

Allied Engineering

Structural Mechanical Electrical Commissioning

MEMORANDUM

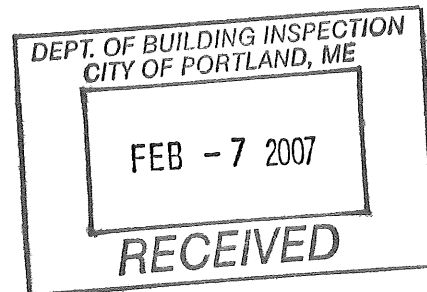
Project Name: State Theatre Electrical Assessment Date: 2/7/07
Project Number: 06106
To: Michael Collins, Electrical Inspector
Company: City of Portland
From: Stephen Markiewicz
RE: Draft Report
Sent Via: Mail
Fax #: # of Pages: HARD COPY TO FOLLOW?: ___ Yes ___ No
 389 Congress St.
Mail Portland, ME 04101
Email
CC: Alex Crothers, Higher Ground Music

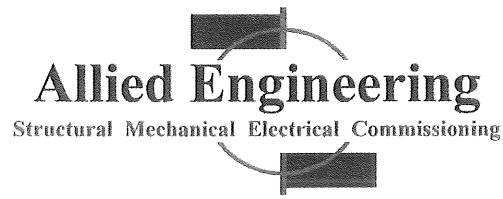
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COMMENTS:

Attached please find for your review a copy of Allied Engineering's Electrical Assessment Draft Report for the State Theatre. If your office has concerns regarding the facility that have not been addressed in our assessment, please contact me to discuss them. Please respond as to whether you agree with our findings relative to code compliance. We would be happy to meet with you at the facility if you would like to conduct a walk-through. I look forward to your reply. Thank you for your time.

State Theatre
046-D-~~039~~
031





December 22, 2006

Alex Crothers
Higher Ground
98 Park Street
Burlington, Vermont 05401

**RE: FACILITY ELECTRICAL ASSESSMENT REPORT FOR THE STATE THEATRE,
PORTLAND, MAINE - DRAFT**

ELECTRICAL REPORT

I. Executive Summary

This document is written to summarize findings of the electrical systems assessment conducted by Allied Engineering, Inc. at the State Theatre facility located at 609 Congress Street, Portland, Maine. This report is offered to outline existing conditions in order to advise facility management and offer prioritization with respect to recommended facility upgrades. In conducting the assessment, our conclusions and recommendations are based upon the current posted occupancy for the facility, which is 1,450 people.

The state theatre is located within a large multi-tenant building. As such, some electrical systems within the theatre are part of, or connected to, other systems that serve the remainder of the building. The scope of this assessment is limited to the theatre, and will discuss the entire systems only as they relate to the theatre facility.

In evaluating the existing building systems, the following items have been considered and our conclusions and recommendations based thereon:

- Conformance with local, State and Federal regulations.
- Age and condition of existing systems.
- Ability of existing systems to support recommended upgrades.

II. Existing Conditions

Service Entrance and Power Distribution

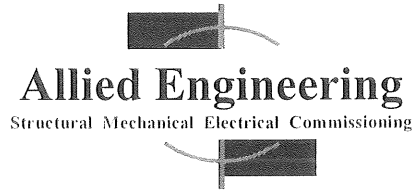
The State Theatre receives its power from the Central Maine Power Co. (CMP) downtown network via service entrance conductors that supply entire building. The building service equipment consists of six disconnect switches, each of which is connected to the service entrance conductors via tap conductors. According to CMP, the available fault current at the State Theatre service disconnect switch is 100,000 symmetrical amps.

The theatre itself has an 800-amp, 208/120-volt, Square D fusible main disconnect switch with Class L current-limiting fuses. This main disconnect switch is one of the six building service disconnects and

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supplies a main distribution panelboard, as well as a 200-amp fusible disconnect switch and separate meter for the Kitchen area. All theatre areas except the second floor Green Room area are controlled by this main switch. The main disconnect switch is estimated to be 12-14 years old and is in excellent condition.

The Green Room has a 200-amp panel that is metered separately and fed from a separate service disconnect from the rest of the theatre. Nine circuit breakers within the Green Room panel are marked to indicate that they supply loads in another tenant space, Unit 208. Only two circuits within the panel indicate that they supply loads associated with the theatre.

A total of three utility meters currently monitor electricity usage at the theatre. One meter monitors the main distribution panel, a second meter monitors the kitchen, and a third meter located in the basement meter closet monitors the Green Room panel. The metering is cold-sequence, which means that each meter is connected downstream of a disconnect switch.

