



City of Minneapolis  
Community  
Planning and  
Economic  
Development

**Target Center**  
Lighting Control System  
Study

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## EXECUTIVE SUMMARY

The existing lighting control system was developed uniquely for the Target Center at the time of construction and is a one of a kind system. Currently, the system is not supported by the manufacturer, the equipment electronics is experiencing failures of an increasing frequency and the availability of parts for repair is decreasing. As result of the decreasing knowledge and support and the increasing need and cost to repair, LEO A DALY recommends a complete replacement of the lighting control system.

If the City decides to proceed with the system replacement, LEO A DALY recommends that the control functions for the shutters on the sports lighting fixtures, the house and spot lights for the US Bank Theater be connected to the new control system to simplify and integrate all the controls for these functions. LEO A DALY also recommends connecting the LED Ribbon Band to the new lighting controls to allow the system to start and stop on a pre-programmed script when events do not require an operator for real time interaction with the Ribbon Band.

The probable construction cost for these three components of the work are estimated to be:

Lighting Control System Replacement: \$1,000,000 to \$1,200,000

Shutter, US Bank Theater, LED Ribbon Band Controls: \$100,000

Catwalk Cabling Corrections: \$125,000

## EXISTING SYSTEMS

### Definitions:

Lighting Control System - represents the portion of controls that includes the relay and dimmer panels used to control the building and arena bowl lighting. The Shutter Controls, US Bank Theater and LED Ribbon Board are separately controlled systems.

## LIGHTING CONTROL SYSTEM

The lighting control system was installed as part of the original building and was completed in October 1990. The lighting control system was designed and manufactured by Lithonia Lighting and includes relay panels, dimmer panels, local switching panels, programming switch panels and a system computer. This was the first time these functions were combined in a lighting control system and became the model for future arenas.

### Relay Panels:

There are eighteen relay panels in the building. Fourteen panels control normal lighting and three control emergency lighting. The emergency power system includes a backup diesel generator to provide emergency lighting during utility outages. The last relay panel is a specially designed panel at that time to connect the relay and dimmer panels of the system.

### Normal Power Relay Panels:

Eight normal power relay panels are located on the catwalk level, two in each quarter of the building, and control the metal halide event lights in the arena bowl. Two panels on the upper concourse, two on the lower concourse and two on street level control the public area normal lighting on the concourses, stairs, escalators, restrooms, skyway and the exterior parapet, soffit and neon lights.

### Emergency Power Relay Panels:

Two emergency power relay panels on the suite level control the emergency step lights on the bowl seating aisles and at the vomitories. One panel on the lower concourse level controls the emergency lights on the concourses, stairs and escalators.

In each relay panel location, there is a companion panelboard that feeds branch circuits through the relay panel and out to the lighting fixtures. There are no overcurrent protection devices (i.e. circuit breakers) in the relay panels.

### Dimmer Panels:

There are eleven dimmer panel locations with multiple dimmer cabinets at each location.

### Normal Power Dimmer Panels:

One normal power dimmer panel is located on each of the upper and lower concourses. These control the dimmable incandescent fixtures around each respective concourse. One dimmer panel location on the lower concourse has never been used.

Four normal dimmer panels are located on the suite level and control the suite lighting in each quad of suites. Each suite includes a local control station to turn the suite lights on and off and change the level of the incandescent lights. This panel includes a switch that turns the fluorescent, non-dimmed, lights on just inside the suite door. A lockout indicator light is on each control panel to signal when the system has taken over control and locked out the local panel so the dimmable fixtures cannot be controlled. The lockout feature is used when the arena bowl is darkened. The lockout does not have control over the fluorescent fixtures in the suite so these fixtures cannot be automatically turned off when the bowl is darkened.

Each normal dimmer panel location is fed from a single three phase feeder originating in a distribution panel. This feeder is tapped to feed each of the individual dimmer cabinets at each location. Each dimmer module has a main circuit breaker and four output breakers, one for each lighting load.

#### Emergency Power Dimming Panels:

Four emergency dimmer panels on the catwalk level control the quartz flood light fixtures in the arena bowl. These quartz fixtures are used for lighting over the seating areas for the audience to arrive and leave events. They also provide emergency lighting to the bowl seating areas in case of a building power failure. Each of the emergency dimmer panels has a companion panelboard associated with it. The panelboard feeds individual branch circuits into the dimmer modules and out to the lighting fixtures. There are no overcurrent protection devices (circuit breakers) in these dimmer panels.

