# CASINO GOLD

## EAST COAST, USA

Photo Credit: Friedmutter Group

10/14/2013

## Existing Electrical Systems


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# Existing Electrical Systems

**TECHNICAL REPORT 2**

## EXECUTIVE SUMMARY

The following report details the analysis of the electrical systems for Casino Gold. The analysis covers connected building loads, as-designed emergency systems, and even possibilities for alternate designs.

The electrical distribution system for this building is large but well designed. With a 309,000 square foot building it is important to have a reliable electrical system. The current design meets or exceeds required codes. Emergency power is provided by a diesel generator as well as two UPS systems. Almost two percent of the total building area is dedicated solely to electrical distribution rooms. A possible addition of a solar array is discussed as a way to offset some energy costs for the building. Any design alternatives would require an in-depth cost and energy analysis to show advantages for modifying the current system.

# Table of Contents

# Part 1- Criteria and Scope

## Preliminary Load Calculations

**Building Type:** Casino
**Occupancy:** A2 Assembly, B, S1
**Building Size:** 309,450 sq. ft.

**Estimated Building Loads**
Lighting: 4W/ft$^2$
Receptacle: 1W/ft$^2$
HVAC: 7W/ft$^2$
Emergency: 1W/ft$^2$
Total Estimated Load: 13W/ft$^2$, 4023kW

**Estimated Demand Factor**
Total Connected Load Estimate: 4023kW
Total Demand Load Estimate: 3,800kW
Demand Factor: 0.94

## Power Company

Baltimore Gas and Electric Company, also known as BGE

Website: www.bge.com

## Preliminary Rate Schedule and Service Voltage

Schedule GL – General Service Large-Electric, 480V Service Voltage

## Preliminary Building Utilization Voltages

- Building Utilization Voltage – 480/277 V
- Lighting – 277 volt, plus low voltage LED lighting
- Receptacle – 120 volt
- Mechanical – 480 volt 3 phase
- Special Equipment
  - IT Equipment – 120 volt
  - Fire Pumps – 208 volt
  - Elevators – 480 volt

## Emergency Power Requirements

- Exit Signs – 120V
- Exit Illumination – 277V
- Exterior Lighting – 277V
- Fire Detection and Fire Alarms – 120V
- Smoke Control Systems – 120V
- Fire Command Center Lighting and Ventilation – 120V
- Elevator Cab and Elevator Cab Lighting – 208V and 120V
- UPS System – 480V and 208V
- Security and Surveillance System – 120V

## Special Occupancy Requirements Based on NEC Chapter 5

Casino Gold houses a multi-purpose room, restaurants, dining and drinking facilities, and gaming areas that can fit well over 100 people. All of these factors lead to an Assembly occupancy type. Article 518 – Assembly Occupancies in the National Electrical Code provides special requirements for this construction. Below is a list of applicable sections of NEC Article 518.

- Emergency Systems
    - Control of emergency systems shall comply with Article 700.
- Wiring Methods
- Nonrated Construction
- Spaces with Finish Rating
- Supply

## Special Equipment Based on NEC Chapter 6

- Electric Signs – Article 600
- Elevators – Article 620
- Information Technology Equipment – Article 645
- Fire Pumps – Article 695

## Priority Assessment

- Reliability – High
- Power Quality – High
- Redundancy – Medium
- Initial Cost – Low
- Long Term Ownership Cost – Low
- Flexibility – Medium

## Back-Up Power

- Short Term Power (UPS System)
  - IT Servers
  - Communication Systems
  - Security and Surveillance Systems
- Long Term Power (Generator)
  - Emergency Lighting
  - Smoke Control System
  - Fire Detection, Alarm, and Suppression System
  - Elevators

## Special Communication Systems

- Telephone/Data Systems
- Fire Alarm
- CATV
- Access Control
- Security – Video Surveillance

## Building Services

- Telephone
- Data
- CATV
- Security – Video Surveillance

## Major Electrical Equipment

- Transformers
- Automatic Transfer Switches
- Emergency Generator
- Switchboard
- Distribution Panels
- UPS Equipment

# Part 2 – Electrical Systems as Currently Designed

## Connected Building Loads

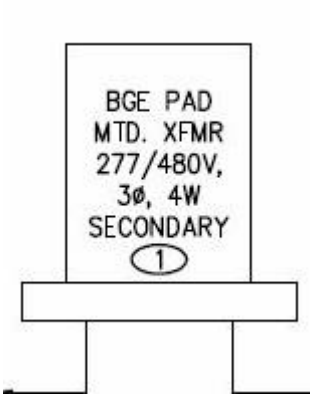
There are numerous distribution boards and panelboards throughout the casino. The distribution system can be somewhat simplified by tracing all of these connected loads back to the five main switchboards that service them. The main switchboards for Casino Gold are: MSA, MSB, MSC, MSD, and GMS1 (the generator switchboard. The loads for each of these are:

- MSA – 723 kVA
- MSB – 2226 kVA
- MSC – 1749 kVA
- MSD – 2482 kVA
- GMS1 – 318 kVA
- Total Building Load – 7498 kVA

## Power Company Rate Schedule

Schedule GL – General Service Large-Electric, 480V Service Voltage

## Building Utilization Voltages




The Power Distribution for Casino Gold begins in the Central Plant building located just outside the casino. Service from Baltimore Gas and Electric enters the Central Plant into multiple 480/277V Secondary transformers. These transformers are owned by Baltimore Gas and Electric even though they are inside of casino property. Adjacent to each transformer is a switchboard that begins a branch of the distribution system. Distributions panels are separated for emergency loads, lighting loads, high voltage loads, and low voltage loads.

- Building Utilization Voltage – 480/277 V
- Lighting – 277 volt, plus low voltage LED lighting
- Receptacle – 120 volt
- Mechanical – 480 volt 3 phase
- Special Equipment
    - IT Equipment – 120 volt
    - Fire Pumps – 208 volt
    - Elevators – 480 volt

## Emergency Power Distribution System

The emergency power for Casino Gold originates at a diesel generator. This 500kVA generator has the capability to produce 400kw of power and operates on 277/480V. Loads connected to the emergency system include:

- Fire Pump (103kVA load)
- Switchboard GMS1 (318kVA load)
    - Distribution Board 'EDBHA'
    - Distribution Board 'EDBHCP'
    - Distribution Board 'ELEV1'

Each of the distribution boards listed above has a 4-pole automatic transfer switch connected to it that operates in the event of a power loss. These boards contain emergency lighting and power panels for the casino, and they can be view in the attached single line diagrams. The total load on the generator is 421kVA, which is 506A at 480V, 3-phase.

