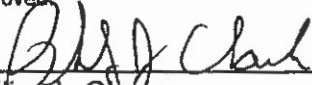


To:		ENGINEERING	95-005
GUIDANCE ONLY SUPERSEDED BY <u>EB 06-004</u> EFFECTIVE <u>9/7/06</u>		TRUCTION w York State Department of Transportation	Supersedes:
SUPERSEDED BY <u>EI 07-006</u> EFFECTIVE <u>9/06/07</u>			
Title: Lighting for Nighttime Operations - Special Specifications		MODIFIED BY EI 95-003 EFFECTIVE 1/18/95	
Distribution:		Approved:	
<input checked="" type="checkbox"/> Main Office(30) <input checked="" type="checkbox"/> Local Gov.(31) <input checked="" type="checkbox"/> Regions(32) <input checked="" type="checkbox"/> Contractors/AGC(39) <input checked="" type="checkbox"/> Consultants(34) <input type="checkbox"/> _____ ()		 Philip J. Clark Deputy Chief Engineer (Design)	
		<u>1/13/95</u> Date	

Attached are metric and non-metric versions of a special specification for lighting nighttime construction operations. This specification is a "Main Office Insert", therefore, the Design Quality Assurance Bureau (DQAB) will add the appropriate version of the specification to proposals for projects which include the corresponding item in the Engineer's Estimate. Specification 15619.6730 is effective with the letting of May 25, 1995. The metric version, 15619.6730 M, is effective with the letting of June 15, 1995.

The specification is to be used on all contracts that require construction operations after sunset or before sunrise. This includes regularly scheduled nighttime operations such as paving, milling, and pavement repair operations. The specification is also to be used for occasional nighttime operations such as bridge demolition, steel erection, or bridge deck placement. This specification is not intended to be used for moving operations such as placement of pavement markings or similar operations that do not require workers on foot in the work area.

For projects where the Department decides to include nighttime operations after the letting, this specification is to be added by Order-on-Contract with an agreed price, or by force account if necessary. When nighttime operations are done at the contractor's request and convenience, these requirements apply but no separate payment shall be made.

LIGHTING REQUIREMENTS

This specification requires the contractor to furnish portable or trailer-mounted light towers to provide Level I [50 lx (5 footcandle)] illumination throughout the entire area of construction operations. Construction operations include all work operations by contractor's personnel, including layout and measurement ahead of the actual work. Additional lighting is required to achieve either Level II [100 lx (10 footcandle)] or Level III [200 lx (20 footcandle)] illumination for the various tasks listed in the specification. These higher levels of illumination may be achieved by adding additional luminaires on the portable or trailer-mounted towers, increasing the number of light towers, or by mounting light towers directly on construction equipment such as paving, milling, and bridge finishing machines. The only exception to the requirement for Level I illumination throughout the area of construction operations is that finish rollers can work beyond the area of Level I illumination using floodlights mounted on the roller.

LIGHTING PLAN

The specification requires the contractor to submit a lighting plan to the EIC at least 30 days prior to the start of nighttime operations. The plan must address the following items to be considered acceptable:

- o Layout plan showing location of light towers, including both typical spacing and lateral placement.
- o Description of light towers to be used.
- o Description of electrical power source.
- o Attachment and mounting details for lights to be attached to equipment.
- o Specific technical details on all lighting fixtures to be provided, including power rating and photometric charts.
- o Details on any hoods, louvers, shields, or other means to be used to control glare.
- o Lighting calculations.

It is the contractor's responsibility to select appropriate lighting fixtures and to determine the appropriate location, arrangement, and spacing to achieve the required illuminance levels. If there is any question as to whether the required illuminance levels will be met, the plan should be referred to the Regional Design or Traffic Group for review.

It will also be necessary to check the photometric charts for the luminaires proposed for use by the contractor to ensure that the glare control requirements of the specification are met.

If the plan does not adequately address any of these points, or has other deficiencies, the contractor shall be notified in writing, with a list of the specific deficiencies that must be addressed.

OPERATIONAL CHECKS

Prior to the start of nighttime operations, the lighting plan must have been submitted and the contractor must have all necessary lighting equipment on the project and installed on the equipment. On the first night of operation, the EIC must check the adequacy of the lighting plan using the photometer supplied by the contractor. A uniform pattern of readings spaced approximately every 3 m (10') throughout a representative test area should be taken. If the required illuminance and uniformity levels are not met, the contractor must make the necessary adjustments before work continues. The EIC must also check for glare that may impair drivers passing through the project. If severe glare is noted for any travel path open to the public, the contractor must adjust the lighting to reduce glare to a level acceptable to the EIC.

