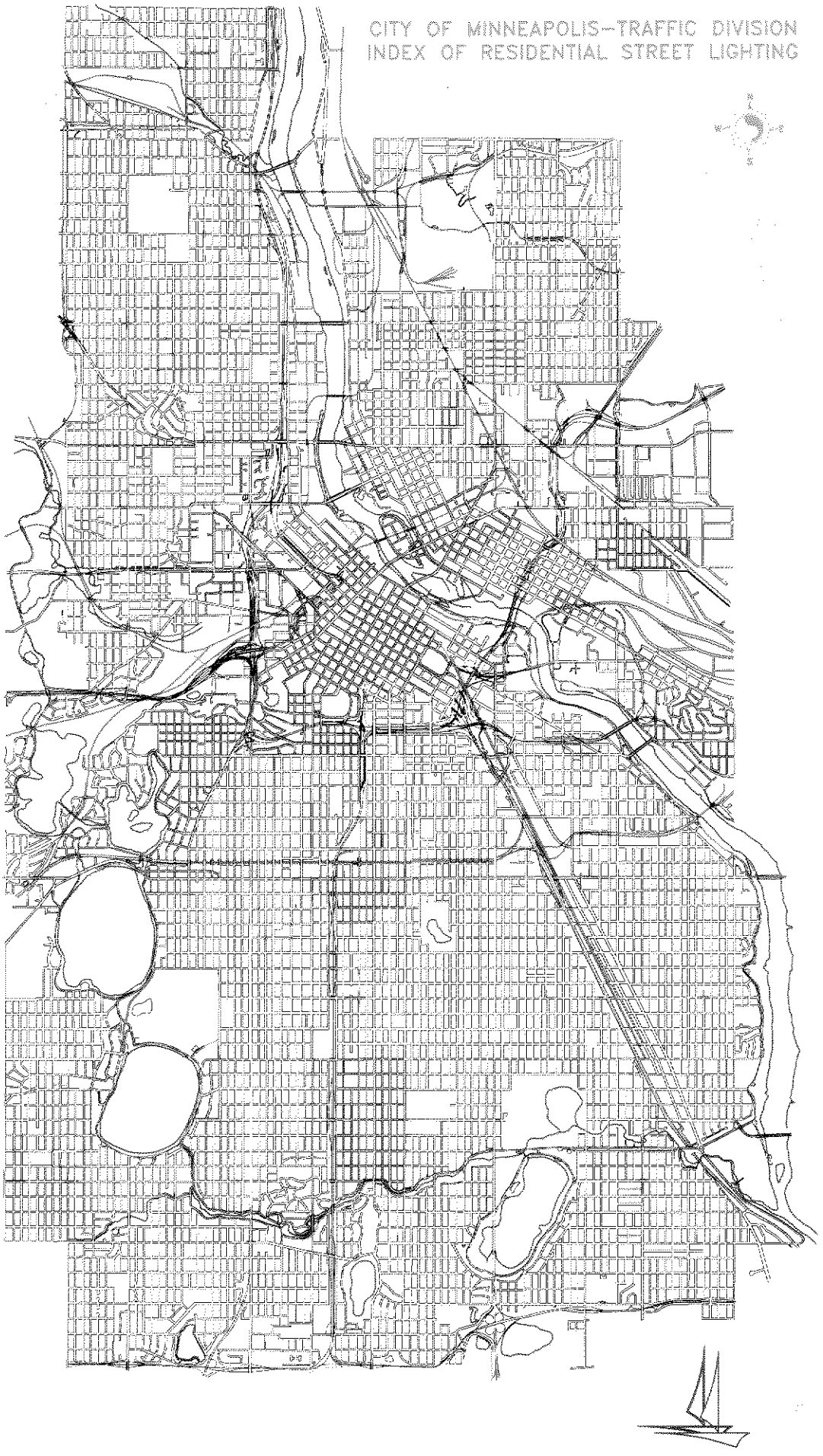
Attachment 1

CITY OF MINNEAPOLIS–TRAFFIC DIVISION
INDEX OF RESIDENTIAL STREET LIGHTING



Performance and Maintenance Criteria for Ornamental Lighting Systems

Criteria for Low and Mid- 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 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)

Term Definitions and Diagrams of Cutoff Classifications

The limited list of lighting related terms below are provided in order to make all decision makers and the public aware of nationally accepted standard terms and their definitions used in the lighting industry. Light poles and lighting systems actually have many distinct parts that work together to make a single light source installation. Similarly, there are various ways of measuring lighting levels and power, as well as many different styles of lighting fixtures.

TERM	ABBREV.	DESCRIPTION
Alternating current	AC	The flow of electricity which travels in waves and pulses on and off in cycles many times per second. The most common frequency of electricity used in this country is 60 cycles per second (hertz).
Acorn		 A traditional looking lens for a luminaire.
Acrylic		A damage resistance material often used for lighting housings such as acorns and globes.
Ambient light		General uniform illumination throughout the (work) area.
Base		Lowest portion of the pole assembly that connects the main pole to its mounting facility, or houses that connection, such as a concrete footing. May have an access panel.
Ballast		Device used in fluorescent and HID luminaires to provide the necessary starting voltage and to limit the lamp current during operation.
Banner arm		Accessory for attachment of decorative and event banners.
Beam Angle		Angular dimension of the cone of light from reflectorized lamps.
Cap		Decorative metal covering over the outside top of a luminaire such as an acorn.
Cobrahead		A type of standard street fixture with the luminaire extended out from the pole over the street on a long metal neck structure.
Color rendering index	CRI	Measure of the degree of color shift that an object undergoes when illuminated by a light source as compared with the color of the same object when illuminated by a referenced source of comparable color temperature. CRI is expressed as a number where 100 indicates that there is no color shift.
Conductor		A substance or material (typically wire) capable of carrying electric current.
Conduit		A protective tube that carries cables and wires to protect them from the elements.
Crossarm		The extension from the light pole that the head/luminaire is attached to.
Current		The flow of electrons in an electrical circuit (measured in amperes)
Cut-off angle		The angle from the photometric vertical axis at which a reflector, louver, or other shielding device cuts off direct visibility of a lamp. It is the complementary angle of the shielding angle.
Dark sky		A movement to reduce nighttime light pollution into the sky.

Diffuser		A translucent piece of glass or plastic that shields the light source in a fixture. The light distribution through the diffuse piece of glass or plastic will be even or "soft."
Direct bury		Method of pole placement where the lower end of the pole is buried into the existing soil.
Efficiency		The ratio of the lumen output of the luminaire to that of the bare lamp.
Finial		A decorative point typically affixed to the cap of a luminaire or the post.
Flag pole holder		Accessory near top of pole for holding flags.
Fluted pole		Traditional pole, possibly tapered, with parallel, linear, half-circle indents running the length of the pole and with possibly a matching base.
Fluorescent		A linear light source consisting of a tube filled with gas. When electrical current is applied, the resulting arc emits ultraviolet light that excites the phosphors on the inside of the lamp wall, causing them to radiate visible light.
Footcandle (FC)	FC	The English unit of measurement of the illuminance onto a surface. One footcandle is equal to one lumen per square foot. Also, the amount of light from a candle that falls on 1 square foot of surface. 1 FC = 10.76 lux.
Glare		The effect of brightness or brightness differences within the visual field sufficiently high to cause annoyance, discomfort or loss of visual performance. Alt. The sensation produced by luminance within the visual field that is significantly greater than the luminance to which the eyes are adapted.
Ground wire		A wire that makes a connection between a piece of electrical equipment and the ground, so the user is protected from electric shock if the equipment develops a fault.
Halogen lamp		Gas used in tungsten-halogen lamps which increases lamp life and enhances lumen output.
Head		Generally, the part of the luminaire that holds the lamp socket and mounting hanger or collar. When the mounting collar is part of or attached directly to the reflector housing, as in a clamshell style, that assembly has been referred to as either the head or the body.
High Intensity Discharge	HID	Abbreviation for High Intensity Discharge. Generic term used to describe mercury vapor, metal halide, high pressure sodium light sources and fixtures.
High Pressure Sodium	HPS	High intensity discharge (H.I.D.) lamp in which light is produced by radiation from sodium vapor operating at a partial pressure of about 1.33 x 10,000 Pa (100 Torr). Gives a yellowish color to the lamp and surroundings.
Illuminating Engineering Society of North American	IESNA	A society of engineers specializing in lighting related design and issues (www.iesna.org).
Illuminance (footcandle or lux)		Photometric term which quantifies light striking a surface or plane at a point. It is expressed either in lumens per square foot, footcandles (the English metric) or lumens per square meter, lux (the metric unit). 1 footcandle = 10.76 lux.