## Special Occupancy Requirements Based on NEC Chapter 5

Casino Gold houses a multi-purpose room, restaurants, dining and drinking facilities, and gaming areas that can fit well over 100 people. All of these factors lead to an Assembly occupancy type. Article 518 – Assembly Occupancies in the National Electrical Code provides special requirements for this construction. Below is a list of applicable sections of NEC Article 518.

- Emergency Systems (Found in Drawings)
    - Control of emergency systems shall comply with Article 700.
- Wiring Methods (Found in Specifications)
- Nonrated Construction (Found in Specifications)
- Spaces with Finish Rating
- Supply (Found in Specifications)

## Special Equipment Based on NEC Chapter 6

- Electric Signs – Article 600
- Elevators – Article 620 (Found in Drawings)
- Information Technology Equipment – Article 645
- Fire Pumps – Article 695 (Found in Drawings)

## Equipment

- Main Service and Distribution Equipment
    - Panelboards
        - 480V and 208V panels, 3 phase
    - Switchboard
        - 480V, 3 phase
    - Switchgear
        - 480V, 3 phase

- Main Service Equipment
  - Single Ended, 480V, 3 phase
- Main Service Transformer
  - Indoor, Utility Owned, 277/480V Secondary, 3 phase
- Distribution Transformers
  - 480V to 208V, 3 phase
- Panelboards
  - MCB, Bolt-in, Copper
- Main Risers and Feeders
  - Wire and conduit and well as floor duct for gaming areas
- Conductors
  - Copper
- Receptacles
  - Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498
  - Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498
  - GFCI Receptacles, Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped
  - Twist Locking Receptacles, Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498
- Switch and Receptacle Faceplates
  - Both metal and plastic, mostly decorative except for back of house
- Motor Starters
  - Individual
- UPS
  - Two 480V UPS systems
    - UPS-T is 480V, 3 phase, 144kW/160KVA
    - UPS-S is 480V, 3 phase, 90kW/100kVA

## Optional Back-up Power

There do not appear to be any loads on optional back-up power, only normal and emergency.

## Special Communication Systems

- Telephone/Data Systems
- Fire Alarm
- Access Control
- Security – Video Surveillance

## Building Services

- Telephone/Data
- Security – Video Surveillance

## Dedicated Electrical Spaces

There are many electrical rooms spread throughout the casino that house Panelboards and switchboards. The following list details the area found in each room and compares that space to the total area of the building.

- Room Number – Square Footage
- B103 – 895 SF
- C105 – 877 SF
- C115 – 102 SF
- C121 – 99 SF
- C144 – 380 SF
- C158 – 120 SF
- C212 – 559 SF
- C220 – 161 SF
- C250 – 421 SF
- C262 – 118 SF
- C319 – 136 SF
- C324 – 421 SF
- Total Electrical Space – 4289 SF
- 4289 SF/309,450 SF = 1.39% of total building space is dedicated to electrical distribution

## Energy Reduction Techniques

There are no unique energy saving techniques found at this time.

## Single Line Diagrams

Single line diagrams for Casino Gold can be found at the end of the report.

# Part 3 – Evaluation and Potential Changes

## Estimated Building Load vs. Connected Building Load

- Estimated Building Load – 4023kW
- Actual Connected Load – 7498kW

When dividing the actual connected load by the total building area (309,450 SF), the $W/ft^2$ turns out to be about 24 $W/ft^2$. This shows that the initial estimate of 13$W/ft^2$ was low. This could be due in part to the dense mechanical loads required for a casino. If the mechanical load estimate was increased, a more realistic estimate could have been reached.

## Power Company Rate Schedule

BGE does not have an overly complex rate schedule and I believe that the current selection is the best choice for the casino.

## Electrical Distribution System

The initial cost of the distribution system may possibly be reduced by incorporating more electrical rooms in central locations of the building. When these central locations are added the runs will be shortened and wire sizes reduced, possibly resulting in lower cost of construction. More electrical rooms could present an architectural challenge with the layout of the gaming areas.

## Emergency Power System

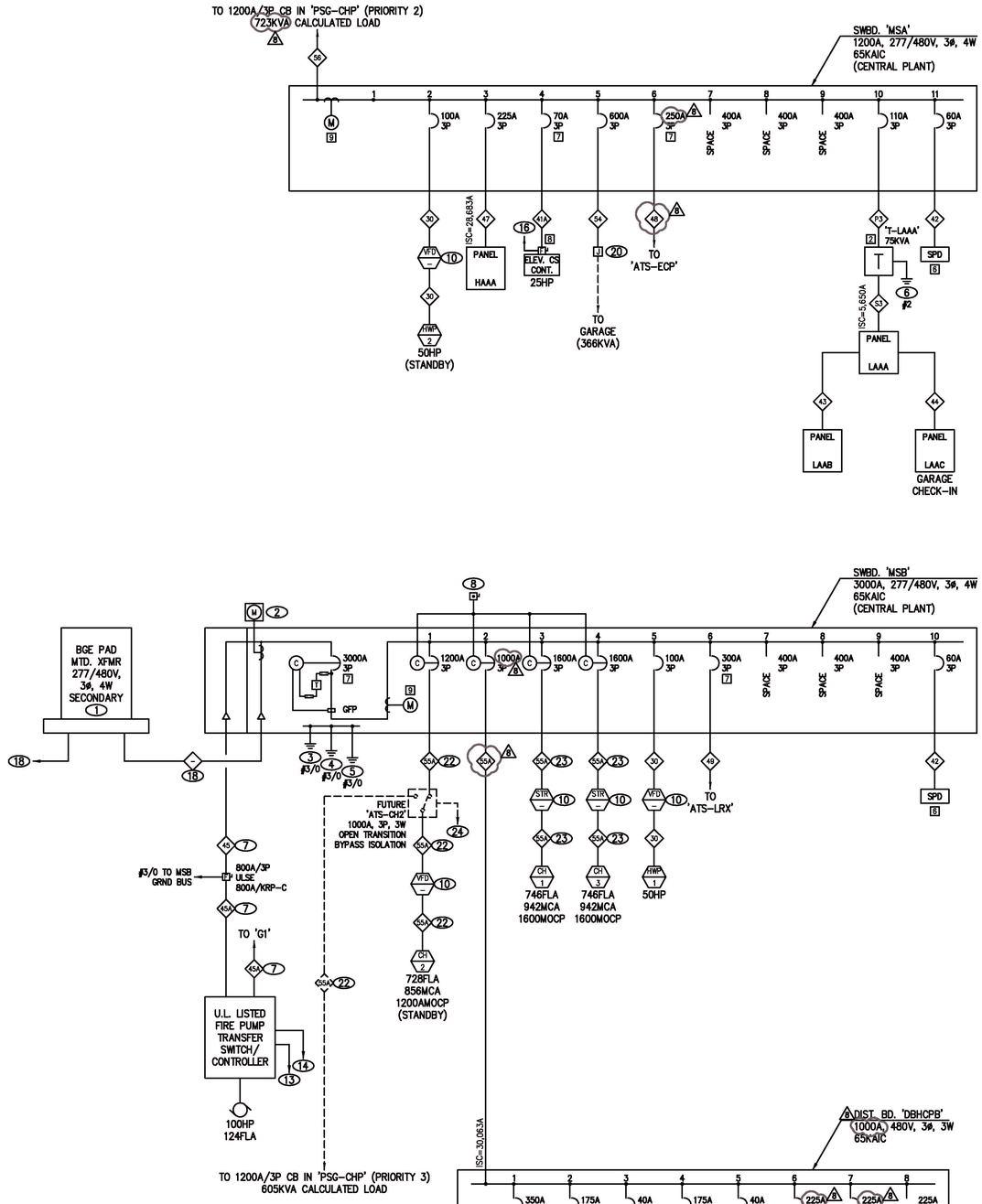
There are no discrepancies between the identified code requirements and the as-designed conditions. A possible change could be switching from a diesel generator to a natural gas generator. It may be feasible to run on natural gas that is directly piped in instead of storing large quantities of fuel on site. This type of change would require a cost analysis to find the payback period of each option.

