3/4" recessing depth.  | Lithonia<br>DLV-WSH-MR16-4AC-<br>LD-277V-TRW<br><br><b>Alternates by:</b><br><b>Lightolier</b><br><b>Kurt Versen</b>   | 1  | 50MR16/IR/FL40<br>Osram Sylvania   | 277V | <u>Dean's Suite</u><br><i>Dimming</i>              |
| L17-CW | Deleted   | NA   | NA | NA   | NA   | NA   |
| L18    | Recessed low voltage, open cone downlight with 4 5/16 dia. aperture, 5-7/16" overlap trim and integral magnetic step down transformer. Fixture dimensions are 16-1/8" length by 13-3/4" width by 6 3/4" recessing depth.  | Lithonia<br>DLV-DWN-MR16-4AC-<br>LD-277V-TRW<br><br><b>Alternates by:</b><br><b>Lightolier</b><br><b>Kurt Versen</b>   | 1  | 50MR16/IR/NFL25<br>Osram Sylvania  | 277V | <u>Dean's Suite</u><br><i>Dimming</i>              |
| L19    | Recessed low voltage, adjustable open cone downlight with 4 5/16 dia. aperture, 5-7/16" overlap trim and integral magnetic step down transformer. Fixture dimensions are 16-1/8" length by 13-3/4" width by 6 3/4" recessing depth.   | Lithonia<br>DLV-ADJ-MR16-4AC-<br>T30-LD-277V-TRW<br><br><b>Alternates by:</b><br><b>Lightolier</b><br><b>Kurt Versen</b>                                       | 1  | 50MR16/IR/NFL25<br>Osram Sylvania  | 277V | <u>Dean's Suite</u><br><i>Dimming</i>              |
| L20    | Decorative linear T5HO fluorescent pendant. Extruded aluminum housing suspended below sandblasted and coated laminated glass on extruded steel pendant stems. Fixture dimensions are 55.1" length by 13.8 " width x 32.7"/48.4" height. Die formed steel canopy 20.5" length.   | Louis Poulsen<br>PLATE-1/54W/T-5/HO<br>minibipin-HiLume-277V-<br>DGR MET.-suspension<br>length<br><br>Lutron HiLume Ballast<br><br><b>PROPRIETARY</b>          | 1  | FP54/830/HO/ECO<br>Osram Sylvania  | 277V | <u>Dean's office</u><br><i>Dimming</i>             |
| L21    | Semi-Recessed compact fluorescent decorative downlight with LDP trim and integral HiLume dimming ballast. Trim type to be determined. Fixture dimensions are 15.5" length by 10.5" width by 6.3" recess depth. Trim protrusion is max 2".   | Louis Poulsen<br>AH300 Series<br><br>Lutron HiLume Ballast<br><br><b>PROPRIETARY</b>   | 1  | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 277V | <u>Executive conference room</u><br><i>Dimming</i> |

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| L22   | Semi-recessed decorative downlight 10.4" dia. White opal glass diffuser with chrome plated brass trim ring and integral electronic ballast. Recess depth is 5.0".   | Louis Poulsen<br>AJ Cirkul<br>AJC-10.4"-1/32W-277V-CHR<br><br><b>PROPRIETARY</b>  | 1          | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 277V           | <u>2nd Dean office area</u><br><i>Non-Dim</i>  |
| L23   | Semi-recessed decorative downlight 20.7" dia. White opal glass diffuser with chrome plated brass trim ring and integral electronic ballast. Recess depth is 6.6".   | Louis Poulsen<br>AJ cirkul<br>AJC-20.7"-<br>1/22W/1/40/T-5 2GX13-<br>277V-CHR<br><br><b>PROPRIETARY</b>   | 1/1        | FPC22/830<br>and<br>FPC40/830<br><br>Osram Sylvania                      | 277V           | <u>2nd,3rd,and 4th floor Commons</u><br><i>Non-Dim</i>   |
| L24   | Deleted   | NA  | NA         | NA   | NA             | NA   |
| L25   | Recessed 5-7/8" aperture PAR38 MH adjustable accent light with Soft Glow cone and white flange trim, integral electronic ballast by Aromat, holder for two accessories, 360° lamp assembly rotation and 45° tilt. Unit locks in place to hold aiming angles. Fixture dimensions are 15-1/2" by 18-1/4" by 10-1/4" recess depth. | Kurt Versen<br>7410-SC-WT-<br>EBH100W-277V-FF38-<br>2<br><br><b>Alternates by:<br/>Lightolier<br/>Gotham</b>  | 1          | CDM70/PAR38/SP/3K<br>Philips- 'Master Color'                             | 277V           | <u>Lobby</u><br><i>Non-Dim</i><br>1. Maximum ceiling thickness 7/8".<br>2. Electrical Contractor shall aim fixtures at 10 degrees from nadir upon completion of installation.<br>3. Fixtures shall be aimed to prevent direct beam illumination of structural columns and other architectural elements. Direct beam illumination shall illuminate only the atrium floor. |
