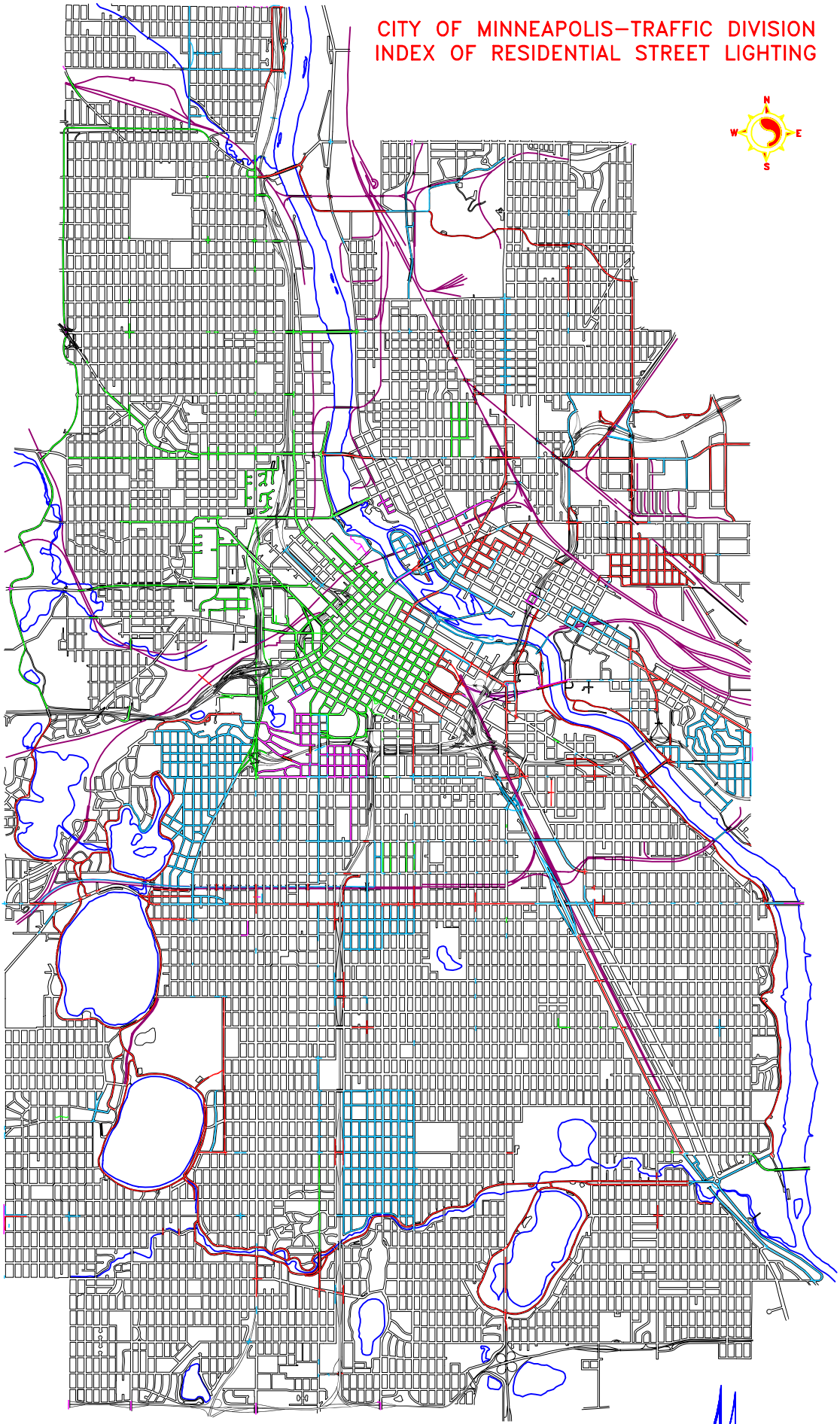
# CITY OF MINNEAPOLIS—TRAFFIC DIVISION
# INDEX OF RESIDENTIAL STREET LIGHTING



## Performance and Maintenance Criteria for Ornamental Lighting Systems

### Criteria for Low Level Systems

**Fixture Performance**

- Must be UL listed
- HPS 100 watts
- Published manufacturers 5-year warranty on all electrical components
- Coefficient of Utilization (CU)
- Efficiency

**Fixture Maintenance**

- Tool-less access to electrical components
- Multi-tap ballast
- Mogul base
- Maintenance able to be done by one-person
- Maximum weight 50 lbs.
- Accept 3 inch tenon
- Acrylic lens

**Pole Criteria**

- Aluminum, steel, or stainless steel
- 12 foot poles in Residential Areas, 20 foot poles in the Central Business District
- Pole and Base must be one Piece
- Manufacturers warranty
- Must meet AASHTO Design standard for wind load
- Minimum conduit entrance – 10inch diameter (able to accept 3 2inch schedule 40 PVC conduits)
- Maximum exterior base diameter of 22 inches, maximum foundation 24inches
- Able to accept a recessed duplex outlet at a height of 11 feet
- 3 inch diameter tenon 2.6 to 3inches long

access door with a removable cover at least 6 inches high and a minimum of 30 square inches

### Criteria for Mid- Level Systems

To Be Determined

### Criteria for High Level Systems

**Fixture Performance**

- Must be UL listed
- HPS 250 watts
- Published manufacturers 5-year warranty on all electrical components
- Coefficient of Utilization

**Fixture Maintenance**

- “Shoebox” style
- Acrylic lens
- Maintenance able to be done by one-person
- Maximum weight 50 pounds

**Pole Criteria**

- Pole must be compatible with city standard foundation and transformer base
- Aluminum, steel, or stainless steel

- Must meet AASHTO Design standard for wind load
- 30 foot (40 foot may be used on some Trunk Highway routes)

DEFINITIONS:

Many existing codes utilize improper or inconsistent use of lighting terminology. The following definitions accurately describe lighting terminology often used in outdoor lighting codes. Where appropriate, a paraphrased definition is provided in plain English to supplement the technical definition.