## Cost of Ownership

With a building that runs 24/7, high quality equipment is important. A small increase in efficiency could result in long term savings. To propose equipment such as more efficient transformers, it would be necessary to calculate the amount of kWh saved each year. These savings are directly related to profit for the building owner.

## Energy Reduction

One technique to reduce the amount of energy bought from the utility could be incorporating cogeneration from a PV array. The vast amount of roof space on this building provides the ideal canvas for a large array and the surrounding buildings have low profiles. It would be important to conduct a solar study of the area to estimate the production of the array, as well as a detailed cost analysis.




## NOTICE

1. REFER TO E50.00 FOR FEEDER SCHEDULE, EQUIPMENT SCHEDULES, NOTES AND ADDITIONAL NOTICES.
2. WORK PROVIDED UNDER 'CORE AND SHELL' PACKAGE SHOWN DARK AND WORK PROVIDED BY OTHERS SHOWN DARK AND DASHED.
3. REFER TO CHP CONSULTANT ELECTRICAL DRAWINGS FOR ADDITIONAL REQUIREMENTS.

## LOAD CALCULATIONS

| | | |
|---|---|---|
| **SWBD. MSA** | | |
| HWP-2 (STANDBY) | = | 0 KVA |
| PNL HAAA | = | 150 KVA |
| ELEV. | = | 28 KVA |
| ATS-ECP | = | 142 KVA |
| GARAGE | = | 366 KVA |
| XFMR T-LAAA | = | 37 KVA |
| TOTAL | = | 723 KVA |
| | /480V, 3ø = | 870A |
| **DIST. BD. DBHCPB** | | |
| CHP-1 | = | 199 KVA |
| CT-1 | = | 80 KVA |
| CT-1 HTR | = | 24 KVA |
| CT-3 | = | 80 KVA |
| CT-3 HTR | = | 24 KVA |
| TP-1 | = | 130 KVA |
| TP-3 | = | 130 KVA |
| TOTAL | = | 667 KVA |
| | /480V, 3ø = | 802A |
| **SWBD. MSB** | | |
| FIRE PUMP | = | 103 KVA |
| CH-2 (STANDBY) | = | 0 KVA |
| DBHCPB | = | 667 KVA |
| CH-1 | = | 620 KVA |
| CH-3 | = | 620 KVA |
| HWP-1 | = | 54 KVA |
| ATS-LRX W/O ELEV. | = | 30 KVA |
| (6) ELEV. @ 28KVA X 0.79 | = | 132 KVA |
| TOTAL | = | 2226 KVA |
| | /480V, 3ø = | 2678A |
| **A SERVICE MINIMUM (PSG BY CHP ENGINEER)** | | |
| SWBD MSA | = | 723 KVA |
| DIST. BD. XDBHCP | = | 1985 KVA |
| TOTAL | = | 2708 KVA |
| | /480V, 3ø = | 3257A |
| **A SERVICE MAXIMUM (PSG BY CHP ENGINEER)** | | |
| SWBD MSA | = | 777 KVA |
| DIST. BD. XDBHCP | = | 2314 KVA |
| TOTAL | = | 3091 KVA |
| | /480V, 3ø = | 3718A |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REVISIONS

| No. | Date | Description |
|---|---|---|
| 1 | 2012.12.07 | ADDENDUM 1 |
| 2 | 2013.01.18 | PROGRESS SET |
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| 7 | 2013.07.30 | BULLETIN 3.2 |
| 8 | 2013.08.16 | BULLETIN 4 |

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Sheet Description: SINGLE LINE DIAGRAM - NORMAL POWER A & B DISTRIBUTION