### SEPARATELY CONTROLLED SYSTEMS

#### Shutter Controls:

There is a system of light control shutters to darken the metal halide sport lighting fixtures during team introductions for Timberwolves games. The shutters are used to blank off the fixtures because they require up to fifteen minutes to come back to full brightness if they were turned off. The shutters are operated by an ETC (Electronic Theatrical Controls, Inc.) theatrical lighting board using a DMX512 control signal protocol. The ETC board along with the DMX512 controls are completely separate from the Lithonia lighting control system.

#### US Bank Theater:

The US Bank Theater was installed in the spring of 2004. This is an event space that's created within the arena bowl for smaller stage events. Rather than use the bowl lights, incandescent down lights were added to the catwalk and are used for "house" lighting at these events. Four spotlights are installed to highlight signage. These fixtures are connected to a new dimmer cabinet which was installed on the catwalk. The dimmer cabinet is connected to and controlled by the ETC board. For an event, the "house" and spot lights are on during audience arrival, then dimmed to off for the event and are brought back up for leaving. The special theatrical lighting for the stage is brought in for each type of event and includes its own separate controls and fixtures.

LED Ribbon Band:

The LED ribbon band is a continuous display that circles the arena mounted to face of the bottom of the upper seating deck. This display is used for advertisements, no smoking notices, emergency messages and on-going activities tied to the event.

## CONDITION OF THE EXISTING SYSTEMS

### Lighting Control System:

The Lithonia control system is a one of a kind system designed specifically for the Target Center to control both relay switching and dimming lighting loads. When this system was installed, it wasn't common in the lighting industry to control both types of lighting loads with one system. To accomplish this goal, Lithonia merged their relay panel system "Panelmax" with their dimming system "Maxstar".

A majority of the controls are located in the lighting control booth at the top of the seating in section 238. These include the computer for the Panelmax system, the control logic panel for the Maxstar system and integration component tying these two systems together. The eighteenth relay panel is part of these integration components. Also in the booth are switch panels used to program the dimming zones and levels.

Because this system was created from two other systems and isn't a standard product, it is no longer supported by Lithonia. Electronic parts for much of the system are either not available or are in very short supply including dimmers, database modules for the dimmer panels, dimmer panel power supplies and relay panel memory chips.

The original system had two computers, a primary and a backup. Both computers used Intel 80386 processors. The primary computer failed in 2004. Numerous efforts to load the software on a new computer have failed. Consequently, the system is currently running on the lone backup computer. If the back-up computer is lost, the system will not operate.

The controller boards in the relay panels were updated in 1999 for Year 2000 issues. Since that time, there has been a recurring problem with the memory chips on these boards. The chips are failing randomly on panels throughout the building and the frequency of failures seems to be increasing. Replacement chips are available but the cost continues to increase. Efforts have been made to eliminate the chip failures but no corrective actions to date have solved this problem. The factory has discussed the failures with the chip supplier and has tried to duplicate these failures in their lab but no solution has been found.

There is a group of push buttons in the security command center that can initiate preset lighting scenes and turn lighting groups on and off. But this is a limited station and does not have the ability to do all the controls available in the lighting booth.

Switch input stations exist in various locations in the building but were never used. When the control booth isn't occupied, the control of the building lighting is done from the command center.

### Shutter Controls:

Because the shutter controls are separate from the building lighting control system, it requires the operator to do two functions to darken the arena bowl for team introductions. They have to dim the arena, turning down both the quartz flood lights and the suite lights via the lighting control system. Then they have to move to the ETC control board to close the shutters. The existing lighting control system doesn't have an interface to allow it to control the shutters.

#### US Bank Theater:

The house lights for the theater are only controlled by the ETC board. The lighting control system doesn't have an interface to control these lights.

#### LED Ribbon Band:

The ribbon band is also used only prior to the event starting. The advertising and other information displayed on the banner is pre-programmed and an operator is required to run this program until the event is about to start, then they turn it off. There is no method for starting and stopping this program via the lighting control system.

#### Catwalk Cabling:

The cabling installed with both the Shutter Control system and the US Bank Theater was done in a temporary manner even though these are permanent installations.