Incandescent lamp		Light source which generates light using a thin filament wire (usually tungsten) heated to white heat by an electric current passing through it.
Insulator		A substance or material (such as rubber or glass) that will not permit the flow of electric current.
Kilowatt hour	KwH	The measure of electrical energy usage from which electricity billing is determined.
Lamp	LP	The actual source of light in a fixture. Some people refer to fluorescent lamps as "tubes" and incandescent lamps as "light bulbs."
Lantern		A traditional style light fixture or luminaire.
Lens		Outside surface of the luminaire, consisting of textured or smooth material such as acrylic, glass, polycarbonate.
Light		The visible portion of the electromagnetic spectrum; this extends from approximately 380 to 770 nanometers (nm).
Light Loss Factor	LLF	A factor used in calculating illuminance after a given period of time and under given conditions. It takes into account temperature and voltage variations, dirt accumulation on luminaire and room surfaces, lamp depreciation, maintenance procedures and atmosphere conditions. Formerly called maintenance factor. Generally light loss factors are divided into two groups, classed as "recoverable" (with cleaning and relamping) and "nonrecoverable."
Light pollution		Upward spillage of light into the night sky, adversely affecting telescopes and satellites.
Light trespass		A situation which occurs when light from a source is distributed onto areas where the illumination is not wanted.
Low Pressure Sodium	LPS	A discharge lamp in which light is produced by radiation from sodium vapor. Considered a monochromatic light source (appears to be orange in color and renders most other colors as gray or brown).
Lumen	lm	Measurement of the light ouput of a lamp, or the SI unit of luminous flux.
Luminaire		A complete lighting unit consisting of a lamp or lamps, the parts designed to distribute the light (housing), and any necessary starting components (ballast, socket, etc.).
Luminaire mounting		The method of attaching the light source to the pole, either pole top or suspended on a crossarm.
Metal Halide	MH	A type of high intensity discharge (HID) lamp in which the major portion of the light is produced by radiation of metal halides, argon and mercury vapors in the arc tube. Includes clear and phosphor-coated lamps which differ in their color-rendering characteristics.
Mercury Lamp		A type of high intensity discharge (HID) lamp in which the major portion of the light is produced by radiation from mercury. This lamp emits light in the blue/ green range and is favored by landscape architects.
Mounting height		In a given application, the distance from the luminous area of the luminaire (typically the bottom) to the floor.
Nadir		An expression used when discussing luminaire photometry. It describes the direction the light is traveling from the luminaire to directly below the luminaire (0 angle).

National Electrical Code	NEC	Nationally recognized standards governing the installation of electrical equipment. The document compiled by the NFPA that provides safety standards for installation and application of electrical equipment.
National Electrical Manufacturers Association	NEMA	An acronym for the National Electrical Manufacturers Association. NEMA is a U.S. electrical industry organization comprised of manufacturers.
Photometry		Photometry is the science of measuring visible light in units that are weighted according to the sensitivity of the human eye.
Photometrics		Photometric Data includes measured product performance for lighting products, including luminous intensity, efficiency, and zonal luminous flux. Test reports are available from laboratories and electronic files are available from most lighting manufacturers.
Pole		The main 'stem' of a light assembly.
Receptacle		Pole accessorie, a standard plug in power source with weatherproof door.
Reflector		The part of a light fixture that shrouds the lamps and directs the light emitted from the lamp.
Refractor		A device used to redirect the light output from a source, primarily by bending the waves of light.
Shoebox		An outdoor luminaire that emits most useful light at lower angles. Essentially, no light above 90 degrees is displayed. Sometimes called a "shoebox" because of its rectangular shape.
Solar lighting		Lighting using the suns energy as the direct power source, and typically comprised of the light, pole, solar collector, insulated battery, support hardware, charging and lighting controller,wire, and related materials, all of which are often at the top of the pole.
Surface mount		Method of bolting the pole base to a concrete surface or footing.
Transformer	Xfmr	A device designed to transfer energy from one circuit to another by electromagnetic induction. Transformers are typically used to increase (step up) or decrease (step down) the voltage from one circuit to another. The turns ratio, or number of windings on the primary and secondary sides of the transformer, will affect the change in voltage.
Underwriter's Laboratories	UL	Private organization which tests and lists electrical (and other) equipment for electrical and fire safety according to UL and other standards. Not an indication of overall performance.
Visible spectrum		Visible light
Watt	W	The unit for measuring electrical power. It defines the energy consumed by an electrical device when it is in operation.
Wire		Copper strands that actually carry power to the lamps.
Zenith		The point of direction directly above the luminaire (180 degree angle).

Lighting term sources:

- City of Minneapolis
- GE
- Hubbell
- Lithonia
- manufacturer catalogs

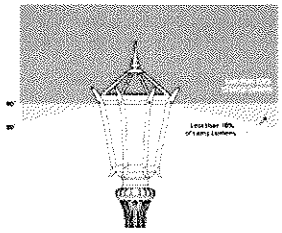
Levels of Cutoff

Full Cutoff – No light above the 90° and only 10 % lamp lumens above 80°.

Full Cutoff

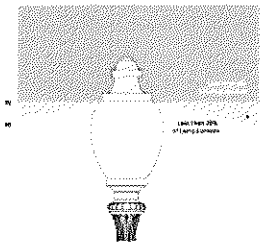
Cutoff – No more then 2.5% of lamp lumens above 90° and only 10% lamp lumens above 80°.

Cutoff



Semi-Cutoff - No more then 5% of lamp lumens above 90° & only 20% lamp lumens above 80°.

Semi-Cutoff



Non-cutoff – limitation on light distribution at any angle

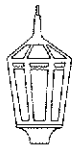
Non-Cutoff

City of Minneapolis
Lighting Unit Choices

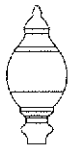
ATTACHMENT 4

Low-Level 100W HPS Fixtures

LANTERN



ACORN

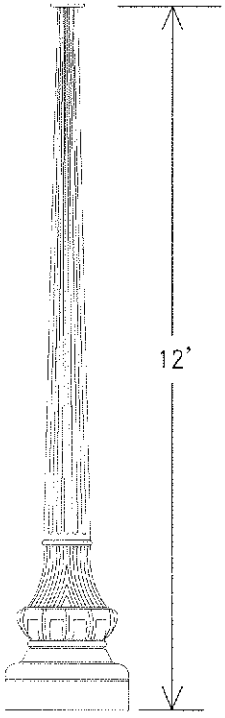


Fixture 3
T.B.D.

?

Fixture 4
T.B.D.

?



Pole 2

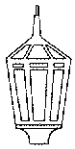
To Be Determined

?

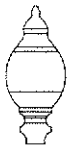
Low-Level Poles

Mid-Level 100W HPS Fixtures

LANTERN



ACORN



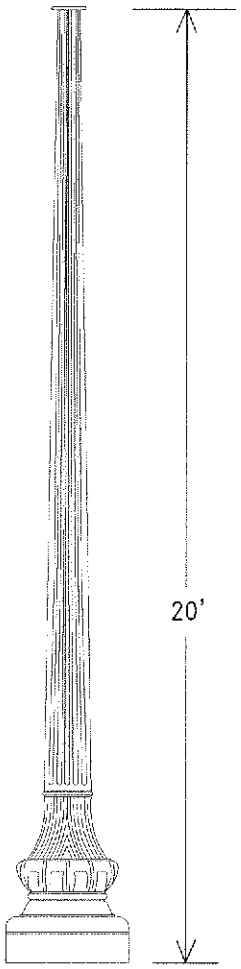
Fixture 3
T.B.D.

