

SECTION 643

TRAFFIC MAINTENANCE

**643-1.01 DESCRIPTION.** Add the following as a third paragraph:

Illuminate construction activities listed in Table 643-2 during hours of night work.

**643-1.02 DEFINITIONS.** Add the following paragraphs after paragraph titled "Construction Phasing Plan":

Night Work: Work occurring between sunset and sunrise.

Night Work Lighting Plan (NWLP). A drawing or drawings indicating the method of illuminating night work areas. The NWLP depicts the lighting equipment, sources of power, and their placement. Use in conjunction with a night work traffic control plan.

**643-1.04. WORKSITE SUPERVISOR.** Add the following to Item 2. Duties:

- i. Supervise the implementation of the Night Work Lighting Plan.

Add the following new Subsection:

**643-1.07 NIGHT WORK LIGHTING PLAN (NWLP).** Submit a NWLP to the Engineer with the Traffic Control Plan or thirty days prior to the start of night work for all projects where night work is planned. Allow seven days for review. Make necessary modifications in response to the Engineer's comments. Do not begin night work before plan approval.

The NWLP shall be submitted on 11 inches by 17-inch paper at an appropriate scale for displaying the work. The NWLP shall include:

1. Layout plan showing light location and configuration, including both typical spacing and lateral placement.
2. Description of light towers to be used.
3. Description of electrical power source.
4. Description of lighting provided by mobile equipment.
5. Specific technical details, including lamp type and wattage, on all lighting fixtures to be provided.
6. Details on any hoods, louvers, shields, or other means to be used to control glare.
7. A document sealed by a professional engineer that certifies the lighting shown on the plan will provide the required illuminance and uniformity.

Add the following new Subsection:

**643-1.08 STATIC FIELD LIGHTING TEST.** Before work begins, do a static layout of all construction and lighting equipment you plan to use. Tell the Engineer when the test will be conducted. Wait until after dark and turn on all the lights. Measure the resulting average and minimum horizontal illuminance levels in each 5, 10, or 20 foot-candle area. The Engineer may verify readings with his own light measuring equipment. In addition, the Engineer will determine whether the system produces too much glare. Modify the system as necessary to provide the required illuminance level, uniformity, and glare mitigation. After final modifications, have the same professional engineer that certified the NWLP certify that the static layout complies with applicable illuminance level and uniformity requirements. Submit the certification (sealed by the professional engineer) and the data to the Engineer.

Take meter readings on the roadway surface. Determine average horizontal illuminance levels by measuring illuminance at each point in a uniform grid pattern, as defined below, across the area required to be illuminated (from Table 643-2). Determine uniformity ratios by dividing the average of all measurements by the measurement at the dimmest point.

Locate the grid of measurement points as follows:

Maximum longitudinal spacing: 5' for lengths of 50' or less. 10' for longer areas  
 Maximum lateral spacing: 5' for widths of 50' or less. 10' for wider areas  
 Longitudinal offset from perimeter of illuminated area: One half the longitudinal spacing.  
 Lateral offset from perimeter of illuminated area: One half the lateral spacing.

**643-2.01 MATERIALS.** *Under Item 16. Flagger Paddles, add the following last sentence:*

During night work use flagger paddles that meet the criteria of this paragraph, except use reflective sheeting that is "diamond grade" sheeting or approved equivalent.

*Add the following new Subsection:*

**643-3.10 LIGHTING OF NIGHT WORK**

Illuminate the night work areas specified in Table 643-2 to the light levels specified.

This specification only covers lighting within project limits for the activities described in Table 643-2. However, the Contractor is responsible for lighting all operations in all locations in accordance with federal regulation 29 CFR 1926.56 and in a manner that meets task lighting needs.

Maintain a uniformity ratio no greater than 5:1 over all illuminated areas. Uniformity ratio is the ratio of average to minimum horizontal illuminance within the illuminated area.

