

To: SUPERSEDED BY <u>EB 06-064</u> EFFECTIVE 9/7/06		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 01-013
Title: SOLAR-CHARGED FLASHING ARROW BOARDS			
Distribution: ☐ Manufacturers (18) ☒ Main Office (30) ☒ Local Govt. (31) ☒ Regions/Agencies (32) ☐ Surveyors (33) ☒ Consultants (34) ☒ Contractors (39) ☐ _____ ()		Approved:  P. J. Clark, Deputy Chief Engineer, Design <u>06/07/01</u> Date	

ADMINISTRATIVE INFORMATION: This Engineering Instruction (EI) is effective with projects submitted for the letting of November 1, 2001. On ongoing projects, the Engineer may immediately approve Contractor requests for substitution of solar charged arrow boards in accordance with this EI and at no additional cost to the state. This EI supersedes EI 92-032, Solar Charged Flashing Arrow boards. The information in this EI will be incorporated into the next revision of the Standard Specifications and Highway Design Manual, Chapter 16.

PURPOSE: To modify the ban on solar charged flashing arrow boards which was established by EI 92-032.

TECHNICAL INFORMATION:

Policy: Flashing arrow boards used for lane closures on multilane highways with preconstruction posted speed limits below 45 mph may be solar charged where approved by the Engineer. However, solar arrow boards shall not be substituted for diesel units where preconstruction posted speeds equal or exceed 45 mph.

Guidance: Contractors may, if approved or directed by the Engineer, substitute solar charged flashing arrow boards for diesel units where preconstruction posted speed limits are below 45 mph for a minimum of 2 km upstream of the taper to ensure that speeds are reduced before encountering the arrow board.

Product approval shall be based on a determination by the Engineer that the arrow display is satisfactory up to a distance of 500 meters upstream of the beginning of the lane closure taper based on the following criteria: (1) the display is sufficiently bright to attract the attention of approaching motorists under all anticipated environmental conditions including fog and direct sunlight on the panel, and (2) it provides sufficient horizontal and vertical angularity to be conspicuous and clearly legible from any point within the roadway (inclusive of shoulders) where sight lines to the display are unobstructed under all anticipated horizontal and vertical highway alignments and driver eye heights. Any solar charged arrow boards which cannot provide a sufficiently bright and clearly legible arrow display at any point within the travel lane or shoulder for that 500 meter distance shall be rejected. While we are unable, at this time, to specify minimum luminance and angularity criteria, the Traffic Engineering & Highway Safety Division can provide general information on those criteria.

Actions: The Engineer should notify the Traffic Engineering & Highway Safety Division whenever

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a solar charged arrow board is used and should provide an evaluation of its performance. Evaluation forms are available from TE&HS.

Changes: The revised §619-3.11 permits the use of solar powered flashing arrow boards in certain situations. The revised §619-2.08 establishes legibility criteria for solar arrow boards to be evaluated in the field by the Engineer. Minor revisions to §619-1.13, §619-4.07 and §619-5.15 add standard language reflecting that there is more than one type of arrow board.

IMPLEMENTATION: Design Quality Assurance Bureau will insert the attached shelf notes in all proposals of projects using item 619.0303, Flashing Arrow Boards, beginning with projects submitted for the letting of November 1, 2001.

TRANSMITTED MATERIALS: Attached are shelf notes revising Sections 619-1.13, 619-2.08, 619-3.11, 619-4.07 and 619-5.15 of the Standard Specifications of January 2, 1995.

BACKGROUND: Section 619-2.08 currently requires that *"All Flashing Arrow boards shall be powered by self-contained engine generator systems capable of energizing the board for 72 hours, unattended"*. El 90-29 and EB 91-15 authorized limited experimental use of solar charged flashing arrow boards on Department projects. El 92-032 ended the experimental use and re instituted the ban on solar charged flashing arrow boards due to their inability to provide consistently adequate visibility across the spectrum of environmental and alignment conditions encountered on Department projects.

Section 619-3.11 requires flashing arrow boards for lane closures on multilane highways with posted speed limits of 45 mph or greater. While arrow boards are not required where the posted speed limit is below 45 mph, on occasion, flashing arrow boards are used on such highways (typically high-volume suburban arterials). In residential or commercial areas, solar charged arrow boards have sometimes been substituted for diesel boards to avoid objectionable noise and fumes.

Performance of solar charged flashing arrow boards has improved since the early 1990s, but not uniformly enough to allow their general use on high-speed highways. However, some boards can provide effective traffic control in low-speed applications. The reduction in noise, air pollution, and use of fossil fuels, as well as the savings in operating costs to Contractors, are desirable as long as they are not obtained at the expense of traffic safety.

The lack of any useful established visibility criteria for arrow boards and the fact that few, if any, of the solar charged flashing arrow boards available are consistently acceptable systemwide, requires that solar arrow board performance be evaluated on a site-specific basis. An approved list is not practical until the Department is familiar enough with the newer solar arrow boards to be confident that site specific conditions will not significantly and unpredictably affect their performance. Use and evaluation of solar arrow boards on a limited basis may help us gain familiarity with the newer boards without compromising safety.

CONTACT: Direct any questions or evaluations to Chuck Riedel of the Traffic Engineering & Highway Safety Division at 457-3537.