| Term | Paraphrased Definition | Technical Definition Based on IESNA |
|---|---|---|
| Candela (cd) | Unit describing the intensity of a light source in a specified direction. Sometimes incorrectly referred to as a "light ray". | The SI unit of luminous intensity, equal to one lumen per steradian (lm/sr). |
| Cutoff<br>Full Cutoff | A light distribution where no light is permitted at or above a horizontal plane located at the bottom of a luminaire. There will be little to no light at the angles that are usually associated with glare. *See Figure 1.* | A luminaire light distribution where zero candela intensity occurs at an angle of 90 degrees above nadir, and at all greater angles from nadir. Additionally, the candela per 1000 lamp lumens does not numerically exceed 100 (10 percent) at a vertical angle of 80 degrees above nadir. |
| Cutoff | A light distribution where a negligible amount of light is permitted at a horizontal plane located at the bottom of a luminaire. Light above the horizontal plane at the bottom of the luminaire is not limited, but cutoff luminaires usually have very little light above the luminaire. *See Figure 2.* | A luminaire light distribution where the candela per 1000 lamp lumens does not numerically exceed 25 (2.5 percent) at an angle of 90 degrees above nadir, and 100 (10 percent) at a vertical angle of 80 degrees above nadir. |
| Cutoff<br>Semicutoff | A light distribution where slightly more light is permitted at a horizontal plane located at the bottom of a luminaire than the cutoff distribution. Like cutoff, light above the horizontal plane at the bottom of the luminaire is not limited, but the amount of light above the luminaire is relatively small. *See Figure 3.* | A luminaire light distribution where the candela per 1000 lamp lumens does not numerically exceed 50 (5 percent) at an angle of 90 degrees above nadir, and 200 (20 percent) at a vertical angle of 80 degrees above nadir. |
| Cutoff<br>Noncutoff | A light distribution that can produce considerable light above the horizontal plane located at the bottom of a luminaire. *See Figure 4.* | A luminaire light distribution where there is no candela limitation in the zone above maximum candela. |
| Disability glare | Glare that is significant enough to keep a person from seeing adequately. | The effect of stray light in the eye whereby visibility and visual performance are reduced. A direct glare source that produces discomfort may also produce disability glare by introducing a measurable amount of stray light in the eye. |
| Discomfort glare | Glare that is bothersome to an individual. | Glare that produces discomfort. It does not necessarily interfere with visual performance or visibility. |
| Efficacy<br>*(Luminous Efficacy)* | A measurement used to compare light output to power consumed. Efficacy is a ratio of lumens to watts and can be defined for bare lamps or for luminaires. | The quotient of total luminous flux emitted by the total power input. |
| Efficiency | A ratio of the light emitted from a luminaire to the light produced by the bare lamps. | The ratio of luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used therein. |
| Glare<br>*(see also disability glare or discomfort glare)* | Light that hinders or bothers the human eye. | The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted, which causes annoyance, discomfort, or loss in visual performance and visibility. Note: the magnitude of the sensation of glare depends upon such factors as the size, position, luminance of the source, number of sources and the luminance to which the eyes are adapted. |
| High Intensity Discharge (HID) | A family of electric-discharge light sources including Metal Halide, High Pressure Sodium, and Mercury Vapor lamps. | An electric-discharge lamp in which the light-producing arc is stabilized by wall temperature, and the arc tube has a bulb wall loading in excess of 3 W/cm$^2$. HID lamps include groups of lamps known as mercury, metal halide and high-pressure sodium. |
| High Pressure Sodium (HPS) | A HID light source that typically provides high efficacy, but poor color. Color rendering is better with HPS than LPS, but the source is still considered to be yellow by most people. | A high-intensity discharge (HID) lamp in which light is produced by radiation from sodium vapor operating at a partial pressure of about 1.33 x 10$^4$ Pa (100 Torr). |
| Illuminance (footcandle or lux) | A term that quantifies light striking a surface or plane at a point. It is expressed either in lumens per square foot (footcandles/the English unit) or lumens per square meter (lux/the metric unit). 1 footcandle = 10.76 lux | The areal density of the luminous flux incident at a point on a surface. |
| Lamp | A light bulb. | A generic term for a source created to produce optical radiation. By extension, the term is also used to denote sources that radiate in regions of the spectrum adjacent to the visible. |
| Low Pressure Sodium (LPS) | Considered a single-color light source (appears to be yellow in color and causes most other colors to be seen as gray or brown). | A discharge lamp in which light is produced by radiation from sodium vapor operating at a partial pressure of 0.1-1.5 Pa (approximately 10$^{-3}$ – 10$^{-2}$ Torr) |
| Luminaire<br>*(Light Fixture)* | A complete lighting unit, often referred to as a "light fixture". A luminaire consists of the light source, optical reflector and housing, and electrical components for safely starting and operating the source. | A complete lighting unit consisting of a lamp or lamps and ballasting (when applicable) together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply. |

| | | |
|---|---|---|
| Lumen | The unit representing the quantity of light being produced by a lamp or emitted from a luminaire. | The luminous flux emitted within a unit solid angle (1 sr) by a point source having a uniform luminous intensity of 1 cd. |
| Luminance | A term that quantifies directional brightness of a light source or of a surface that is illuminated and reflects light. It is expressed as footlamberts (English units) or candelas/meters squared (Metric units). *(Note: footlambert is no longer a recognized unit by the IESNA.)* | The quotient of the luminous flux at an element of the surface surrounding the point, and propagated in directions defined by an elementary cone containing the given direction, by the product of the solid angle of the cone and the area of the orthogonal projection of the element of the surface on a plan perpendicular to the given direction. |
| Mercury *(Mercury Vapor)* | A HID light source that typically provides long lamp life, but poor color and low efficacy compared to other HID sources. | A high-intensity discharge (HID) lamp in which the major portion of the light is produced by a radiation from mercury operating at a partial pressure in excess of $10^5$ Pa (approximately 1 atm). |
| Metal Halide | A HID light source that typically provides good color and high efficacy. | A high-intensity discharge (HID) lamp in which the major portion of light is produced by radiation of metal halides and their products of dissociation – possibly in combination with metallic vapors such as mercury. |
| Nadir | The point directly below the luminaire when the luminaire is pointed down (0-degree angle). | None. |
| Photo Control | The device that turns the luminaire on at dusk and off at dawn. Also called photo eye, photocell, and or control. Photo controls may contain a timer to turn luminaires off part way through the night. | None |
| Shielded, Partially Shielded or Fully Shielded | Sometimes used in reference to a luminaire that is provided with internal or external louvers, shields or visors to limit glare. Also used to refer to luminaires that are designed to control glare without the use of additional shields. "Shielded" and "Fully Shielded" are sometimes used in place of either "Cutoff" or "Full Cutoff". "Partially Shielded" is sometimes used in place of "Semicutoff". The cutoff classifications are the industry-accepted terminology. | None |