The theatre's main distribution panelboard (MDP) is a Square D, I-Line, 1200-amp rated main lug panelboard that is supplied by an 800-amp feeder from the main disconnect switch. The largest branch circuit breaker that could be installed in the MDP is 600 amps. The panel is estimated to be 12-14 years old and is in excellent condition. Most circuit breakers within the MDP, however, do not have adequate short-circuit current (AIC) ratings for the available fault current at the panel. The following loads are currently labeled as connected to the MDP:

- Auditorium: This is a 125-amp, 3-pole circuit breaker, only two legs of which are connected. It is not clear exactly what this circuit breaker feeds. We suspect it may be one of two feeders to the old dimmer rack on the stage.
- Projection Booth - 1-ph: This is an 80-amp, 2-pole circuit breaker that appears to supply a very old fuse panel in the projection booth. This circuit breaker does not have an adequate AIC rating for the fault current available.
- Fans: This is a 225-amp, 3-pole circuit breaker that appears to supply both of the large ventilation fans that serve the auditorium. The breaker is equipped with a shunt trip that is currently not connected. This circuit breaker does not have an adequate AIC rating for the fault current available.
- Panel on Stage: This is a 225-amp, 3-pole circuit breaker that supplies a 42-circuit, 200-amp load center on the stage, as well as a 200-amp non-fused disconnect switch located above the stage panel that appears to have been used to connect portable stage equipment. This circuit breaker does not have an adequate AIC rating for the fault current available and is oversized for the panel and disconnect switch it protects.
- Sign panel: This is a 100-amp, 2-pole circuit breaker. We expect that it supplies one of the panels in the first floor closet near the lobby concession area. This circuit breaker does not have an adequate AIC rating for the fault current available.



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- Bar Panel: This is a 200-amp, 3-pole circuit breaker that does not have an adequate AIC rating for the fault current available.
- Organ: This is a 60-amp 3-pole circuit breaker that does not have an adequate AIC rating for the fault current available.
- Projection Booth 3-ph: This is a 200-amp, 3-pole circuit breaker that supplies a 200-amp 42-circuit load center in the Projection Booth, as well as a 200-amp non-fused disconnect switch locate adjacent to that panel. This circuit breaker does not have an adequate AIC rating for the fault current available.
- Dimmer Board: This is a 400-amp, 3-pole circuit breaker, only two legs of which are connected, that supplies the very old dimmer rack on the stage. This circuit breaker does not have an adequate AIC rating for the fault current available.

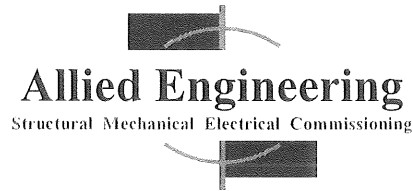
In addition to the feeders described above, there is a tap from the main lugs of the MDP that supplies the source for an Onan 70-amp automatic transfer switch, which in turn supplies Panel “LP” located in the first floor closet near the lobby area concession booth. The tap is code-compliant and terminates in a disconnect switch containing 70-amp fuses. The transfer switch is appears to be relatively new and in excellent condition.

Two branch-circuit panels are located on the stage, there are two panels in the closet near the lobby concession area, one in the kitchen, one in the first floor bar near the kitchen, two in the Projection Room, and one in a corridor of the second floor Green Room area as described above. Most of the panels are estimated to be 12-14 years old, with the exception of the old fuse panel in the projection room, which appears to be at least 70 years old and should be replaced. The panels are generally in good condition, although it was noted that a blank filler plate is missing from the 200-amp stage panel. All panels except the projection room fuse panel are Square D type QO loadcenters.

One of the panels on the stage is a 100-amp load center on the stage that is labeled “Sound.” There are five type SJ cords that run between the “sound” panel and the dimmer rack. There also appears to be conductors installed from the MDP to a wireway below the panel that were originally intended as feeder conductors for the panel, but these are not connected to a circuit breaker within the MDP and only one conductor terminates in the panel itself. The neutral conductor from the MDP to the wireway is currently connected to a bare copper wire that we believe was used as a reference ground for sound equipment. It is not clear what function the panel performed, but it is not currently connected for use as a conventional branch circuit panel. While the panel itself appears to be appropriate for reuse, it would need to be re-wired to current standards before it could be used.

Lighting

House lighting for the Auditorium includes incandescent wall sconces, incandescent lighting around the perimeters of four false windows, perimeter lighting at the proscenium, chair mounted incandescent fixtures, recessed fixtures at the underside of the balcony and at the balcony ceiling, and some tube lighting at the side walls. Some quartz utility lights have been added above the balcony, apparently to



compensate for none of the original recessed balcony lighting being operational. It was also noted that the false windows are equipped with theatrical border lights that are apparently not functional.