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Make the following changes to the Standard Specifications of January 2, 1995

Page 6-77,

delete §619-1.13 Flashing Arrow Board in its entirety, and **replace** with the following:

619-1.13 Flashing Arrow Board. Furnish, install, maintain and remove Flashing Arrow Board warning devices in accordance with plans, NYS Manual of Uniform Traffic Control Devices or the directions of the Engineer. Flashing arrow boards are intended for use as temporary traffic warning devices during construction and obstruction periods, and under this item the Contractor shall provide Flashing Arrow Boards made necessary by the operations. The number and type required shall be the number and type necessary, in accordance with the criteria given below, to satisfactorily guide traffic through the construction. The actual number will depend on the Contractor's sequence of operations.

Page 6-82,

delete §619-2.08 Flashing Arrow Board in its entirety and **replace** with the following:

619-2.08 Flashing Arrow Board. The Flashing Arrow Boards shall be trailer mounted self contained units or, with permission of the Engineer, truck mounted self-contained units. Flashing Arrow Boards shall display a flashing symbol consisting of flashing yellow lights arranged on a panel to form an arrow.

The arrow panel shall consist of 1200 X 2400 mm rectangular solid panel finished in non-reflective black, and shall be mounted so that the bottom of the panel is a minimum of 2.1 m above the roadway. The arrow indication shall cover the entire area of the panel, and shall be composed of lamp units with five lamps in the arrowhead and five lamps in the shaft.

Lamps shall be arranged and controlled to provide the following mode selections: Left Arrow, Right Arrow, Left and Right Arrow, and Caution. In the three directional modes, the lamps in the shaft next to the arrow point shall not illuminate. The caution mode shall consist of either two pairs of alternately flashing lamps arranged in a pattern that does not indicate direction, or four lamps simultaneously flashing in each of the four corners of the board. The rear face of the arrow panel shall contain one or more clear lamps to indicate that the arrow board is operating properly. Arrow panel operation controls shall be mounted in a lockable enclosure.

The lamps shall flash at a rate of not less than 25 nor more than 40 flashes per minute with a minimum lamp "on time" of at least 50 percent of the cycle. The lamps shall be recess mounted or

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alternatively equipped with an upper hood of not less than 180 degrees. The lamps shall be equipped with an automatic solar cell controlled dimming switch activated at a level of approximately five candellas. The solar cell dimming switch shall be equipped with a delay to prevent undesirable actuation from car lights. The dimming voltage to the lamps shall be manually controllable over a five to twelve volts effective range.

Flashing Arrow Boards shall be powered by line voltage, diesel motor generator system, or by a solar charged battery system. Boards powered by diesel motor generator system shall be capable of sustained operation for 72 continuous hours at normal operating voltage. Solar charged arrow boards shall be capable of continuous operation on battery power only for the same period at normal operating voltage. The flashing arrows of diesel or line powered boards shall be legible at a minimum distance of 1600 meters on a bright sunny day or a clear night. The flashing arrows of solar charged boards shall be clearly legible continuously from any point on the traveled way or shoulder from the beginning of the lane closure taper to an upstream distance of 500 meters on a bright sunny day or a clear night.

Page 6-96,

delete §619-3.11, **Flashing Arrow Boards** in its entirety and *replace* with the following:

“619-3.11 Flashing Arrow Boards. The Contractor shall provide Flashing Arrow Boards on multilane highways with preconstruction posted speed limits of 45 mph and higher whenever a lane is closed to traffic and vehicles are required to merge with traffic in adjacent lanes. One Flashing Arrow Board is required for each lane closed to traffic, regardless of the duration. Flashing Arrow Boards shall also be provided at locations where posted speeds are below 45 mph when shown on the plans or when indicated in the proposal.

Flashing Arrow Boards will not be required where they would interfere with the operation of a 3 color signal or flasher or where there is an operation controlled by a signal or flagger. Flashing Arrow Boards will not be required for alignment changes or lane diversions where the number of through traffic lanes is not reduced unless specifically indicated on the plans.

Flashing Arrow Boards shall be placed in accordance with the Manual of Uniform Traffic Control Devices. They shall be used as a substitute for the W1-11B; W1-11C; W1-12B; or W1-12C large arrow sign located nearest the beginning of the taper. The arrow boards shall be mounted so that the base of the panel is at least 2.1 m above the pavement surface and properly aligned to provide optimum viewing by approaching motorists. Flashing Arrow Boards may be relocated or reoriented on a daily basis or more frequently as ordered by the Engineer.

Where the posted preconstruction speed limit on the highway is 45 mph or greater within 2.0

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km upstream of the board, only diesel or line powered arrow boards shall be used, unless indicated or directed otherwise. Where the posted preconstruction speed limit is below 45 mph for at least 2.0 km upstream of the taper, diesel powered, line powered or solar charged boards shall be used as approved or as directed by the Engineer.

The Contractor shall be responsible for maintenance, repair and continuous operation of the Flashing Arrow Board until progress of work no longer requires its use, as directed by the Engineer.

Page 6-98,

delete §619-4.07 Flashing Arrow Board in its entirety and *replace* with the following:

619-4.07 Flashing Arrow Board. When this work is specified to be measured as lump sum, it shall be measured on a lump sum basis, for the Flashing Arrow Boards of the required type satisfactorily furnished, installed, maintained, and removed in accordance with these specifications.

Page 6-103,

delete §619-5.15 Flashing Arrow Board. in its entirety and *replace* with the following:

619-5.15 Flashing Arrow Board. The lump sum amount bid for this work shall include the cost of all material, equipment, labor, maintenance, and electrical power necessary to complete this work in a manner approved by the Engineer.

Progress payments will be made for this work in proportion to the total amount of contract work completed.