Questions on this EI may be directed to Jim Bryden of the Construction Division at (518) 485-1834 or to Steve Witham of the Design Quality Assurance Bureau at (518) 457-7284.

ITEM 15619.6730 LIGHTING FOR NIGHTTIME OPERATIONS

DESCRIPTION

This work shall consist of furnishing, installing, operating, maintaining, moving and removing portable light towers and equipment-mounted lighting fixtures for nighttime construction operations, for the duration of nighttime work on the contract. Nighttime operations consist of work specifically scheduled to occur after sunset and before sunrise.

MATERIALS

None specified.

CONSTRUCTION DETAILS

General - Before nighttime operations may begin; (1) an acceptable lighting plan must be submitted and (2) all required lighting equipment and/or materials must be ready for operation.

Lighting Plan - Thirty days prior to the start of night work, the Contractor shall submit a lighting plan to the Engineer. The lighting plan shall include the following:

- o Layout plan showing location of light towers, including both typical spacing and lateral placement.
- o Description of light towers to be used.
- o Description of electrical power source.
- o Attachment and mounting details for lights to be attached to equipment.
- o Specific technical details on all lighting fixtures to be provided, including power rating and photometric charts.
- o Details on any hoods, louvers, shields, or other means to be used to control glare.
- o Lighting calculations confirming that the illumination requirements will be met by the layout plan.

The layout plan shall be on U.S. standard D size sheets (22" x 34") at an appropriate scale to adequately describe the work. It shall clearly show the location of all lights necessary for every aspect of work to be done at night.

In addition to the plan sheets, the Contractor shall submit catalog cuts giving the specific brand names, model numbers and ratings of the lighting equipment. The submittal shall include power ratings and photometric data.

Light Levels - Tower-mounted luminaires, whether portable, trailer-mounted, or equipment-mounted, shall be of sufficient wattage and/or quantity to provide an average maintained horizontal illuminance equal to or greater than the following over the work area:

Level I	-	5 footcandles
Level II	-	10 footcandles
Level III	-	20 footcandles

The uniformity of illuminance, defined as the ratio of the average illuminance to the minimum illuminance over the work area, shall not exceed 5:1.

Illuminance Requirements - Lighting shall be adequate to meet the required level of illuminance and uniformity over the entire area of operation as follows:

Level I - All areas of general construction operations including excavation; cleaning and sweeping; landscaping; planting and seeding. Level I shall also be provided at the area of lane and/or road closures continuously throughout the period of closure, including the setup and removal of the closures.

Level II - Asphalt paving, milling, and concrete placement and/or removal.

Level III- Pavement or structural crack filling, joint repair, pavement patching and repairs, installation of signal equipment or other electrical/mechanical equipment, and other tasks involving fine details or intricate parts and equipment.

For paving and milling operations, including bridge decks, Level II illuminance shall be provided 50 ft. ahead of and 100 ft. behind the paving or milling machine. In addition, Level I illuminance shall be provided a minimum of 400 ft. ahead and 800 ft. behind the paving or milling machine, or for the entire area of concrete placement or pavement work if less than this distance. This area shall be extended as necessary to incorporate all vehicle and equipment operations associated with the paving operation. The only exception to the requirement for Level I illumination throughout the area of construction operations is that finish rollers can work beyond the area of Level I illumination using floodlights mounted on the roller.

Construction operations shall be deemed to include all work operations by contractor's personnel, including layout and measurements ahead of the actual work.

Equipment - All lighting equipment will be furnished as required and retained by the Contractor after the work is completed. Material and/or equipment shall be in good operating condition and in compliance with applicable safety and design codes.

Lighting Fixtures - Lighting fixtures shall consist of portable ground-mounted or trailer-mounted light towers; light towers affixed to paving machines, finishing machines, and milling machines; and floodlights mounted on construction equipment.

Flood lights mounted on construction equipment shall consist of a minimum of two 500-watt flood lights facing in each direction to provide a minimum of 1 foot-candle of horizontal illuminance measured 60 feet in front of and behind the equipment.

Construction equipment that is operating solely in areas illuminated by tower lighting shall not require floodlights.

Portable Generators - The contractor shall provide portable generators to furnish adequate AC power to operate all required lighting equipment. Fuel tank capacity and availability of fuel on site shall be sufficient to permit uninterrupted operation throughout the planned shift. Adequate switches shall be provided to control the various lights. All wiring shall be weatherproof and installed according to local, State, Federal and OSHA requirements. All power sources shall be equipped with a Ground-Fault Circuit Interrupter to prevent electrical shock.

