

# Owner's Project Requirements

---

## City of Duluth Energy Efficiency Lighting Project Project Number 84493



*Prepared for*  
**City of Duluth**

Prepared by  
Gausman & Moore Associates, Inc.

**Gausman  
& Moore**  
Mechanical and  
Electrical Engineers

# Owner's Project Requirements

## City of Duluth Energy Efficiency Lighting Project Duluth, MN

Introduction .....	2
Owner's Project Requirements.....	2
General Project Description .....	2
System Guideline .....	3
Functional Uses .....	4
Occupancy Requirements .....	5
Budget Considerations and Limitations .....	5
Performance Criteria .....	5
General .....	5
Construction Process.....	6
Maintenance and Operations.....	6
Light Fixtures .....	7
Network Lighting Control Systems .....	8
Energy Rebates .....	8

## Introduction

The purpose of this project is to develop product standards and procedures for the City of Duluth to reduce energy and maintenance costs associated with the energy efficiency project improvements. This project includes the creation of Owner project requirements for lighting replacement and building automation upgrades. This project also includes: Bid package #1- light fixture replacement at indoor (parking ramps and buildings) and exterior (parks/pathways); Bid package #2- exterior (parks, trails/pathways, and parking lot) site locations through-out the City of Duluth; and Bid package #3 - addition of air curtains at fire station #4. The scope of work includes upgrading existing light fixtures to LED source type with controls that include but are not limited to wireless control and monitoring, dimming, occupancy, and day-light harvesting.

## Owner's Project Requirements (OPR)

Key OPRs have been identified that are critical to the success of these projects.

For Lighting systems in this project, the key OPR are:

- Light fixture installation-
  - Reduce energy consumption.
  - Reduce maintenance costs.
  - Increase controllability.
  - Conform to UDCC, ASHRAE and IES standards and procedures, and City of Duluth operating hours.
  - The installation of interior and exterior light fixtures must meet all of the City of Duluth construction requirements.
  - Use of stainless steel screws and/or bolts to help prevent screws and bolts from rusting in place and adding to maintenance costs.
  - Replace branch circuit wiring within existing light pole (s).
- Sustainability - The design and construction of the lighting, lighting control system and air curtain systems must take into account long term and life cycle issues. The lighting, lighting control system, demand limiting controllers, and air curtain systems must be easily maintainable by staff maintenance personnel, with easy and non-disruptive access to components and systems for routine maintenance.

## General Project Description

The City of Duluth Energy Efficiency Lighting Project includes three (3) separate bid packages as follows:

Bid Package #1- Includes the Medical District Ramp, Tech Center Ramp, City of Duluth Parking area within the Michigan Street and 5<sup>th</sup> Avenue Parking Ramp and Lake Place Park trails/pathways and area lighting. Each ramp will receive new LED lighting and wireless controls to achieve energy savings, lower maintenance costs and provide the City with the ability to control lighting functions remotely.

Bid Package #2- Includes the Lakewalk, Leif Erickson Park, Rose Garden, Channel Walk, Bayfront Park, and the corner of Lake Avenue/Carriage Walk/Sister Cities Garden pathway and area lighting. Each area will receive new LED lighting and wireless controls to achieve energy savings, lower maintenance costs and provide the City with the ability to control lighting functions remotely.

Bid Package #3- This package includes the installation of air curtains above four (4) overhead garage doors at Fire Station #4. The installation of air curtains will allow the city to determine the energy savings of adding air curtains and potential savings at other sites.

Task	Date
<b>Bid Package 1:</b>	
Bid Package 1 Issue for Bid	7/22
Bid Package 1 Bids Due	8/8
Bid Package 1 Notice to Proceed	8/15
Bid Package 1 Substantial Completion	Note 1
<b>Bid Package 2:</b>	
Bid Package 2 Issue for Bid	8/11
Bid Package 2 Bids Due	8/25
Bid Package 2 Notice to Proceed	9/9
Bid Package 2 Substantial Completion	Note 1
<b>Bid Package 3:</b>	
Bid Package 3 Issue for Bid	9/2
Bid Package 3 Bids Due	9/16
Bid Package 3 Notice to Proceed	10/7
Bid Package 3 Substantial Completion	Note 1
<b>Project Close-Out</b>	<b>12/12 - 12/30</b>

Note 1: Bid submissions shall include substantial completion date.