Shutter control components were located in the web space of columns wherever there was open space. DMX cables are routed along the catwalk handrails and are tie wrapped to the handrail pipes. Rigging ropes are found laying across these cables in several locations on the catwalk and evidence of insulation abrasion is apparent where the ropes have been repeatedly pulled across the cables. In some locations the cables cross the walking path of the catwalk and are covered with tape as would be done in a temporary installation. No permanent method to route and protect these cables was installed when the system was added in the building.

US Bank Theater lighting cables are lying loose on the catwalk between the dimmer cabinet and the lighting fixtures. These cables are not protected from any type of damage and present a trip hazard to persons walking on the catwalk. A permanent method to manage and protect these cables was not included in this installation.

## RECOMMENDATIONS

The Lighting Control system is a one of a kind system that has been discontinued and is no longer supported by the manufacturer. The number of problems that are occurring with the system are increasing and the availability of parts are decreasing. These are the reasons for our recommendation for a complete replacement of the Lighting Control System.

Our recommendation includes the following scope of work:

### LIGHTING CONTROL SYSTEM REPLACEMENT

#### New Relay Panels -

The new system would include new relay panels replacing the existing normal and emergency relay panels. The existing panelboards feeding branch circuits into the relay panels would remain and connect to the new relay panels in the same fashion as the existing.

#### New Dimmer Panels -

In the normal dimmer panel locations, the new panels will connect directly to the existing feeders. These dimmer panels will include the branch circuit overcurrent protection required for each dimmed circuit.

In the emergency dimmer panel locations on the catwalk level, the existing panelboards will remain and continue to provide the overcurrent protected branch circuits into the new dimmer panels.

#### Computer Control Locations -

Two new computers will be able to control the building lighting. One will be located in the existing lighting control booth and the second in the existing Command Center. Both computer locations will have the ability to control the lighting and make changes to the presets and programming based upon a login. Multiple logins will allow various levels of access to the software.

### ADDITIONAL RECOMMENDED WORK

As part of system replacement, it is our recommendation to incorporate the following items into the new Lighting Control System:

#### Shutter Controls -

Incorporate the shutter controls into the lighting control system in addition to the separate controls from the theatrical lighting control board. Having the shutters included in the lighting control system would allow presets to be created that would operate the shutters in addition to the other lighting effects programmed into that preset. An example of this is the dark arena bowl for player introductions. The preset would dim the quartz lights over the seating, dim the suites and close the shutters.

Keeping the shutter controls connected to the theatrical control board adds flexibility to the lighting controls. It also allows for using the shutters for special lighting effects should they be desired for a particular event.

## US Bank Theater-

Incorporate the house and spot lights used with the US Band Theatre into the lighting control system and by the theatrical control board. These fixtures use the DMX control language and can be connected and controlled from both systems. This would add flexibility to the available control schemes both in terms of setting up and event and doing the actual controls during the event.

## Control Locations -

From a setup and possibly a control standpoint, it would be very helpful to have three control input locations on the arena floor. These locations would be along the west side of the bowl at floor level, one on each end and one in the mid point of the floor. Each of these locations would include a plug in location for a DMX control board and a separate port for attaching a laptop.

The DMX input would be used to connect a small scene control board and be able to operate selected lights during an event without having to do it from the existing control booth. This would eliminate the problems caused when certain events have the control booth hidden behind black out curtains requiring the lighting operator to do controls effectively blind and only being in contact with the show floor via an intercom.

The laptop input would allow for creating custom lighting looks and programming and testing them right from the floor rather than having to have another person in the control booth or running up to the booth and back for every change.

## LED Ribbon Band -

It would be more efficient to have the means to start and stop the ribbon band program from the lighting control system. This could be programmed as a separate control function or as part of a preset.

Additionally the existing cabling on the catwalk level was installed in a temporary manner and should be re-installed in a permanent configuration. We recommend installing a method to support and protect these cables. This will eliminate any existing trip hazards, premature failure of cables due to wear and any OSHA, National Electrical Code or building official issues.

**PROBABLE ESTIMATE OF CONSTRUCTION COST**

Lighting Control System Replacement:

\$1,000,000 to 1,200,000

Shutter, US Bank, LED Ribbon Band control interface into the new system:

\$100,000

Catwalk Cabling Revisions to Permanent System:

\$125,000