?

Fixture 4
T.B.D.

?

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



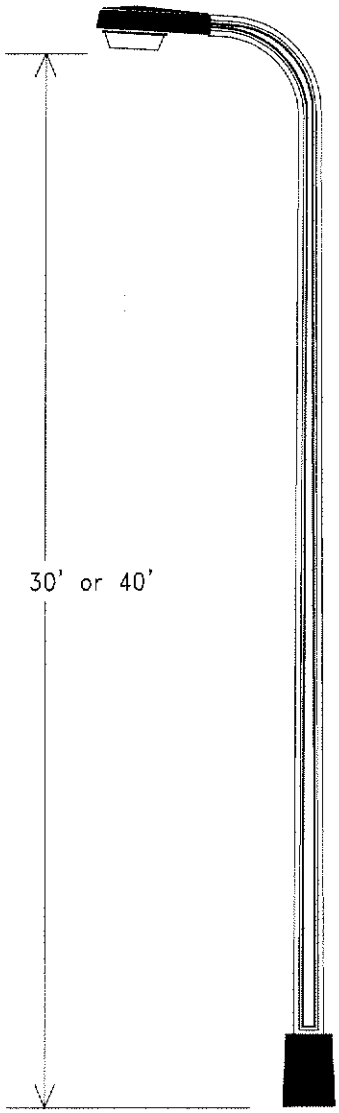
Pole 2

To Be Determined

?

Mid-Level Poles

High-Level Fixtures
250W HPS
SHOEBOX FIXTURE AND POLE



High-Level Poles

July 2004

Costs of Street Lighting Systems

Residential

Type	Number of Structures	Wattage	Total Operation and Maintenance	Foot Candle	Total Capital	Total Cost
Xcel (2 intersection & 5 mid-block)	7	800	$20,550	0.3	included in flat rate	$20,550
Low Level	14	1400	$23,300	0.4	$18,200	$41,500

*Based on 3 sides (2 long and a short) of a 600 by 300 foot residential block over a 25 year life (32 foot street width)

Central Business District

Type	Number of Structures	Wattage	Total Operation and Maintenance	Foot Candle	Total Capital	Total Cost
Low-Level	13	1300	$21,655	1.7	$16,900	$38,555
Mid-Level	9	900	$19,200	2.0	$53,280	$72,480
High-Level	8	2000	$18,920	2.5	$20,800	$39,720

*Based on a 350 foot downtown block over a 25 year life

Pedestrian Districts

Type	Number of Structures	Wattage	Total Operation and Maintenance	Foot Candle	Total Capital	Total Cost
Low-Level	9	900	$15,800	0.8	$20,000	$35,800
Mid-Level single	17	1700	$28,300	1.2	$90,800	$119,100
Mid-Level twin	9	1800	$19,200	1.2	$53,100	$72,300
High	7	1750	$18,200	1.6	$20,300	$38,500
Mixed (4 high, 4 low)	8	1400	$16,100	1.2	$20,500	$36,600

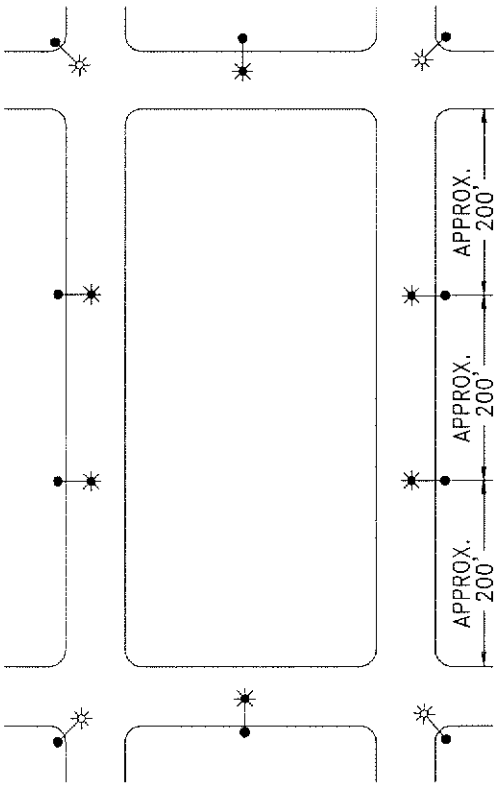
*Based on a 50 foot roadway width on 600 foot block over a 25 year life

Assumptions made:
Low and Mid level use 100 watt HPS
High Level use 250 watt HPS
Electric cost = [(wattage)*(11.4 hours/day)*(365 days/year)*(25 years)/1000]*$0.04766/Kwh
Annual Maintenance cost: (includes relamping and knock-downs)
High-level shoebox= $4/month/fixture
Low-level ornamental= $5.50/month/fixture