Light Meter - The Contractor shall furnish, for the use of the Engineer, a photometer capable of measuring the level of illuminance. This photometer shall be available to the Engineer for use as necessary to check the adequacy of illumination throughout the nighttime operations.

Equipment Mounting - The Contractor shall provide suitable brackets and hardware to mount lighting fixtures and generators on machines and equipment. Mountings shall be designed so that light fixtures can be aimed and positioned as necessary to reduce glare and to provide the required illuminance. Mounting brackets and fixtures shall not interfere with the equipment operator or any overhead structures, and shall provide for secure connection of the fixtures with minimum vibration.

Portable and Trailer-Mounted Light Towers - Light towers shall be provided as the primary means of illumination, and shall provide Level I illuminance throughout the work area. They shall be supplemented to the extent necessary by lighting fixtures mounted on construction equipment to provide Level II or Level III illuminance where required. Towers shall be sturdy and free-standing without the aid of guy wires or bracings. Towers shall be capable of being moved as necessary to keep pace with the construction operation. Portable towers and trailers shall be positioned to minimize the risk of being impacted by traffic on the roadway or by construction traffic or equipment.

Light Towers on Paving, Milling, and Finishing Machines - If needed to supplement portable and/or trailer-mounted light towers, towers shall be affixed to paving, milling, and finishing machines to provide the required level of illuminance for the specified distance in front of and behind the machine. Machine mounted light towers shall not exceed a height of 13 ft above ground. Luminaires shall be aimed and adjusted to provide uniform illumination with a maximum uniformity ratio of 5:1. The hopper, auger, and screed areas of pavers shall be uniformly illuminated. The operator's controls on all machines shall be uniformly illuminated.

Equipment Lights - All construction equipment, including rollers, backhoes, loaders, and other equipment operating in work areas not illuminated to a minimum of Level I illuminance shall be equipped with floodlights as described above. Whether or not floodlights are provided, all construction equipment shall be equipped with conventional vehicle headlights to permit safe movement in non-illuminated areas. Headlights shall not be permitted as the sole means of illumination while working.

Glare Control - All lighting provided under this item shall be designed, installed, and operated to avoid glare that interferes with traffic on the roadway or that causes annoyance or discomfort for residences adjoining the roadway. The contractor shall locate, aim, and adjust the lighting fixtures to provide the required level of illuminance and uniformity in the work area without the creation of objectionable glare. The Engineer shall be the sole judge of when glare exceeds acceptable levels, either for traffic or for adjoining residences.

The contractor shall provide shields, visors or louvers on luminaires as necessary to reduce objectionable levels of glare. As a minimum, the following requirements shall be met to avoid objectionable glare on roadways open to traffic in either direction:

- o Tower-mounted luminaires shall be aimed either generally parallel or perpendicular to the roadway.
- o All luminaires shall be aimed such that the center of the beam axis is no greater than 60° above the vertical.
- o No luminaires shall be permitted that provide a luminous intensity greater than 20,000 candela at an angle of 72° above the vertical.

Existing Roadway Lights - Existing street and highway lighting shall not eliminate the need for the contractor to provide lighting. Consideration may be given to the amount of illumination provided by existing lights in determining the wattage and/or quantity of lights to be provided. Such consideration shall be discussed in the Contractor's lighting plan.

Continuous Operation - The Contractor shall provide sufficient fuel, spare lamps, generators, and qualified personnel to ensure that all required lights will operate continuously during nighttime operation. In the event of any failure of the lighting system, the operation shall be discontinued until the required level of illumination is restored.

Traffic Control Areas - Level I illuminance shall be provided during the setup of lane closures or road closures installed in conjunction with nighttime construction operation and shall be maintained until the closure is removed. Such lighting shall be required at the actual points of closure, including the lane closure tapers. Lighting shall not be required throughout the entire lane closure, except as required at work areas.

METHOD OF MEASUREMENT

Payment for lighting for nighttime operations will be made on a lump sum basis.

BASIS OF PAYMENT

The lump sum price bid for portable lighting shall include all equipment, materials, and labor necessary to provide, install, operate, and maintain illumination of the nighttime work areas and associated traffic control operations.

Payment will be made at the lump sum price bid as follows:

- Ten percent when the lighting plan has been accepted and satisfactory lighting of nighttime operations has begun.
- The remaining ninety percent will be paid in progress payments per calendar day of nighttime operations completed. The amount of such calendar day payment will be determined by dividing ninety percent of the lump sum amount bid by the total number of days of nighttime operations included in the contractor's current schedule of operations.