The wall sconces and tube lighting appear to have been installed in the early 1990's; The recessed fixtures below and above the balcony appear original to the facility; only one of these fixtures is currently working, although it is not clear whether there are wiring issues or if the lamps have simply failed. The lighting at the false windows and proscenium is also quite old, but appears to be in good condition.

Most of the auditorium house lights are connected to a non-dimmable switch in the stage dimming rack. Exceptions to this are the balcony level recessed fixtures, which are fed from the circuit breaker loadcenter in the Projection Room, and the seat mounted aisle lights, which are fed from the "sign" panel in the first floor closet near the lobby concession area.

The stage dimming rack is well beyond its anticipated useful life and should be replaced. The rack is supplied by a 400-amp, single-phase feeder from the MDP. The feeder conductors are very old cloth covered wiring that would not be appropriate for re-use.

The first and second floor main corridors have surface mounted incandescent fixtures that appear to be original. There is a large chandelier in the lobby and nine post-top lampholders at the lobby stair and around the second floor level of the lobby which also appear to be original. Most back-of-house spaces are illuminated by surface mounted fluorescent fixtures. The Projection Room has fairly new surface mounted incandescent fixtures. Other spaces such as some closets and utility rooms have incandescent lampholders.

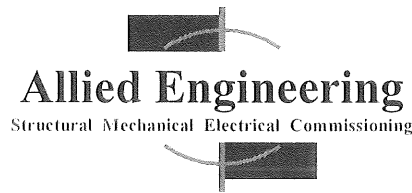
Most of the lighting fixtures within the facility are in good or serviceable condition, although it was noted that the canopy of the lobby chandelier is not properly secured. Lighting levels in most areas appear adequate, except for the auditorium itself and the stage right area near the existing dimmer rack. We expect that the existing auditorium house lighting would provide adequate illumination if all of the fixtures were functioning.

Exterior lighting at the alley consists of quartz flood lights that are in fair to poor condition and do not provide adequate illumination for the egress routes.

Emergency lighting in the main corridor and lobby areas is provided by an Onan generator located in the alley outside of the building. This generator serves emergency and back-up loads for the entire building. It appears relatively new and in excellent condition. As discussed elsewhere in this report, a separate automatic transfer switch connected to "LP" serves emergency loads in the theatre.

Emergency lighting in the auditorium and some back-of-house areas is provided by battery powered emergency lighting units. The normal source for the auditorium units is from the same panel as the aisle lights, but from a different source than most of the house lighting. The aisle lights themselves do not provide adequate egress illumination, thus the auditorium emergency lighting should be connected to monitor the general house lighting feeder as well as the aisle lights.

There appears to be no emergency lighting for exterior areas.



Exit signs are in place in most areas to guide occupants to means of egress. A notable exception is that there is no exit at the exterior door from the kitchen area. There are five exit signs within the Auditorium that appear to be original to the building and consist of lettering cut into door framing and illuminated by red incandescent lamps. The City of Portland Electrical Inspector has indicated that it would be permissible to continue the use of these original signs if they were retrofitted with LED lamps.

Receptacles and Branch Circuit Wiring

The branch circuit wiring within the theatre varies widely in age. As renovations have occurred over the years, much wiring has been updated to meet the changing needs of the facility. There is, however, much original wiring still in place. There are many two-prong, ungrounded receptacles throughout the facility, but these generally appear to be in good condition and code does not require existing installations to be updated. The original wiring is a mixture of old type BX cable and insulated conductors installed in conduit. Most of the house lighting appears to be wired using conduit. The lobby chandelier and second floor corridor lighting has been updated. We suspect that the wiring for the auditorium wall sconces may have been installed at the time the fixtures were installed. Most of the updated wiring is insulated conductors installed in conduit or type MC cable.

From what can be seen from a non-destructive inspection, the wiring generally appears to be in good condition. Where original cloth-covered wiring is visible, we found no visible evidence of insulation failure or deterioration. The wiring for the recessed light fixtures above and below the balcony is suspect, however, considering the number of these fixtures that are not working. Another notable item of concern is a type NM (romex) cable that is installed on the stage area, extending from the "sound" panel through the stage floor. It is not clear what this cable supplies, but type NM cable is not permitted by code in assembly occupancies.