City of Minneapolis
Standard
Street Lighting

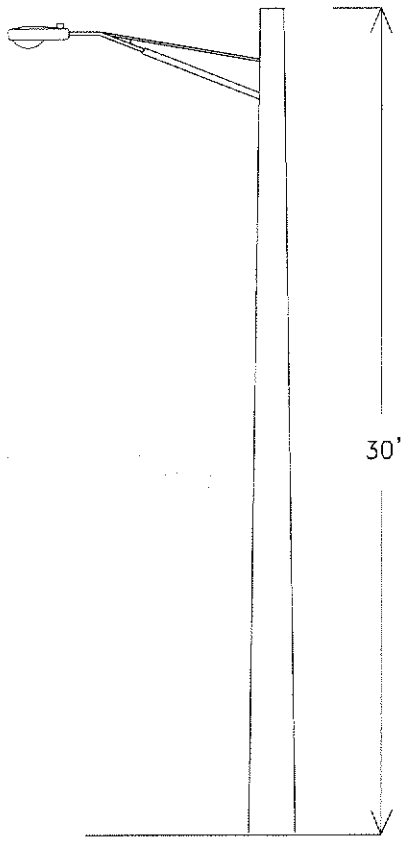
ATTACHMENT 6

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

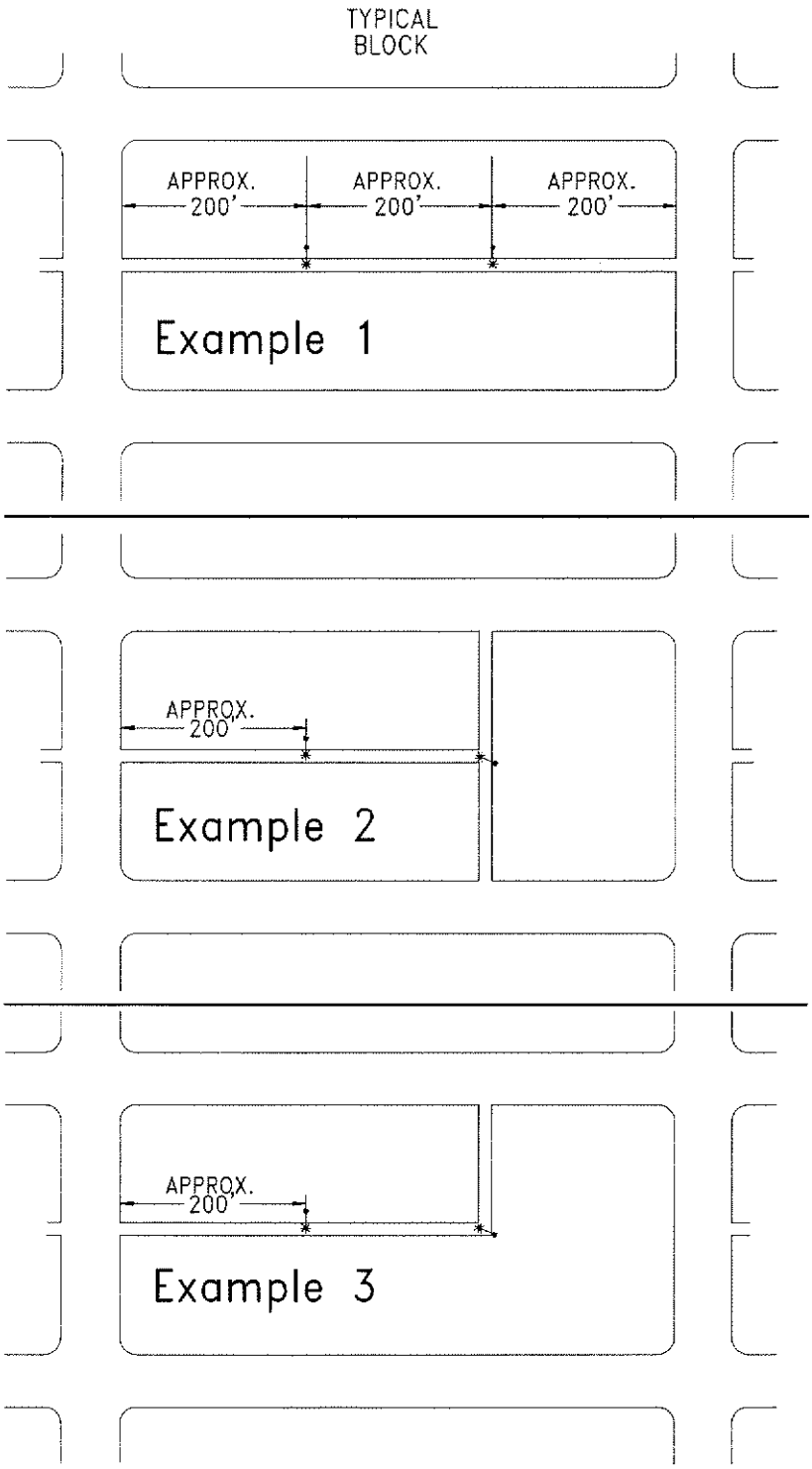


NO SCALE

December 2004

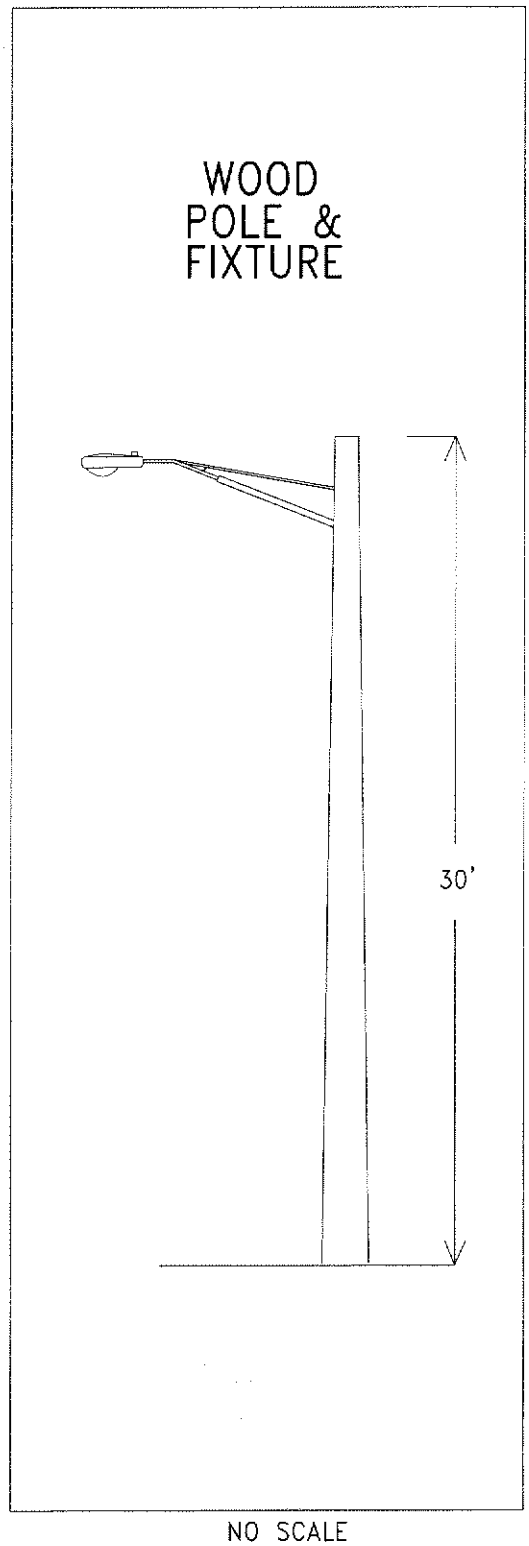
City of Minneapolis
Standard
Alley Lighting

ATTACHMENT 7



100w HPS Fixtures (Typical)

Note: Spacing will vary based on field conditions



NO SCALE

December 2004

Attachment 8

DEPARTMENTAL USE ONLY

Date Received _____
Date Approved _____
Type Light _____
Project No. _____
Petition % _____
Ward _____

PETITION REQUESTING STANDARD (WOOD POLE) RESIDENTIAL AREA STREET/ALLEY LIGHTING

We, the following property owners/residents upon _____ between the limits of _____ and _____, by affixing our signatures below, do hereby petition the City Council to authorize the installation of ___ standard wood pole street/alley light(s) in this area.

The light(s) would be located approximately _____.

65% of the properties listed on the petition must approve of the installation.

Public Works must receive the completed petition by _____ to be considered.

Property owner/resident Name	**Property owner/resident Signature**	**Property Address**
		XXXX Street
		XXXX Street
		XXXX Street
		XXXX Street
		XXXX Street
		XXXX Street

For additional information, contact the Traffic Engineering Division, 350 S 5th St, Rm 233 City Hall, Minneapolis, MN 55415 or call (612) 673-2411.

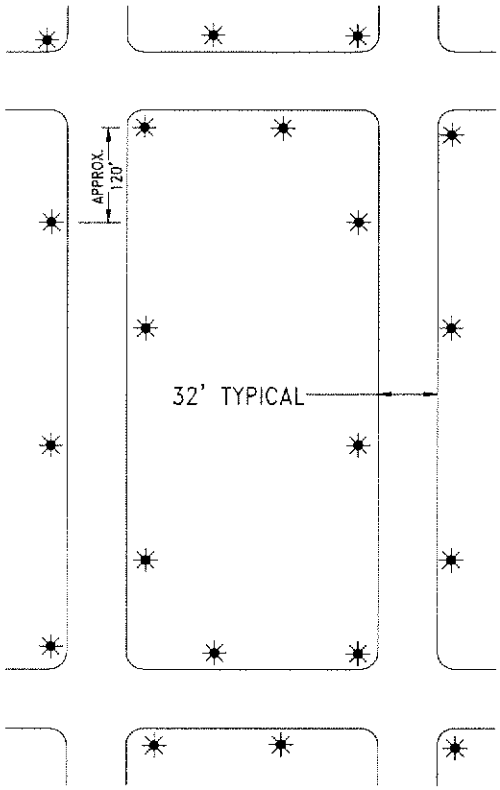
City of Minneapolis
Ornamental
Low-Level
Residential
Street Lighting

ATTACHMENT 9

Light Level Standards

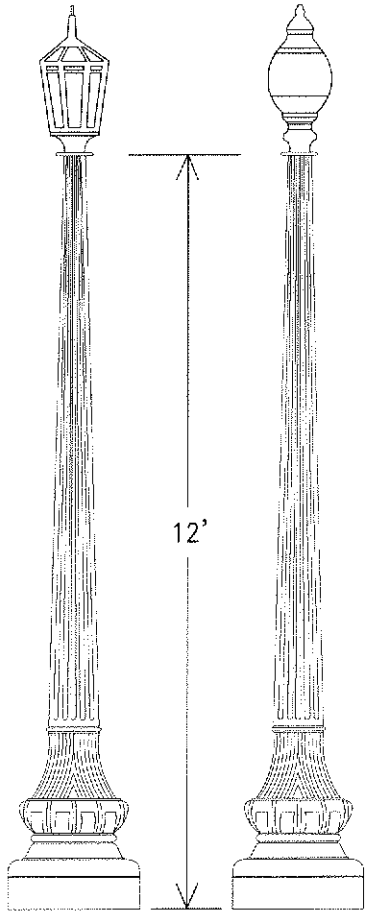
Average Footcandles 0.3 - 0.6
Uniformity Ratio (Avg/Min) 6:1