**Full Cutoff**

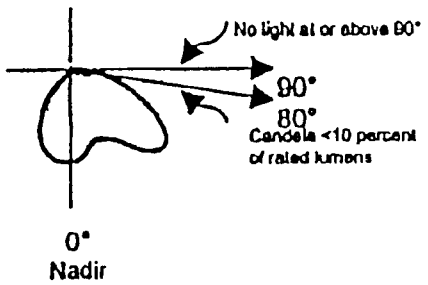



**FIGURE 1**

**Cutoff**

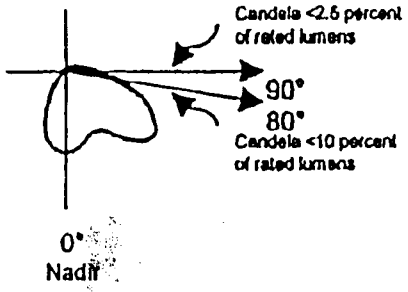



**FIGURE 2**

**Semicutoff**

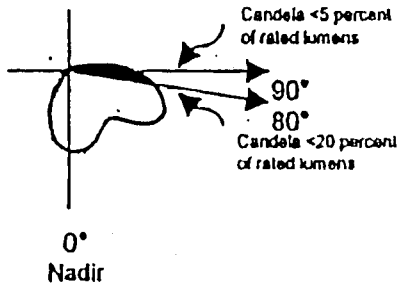



**FIGURE 3**

**Noncutoff**

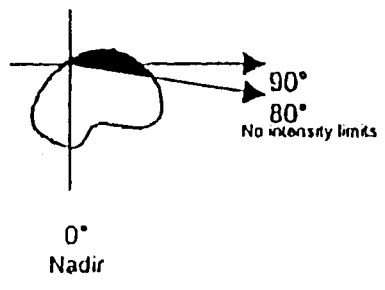



**FIGURE 4**

## References:

Rea, Mark S (editor), *IESNA Handbook*, Ninth Edition, New York: Illuminating Engineering Society of North America, 1999.

IESNA Outdoor Environment Lighting Committee, "Lighting for Exterior Environments", RP-33-99, New York: Illuminating Engineering Society of North America, 1999.



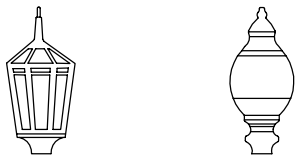
Attachment pg 2

# City of Minneapolis
# Lighting Unit Choices

ATTACHMENT

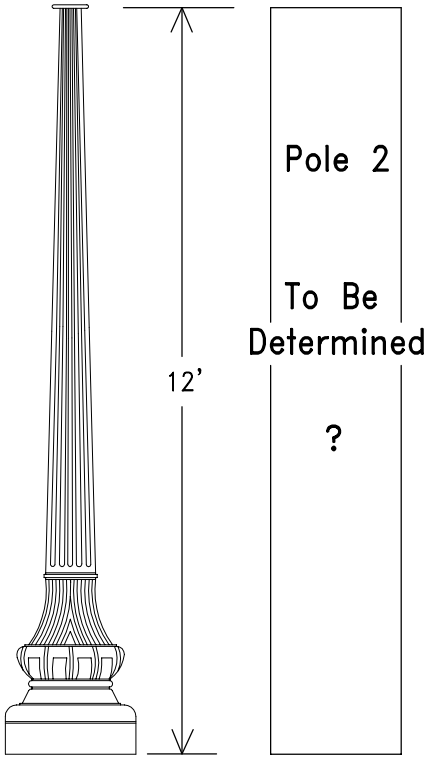
## Low–Level 100W HPS Fixtures

LANTERN ACORN



Fixture 3 T.B.D. ?

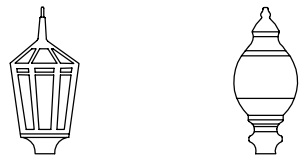
Fixture 4 T.B.D. ?




Low–Level Poles

## Mid–Level 100W HPS Fixtures

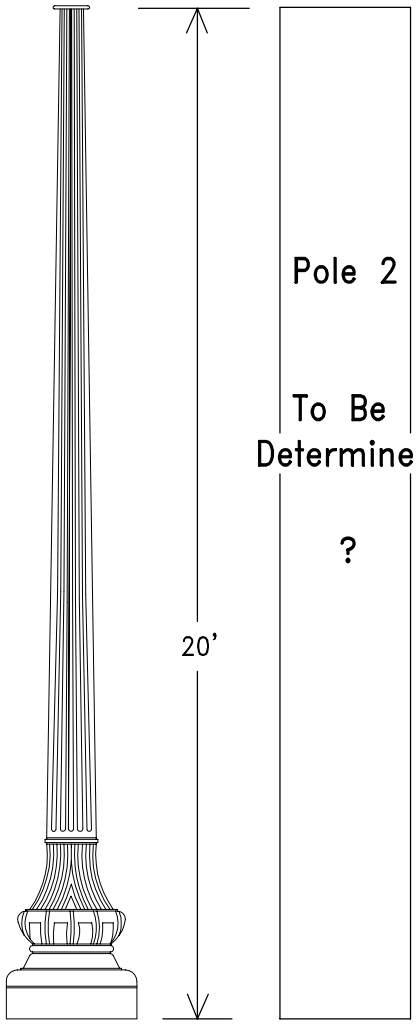
LANTERN ACORN



Fixture 3 T.B.D. ?

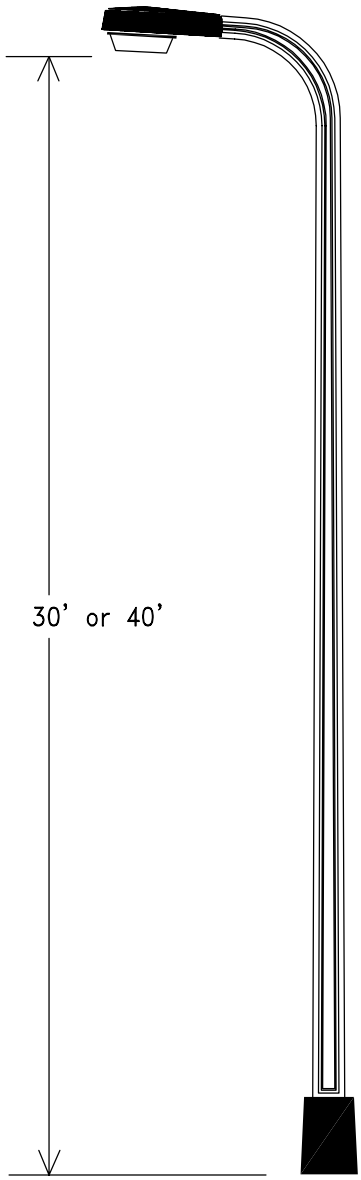
Fixture 4 T.B.D. ?

* Depending on location, twin mounted fixtures may be needed.