## System Guideline

Guidelines for energy efficient lighting upgrades include:

1. Lighting upgrades- The existing lighting at specific sites listed will be upgraded to LED type. Existing lighting lay-outs may be revised to achieve or maintain IES recommended lighting levels and performance.
2. Lighting controls- Lighting controls will be added or upgraded at specific sites listed to provide energy savings and energy monitoring through occupancy sensors, day-light harvesting, timed on/off control and associated remote monitoring system provide with lighting control package. Controls will be provided that interface with existing City of Duluth Echelon system
  - a. Wireless control system will include necessary software/hardware with related equipment and programming to provide City of Duluth the capability for remote control and data logging/tracking for reporting purposes.
3. Energy efficiency goals – the following are the goals for energy efficiency.
  - a. Use light harvesting as described in ASHRAE 90.1
  - b. Use occupancy sensors and/or timed control to turn off lights when space is not in use.
  - c. Complete Minnesota Power Energy Rebate Program documentation on behalf of the City of Duluth.

4. Environmental and sustainability goals:
  - a. Lighting – Lower energy consumption utilizing LED lighting, occupancy sensors and daylighting sensors.
5. Adaptability for future changes and upgrades –Future projects will have capability (full function) for wireless and/or a combination of wireless and hardwired connection to the City of Duluth controls (Echelon system) implemented under this and previous projects.
6. Provide a key plan including identification (engraved mechanically fastened “ID-Tag”) for each light fixture included in project (s).
7. The following items represent minimum expectations and goals for a successful project:
  - a. The project remains on time and budget to meet bonding schedule requirements and avoid penalties.
  - b. Reduced utility expenses compared to historic data and current demand charges.
  - c. All of the goals of this OPR are met.
  - d. The goals set during the planning/user meetings are met and that the design is efficient for users.
  - e. The City receives a properly operating lighting and control system for sites identified in this document.
  - f. Clear maintenance and operation requirements.
  - g. Shipping schedule related issues.
  - h. Poor systems performance after turnover.
  - i. A project that does not incorporate commissioning.
  - j. End user changes during construction. This will be the owner’s responsibility.

## **Functional Uses**

1. Bid Package #1 – City of Duluth Parking Ramps
  - a. Energy Efficient LED Lighting System
  - b. Low Maintenance requirements for installed lighting and control systems.
  - c. Light fixtures and associated control systems that are easy to maintain and repair.
  - d. Provide adjustable control system that allows the Owner to easily make modifications. The control system shall be compatible with other systems and their devices for future modifications and/or additions.
2. Bid Package #2- City of Duluth Parks and Trails
  - a. Energy Efficient Lighting System
  - b. Low Maintenance requirements for installed lighting and control systems.
  - c. Light fixtures and associated control systems that are easy to maintain and repair.
  - d. Provide adjustable control system that allows the Owner to easily make modifications. The control system shall be compatible with other systems and their devices for future modifications and/or additions.
  - e. Light fixtures are LED source robust, rated for specified installation, and includes integral lighting control where specified.
3. Bid Package #3- City of Duluth Buildings
  - a. Low Maintenance requirements for installed air curtain systems.
  - b. Air curtain systems that are easy to maintain and repair.
  - c. Air curtains to off-set heat loss in winter months

## Occupancy Requirements

Project sites will remain operational during described work. Phase and schedule work to allow facilities to remain fully functional during the hours of operation.