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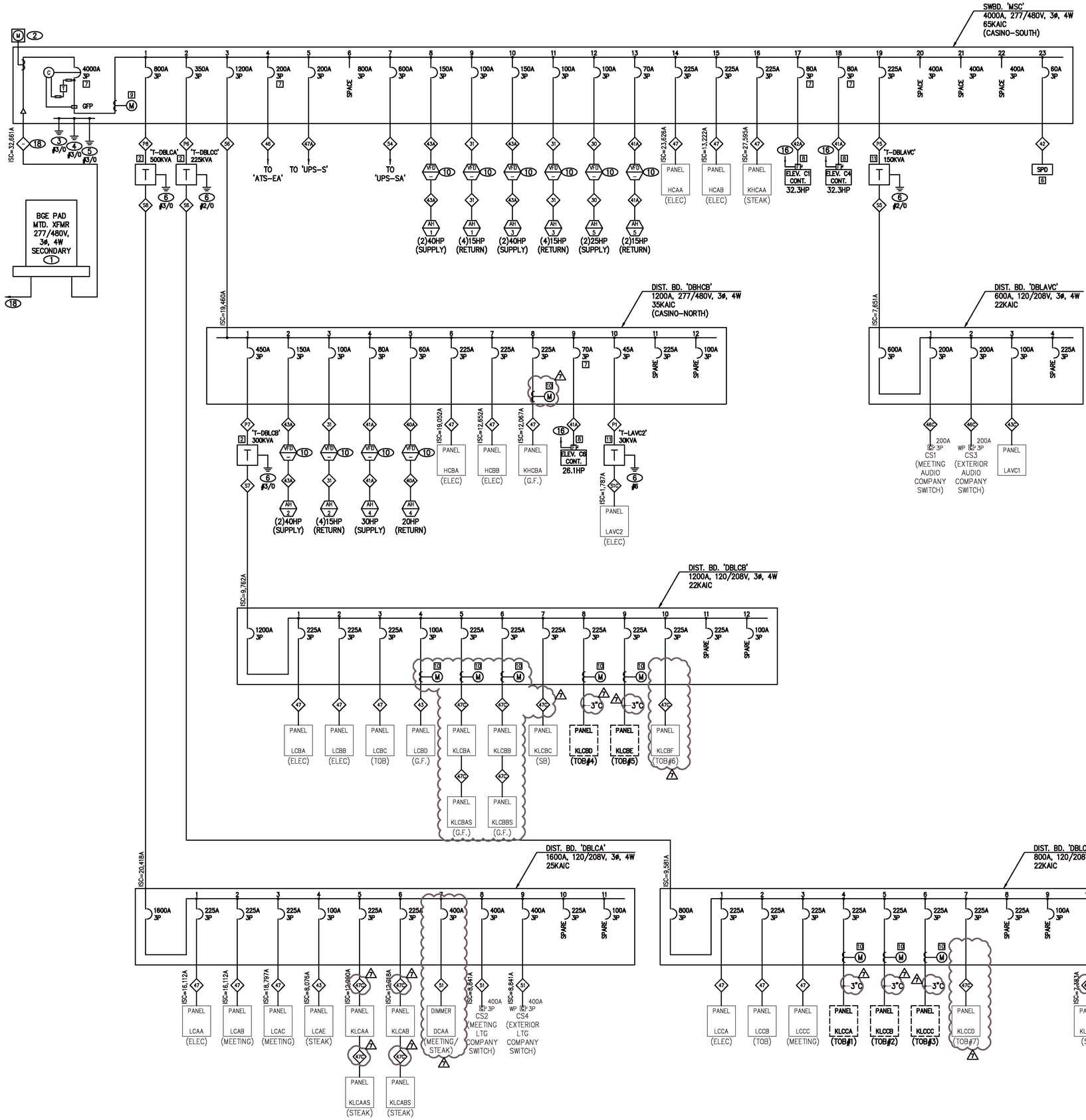
Checked By: JJW

KA/jn: 12005

Phase #

**E50.01**

Sheet #

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## LOAD CALCULATIONS

| | | |
|---|---|---|
| **DIST. BD. DBLCA** | | |
| PNL LCAA | = | 19 KVA |
| PNL LCAB | = | 8 KVA |
| PNL LCAC | = | 4 KVA |
| PNL LCAE | = | 1 KVA |
| PNLS KLCAA/KLCAAS | = | 64 KVA |
| PNLS KLCAB/KLCABS | = | 70 KVA |
| DIMMER DCAA | = | 30 KVA |
| CS2 | = | 10 KVA |
| CS4 | = | 10 KVA |
| TOTAL | = | 216 KVA /208V, 3ø = 600A |
| **DIST. BD. DBLCC** | | |
| PNL LCCA | = | 11 KVA |
| PNL LCCB | = | 12 KVA |
| PNL LCCC | = | 13 KVA |
| PNL KLCCA | = | 0 KVA |
| PNL KLCCB | = | 0 KVA |
| PNL KLCCC | = | 0 KVA |
| PNL KLCCD | = | 0 KVA |
| PNL KLCCE | = | 44 KVA |
| TOTAL | = | 80 KVA /208V, 3ø = 222A |
| **DIST. BD. DBLCB** | | |
| PNL LCBA | = | 12 KVA |
| PNL LCBB | = | 19 KVA |
| PNL LCBC | = | 9 KVA |
| PNL LCBD | = | 2 KVA |
| PNLS KLCBA/KLCBAS | = | 0 KVA |
| PNLS KLCBB/KLCBBS | = | 0 KVA |
| PNL KLCBC | = | 29 KVA |
| PNL KLCBD | = | 0 KVA |
| PNL KLCBE | = | 0 KVA |
| PNL KLCBF | = | 0 KVA |
| TOTAL | = | 71 KVA /208V, 3ø = 197A |
| **DIST. BD. DBHCB** | | |
| XFMR T–DBLCB | = | 71 KVA |
| AH–2S | = | 83 KVA |
| AH–2R | = | 72 KVA |
| AH–4S | = | 33 KVA |
| AH–4R | = | 22 KVA |
| PNL HCBA | = | 10 KVA |
| PNL HCBB | = | 4 KVA |
| PNL KHCBA | = | 0 KVA |
| ELEV. C6 | = | 28 KVA |
| XFMR T–LAVC2 | = | 2 KVA |
| TOTAL | = | 325 KVA /480V, 3ø = 391A |
| **DIST. BD. DBLAVC** | | |
| CS1 | = | 5 KVA |
| CS2 | = | 5 KVA |
| PNL LAVC1 | = | 7 KVA |
| TOTAL | = | 17 KVA /208V, 3ø = 47A |
| **SWBD. MSC** | | |
| XFMR T–DBLCA | = | 216 KVA |
| XFMR T–DBLCC | = | 80 KVA |
| DIST. BD. DBHCB W/O ELEV. | = | 297 KVA |
| (1) ELEV. @ 28KVA X 0.85 | = | 24 KVA |
| ATS–EA | = | 56 KVA |
| UPS–S | = | 67 KVA |
| UPS–SA | = | 460 KVA |
| AH–1S | = | 83 KVA |
| AH–1R | = | 72 KVA |
| AH–3S | = | 83 KVA |
| AH–3R | = | 72 KVA |
| AH–5S | = | 56 KVA |
| AH–5R | = | 36 KVA |
| PNL HCAA | = | 22 KVA |
| PNL HCAB | = | 6 KVA |
| PNL KHCAA | = | 54 KVA |
| (2) ELEV. @ 28KVA X 0.85 | = | 48 KVA |
| XFMR T–DBLAVC | = | 17 KVA |
| TOTAL | = | 1749 KVA /480V, 3ø = 2104A |