Mid–Level Poles

## High–Level Fixtures
## 250W HPS
## SHOEBOX FIXTURE AND POLE




High–Level Poles

July 2004

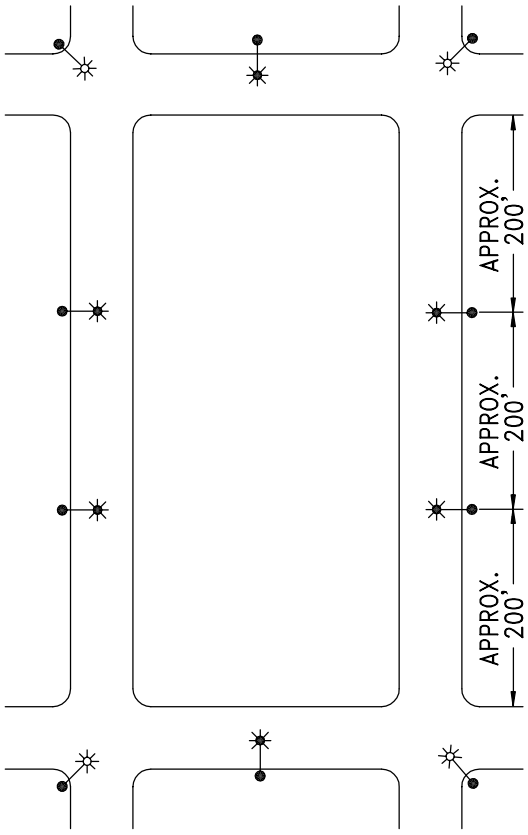
Street Lighting Cost Comparisons

| | | Residential | | OBD/Pedestrian Corridors | | CBD | |
|---|---|---|---|---|---|---|---|
| | | Xcel Wood Pole | Ornamental | Xcel Wood Pole | Ornamental | High level | Low Level |
| **Material** | | | | | | | |
| | lantern | | | | | | |
| | acorn | | | | | | |
| | shoebox | | | | | | |
| | cobrahead | | | | | | |
| | TBD fixture 1 | | | | | | |
| | TBD fixture 2 | | | | | | |
| | pole | | | | | | |
| | wire | | | | | | |
| | conduit | | | | | | |
| | luminaire | | | | | | |
| **Energy** | | | | | | | |
| | energy used | | | | | | |
| | KWH | | | | | | |
| | energy cost | | | | | | |
| **Capital** | | | | | | | |
| | labor | | | | | | |
| | amortized | | | | | | |

# City of Minneapolis
# Standard
# Street Lighting

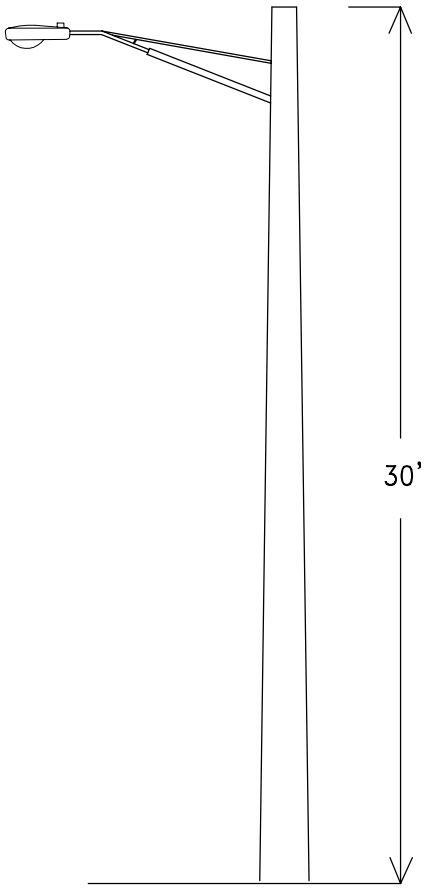
ATTACHMENT

TYPICAL
BLOCK




☼ 150w HPS Fixtures (Typical) at intersection
✳ 100w HPS Fixtures (Typical) mid block
Note: Spacing will vary based on field conditions