1. Bid Package #1- The parking ramps identified in this project are regularly occupied by City of Duluth building maintenance and parking attendant from 7 a.m. to 5 p.m., Monday through Friday, with 24 hour public use.
2. Bid Package #2- The parks and trails identified in this project are regularly occupied by City of Duluth Parks and Recreation staff and patrolled by security. These parks and trails are open 24 hours a day, seven days a week for general public use.
3. Bid Package #3- The Fire Hall #4 identified as receiving the air curtain system is occupied by staff 24 hours a day, seven days a week.

## Budget Considerations and Limitations

The budget for this project is \$500,000 including design and construction. The project is broken into three (3) separate Bid Packages that will allow the City to monitor and determine the work that can be accomplished with this budget. After each Bid Package is issued and bids are received the City can review and determine if the budget will allow them to proceed with construction. All three (3) Bid Packages may or may not be completed based on the cost of construction. If funding is not available within this budget to complete one or more of the Bid Packages, paybacks from energy savings, reduced maintenance costs and/or energy rebates from the previous Bid Package(s) may be allocated to complete in the future. These paybacks may also fund future projects not included in this scope.

## Performance Criteria

The performance criteria upon which this project is being evaluated by the Commissioning Team are included in this section. Each performance criterion is verified during the Pre-Design, Design, Construction, and/or Occupancy & Operations phase(s) of the project. The performance criteria are categorized into the following groups:

- General
- Construction Process
- Maintenance and Operations

### General

1. Quality requirements of materials and construction –the level of quality of the light fixtures and associated controls is defined by:
  - a. Durability – high durability with resistance to damage by ambient conditions, users or operation and maintenance personnel.
  - b. Time expectancy between failures – no equipment failures during the first five years of operation.
  - c. Time expectancy between replacements – 25 years.
  - d. Owner general expectations of quality of construction – above average.

2. Aesthetics –Exposed conduit shall be limited. Where exposed conduit is required, route parallel to building structure to minimize visibility.
3. Communications – There shall be one communication system (backbone) for lighting at each site, which the lighting control system will use between its components.

## **Construction Process**

Because of the phasing that will occur with the Energy Efficiency project there are certain construction considerations that must be met. They include:

1. Keeping the project on budget
2. Amicable cooperation among all project team members
3. Minimal change orders
4. Minimal occupant disruption during construction
5. Phasing coordination from site to site

## **Maintenance and Operations**

Training requirements for owner's personnel – the owner will be utilizing in-house operations and maintenance resources. These personnel will have between 10 and 25 years of experience and it is assumed they are conversant in basic maintenance techniques and are computer proficient. The training needs to contain a variety of sessions that operations and maintenance personnel will attend. The sessions shall be digitally recorded and processed for long-term availability to changing staff. The following defines what is considered successful training:

1. Equipment and system level training – Each contractor will provide equipment and system level training to the maintenance crew for systems and equipment that they provided and installed.
2. Training style – Training sessions will be both classroom style and hands on, in field at the equipment.
3. Sequence of Operations – Designer and control contractor shall provide training to the maintenance crew on the operational sequences of the equipment and systems.
4. Capture training sessions – All training sessions should be captured digitally for future training use by City of Duluth.
5. Technical support – Telephone and email contact information for contractors should be provided to the owner for future technical support.

Warranty Requirements – All lighting, lighting control, and air curtain systems warranties are to begin at substantial completion, regardless of when the component is delivered, installed, or started-up. For small components (those under \$100,000 in first cost) the warranty shall be for one year. For large components (those over or equal to \$100,000 in first cost) the warranty shall be for five years and include all labor costs, parts, and consumables. Any item required to be accomplished by the operations and maintenance personnel must be clearly documented and provided prior to the start of warranties. Prior to any changes to components, the warranty requirements summary will be reviewed to avoid voiding of warranties.