TYPICAL
BLOCK



✷ 100w HPS Fixtures

EXAMPLE FIXTURE AND POLE



NO SCALE

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

December 2004

BLANK STREET NEIGHBORHOOD LOW LEVEL LIGHTING PROJECT 11/04

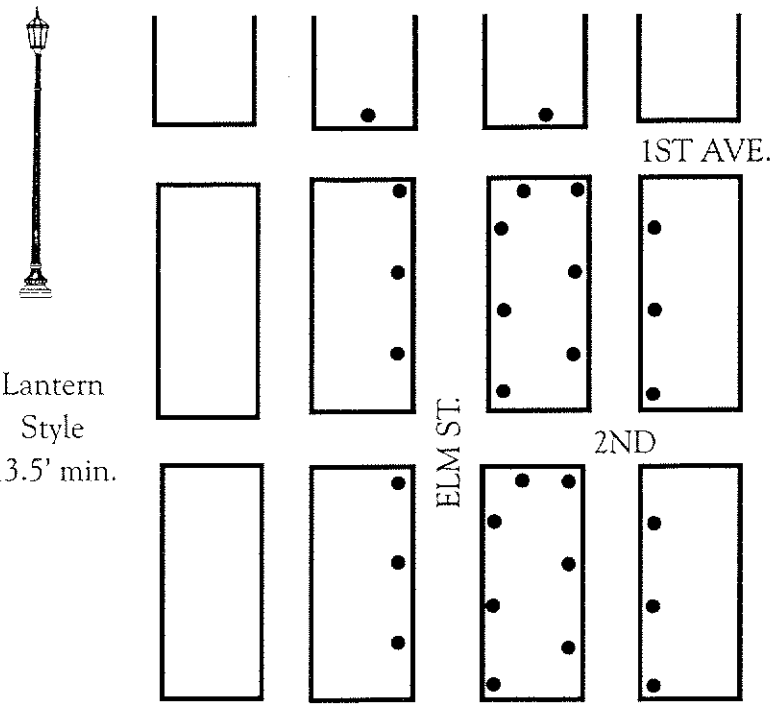
SAMPLE

We, the undersigned property owners, do hereby request the City of Minneapolis to proceed with the formal process of approving the installation of low level lights in the BLANK STREET area, per the plan attached.

We understand that the capital cost of the total project is estimated at $_____ which may be reduced by NRP funds.

This capital assessment will be spread over a 20-year period of time. The current estimated assessment is $__ per ___ square foot of property, plus interest on the unpaid balance (approximately $_____ for a typical size lot.)

We understand that there will be no assessment for the operation and maintenance of these lights.



Name (please print and sign)	Address	Phone #

DEFINITION OF DISTRICTS

Public Works is preparing a map denoting the three lighting districts. The start of this map can be seen on the following page and will be completed by January 1, 2005.

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 Santa Fe railroad tracks

Some areas within the CBD are more residential than commercial in nature. It may be requested to have a lower lighting level than typical commercial areas, but higher than typical residential areas (examples: Elliot Park, Mills District, Loring Park).

Pedestrian District (PD)

Pedestrian Districts (PD) will be defined based on the following criteria:

- 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 current 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 and are reasonably contiguous to other pedestrian districts.
- Public Works and CPED will further define locations determined to be high pedestrian activity areas.

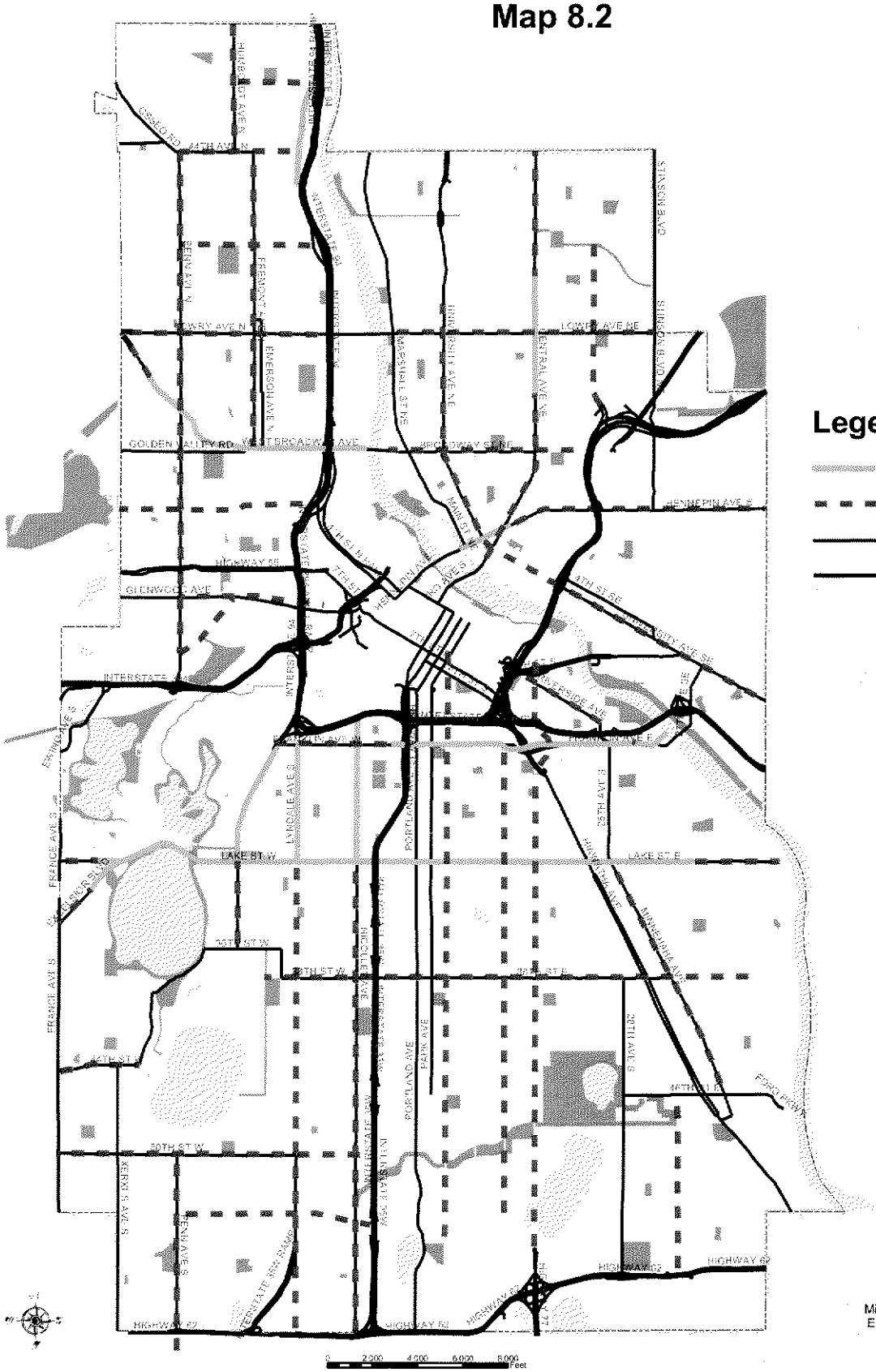
Residential District

- All areas not defined above are a residential district

Attachment 11

City of Minneapolis

Classification of Major Corridors
Map 8.2



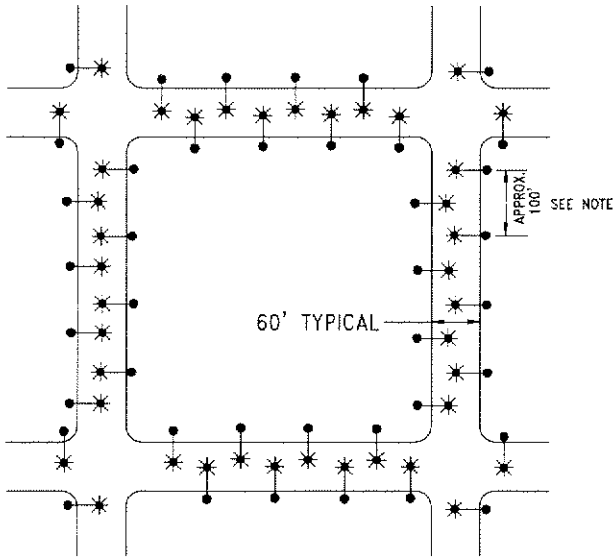
City of Minneapolis
Ornamental High-Level
Central Business District
Street Lighting