| L26   | <b>Floor or table lamp integrated in furniture.</b>   | <b>TBD<br/>By Architect</b>   | <b>TBD</b> | <b>TBD</b>   | <b>By E.E.</b> | <b><u>Throughout</u></b><br><b><i>Non-Dim</i></b>  |
| L27   | Recessed steplight with die cast aluminum louvers and etched tempered diffuser. Overall Dimensions: 11 13/16" W x 2 9/16" H x 4 1/4" D. Opening: 11 13/32"W x 2 7/16"H x 4"D.   | BEGA<br>2286P<br><br><b>Alternates by:<br/>Lumiere<br/>Cole</b>   | 1          | PL-S 13W/835<br>GX23 Base<br>Philips                                     | 277V           | <u>Classroom</u><br><i>Non-Dim</i>   |
| L28   | Surface mounted two circuit track as needed to be 1 13/16" X 1 7/16" and allow fixtures to be mounted anywhere along its length. Track to be field cuttable and have joiners as necessary. Finish by Architect to match clg.  | LSI:<br>Two Circuit Surface<br>Mounted Track<br>Finish: TBD<br><br><b>Alternates by:<br/>Lightolier Prospec<br/>Litelab</b>   | n.a.       | n.a.   | 277V           | <u>Lobby Skylight</u><br><i>Non-Dim</i><br>1. Finish by Architect<br>2. 277V input voltage to Track Transformer  |
| L28-A | Track mounted metal halide PAR38 wallwash fixture with aluminum housing to be 6 1/8" dia. X 6-3/8" high. Removable spread lens. Steel self-locking yoke with on/off switch. Accessories include black louver & beam softener. Finish TBD.   | LSI (Lighting Services Inc.)<br>Cat# 2907-00-<br>Accessories: Louver C,<br>Hood C, Spread Lens<br>C996 (45x50deg)<br><br><b>Alternates by:<br/>Lightolier Prospec<br/>Litelab</b> | 1          | CDM70/PAR38/FL/3K<br>Philips- 'Master Color'                             | 277V           | <u>Lobby Skylight</u><br><i>Non-Dim</i><br>1. Every other fixture will be switched separately to provide two light levels on the lobby wall.<br>2. 277V input voltage to Track Transformer   |

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| L29 | Wall mounted single lamp T5 linear continuous fixture at Atrium wall. Made up of 4'-0" length of fixture. Complete with integral ballast, rectangular canopy and 12" suspended arm. Finished to be brushed nickel.<br>Diameter is 1.125" and length as required.                               | Translite Systems<br>#SL5-1-54-IN-12"-NK<br><br><b>PROPRIETARY</b>  | 1  | FP54/830/HO/ECO<br>Osram Sylvania  | 277V | ATRIUM<br><i>Non-Dim</i>   |
| L30 | Deleted  | NA  | NA | NA   | NA   | NA   |
| L31 | Recessed fluorescent round downlight with concave lens. Fixture dimensions are 4'-0" dia and 8.625" recessing depth.   | Focal point<br>Skydome<br>#FSD44D-4T8-E-Osram<br>Sylvania<br>QTP(4X)T8PSX-277V-U-<br>CR-HW<br><br>Osram Sylvania Ballast<br>QTP4XT8UNV-PSX<br>0.74 Ballast Factor<br><br><b>Alternates by:<br/>Legion<br/>Mark Lighting</b> | 4  | FO32/830XPS/ECO<br>Osram Sylvania<br>3150 Lumens                         | 277V | 1st Floor Commons<br><i>Non-Dim</i>  |
| L32 | Deleted  | NA  | NA | NA   | NA   | NA   |
| L33 | <b>Pendant mounted compact fluorescent decorative luminaire with white concentric spun aluminum shades and integral 1-100% Lutron Hi-Lume dimming ballast. Fixture dimensions are 23.6" diameter by 5.5" high by 6'-0" max pendant length. Stem length is 16.1". Canopy is 11.0" diameter.</b> | Louis Poulsen<br>OSP-4-24W/27W/CF<br>2G11- 120-277V-WHT<br><br><b>PROPRIETARY</b>   | 4  | PL-L24W/830<br>Philips<br>Compact Fluorescent                            | 277V | <b>Cafeteria @ 1st floor</b><br><b>Dimming</b><br>1. Pendant length is to be determined in design phase of café.<br>2. Architect to verify finish.   |