<b>Table 643-2 Minimum Night Work Illumination Levels and Area of Coverage</b>				
<b>Type of Work/ Equipment</b>	<b>Illumination Level (horizontal footcandles)</b>		<b>Area of Illumination</b>	
	<b>Average</b>	<b>Minimum</b>	<b>Length (along road)</b>	<b>Width (across road)</b>
Paving	10	2	25' beyond front and back of paving machine	Lane(s) being paved plus 5' beyond both sides of paving machine
	5	1	50' beyond front and back of paving machine	Lane(s) being paved plus 15' beyond both sides of paving machine
Milling	10	2	25' beyond front and back of milling machine	Lane(s) being milled plus 5' beyond both sides of milling machine
	5	1	50' beyond front and back of milling machine	Lane(s) being milled plus 15' beyond both sides of milling machine
Rolling	10	2	15' beyond front and back of roller	5' beyond both sides of the roller
	n/a	1	50' beyond front and back of roller	5' beyond both sides of the roller
Flagging	20	4	The area where the flagger normally stands when waiting for the first car in a queue to approach plus 15' in each direction.	
Truck/Equipment Crossings and Entry Points on roads with speed limits over 40 MPH and average daily traffic during the construction season over 750.	5	1	Width of the cross road, including shoulders, plus 15' both directions	Width of the main road, including shoulders

Provide the required light level and quality with any combination of equipment mounted, trailer mounted, ground-mounted, or tethered balloon lights.

The Engineer may verify illuminance levels and uniformity at any time using a handheld light meter.

Install lighting in a manner that minimizes glare for motorists, workers, and annoyance or discomfort for residents living along the roadway. Locate, aim, louver, and/or shield light sources to achieve this goal.

The Engineer shall be the sole judge of when glare is unacceptable, either for traffic or for adjoining residences. When notified of unacceptable glare, modify the lighting system to eliminate it.

If the Contractor fails to meet required illuminance levels, uniformity ratios, or provides lighting that creates unacceptable glare at any time, the Contractor shall cease nighttime operations in that area until the condition is corrected.

Lighting equipment shall be in good operating condition and in compliance with applicable OSHA, NEC, and NEMA codes.

Provide suitable brackets and hardware to mount lighting fixtures and generators on machines and equipment. Design mountings so lights can be aimed and positioned as necessary to reduce glare and to provide the required illuminance. Locate mounting brackets and fixtures so they don't interfere with the equipment operator or overhead structures. Connect fixtures securely in a manner that minimizes vibration.

Ground, trailer, and equipment-mounted light towers shall be sturdy and freestanding without the aid of guy wires. Towers shall be capable of being moved as necessary to keep pace with the construction operation. Position ground and trailer-mounted towers and trailers to minimize the risk of being impacted by traffic on the roadway or by construction traffic or equipment.

Ensure that all trailer or equipment mounted light towers do not exceed the height of overhead objects such as trees, aerial utilities, or bridges. Aim and adjust lights to provide the required light levels and uniformity. Provide uniform illumination on the hopper, auger, and screed areas of pavers. Illuminate the operator's controls on all machines uniformly.

Conventional vehicle headlights do not eliminate the need for the Contractor to provide lighting. Furnish each side of non-street legal equipment with a minimum of 75 square inches high intensity retroreflective sheeting in each corner, so at least 150 square inches of sheeting is visible from each direction.

Existing street and highway lighting do 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 additional light to be provided.

Provide sufficient fuel, spare lamps, generators, and qualified personnel to ensure that all required lights operate continuously during nighttime operations. Ensure generators have fuel tanks of sufficient capacity to permit operation of the lighting system for a minimum of 12 hours. In the event of any failure of the lighting system, discontinue the operation until the required level and quality of illumination is restored.

Maintain a supply of emergency flares for use in the event of emergency or unanticipated situations.

**643-4.01 Method of Measurement** *Add the following:*

16. Work Zone Illumination. By Lump Sum. This item consists of all labor, materials, and equipment required to illuminate night work zones as specified in this section. If this item is not included in the bid schedule, payment for work zone illumination is subsidiary to other items.

**643-5.01 Basis of Payment** *Add the following:*

643(29)	Work Zone Illumination	Lump Sum
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**643-1.04. WORKSITE SUPERVISOR.** Add the following to Item 2. Duties:

- i. Supervise the implementation of the Night Work Lighting Plan.

Add the following new Subsection:

**643-1.07 NIGHT WORK LIGHTING PLAN (NWLP).** Submit a NWLP to the Engineer with the Traffic Control Plan or thirty days prior to the start of night work for all projects where night work is planned. Allow seven days for review. Make necessary modifications in response to the Engineer's comments. Do not begin night work before plan approval.