ATTACHMENT 12

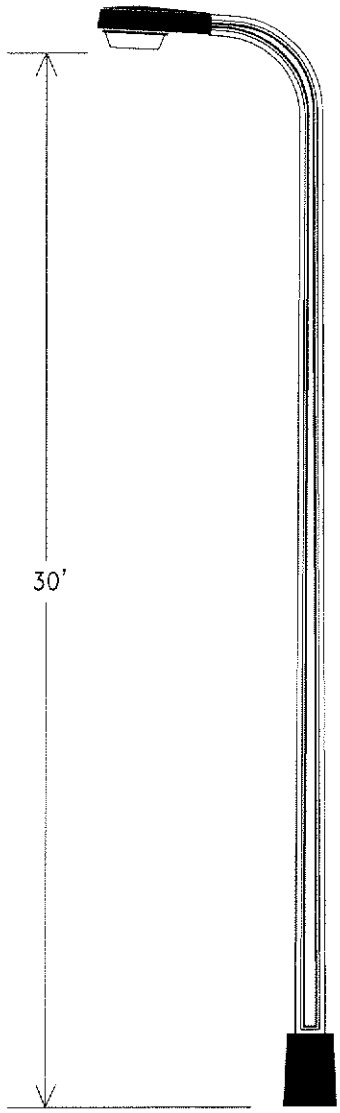
Light Level Standards

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

TYPICAL
COMMERCIAL 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

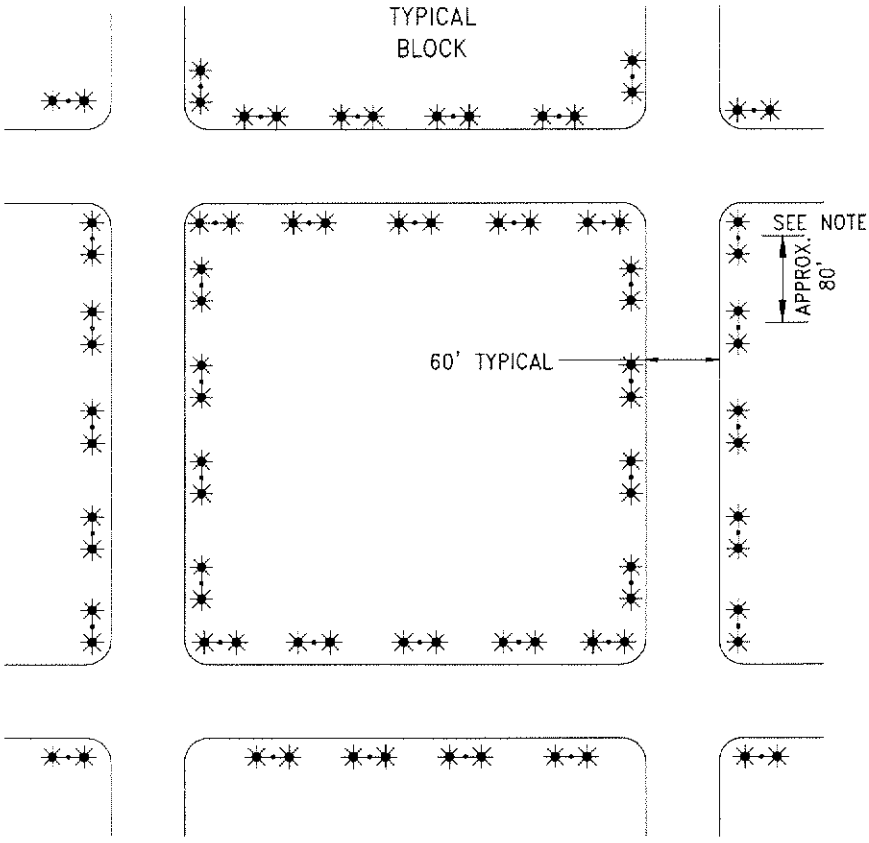
December 2004

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

ATTACHMENT 13

Light Level Standards

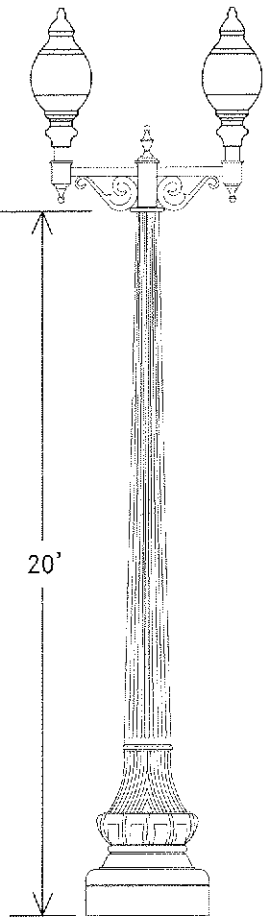
Average Footcandles 2.0
Uniformity Ratio (Avg/Min) 3:1



✷ 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

December 2004

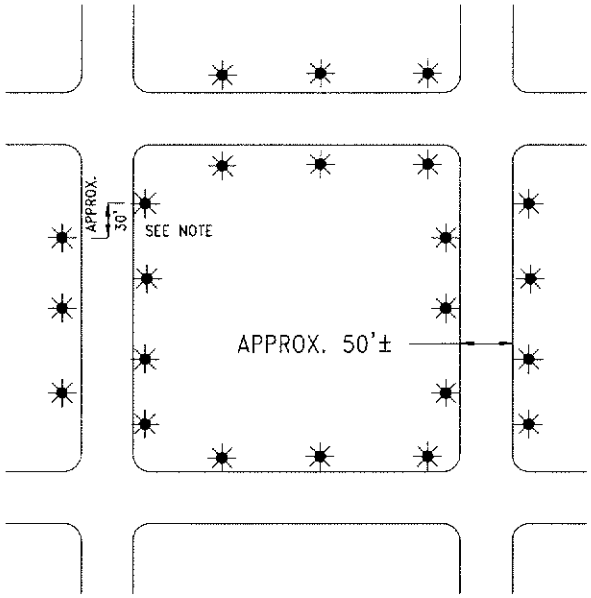
City of Minneapolis
Ornamental
Low–Level
Central Business District
Street Lighting

ATTACHMENT 14

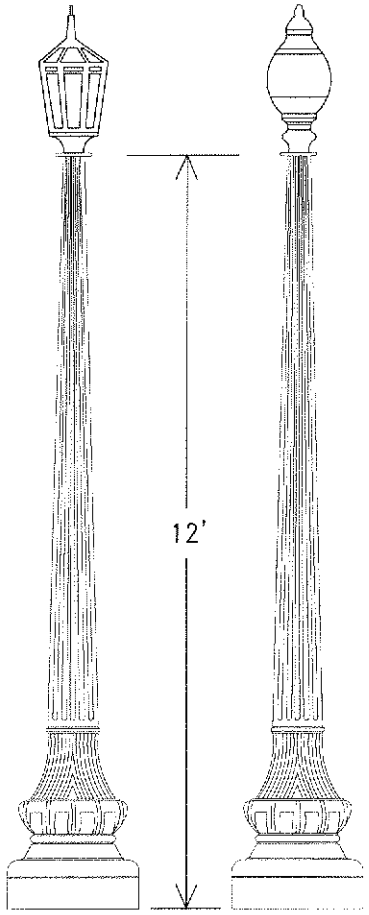
Light Level Standards

Average Footcandles 1.7
Uniformity Ratio (Avg/Min) 1.3:1

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
(12 ft. poles will only be used in areas with less than typical downtown street widths)