Fire Alarm and Security Systems

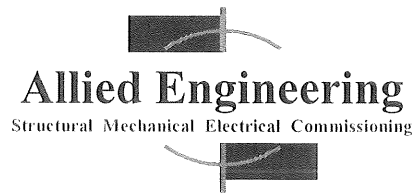
The State Theatre is equipped with a Fire-Lite Alarms, model MS-9200 fire alarm control panel. Alarms are initiated by manual pull stations in egress paths, spot type smoke and heat detectors in corridors and back-of-house areas, and beam type smoke detectors in the auditorium.

Occupant notification is provided audibly by a voice evacuation system and visibly by strobes. The voice evacuation panel is a separate component from the fire alarm control panel and is an Audiosone, inc. Series AU-360. The notification appliances appear to be placed appropriately per current standards.

The fire alarm system is connected to the Portland Fire Department via a master box.

The fire alarm control panel is currently displaying a trouble condition. The Building Engineer reports that the battery charger within the panel has failed. The model MS-9200 has been discontinued by Fire-Lite alarms.

There are three items of concern regarding the fire alarm system in addition to the defective battery charger:



- The system is not connected to automatically turn on the house lights in the event of an alarm. As stated elsewhere in this report, the seat mounted aisle lighting alone does not provide adequate illumination for means of egress. It appears that the current lighting scheme would have only this lighting on during performances.
- The speakers within the auditorium would likely not provide code-required sound pressure levels above the ambient noise level during a live music performance. For high-ambient sound areas such as theatres, it is common practice to disable the sound system in the event of a fire alarm.
- The system is not connected to automatically shut down the ventilation supply fan in the event of an alarm. NFPA requires supply fans that deliver more than 2,000 CFM to be shut down by duct smoke detectors and return fans in systems operating at more than 15,000 CFM to be shut down. Where the areas served by the ventilation system have complete smoke detector coverage, as is the case at the State Theatre, these are permitted to shut down the return fan in lieu of duct smoke detectors.

An area of refuge communication system is installed between the lobby concession area, the courtyard, and the upper balcony. This system is estimated to be between 12 and 14 years old and appears to be in good condition.

Intrusion detection is provided by a Radionics control panel initiated by motion sensors and door contacts. The system appears to be connected for central station monitoring. The system is estimated to be 8-10 years old and in good condition.

III. Recommendations

allied engineering, inc. (AEI) recommends the following upgrades be undertaken within this facility prior to re-opening:

- Replace fire alarm control panel. Provide duct smoke detector to shut down supply fan upon detector activation; connect return fan to fire alarm system such that the fan is shut down by area smoke detectors. Provide input to dimmer rack to bring house lights up to full bright upon fire alarm system activation.

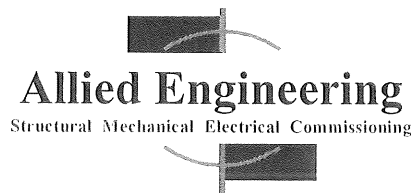
Estimated Budget: \$15,700 to \$18,100

- Replace branch circuit breakers within MDP that have inadequate AIC ratings. Remove existing projection room fuse panel. Re-wire loads currently supplied from this panel to projection room circuit breaker panel

Estimated Budget: \$13,500 to \$15,500

- Remove old stage dimming rack, "sound" panel, and type NM cable that originates in "sound" panel. Provide a modern dimming rack for house lights that includes architectural preset control stations as well as capability for DMX input. Connect auditorium emergency lighting to operate upon loss of power to the dimming rack. Retrofit LED lamps into original auditorium exit signs.

Estimated Budget: \$95,000 to \$105,000



- Replace existing incandescent lampholders in recessed fixtures above and below balcony with dimmable fluorescent fixtures mounted above existing decorative glass panels. Repair and/or re-wire existing border lights at artificial windows. Connect the lighting associated with this item to new house dimming rack. Remove existing quartz lights above balcony.
Estimated Budget: \$28,000 to \$32,000
- Test Area of Refuge communication system to ensure that it is fully functional. Test all existing battery powered emergency lighting.
- Update existing outdoor lighting at fire escapes and connect this lighting to the emergency generator.
Estimated Budget: \$5,500 to \$7,000
- Add task lighting at stage right.
Estimated Budget: \$1,200 to \$1,500
- Electrical work associated with Architectural modifications and Higher Ground Fitup.
Estimated Budget: To be determined upon definition of final scope

IV. CLOSING

This report has been prepared based on our past experience with similar assessments. This report has also been prepared for you as our client. Any reproduction of this document requires consent from **allied engineering, inc.**

We thank you for this opportunity to be of service. Should you have questions after having read through this report, please feel free to call.

Respectfully Submitted by,
allied engineering, inc.

Stephen R. Markiewicz
Senior Electrical Designer

Reviewed by: Catherine A. Faucher, P.E., Principal