The NWLP shall be submitted on 279mm by 432mm paper at an appropriate scale for displaying the work. The NWLP shall include:

1. Layout plan showing light location and configuration, including both typical spacing and lateral placement.
2. Description of light towers to be used.
3. Description of electrical power source.
4. Description of lighting provided by mobile equipment.
5. Specific technical details, including lamp type and wattage, on all lighting fixtures to be provided.
6. Details on any hoods, louvers, shields, or other means to be used to control glare.
7. A document sealed by a professional engineer that certifies the lighting shown on the plan will provide the required illuminance and uniformity.

Add the following new Subsection:

**643-1.08 STATIC FIELD LIGHTING TEST.** Before work begins, do a static layout of all construction and lighting equipment you plan to use. Tell the Engineer when the test will be conducted. Wait until after dark and turn on all the lights. Measure the resulting average and minimum horizontal illuminance levels in each 5, 10, or 20 foot-candle area. The Engineer may verify readings with his own light measuring equipment. In addition, the Engineer will determine whether the system produces too much glare. Modify the system as necessary to provide the required illuminance level, uniformity, and glare mitigation. After final modifications, have the same professional engineer that certified the NWLP certify that the static layout complies with applicable illuminance level and uniformity requirements. Submit the certification (sealed by the professional engineer) and the data to the Engineer.

Take meter readings on the roadway surface. Determine average horizontal illuminance levels by measuring illuminance at each point in a uniform grid pattern, as defined below, across the area required to be illuminated (from Table 643-2). Determine uniformity ratios by dividing the average of all measurements by the measurement at the dimmest point.

Locate the grid of measurement points as follows:

Maximum longitudinal spacing: 1.5m for lengths of 15m or less. 3m for longer areas  
 Maximum lateral spacing: 1.5m for widths of 15m or less. 3m for wider areas  
 Longitudinal offset from perimeter of illuminated area: One half the longitudinal spacing.  
 Lateral offset from perimeter of illuminated area: One half the lateral spacing.

**643-2.01 MATERIALS.** *Under Standard Modification M 91, Section 643-2.01, Item 16. Flagger Paddles, add the following last sentence:*

During night work use flagger paddles that meet the criteria of this paragraph, except use reflective sheeting that is “diamond grade” sheeting or approved equivalent.

*Add the following new Subsection:*

**643-3.10 LIGHTING OF NIGHT WORK**

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	<b>Average</b>	<b>Minimum</b>	<b>Length (along road)</b>	<b>Width (across road)</b>
Paving	10	2	7.5m beyond front and back of paving machine	Lane(s) being paved plus 1.5m beyond both sides of paving machine
	5	1	15m beyond front and back of paving machine	Lane(s) being paved plus 4.5m beyond both sides of paving machine
Milling	10	2	7.5m beyond front and back of milling machine	Lane(s) being milled plus 1.5m beyond both sides of milling machine
	5	1	15m beyond front and back of milling machine	Lane(s) being milled plus 4.5m beyond both sides of milling machine
Rolling	10	2	4.5m beyond front and back of roller	1.5m beyond both sides of the roller
	n/a	1	15m beyond front and back of roller	1.5m beyond both sides of the roller
Flagging	20	4	The area where the flagger normally stands when waiting for the first car in a queue to approach plus 4.5m in each direction.	
Truck/Equipment Crossings and Entry Points on roads with speed limits over 40 MPH and average daily traffic during the construction season over 750.	5	1	Width of the cross road, including shoulders, plus 4.5m in both directions	Width of the main road, including shoulders

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Conventional vehicle headlights do not eliminate the need for the Contractor to provide lighting. Furnish each side of non-street legal equipment with a minimum of 0.05 square meters of high intensity retroreflective sheeting in each corner, so at least 0.10 square meters of sheeting is visible from each direction.

Existing street and highway lighting do 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 additional light to be provided.

Provide sufficient fuel, spare lamps, generators, and qualified personnel to ensure that all required lights operate continuously during nighttime operations. Ensure generators have fuel tanks of sufficient capacity to permit operation of the lighting system for a minimum of 12 hours. In the event of any failure of the lighting system, discontinue the operation until the required level and quality of illumination is restored.

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**643-4.01 Method of Measurement** *Add the following:*

14. Work Zone Illumination. By Lump Sum. This item consists of all labor, materials, and equipment required to illuminate night work zones as specified in this section. If this item is not included in the bid schedule, payment for work zone illumination is subsidiary to other items.

**643-5.01 Basis of Payment** *Add the following:*

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