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Sheet Description: SINGLE LINE DIAGRAM - NORMAL POWER C DISTRIBUTION

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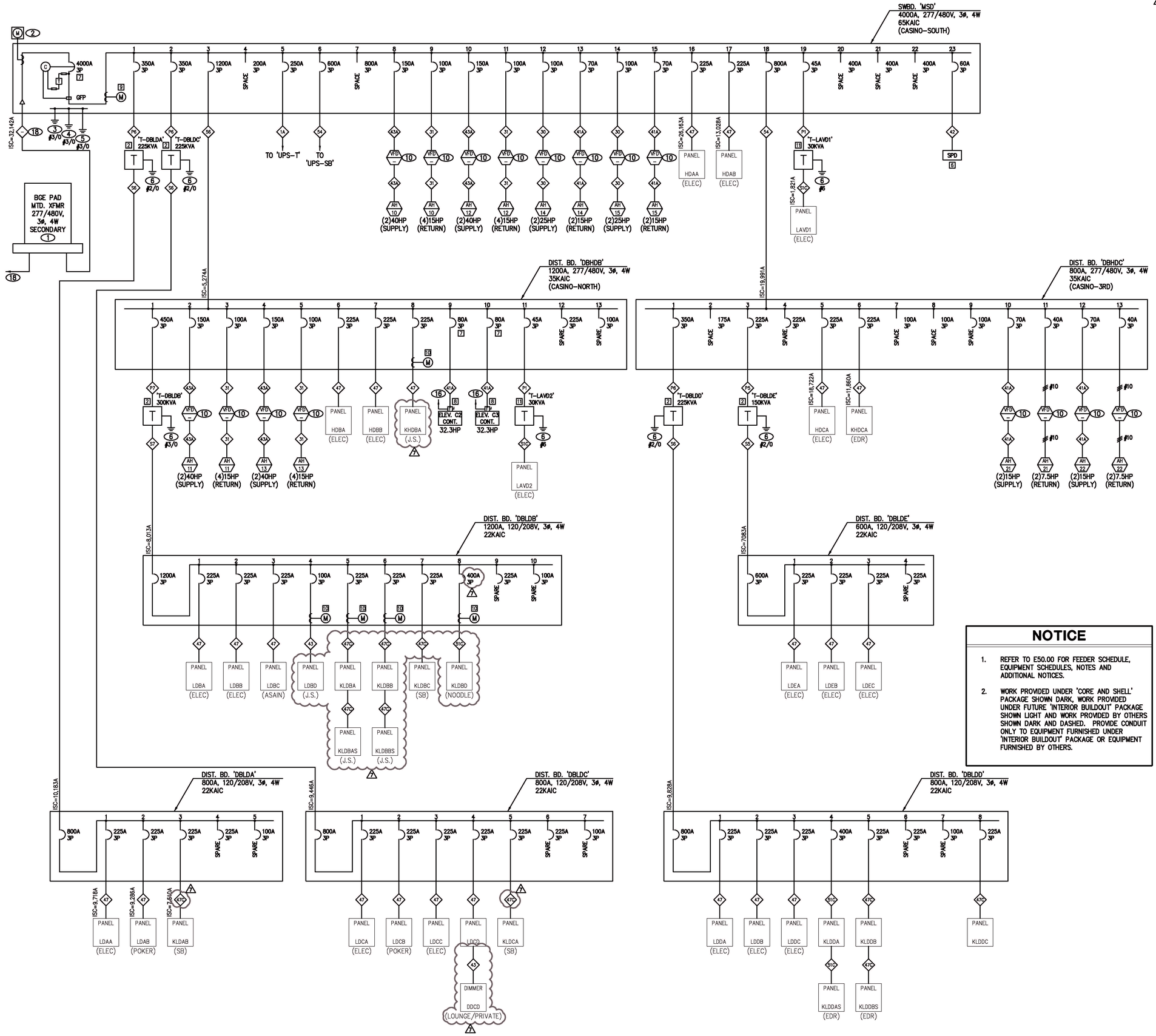
Phase #

E50.02

Sheet #

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## LOAD CALCULATIONS

**DIST. BD. DBLDA**

| | | |
|---|---|---|
| PNL LDAA | = | 17 KVA |
| PNL LDAB | = | 8 KVA |
| PNL KLDAB | = | 49 KVA |
| TOTAL | = | 74 KVA |
| | /208V, 3ø = | 205A |

**DIST. BD. DBLDC**

| | | |
|---|---|---|
| PNL LDCA | = | 7 KVA |
| PNL LDCB | = | 1 KVA |
| PNL LDCC | = | 1 KVA |
| PNL LDCD | = | 26 KVA |
| PNL KLDCA | = | 30 KVA |
| TOTAL | = | 65 KVA |
| | /208V, 3ø = | 180A |

**DIST. BD. DBLDB**

| | | |
|---|---|---|
| PNL LDBA | = | 7 KVA |
| PNL LDBB | = | 17 KVA |
| PNL LDBC | = | 8 KVA |
| PNL LDBD | = | 0 KVA |
| PNLS KLDBA/KLDBAS | = | 0 KVA |
| PNLS KLDBB/KLDBBS | = | 0 KVA |
| PNL KLDBC | = | 49 KVA |
| PNL KLDBD | = | 67 KVA |
| TOTAL | = | 148 KVA |
| | /208V, 3ø = | 411A |

**DIST. BD. DBHDB**

| | | |
|---|---|---|
| XFMR T-DBLDB | = | 148 KVA |
| AH-11S | = | 83 KVA |
| AH-11R | = | 72 KVA |
| AH-12S | = | 83 KVA |
| AH-12R | = | 72 KVA |
| PNL HDBA | = | 12 KVA |
| PNL HDBB | = | 70 KVA |
| PNL KHDBA | = | 0 KVA |
| (2) ELEV. @ 28KVA X 0.95 | = | 53 KVA |
| XFMR T-LAVD2 | = | 7 KVA |
| TOTAL | = | 600 KVA |
| | /480V, 3ø = | 722A |