| L34 | Recessed 2x2 compact fluorescent downlight with 30 cell matte louver on center and integral electronic ballast.  | Zumtobel<br>SC22-2405-C-W-120V<br><br><b>Alternates by:<br/>Linear Lighting<br/>Mark Lighting</b>   | 2  | PL-L40W/835/RS/IS<br>Philips<br>Compact Fluorescent                      | 120V | <u>Classrooms</u><br><i>Non-Dim</i>  |
| L35 | Recessed 7 1/4" conoid aperture adjustable Par 38 accentlight. Housing Dimension: 11 3/4"D x 17 1/2"W x 19 1/2"L   | Kurt Versen<br>C7311-SC*GD<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b>   | 1  | 100PAR/HIR/FL40<br>GE  | 120V | <u>Classrooms</u><br><u>Dimming</u><br>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer. |
| L36 | Recessed compact fluorescent, cross baffle downlight with 6" dia. aperture and integral electronic ballast. Fixture dimensions are 17-7/16" length by 16-1/4" width by 4-3/8".   | Prescolite<br>CFCB642THEB-<br>WTCB6ACL-Trim<br>Finish*GD<br><br><b>Alternates by:<br/>Gotham<br/>Kurt Versen</b>  | 1  | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Classrooms</u><br><i>Non-Dim</i><br>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer. |

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| L37    | Recessed 5-7/8" diameter one-lamp compact fluorescent wallwasher with Softglow clear cone and integral HiLume dimming ballast. Fixture dimensions are 19" length by 13-1/2" wide by 6" recess depth.  | Kurt Versen<br>P953-SC-GD<br>Soft Glow Clear Cone<br><br>HiLume Dimming Ballast<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b>   | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Classrooms</u><br><i>Dimming</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>   |
| L37-CW | Same as type L37 except corner wallwash cone.   | Kurt Versen<br>P953-SC-GD-C<br>Soft Glow Clear Cone<br><br>HiLume Dimming Ballast<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b>   | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Classrooms</u><br><i>Dimming</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>   |
| L38    | Recessed lensed square wallwasher for chalk board. 4 1/2" x 8 1/2" aperture. Housing dimensions: 5 1/2"D x 13 1/2"W x 18 3/4"L  | Kurt Versen<br>T4524-SC-WT*GD<br><br><b>PROPRIETARY</b>  | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Classrooms</u><br><i>Non-Dim</i>   |
| L38-A  | Recessed lensed square downlight to match chalk board wallwash. 4 1/2" x 8 1/2" aperture. Housing dimensions: 5 1/2"D x 13 1/2"W x 18 3/4"L   | Kurt Versen<br>4142-SC-WT*GD<br><br><b>PROPRIETARY</b>   | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Classrooms</u><br><i>Non-Dim</i>   |
| L39    | Recessed T8 linear fluorescent perimeter wall wash system consisting of 16 guage steel continuous support rail, steel housing painted matte white, curved specular aluminum reflector, extruded aluminum ceiling trim with internal aligner splines, and integral HiLume dimming ballast. Modified from standard product with flat plenum bracket for 8" maximum recess depth and air return function. Fixture dimension are 13.50" wide by 9" aperture by 8" recess depth. | Litecontrol<br>Wall Slot 2000<br>#96-335-018<br><br><i>MODIFIED FOR FLAT<br/>PLENUM BRACKET<br/>AND AIR RETURN TO<br/>PLENUM</i><br><br>Lutron HiLume<br>Dimming Ballast<br><br><b>Alternates by:<br/>Neoray<br/>Linear Lighting</b> | 1 | FO32/830XPS/ECO<br>Osram Sylvania<br>3150 Lumens                         | 120V | <u>Classrooms</u><br><i>Dimming</i><br>1. Finish of wall shall extend 13" above the finished ceiling height.<br>2. Architect to confirm ceiling type compatibility with ceiling trim system.<br>3. Fixture must be installed prior to ceiling installation.<br>4. Manufacturer shall provide the minimum number of ballast for specified run lengths.<br>5. Shop drawing shall clearly indicate slots for air return.<br>6. Mechanical Engineer and Architect shall verify all requirements for air function. |