The system documentation must be accurate and consistent with actual installed components and operation. The requirements for the system documentation include:

1. O & M Manuals - timely manner (before final payment/retainage), hard copy and electronic backup.
2. Controls/smart controls - sequence of operation and training, control diagrams, for each phase, analytical program.
3. Full set of Electrical plans (As-builts) - Electronic as-built drawings in CAD software, redline drawings (before final payment/retainage).
4. Shakedown period documentation - commissioning report
5. Design Parameters - A listing of input parameters in the control system; default values
6. Asset management program - third party, owners responsibility

Equipment and system maintainability expectations – the requirements for the system maintenance include:

1. All equipment must be easily accessible, locatable, and clearly labeled.
2. Robust equipment for low maintenance frequency – long lifecycle, tough finishes, ease of cleaning, low maintenance high traffic, efficient service.
3. Standardization of paint colors, parts, light bulbs, etc. for all systems.
4. Smart controls and analytics – reportable and recordable, ability to track, control and analyze.
5. Equipment and systems that are repairable and maintainable – ease of access.
6. Equipment that is energy efficient – not expensive to maintain.
7. Long term Shake-down – Provide 18 month trending, system analyzing period to fine tune controls system.
8. A proactive preventative maintenance program – work orders, preventive maintenance program based off of O&M Manuals.
9. Understandable and intuitive – Control system, mechanical systems and infrastructure, labeling of components.
10. Adaptability – any changes to the space or system will be evaluated against the current OPR and BoD to verify the system can meet the new requirements and any changes to the systems are properly documented. The Lighting and lighting control systems shall be flexible to future changes without the need for additional investment or outside resources.

## **Lighting Fixtures**

Light fixtures, as specified below, will be purchased by the City directly including integral lighting control module(s) where applicable. The City has purchased fixtures for some projects specified and will purchase the additional remaining fixtures as needed.

Replace light fixture branch circuit wiring within pole, no splices allowed.

To limit light pollution (dark sky compliance), enhance or maintain public safety and ensure appropriate aesthetic lighting qualities in public spaces as most appropriate in each individual lighting application.

Bid Package #1 – LED parking garage style light fixture for parking ramps identified for this project, see cut sheet included in this document. Also LED pole mounted light fixtures for park/pathways identified for this project. Install lock-tight substance furnished with light fixture per manufacturer requirements and/or recommendations. Provide 6" aluminum nipple welded to fixture arm, painted to match light fixture, as manufactured by Duluth Steel Fabricators, Inc. Contact Mark Youngren, 218-624-5793. This applies to pole mounted fixtures, verify exact quantity with city prior to order. Light fixtures will be controlled via wireless control system as outlined in this document. Aluminum arm welding scope with Duluth Steel Fabricators will include a minimum of 10 arms per each work order package.



Bid Package #2 – LED pole mounted and post top mounted decorative light fixtures for parks and trails/pathways identified for this project, see cut sheets included in this document. Install lock-tight substance furnished with light fixture per manufacturer requirements and/or recommendations. Provide 6" aluminum nipple welded to fixture arm, painted to match light fixture, as manufactured by Duluth Steel Fabricators, Inc. Contact Mark Youngren, 218-624-5793. This applies to pole mounted fixtures, verify exact quantity with city prior to order. Light fixtures will be controlled via wireless control system as outlined in this document. Aluminum arm welding scope with Duluth Steel Fabricators will include a minimum of 10 arms per each work order package.

## **Network Lighting Control Systems**

### **General**

Provide programmable wireless lighting control system(s) as identified on the plans, specifications, and this document. Lighting control systems shall be rated for their specified use and conform to nationally recognized testing agencies. Lighting control systems shall include but are not limited to occupancy sensor devices, day-light harvesting devices, photocell, time-clock, and head end equipment (gateway) and associated control programming for a complete and operational system. Lighting control system manufacturer shall provide a mock-up of system for City of Duluth personnel to test and approve prior to purchase.

The City has identified the 'Lumewave' by 'Echelon' and 'Roam' by 'Holophane' lighting control systems as approved manufacturers. Some of the purchased light fixtures include integral lighting control modules of the above-mentioned lighting control systems.

## **Energy Rebates**

This project is eligible for energy rebates through Minnesota Power. Coordinate with Energy Insights for energy rebate form submission to Minnesota Power. Rebates received through this project will allow for funding of future projects similar to this.