**DIST. BD. DBLDD**

| | | |
|---|---|---|
| PNL LDDA | = | 16 KVA |
| PNL LDDB | = | 16 KVA |
| PNL LDDC | = | 14 KVA |
| PNLS KLDDA/KLDDAS | = | 75 KVA |
| PNLS KLDDB/KLDDBS | = | 60 KVA |
| PNLS KLDDC | = | 34 KVA |
| TOTAL | = | 215 KVA |
| | /208V, 3ø = | 597A |

**DIST. BD. DBLDE**

| | | |
|---|---|---|
| PNL LDEA | = | 6 KVA |
| PNL LDEB | = | 25 KVA |
| PNL LDEC | = | 22 KVA |
| TOTAL | = | 53 KVA |
| | /208V, 3ø = | 147A |

**DIST. BD. DBHDC**

| | | |
|---|---|---|
| XFMR T-DBLDD | = | 215 KVA |
| XFMR T-DBLDE | = | 53 KVA |
| PNL HDCA | = | 34 KVA |
| PNL KHDCA | = | 151 KVA |
| AH-21S | = | 36 KVA |
| AH-21R | = | 18 KVA |
| AH-22S | = | 36 KVA |
| AH-22R | = | 18 KVA |
| TOTAL | = | 561 KVA |
| | /480V, 3ø = | 675A |

**SWBD. MSD**

| | | |
|---|---|---|
| XFMR T-DBLDA | = | 74 KVA |
| XFMR T-DBLDC | = | 65 KVA |
| DIST. BD. DBHDB | = | 600 KVA |
| UPS-T | = | 150 KVA |
| UPS-SB | = | 466 KVA |
| AH-10S | = | 83 KVA |
| AH-10R | = | 72 KVA |
| AH-12S | = | 83 KVA |
| AH-12R | = | 72 KVA |
| AH-14S | = | 56 KVA |
| AH-14R | = | 36 KVA |
| AH-15S | = | 56 KVA |
| AH-15R | = | 36 KVA |
| PNL HDAA | = | 19 KVA |
| PNL HDAB | = | 49 KVA |
| DIST. BD. DBHDC | = | 561 KVA |
| XFMR T-LAVD1 | = | 4 KVA |
| TOTAL | = | 2482 KVA |
| | /480V, 3ø = | 2985A |


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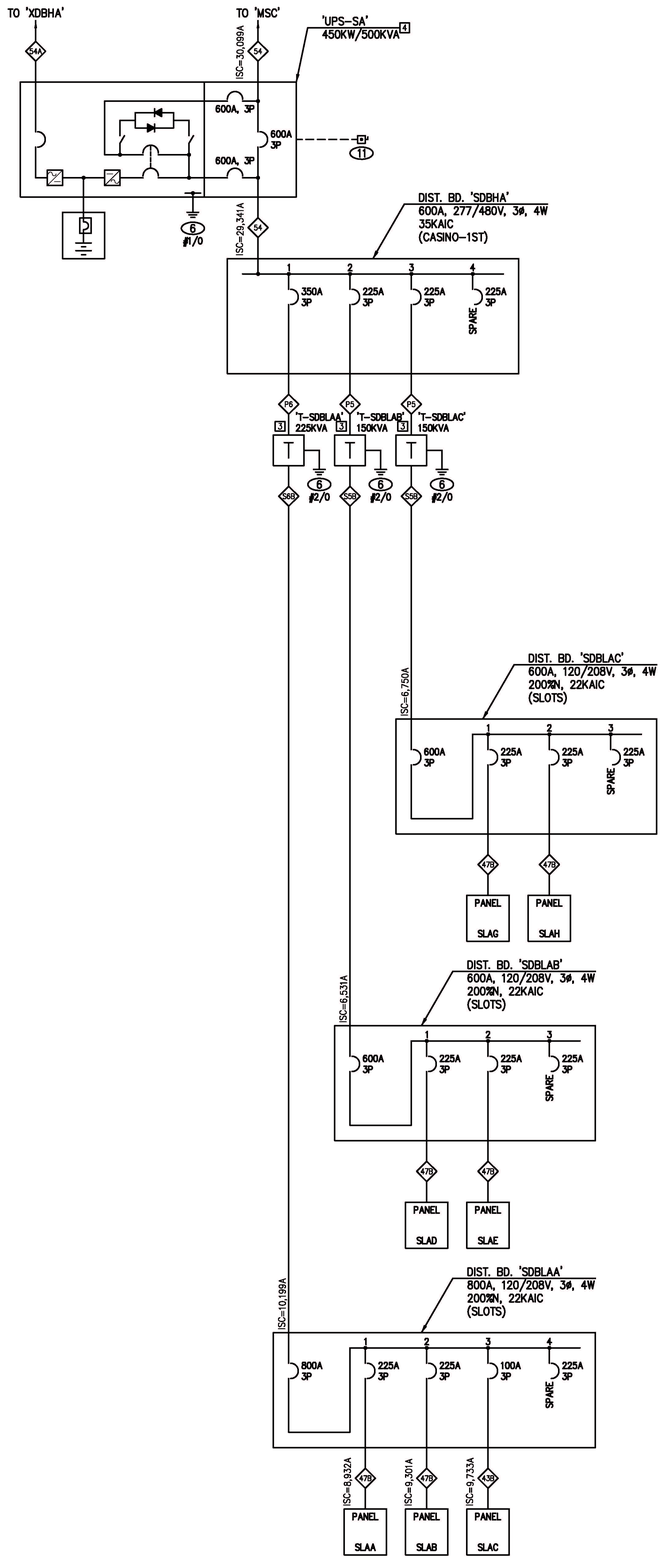
Phase #