WOOD
POLE &
FIXTURE

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July 2004

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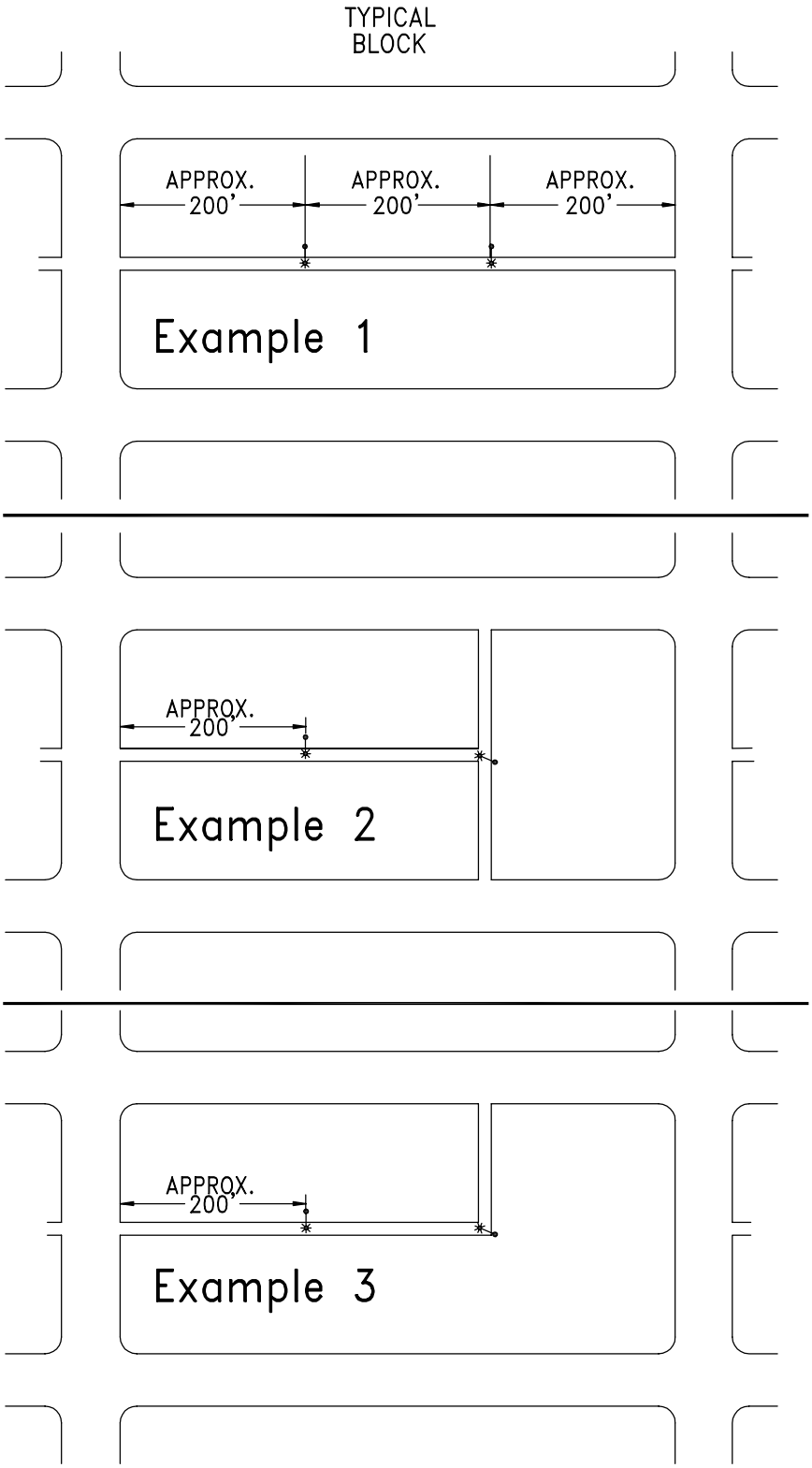
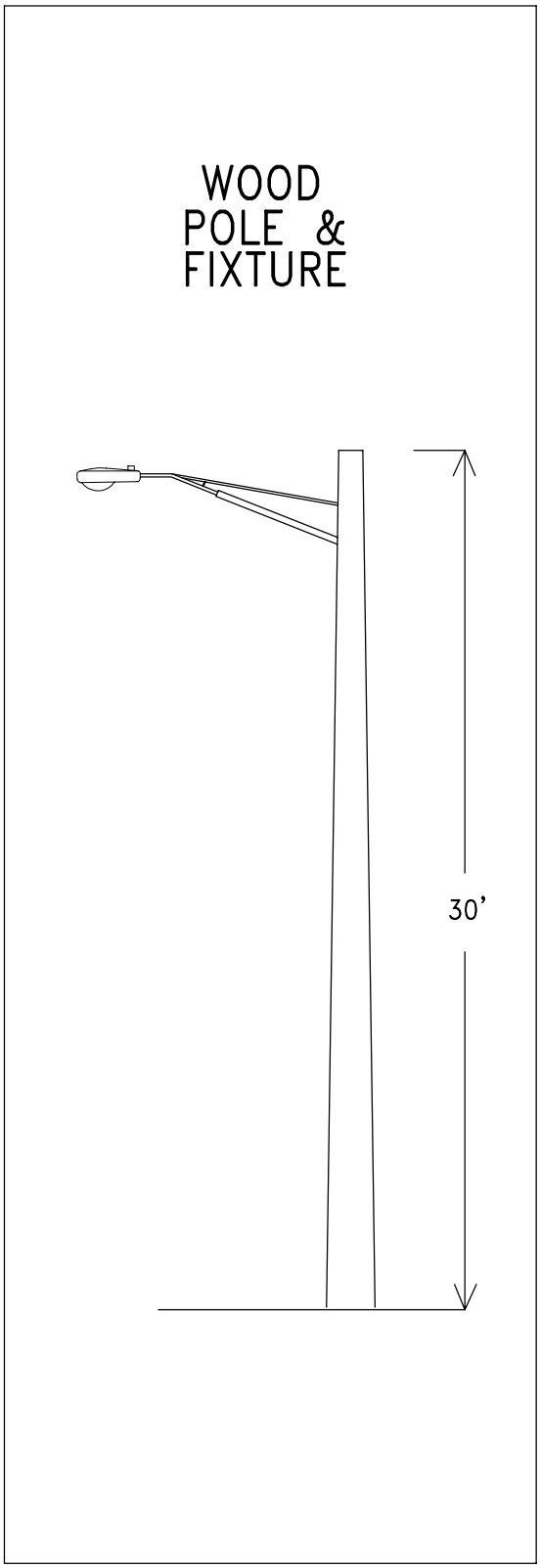
# City of Minneapolis
# Standard
# Alley Lighting

ATTACHMENT




100w HPS Fixtures (Typical)

Note: Spacing will vary based on field conditions

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Attachment 8

Place-holder for Sample petition for Standard Street or Alley Lighting

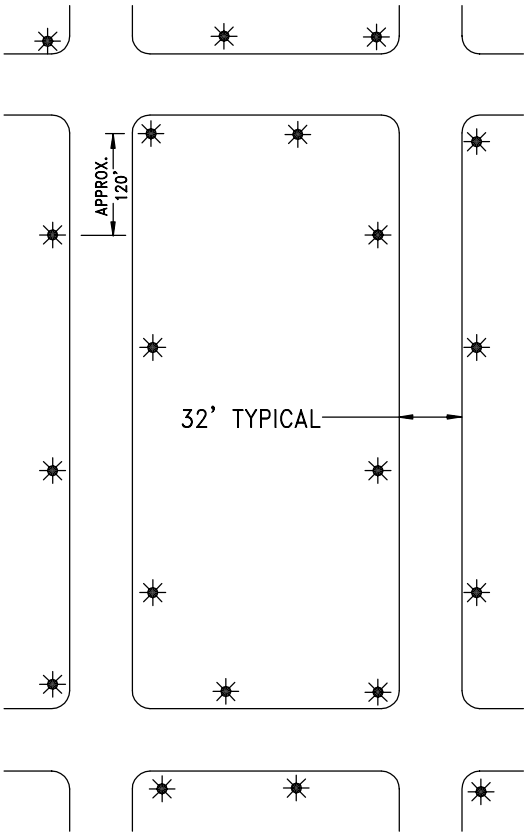
City of Minneapolis
Ornamental
Low–Level
Residential
Street Lighting