| L40    | Recessed 5-7/8" conoid aperture compact fluorescent downlight in architectural slot with integral HiLume ballast. Housing dimensions: 6 1/8"D x 14"W x 18 3/4"L   | Kurt Versen<br>P922-SC<br><br>Lutron HI-LUME 1%<br>dimming ballast<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b>  | 1 | PL-T<br>42W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Auditorium @ 1st floor</u><br><i>Dimming</i>   |

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| L41 | Surface mounted T8 fluorescent super slim standard strip in perimeter architectural cove with integral HiLume 1-100% dimming ballast. Steel housing with hi-gloss baked white enamel finish. Fixture dimensions are 1.875" wide by length by 2.75" height. | A+L:<br>Cat# SS-STD-T8-<br>Length: by GC<br><br>Lutron HI-LUME 1% dimming ballast<br><br><b>Alternates by:</b><br><b>Metalux</b><br><b>Lithonia</b>        | 1  | FO32(25)/830XPS/ECO<br>Osram Sylvania<br>3150(2250) Lumens                    | 120V | <u>Auditorium @ 1st floor</u><br><i>Dimming</i><br>1. Provide minimum number of ballast possible using tandem wiring between units.<br>2. Electrical Contractor to install fixtures w/ 6" overlapping stagger to eliminate socket shadows in cove.<br>3. Electrical Contractor to install fixtures within 4" of the end of the cove to prevent shadows.<br>4. Electrical Contractor shall refer to architectural details for further notes and requirements.<br>5. Inside surfaces of cove to be painted matte white. |
| L42 | Decorative custom wall sconce and speaker enclosure recessed into plywood wall niche consisting of upper light fixture, finished faceplate with speaker cloth and opal glass, and lower speaker cavity. See architectural details for more information.    | Custom Luminaire by:<br>Charles Loomis<br>Winona<br><br>Lutron HI-LUME 1% dimming ballast  | 1  | PL-T<br>26W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips      | 120V | <u>Auditorium @ 1st floor</u><br><i>Dimming</i><br>1. Coordination of trades and details necessary,   |
| L43 | Decorative semi-recessed compact fluorescent luminaire with concentric spun aluminum polished shades and integral electronic ballast.  | Louis Poulsen<br>#Magic-2/26W-CF-<br>120/277V-Polished-<br>EMPK<br><br>PROPRIETARY   | 2  | PL-<br>C26W/830/4P/ALTO<br>Quad Tube Compact<br>Fluorescent<br>Philips        | 120V | <u>Auditorium @ 1st floor</u><br><i>Non-Dim</i><br>1. Electrical Engineer to verify emergency option and operation.   |
| L44 | Deleted  | NA   | NA | NA  | NA   | NA  |
| L45 | Surface mounted (in recessed architectural pocket) continuous cold cathode luminaire consisting of cold cathode tubing mounted into continuous finished metal enclosure with butt glazed opal glass lens in 7" aperture.                                   | National Cathode Corporation<br><br>SS24-240MA NPF System in custom enclosure with remote transformer located in the wall under benches in Elevator lobby. | 2  | Cold Cathode<br>Double Row 240MA<br>system to produce<br>1550 lumens per foot | 277V | <u>Atrium Stair Tower</u><br><i>Non-Dim</i><br>1. Architectural details must be coordinated to incorporate remote transformer.  |
| L46 | Surface mounted two circuit track as needed to be 1 13/16" X 1 7/16" and allow fixtures to be mounted anywhere along its length. Track to be field cuttable and have joiners as necessary. Finish by Architect to match clg.                               | LSI:<br>Two Circuit Surface<br>Mounted Track<br>Finish: TBD<br><br><b>Alternates by:</b><br><b>Lightolier Prospec</b><br><b>Litelab</b>                    |    | n.a.  | 277V | <u>Atrium</u><br><i>Non-Dim</i><br>1. Finish by Architect   |