December 2004

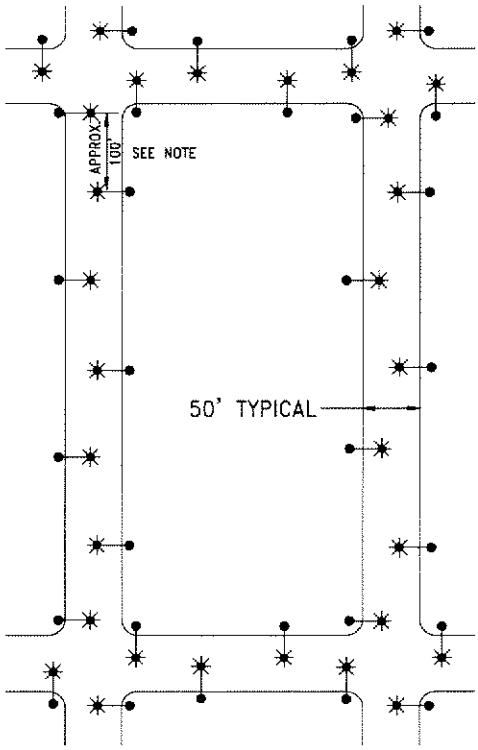
City of Minneapolis
Ornamental
High–Level
Pedestrian District
Street Lighting

ATTACHMENT 15

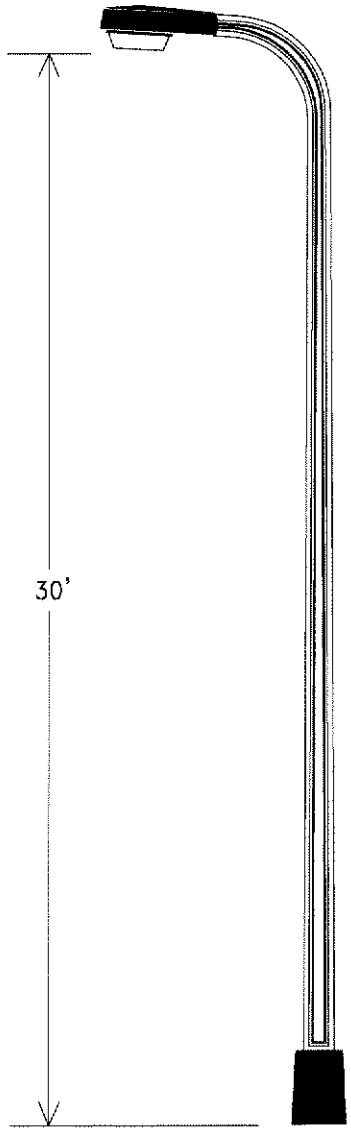
Light Level Standards

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

December 2004

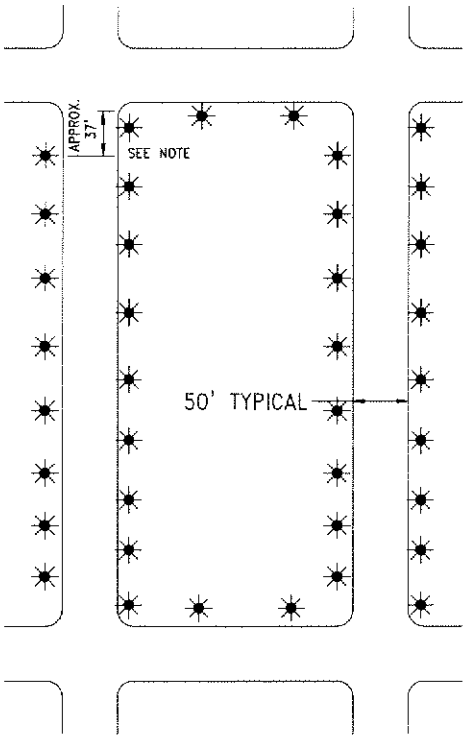
City of Minneapolis
Ornamental
Mid-Level
Pedestrian District
Street Lighting

ATTACHMENT 16

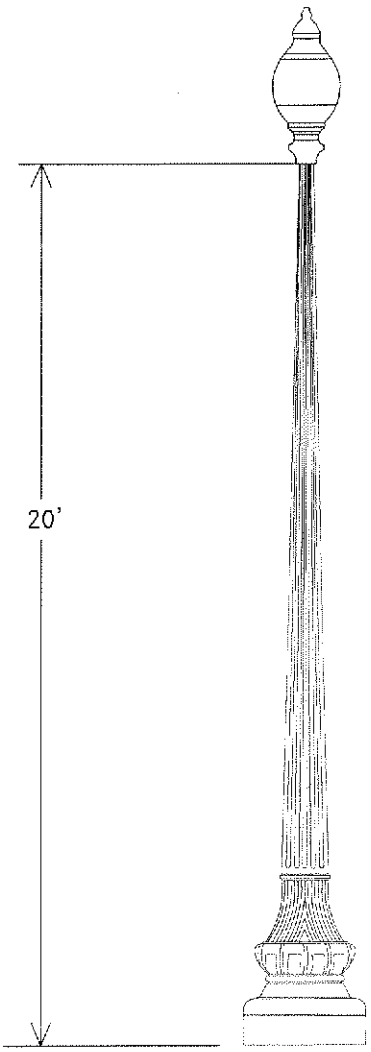
Light Level Standards

Average Footcandles 1.2
Uniformity Ratio (Avg/Min) 3:1

TYPICAL
BLOCK



EXAMPLE FIXTURE
AND POLE



SINGLE FIXTURE

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

December 2004

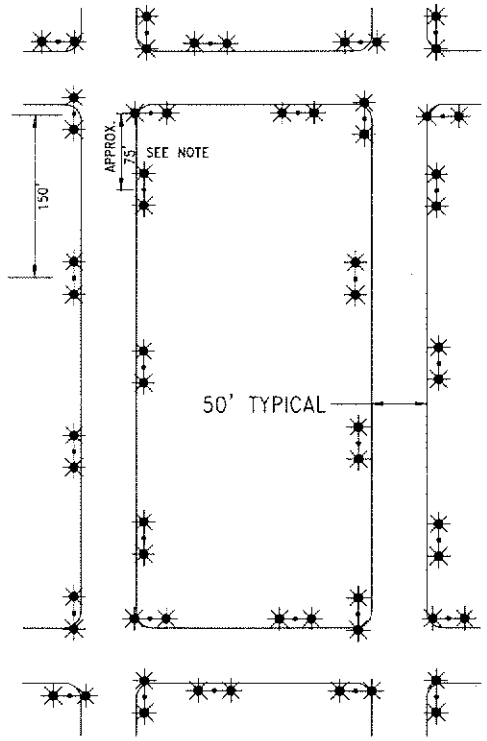
City of Minneapolis
Ornamental
Mid-Level
Pedestrian District
Street Lighting