ATTACHMENT

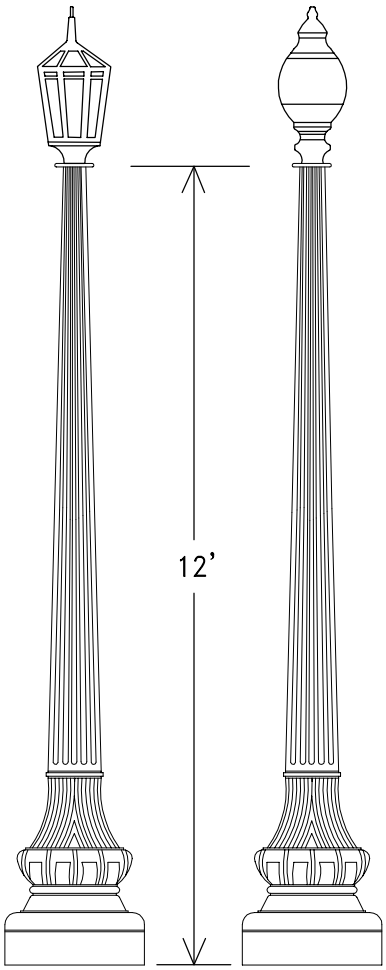
## Light Level Standards

Average Footcandles 0.3
Uniformity Ratio (Avg/Min) 6:1

TYPICAL
BLOCK




## EXAMPLE FIXTURE AND POLE




NO SCALE

✳ 100w HPS Fixtures

Note: Exact spacing will vary based on field conditions and roadway width as determined by the Director of Public Works

July 2004

Attachment 11

# DEFINITION OF DISTRICTS

## Central Business District (CBD)

The area within the following boundaries defines the Central Business District (CBD):

- Mississippi River
- I-35W
- I-94
- I-394, Third Ave Distributor, and the Burlington Northern Sante Fe railroad tracks

The areas within the CBD that shall meet the Residential District definition (examples: Elliot Park, Mills District, Loring Park) are as follows:

- To Be Determined with CPED and community assistance

## Pedestrian District (PD)

Pedestrian District (PD) will be defined as follows:

- A street block that is designated in the Minneapolis Plan as a commercial area AND it has a majority of commercially zoned properties. The Minneapolis Plan cites commercial areas in numerous ways: Commercial Corridors, Growth Centers, Large Scale Auto-Oriented Commercial Centers, and Activity Centers. A complete list of these specific locations is cited in the Minneapolis Plan. The City Council in the future may add or subtract to the list of eligible areas as amendments/revisions to the Minneapolis Plan.
- Streets (not designated above in the Minneapolis Plan) that are at least 60% zoned commercial land uses based on the linear front footage.
- Locations determined to be high pedestrian activity areas Public Works and CPED will further define these areas

## Residential District

- All areas not defined above are a residential district

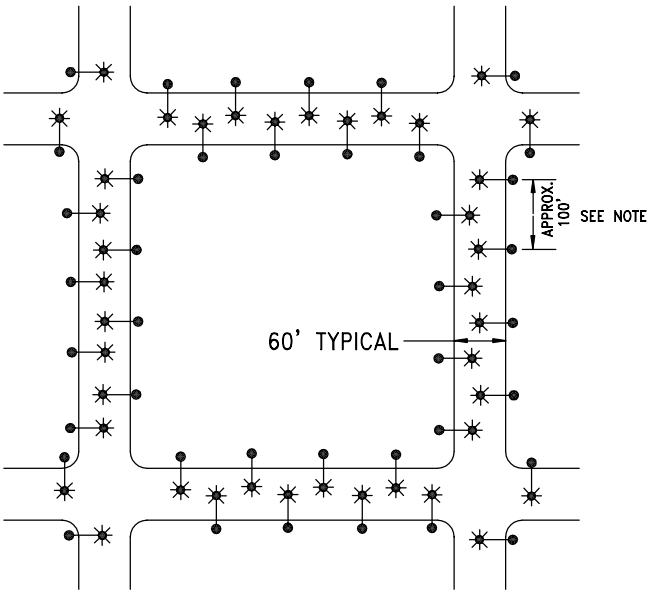
# City of Minneapolis
# Ornamental High–Level
# Central Business District
# Street Lighting

ATTACHMENT

## Light Level Standards

Average Footcandles 2.5
Uniformity Ratio (Avg/Min) 3:1

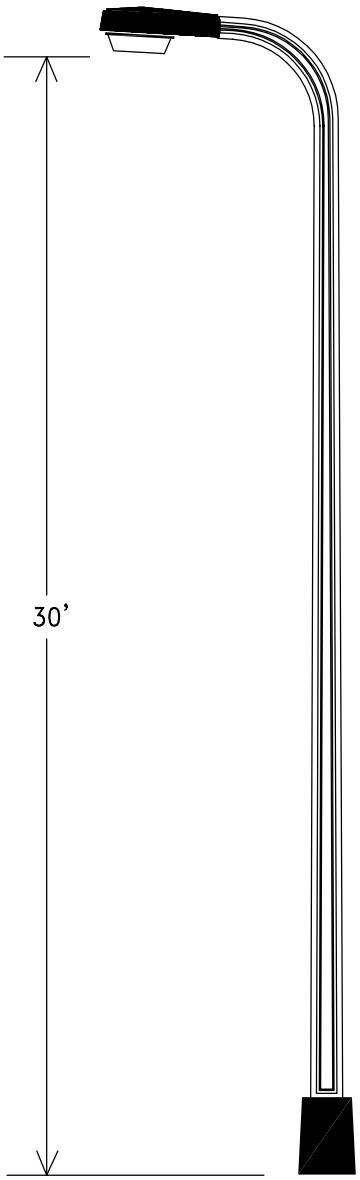
TYPICAL
COMMERCIAL BLOCK




250w HPS Fixtures

Note: Exact spacing will vary based on field conditions
and roadway width as determined by the Director of Public Works