ITEM 15619.6730 M LIGHTING FOR NIGHTTIME OPERATIONS

DESCRIPTION

This work shall consist of furnishing, installing, operating, maintaining, moving and removing portable light towers and equipment-mounted lighting fixtures for nighttime construction operations, for the duration of nighttime work on the contract. Nighttime operations consist of work specifically scheduled to occur after sunset and before sunrise.

MATERIALS

None specified.

CONSTRUCTION DETAILS

General - Before nighttime operations may begin; (1) an acceptable lighting plan must be submitted and (2) all required lighting equipment and/or materials must be ready for operation.

Lighting Plan - Thirty days prior to the start of night work, the Contractor shall submit a lighting plan to the Engineer. The lighting plan shall include the following:

- Layout plan showing location of light towers, including both typical spacing and lateral placement.
- Description of light towers to be used.
- Description of electrical power source.
- Attachment and mounting details for lights to be attached to equipment.
- Specific technical details on all lighting fixtures to be provided, including power rating and photometric charts.
- Details on any hoods, louvers, shields, or other means to be used to control glare.
- Lighting calculations confirming that the illumination requirements will be met by the layout plan.

The layout plan shall be on U.S. standard D size sheets (559 mm x 864 mm) at an appropriate scale to adequately describe the work. It shall clearly show the location of all lights necessary for every aspect of work to be done at night.

In addition to the plan sheets, the Contractor shall submit catalog cuts giving the specific brand names, model numbers and ratings of the lighting equipment. The submittal shall include power ratings and photometric data.

Light Levels - Tower-mounted luminaires, whether portable, trailer-mounted, or equipment-mounted, shall be of sufficient wattage and/or quantity to provide an average maintained horizontal illuminance equal to or greater than the following over the work area:

Level I	-	50 lx
Level II	-	100 lx
Level III	-	200 lx

The uniformity of illuminance, defined as the ratio of the average illuminance to the minimum illuminance over the work area, shall not exceed 5:1.

Illuminance Requirements - Lighting shall be adequate to meet the required level of illuminance and uniformity over the entire area of operation as follows:

Level I - All areas of general construction operations including excavation; cleaning and sweeping; landscaping; planting and seeding. Level I shall also be provided at the area of lane and/or road closures continuously throughout the period of closure, including the setup and removal of the closures.

Level II - Asphalt paving, milling, and concrete placement and/or removal.

Level III - Pavement or structural crack filling, joint repair, pavement patching and repairs, installation of signal equipment or other electrical/mechanical equipment, and other tasks involving fine details or intricate parts and equipment.

For paving and milling operations, including bridge decks, Level II illuminance shall be provided 15 m ahead of and 30 m behind the paving or milling machine. In addition, Level I illuminance shall be provided a minimum of 120 m ahead and 240 m behind the paving or milling machine, or for the entire area of concrete placement or pavement work if less than this distance. This area shall be extended as necessary to incorporate all vehicle and equipment operations associated with the paving operation. The only exception to the requirement for Level I illumination throughout the area of construction operations is that finish rollers can work beyond the area of Level I illumination using floodlights mounted on the roller.

Construction operations shall be deemed to include all work operations by contractor's personnel, including layout and measurements ahead of the actual work.

Equipment - All lighting equipment will be furnished as required and retained by the Contractor after the work is completed. Material and/or equipment shall be in good operating condition and in compliance with applicable safety and design codes.

Lighting Fixtures - Lighting fixtures shall consist of portable ground-mounted or trailer-mounted light towers; light towers affixed to paving machines, finishing machines, and milling machines; and floodlights mounted on construction equipment.

Flood lights mounted on construction equipment shall consist of a minimum of two 500 W flood lights facing in each direction to provide a minimum of 10 lx of horizontal illuminance measured 20 m in front of and behind the equipment. Construction

equipment that is operating solely in areas illuminated by tower lighting shall not require floodlights.

Portable Generators - The contractor shall provide portable generators to furnish adequate AC power to operate all required lighting equipment. Fuel tank capacity and availability of fuel on site shall be sufficient to permit uninterrupted operation throughout the planned shift. Adequate switches shall be provided to control the various lights. All wiring shall be weatherproof and installed according to local, State, Federal and OSHA requirements. All power sources shall be equipped with a Ground-Fault Circuit Interrupter to prevent electrical shock.