E50.03

Sheet #

#12.0690




## NOTICE

1. REFER TO E50.00 FOR FEEDER SCHEDULE, EQUIPMENT SCHEDULES, NOTES AND ADDITIONAL NOTICES.

## LOAD CALCULATIONS

| | | |
|---|---|---|
| **DIST. BD. SDBLAA** | | |
| PNL SLAA | = | 74 KVA |
| PNL SLAB | = | 74 KVA |
| PNL SLAC | = | 74 KVA |
| TOTAL | = | 222 KVA /208V, 3ø = 616A |
| **DIST. BD. SDBLAB** | | |
| PNL SLAD | = | 51 KVA |
| PNL SLAE | = | 51 KVA |
| TOTAL | = | 102 KVA /208V, 3ø = 283A |
| **DIST. BD. SDBLAC** | | |
| PNL SLAG | = | 68 KVA |
| PNL SLAH | = | 68 KVA |
| TOTAL | = | 136 KVA /208V, 3ø = 378A |
| **DIST. BD. SDBHA** | | |
| XFMR T-SDBLAA | = | 222 KVA |
| XFMR T-SDBLAB | = | 102 KVA |
| XFMR T-SDBLAC | = | 136 KVA |
| TOTAL | = | 460 KVA /480V, 3ø = 553A |
| **DIST. BD. SDBLBA** | | |
| PNL SLBA | = | 53 KVA |
| PNL SLBB | = | 53 KVA |
| TOTAL | = | 106 KVA /208V, 3ø = 294A |
| **DIST. BD. SDBLBB** | | |
| PNL SLBD | = | 42 KVA |
| PNL SLBE | = | 42 KVA |
| TOTAL | = | 84 KVA /208V, 3ø = 233A |
| **DIST. BD. SDBLBC** | | |
| PNL SLBF | = | 55 KVA |
| PNL SLBG | = | 55 KVA |
| PNL SLBH | = | 56 KVA |
| TOTAL | = | 166 KVA /208V, 3ø = 461A |
| **DIST. BD. SDBLBD** | | |
| PNL SLBJ | = | 55 KVA |
| PNL SLBK | = | 55 KVA |
| TOTAL | = | 110 KVA /208V, 3ø = 305A |
| **DIST. BD. SDBHA** | | |
| XFMR T-SDBLBA | = | 106 KVA |
| XFMR T-SDBLBB | = | 84 KVA |
| XFMR T-SDBLBC | = | 166 KVA |
| XFMR T-SDBLBD | = | 110 KVA |
| TOTAL | = | 466 KVA /480V, 3ø = 561A |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Original Issue Date: 2012.11.16

REVISIONS

| No. | Date | Description |
|---|---|---|
| 1 | 2012.12.07 | ADDENDUM 1 |
| 2 | 2013.01.18 | PROGRESS SET |
| 3 | 2013.03.15 | SHELL PACKAGE |
| 4 | 2013.07.25 | BULLETIN 3.1 |
| 5 | 2013.08.16 | BULLETIN 4 |

Authorized Use:

- ☐ Design Development
- ☐ Progress
- ☐ Bidding
- ☒ Building Permit
- ☒ Construction