SHOEBOX FIXTURE
AND POLE




NO SCALE

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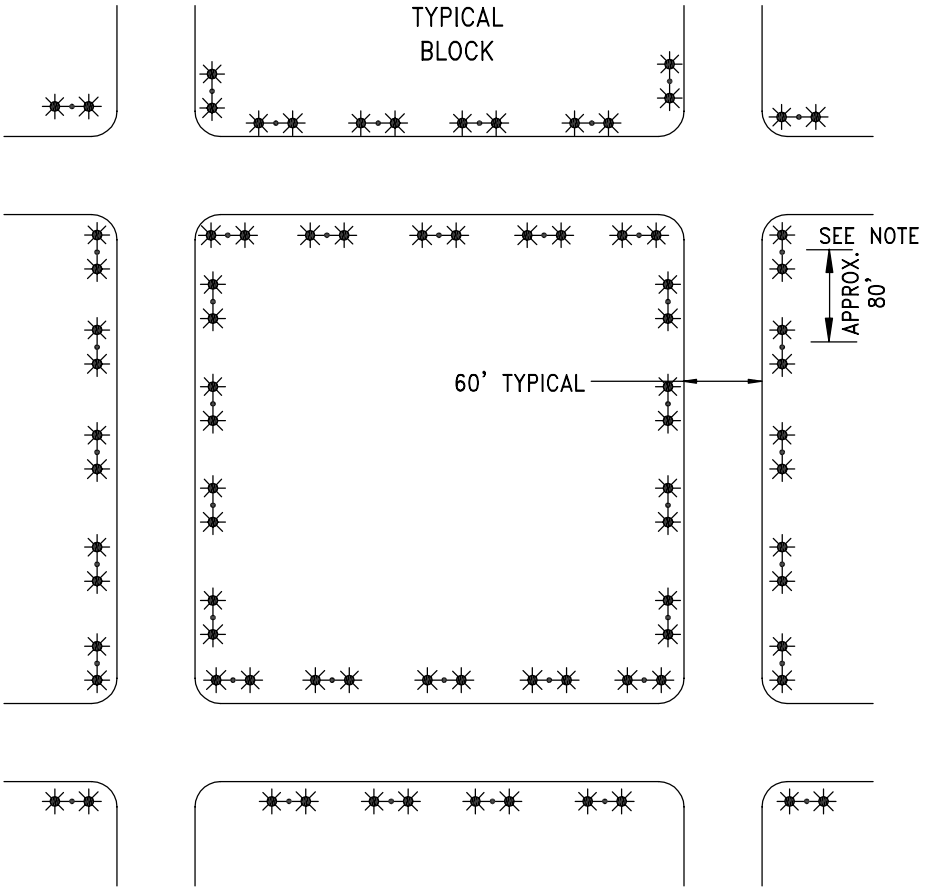
City of Minneapolis
Ornamental
Mid–Level
Central Business District
Street Lighting

ATTACHMENT

## Light Level Standards

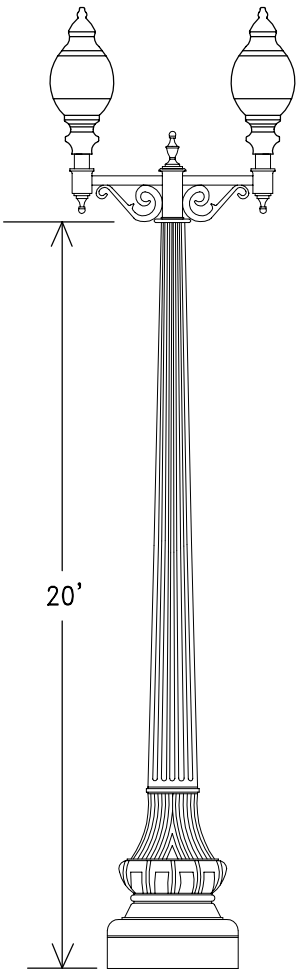
Average Footcandles 2.0
Uniformity Ratio (Avg/Min) 3:1




✳ 100w HPS Fixtures

Note: Exact spacing will vary based on field conditions
and roadway width as determined by the Director of Public Works

## EXAMPLE TWIN FIXTURE AND POLE




NO SCALE

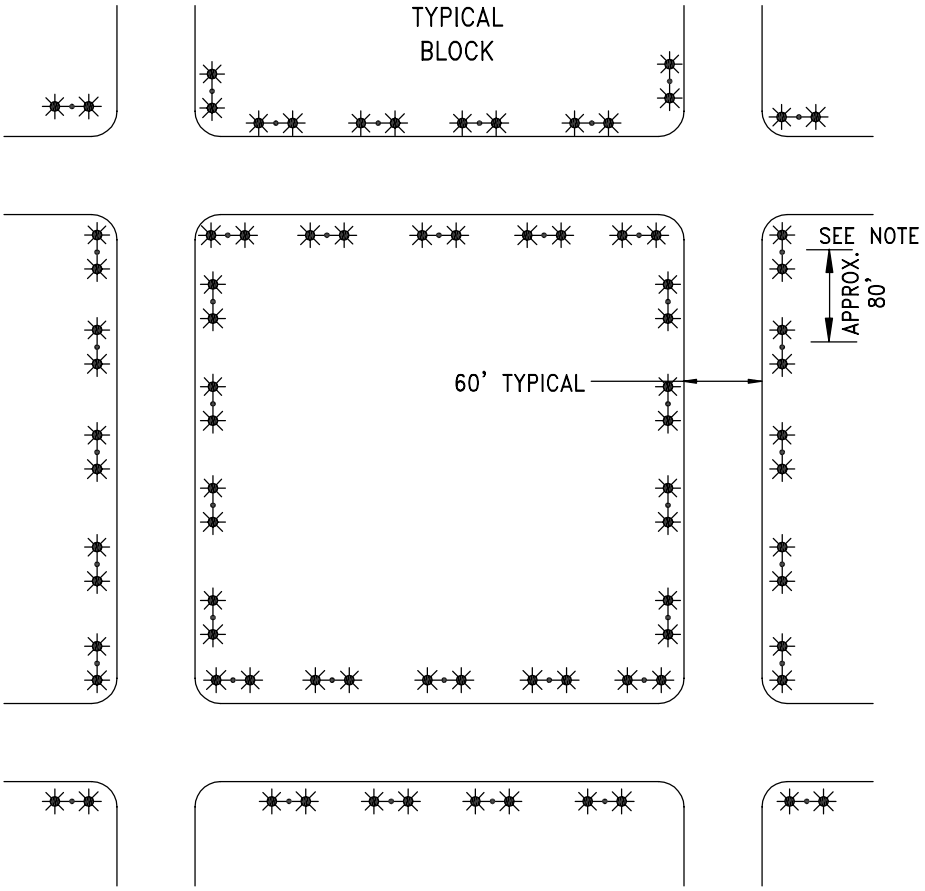
July 2004

City of Minneapolis
Ornamental
Mid–Level
Central Business District
Street Lighting

ATTACHMENT

## Light Level Standards

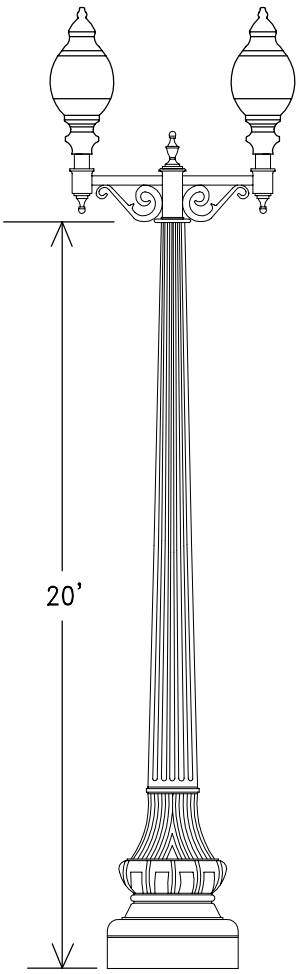
Average Footcandles 2.0
Uniformity Ratio (Avg/Min) 3:1