Light Meter - The Contractor shall furnish, for the use of the Engineer, a photometer capable of measuring the level of illuminance. This photometer shall be available to the Engineer for use as necessary to check the adequacy of illumination throughout the nighttime operations.

Equipment Mounting - The Contractor shall provide suitable brackets and hardware to mount lighting fixtures and generators on machines and equipment. Mountings shall be designed so that light fixtures can be aimed and positioned as necessary to reduce glare and to provide the required illuminance. Mounting brackets and fixtures shall not interfere with the equipment operator or any overhead structures, and shall provide for secure connection of the fixtures with minimum vibration.

Portable and Trailer-Mounted Light Towers - Light towers shall be provided as the primary means of illumination, and shall provide Level I illuminance throughout the work area. They shall be supplemented to the extent necessary by lighting fixtures mounted on construction equipment to provide Level II or Level III illuminance where required. Towers shall be sturdy and free-standing without the aid of guy wires or bracings. Towers shall be capable of being moved as necessary to keep pace with the construction operation. Portable towers and trailers shall be positioned to minimize the risk of being impacted by traffic on the roadway or by construction traffic or equipment.

Light Towers on Paving, Milling, and Finishing Machines - If needed to supplement portable and/or trailer-mounted light towers, towers shall be affixed to paving, milling, and finishing machines to provide the required level of illuminance for the specified distance in front of and behind the machine. Machine mounted light towers shall not exceed a height of 4 m above ground. Luminaires shall be aimed and adjusted to provide uniform illumination with a maximum uniformity ratio of 5:1. The hopper, auger, and screed areas of pavers shall be uniformly illuminated. The operator's controls on all machines shall be uniformly illuminated.

Equipment Lights - All construction equipment, including rollers, backhoes, loaders, and other equipment operating in work areas not illuminated to a minimum of Level I illuminance shall be equipped with floodlights as described above. Whether or not floodlights are provided, all construction equipment shall be equipped with conventional vehicle headlights to permit safe movement in non-illuminated areas. Headlights shall not be permitted as the sole means of illumination while working.

Glare Control - All lighting provided under this item shall be designed, installed, and operated to avoid glare that interferes with traffic on the roadway or that causes annoyance or discomfort for residences adjoining the roadway. The contractor shall locate, aim, and adjust the lighting fixtures to provide the required level of illuminance and uniformity in the work area without the creation of objectionable glare. The Engineer shall be the sole judge of when glare exceeds acceptable levels, either for traffic or for adjoining residences.

The contractor shall provide shields, visors or louvers on luminaires as necessary to reduce objectionable levels of glare. As a minimum, the following requirements shall be met to avoid objectionable glare on roadways open to traffic in either direction:

- o Tower-mounted luminaires shall be aimed either generally parallel or perpendicular to the roadway.
- o All luminaires shall be aimed such that the center of the beam axis is no greater than 60° above the vertical.
- o No luminaires shall be permitted that provide a luminous intensity greater than 20 000 cd at an angle of 72° above the vertical.

Existing Roadway Lights - Existing street and highway lighting shall not eliminate the need for the contractor to provide lighting. Consideration may be given to the amount of illumination provided by existing lights in determining the wattage and/or quantity of lights to be provided. Such consideration shall be discussed in the Contractor's lighting plan.

Continuous Operation - The Contractor shall provide sufficient fuel, spare lamps, generators, and qualified personnel to ensure that all required lights will operate continuously during nighttime operation. In the event of any failure of the lighting system, the operation shall be discontinued until the required level of illumination is restored.

Traffic Control Areas - Level I illuminance shall be provided during the setup of lane closures or road closures installed in conjunction with nighttime construction operation and shall be maintained until the closure is removed. Such lighting shall be required at the actual points of closure, including the lane closure tapers. Lighting shall not be required throughout the entire lane closure, except as required at work areas.

METHOD OF MEASUREMENT

Payment for lighting for nighttime operations will be made on a lump sum basis.

BASIS OF PAYMENT

The lump sum price bid for portable lighting shall include all equipment, materials, and labor necessary to provide; install, operate, and maintain illumination of the nighttime work areas and associated traffic control operations.

Payment will be made at the lump sum price bid as follows:

- o Ten percent when the lighting plan has been accepted and satisfactory lighting of nighttime operations has begun.
- o The remaining ninety percent will be paid in progress payments per calendar day of nighttime operations completed. The amount of such calendar day payment will be determined by dividing ninety percent of the lump sum amount bid by the total number of days of nighttime operations included in the contractor's current schedule of operations.