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| L46-A | Track mounted metal halide PAR38 wallwash fixture with aluminum housing to be 6 1/8" dia. X 6-3/8" high. Removable spread lens. Steel self-locking yoke with on/off switch. Accessories include black louver & spread lens. Finish TBD. | LSI (Lighting Services Inc.)<br>Cat# 2907-00-<br>Accessories: Louver C, Hood C, Spread Lens C996 (45x50deg)<br><br><b>Alternates by:<br/>Lightolier Prospec<br/>Litelab</b> | 1 | CDM70/PAR38/FL/3K<br>Philips- 'Master Color'                             | 277V | Atrium<br><i>Non-Dim</i>   |
| L46-B | Track mounted metal halide PAR38 fixture with aluminum housing to be 6 1/8" dia. X 6-3/8" high. Removable spread lens. Steel self-locking yoke with on/off switch. Accessories include black louver & beam softener. Finish TBD.        | LSI (Lighting Services Inc.)<br>Cat# 2907-00-<br>Accessories: Louver C, Hood C, Beam Softener C998<br><br><b>Alternates by:<br/>Lightolier Prospec<br/>Litelab</b>          | 1 | CDM70/PAR38/SP/3K<br>Philips- 'Master Color'                             | 277V | Atrium<br><i>Non-Dim</i>   |
| L47   | Recessed compact fluorescent downlight with 4-1/2" aperture and 8-1/8" recess depth complete with integral electronic ballast. Housing dimensions are 11-1/2" by 10-1/2".   | Lightolier<br>#8011-CCD-4118VU<br><br><b>Alternates by:<br/>Edison Price</b>  | 1 | PL-T<br>18W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 277V | <u>Doorways Throughout</u><br><i>Non-Dim</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b> |
| L48   | Deleted   |   |   |  |      |  |
| L49   | Pendant mounted compact fluorescent cross baffle cylinder mounted to bridge structure. Die cast construction with integral electronic ballast. Fixture dimensions are 7.5" diameter by 12" high.  | Gardco<br>#300-DP-LL-32TRF-277-<br>Finish<br><br><b>Alternates by:<br/>BEGA<br/>Designplan</b>  | 1 | PL-T<br>32W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 277V | <u>Atrium Bridge @ 4th Floor</u><br><i>Non-Dim</i><br>1. Refer to architectural details and fixture cuts for mounting detail:<br>Contractor shall provide all hardware necessary for proper mounting and operation of this fixture.  |

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| L50 | Recessed 5-7/8" conoid aperture compact fluorescent wallwasher in architectural slot with integral HiLume ballast. Housing dimensions: 9-3/4" recess depth x 10-1/2"W x 13 1/4"L                       | Kurt Versen<br>P915-SC<br><br>Lutron HI-LUME 1% dimming ballast<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b> | 1 | PL-T<br>42W/830/4P/ALTO<br>Triple Tube Compact<br>Fluorescent<br>Philips | 120V | <u>Auditorium @ 1st floor</u><br><i>Dimming</i><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b> |
| L51 | Surface mount compact fluorescent crossbaffle downlight. Dimensions are 7-3/4" aperture by 11-1/2" diameter by 4-1/2" total projection.  | Prescolite<br>#CFSCB813EB<br><br><b>Alternates by:<br/>Gotham<br/>Lightolier</b>                                       | 2 | PL-C<br>13W/830/4P/ALTO<br>Twin Tube Compact<br>Fluorescent<br>Philips   | 277V | <u>Stairwells</u><br><b>1. Contractor shall provide samples of available trim finishes at time of shop drawing review for matching to other selected finishes by the Architect and Lighting Designer.</b>                               |
| L52 | Wall mount circular compact fluorescent luminous medallion with perforated trim, white acrylic diffuser, and integral electronic ballast. Fixture dimensions are 13-1/2" in diameter by 4" projection. | Shaper Lighting<br>#692-CF-2/26-<br>120SSB/277SSB-MW<br><br><b>Alternates by:<br/>Winona<br/>Lightolier</b>            | 2 | PL-<br>C26W/830/4P/ALTO<br>Quad Tube Compact<br>Fluorescent<br>Philips   | 277V | <u>Stairwells</u><br><b>1. Architect to verify finish.<br/>2. Electrical engineer to verify emergency operation and voltage.</b>  |