✳ 100w HPS Fixtures

Note: Exact spacing will vary based on field conditions
and roadway width as determined by the Director of Public Works

## EXAMPLE TWIN FIXTURE AND POLE




NO SCALE

July 2004

Attachment 14

Place-holder for Low Level Central Business District

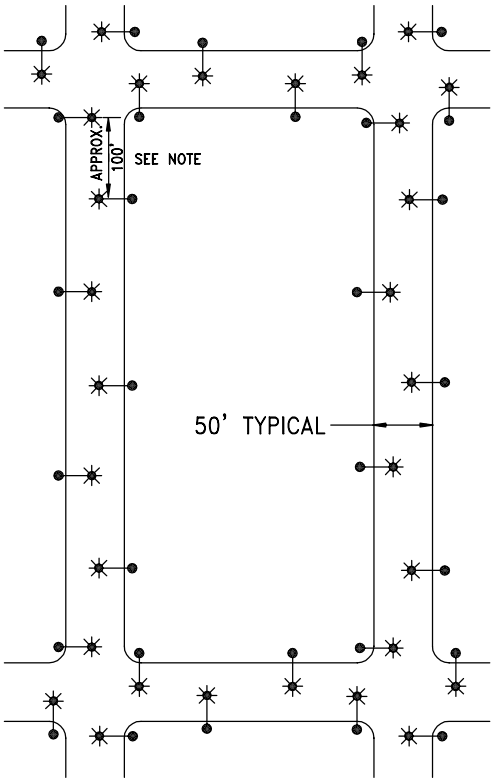
City of Minneapolis
Ornamental
High–Level
Pedestrian District
Street Lighting

ATTACHMENT

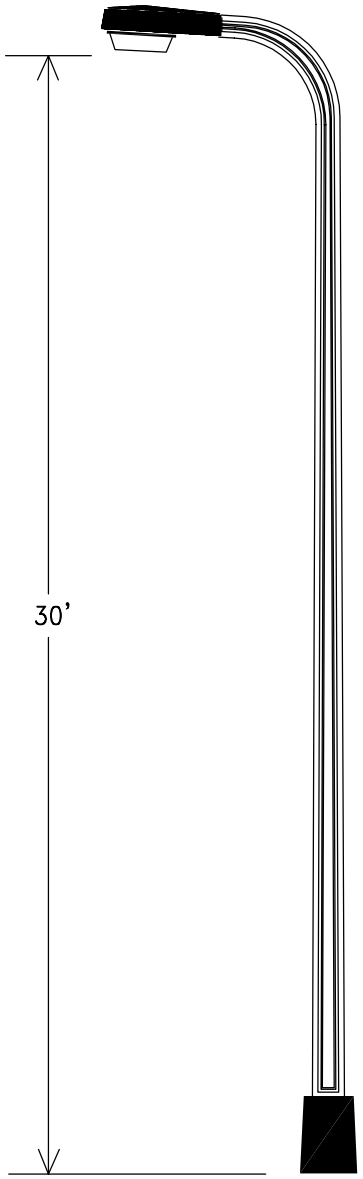
## Light Level Standards

Average Footcandles 1.6
Uniformity Ratio (Avg/Min) 3:1

TYPICAL
BLOCK




SHOEBOX FIXTURE
AND POLE




NO SCALE

✳—● 250w HPS Fixtures

Note: Exact spacing will vary based on field conditions
and roadway width as determined by the Director of Public Works

July 2004

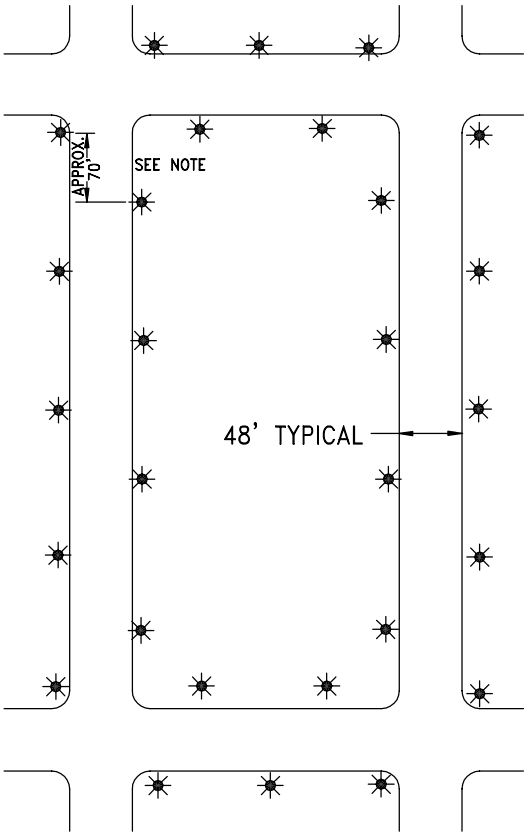
# City of Minneapolis
# Ornamental
# Low–Level
# Pedestrian District
# Street Lighting

ATTACHMENT

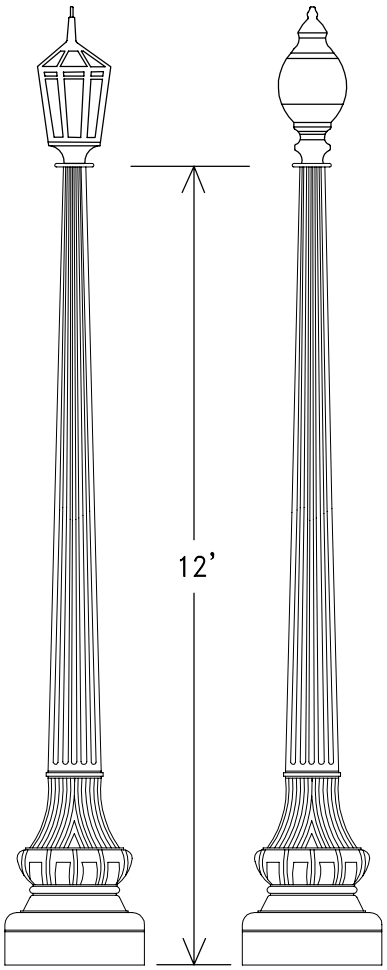
## Light Level Standards

Average Footcandles 0.8
Uniformity Ratio (Avg/Min) 3:1

TYPICAL
BLOCK




## EXAMPLE FIXTURE AND POLES




NO SCALE

✳ 100w HPS Fixtures

Note: Exact spacing will vary based on field conditions and roadway width as determined by the Director of Public Works

July 2004

Attachment 14

Place-holder for Park Board Parkway Lighting