Sheet Description: SINGLE LINE DIAGRAM - SLOT POWER DISTRIBUTION

Drawn By: MB

Checked By: JJW

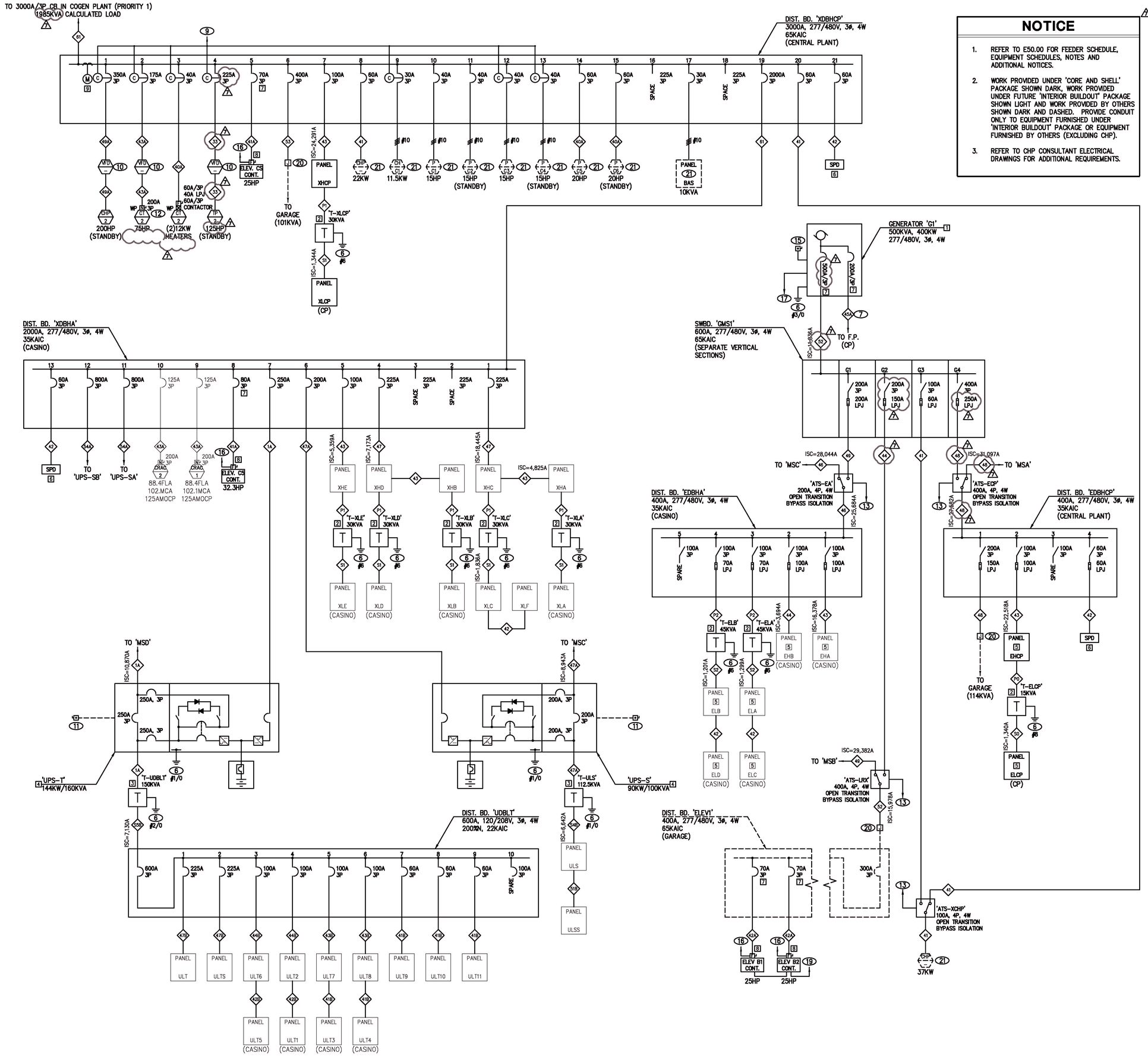
KA/jn: 12005

Phase #

E50.04

Sheet #

#12.0690




## NOTICE

1. REFER TO E50.00 FOR FEEDER SCHEDULE, EQUIPMENT SCHEDULES, NOTES AND ADDITIONAL NOTICES.
2. WORK PROVIDED UNDER 'CORE AND SHELL' PACKAGE SHOWN DARK, WORK PROVIDED UNDER FUTURE 'INTERIOR BUILDOUT' PACKAGE SHOWN LIGHT AND WORK PROVIDED BY OTHERS SHOWN DARK AND DASHED. PROVIDE CONDUIT ONLY TO EQUIPMENT FURNISHED UNDER 'INTERIOR BUILDOUT' PACKAGE OR EQUIPMENT FURNISHED BY OTHERS (EXCLUDING CHP).
3. REFER TO CHP CONSULTANT ELECTRICAL DRAWINGS FOR ADDITIONAL REQUIREMENTS.

## LOAD CALCULATIONS

**DIST. BD. UDBLT**

| | | |
|---|---|---|
| PNL ULT | = | 50 KVA |
| PNL ULTS | = | 50 KVA |
| PNL ULT5 | = | 7 KVA |
| PNL ULT2 | = | 10 KVA |
| PNL ULT7 | = | 11 KVA |
| PNL ULT8 | = | 11 KVA |
| PNL ULT9 | = | 3 KVA |
| PNL ULT10 | = | 3 KVA |
| PNL ULT11 | = | 5 KVA |
| TOTAL | = | 150 KVA /208V, 3ø = 416A |

**DIST. BD. XDBHA**

| | | |
|---|---|---|
| PNL XHC | = | 94 KVA |
| PNL XHD | = | 48 KVA |
| PNL XHE | = | 114 KVA |
| UPS–S | = | 67 KVA |
| UPS–T | = | 150 KVA |
| ELEV. C5 | = | 33 KVA |
| CRAC–1 | = | 74 KVA |
| CRAC–2 | = | 74 KVA |
| UPS–SA | = | 460 KVA |
| UPS–SB | = | 466 KVA |
| TOTAL | = | 1580 KVA /480V, 3ø = 1901A |

**DIST. BD. EDBHA**

| | | |
|---|---|---|
| PNL EHA | = | 19 KVA |
| PNL EHB | = | 24 KVA |
| XFMR T–ELA | = | 5 KVA |
| XFMR T–ELB | = | 8 KVA |
| TOTAL | = | 56 KVA /480V, 3ø = 67A |

**DIST. BD. ELEV1 (NORMAL OPERATION)**

| | | |
|---|---|---|
| (6) ELEV. @ 28KVA X 0.79 | = | 133 KVA |
| MISC. LOADS | = | 30 KVA |
| TOTAL | = | 163 KVA /480V, 3ø = 196A |

**DIST. BD. ELEV1 (GENERATOR OPERATION)***

| | | |
|---|---|---|
| (2) ELEV. @ 28KVA X 0.95 | = | 53 KVA |
| MISC. LOADS | = | 30 KVA |
| TOTAL | = | 83 KVA /480V, 3ø = 100A |

*LIMIT (1) ELEV. PER BANK UNDER GENERATOR POWER

**DIST. BD. XDBHCP**

| | | |
|---|---|---|
| CHP–2 (STANDBY) | = | 0 KVA |
| CT–2 | = | 80 KVA |
| CT–2 HTR | = | 24 KVA |
| TP–2 (STANDBY) | = | 0 KVA |
| ELEV. C5 | = | 28 KVA |
| GARAGE | = | 101 KVA |
| PNL XHCP | = | 70 KVA |
| CHP | = | 22 KVA |
| CH–C1 | = | 12 KVA |
| P–C1 | = | 18 KVA |
| P–C2 (STANDBY) | = | 0 KVA |
| P–C3 | = | 18 KVA |
| P–C4 (STANDBY) | = | 0 KVA |
| P–C5 | = | 22 KVA |
| P–C6 (STANDBY) | = | 0 KVA |
| BAS | = | 10 KVA |
| XDBHA | = | 1580 KVA |
| CHP (STANDBY) | = | 0 KVA |
| TOTAL | = | 1985 KVA /480V, 3ø = 2388A |

**DIST. BD. EDBHCP**

| | | |
|---|---|---|
| GARAGE | = | 114 KVA |
| PNL EHCP | = | 28 KVA |
| TOTAL | = | 142 KVA /480V, 3ø = 171A |

**SWBD. GMS1***

| | | |
|---|---|---|
| ATS–EA | = | 56 KVA |
| ATS–LRX W/O ELEV. | = | 30 KVA |
| (2) ELEV. @ 28KVA X 0.95 | = | 53 KVA |
| ATS–XCHP | = | 37 KVA |
| ATS–ECP | = | 142 KVA |
| TOTAL | = | 318 KVA /480V, 3ø = 383A |

*LIMIT (1) ELEV. PER BANK UNDER GENERATOR POWER

**GENERATOR G1**

| | | |
|---|---|---|
| GMS1 | = | 318 KVA |
| FIRE PUMP | = | 103 KVA |
| TOTAL | = | 421 KVA /480V, 3ø = 506A |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| No. | Date | Description |
| 1 | 2012.12.07 | ADDENDUM 1 |
| 2 | 2013.01.18 | PROGRESS SET |
| 3 | 2013.03.15 | SHELL PACKAGE |
| 4 | 2013.03.29 | BULLETIN 1 |
| 5 | 2013.05.15 | BULLETIN 2 |
| 6 | 2013.07.25 | BULLETIN 3.1 |
| 7 | 2013.08.16 | BULLETIN 4 |

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Sheet Description: SINGLE LINE DIAGRAM - EMER AND XBY POWER DISTRIBUTION

Drawn By: MB

Checked By: JJW

KA/jn: 12005

Phase #

E50.05

Sheet #


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