ATTACHMENT 17

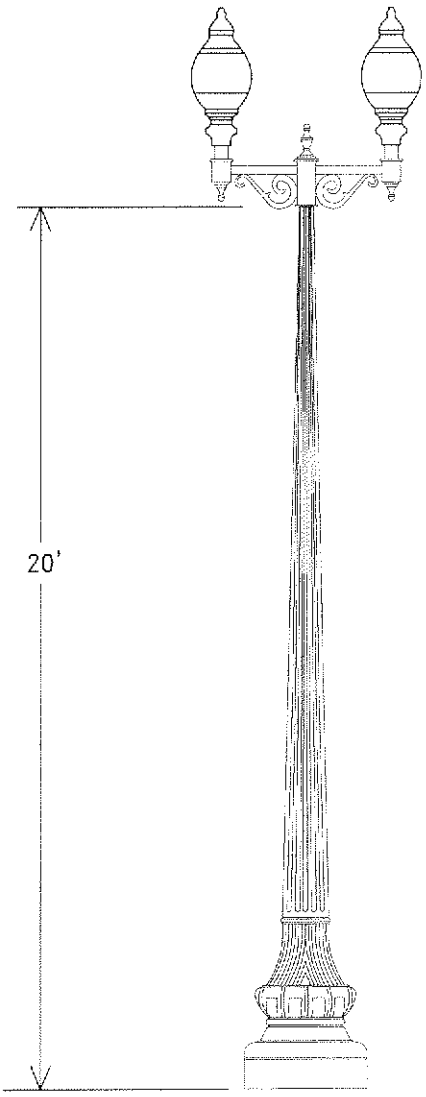
Light Level Standards

Average Footcandles 1.2
Uniformity Ratio (Avg/Min) 3:1

TYPICAL
BLOCK



EXAMPLE FIXTURES
AND POLE



TWIN FIXTURE

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

December 2004

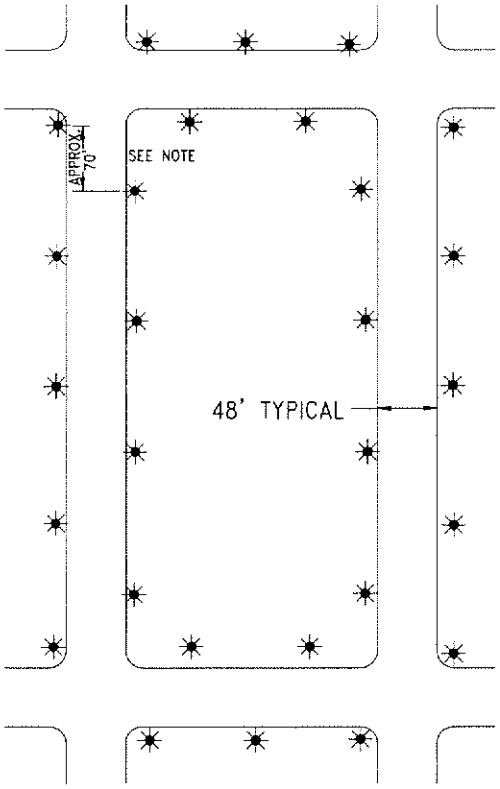
City of Minneapolis
Ornamental
Low-Level
Pedestrian District
Street Lighting

ATTACHMENT 18

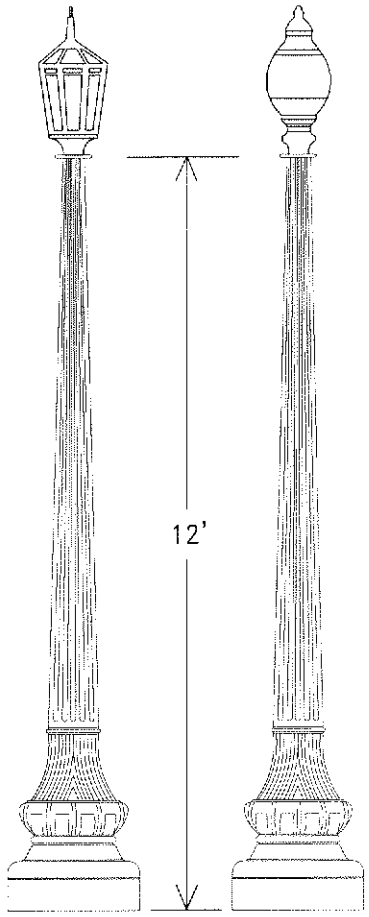
Light Level Standards

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

December 2004

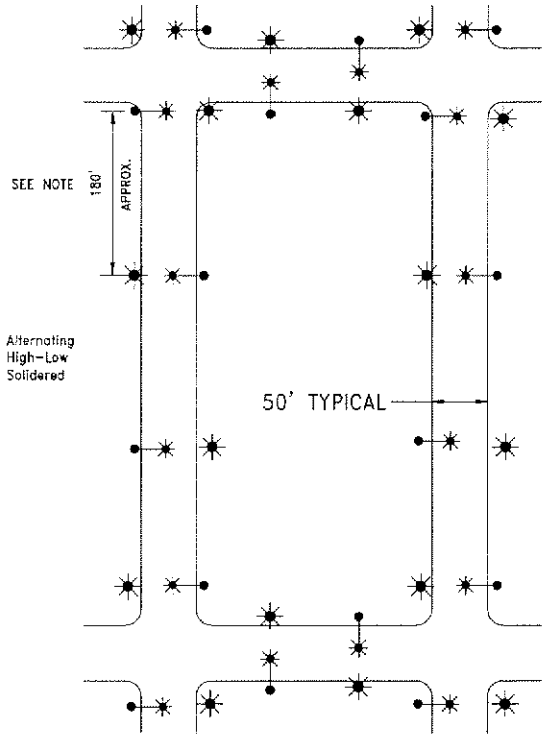
ATTACHMENT 19

City of Minneapolis
Ornamental
Mixed High-Level & Low-Level
Pedestrian District
Street Lighting

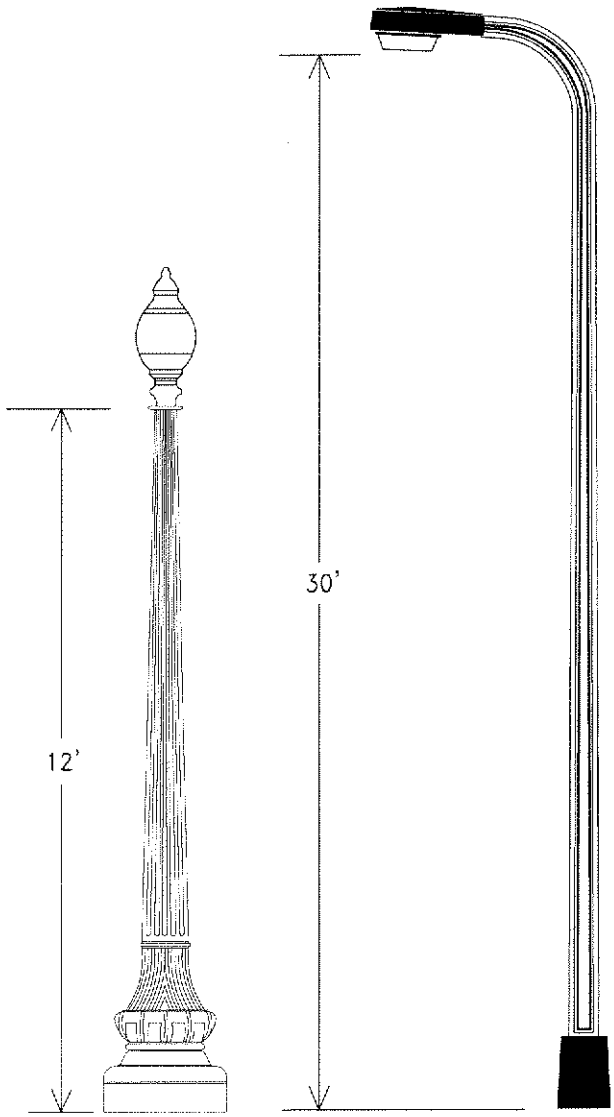
Light Level Standards

Average Footcandles 1.2
Uniformity Ratio (Avg/Min) 3:1

TYPICAL
BLOCK



EXAMPLE FIXTURE
AND POLES



NO SCALE

✳ 100w HPS Fixtures
✳—• 250w HPS Fixtures

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

December 2004

Attachment 20

Place-holder for Park Board Parkway Lighting