# NFPA 1901 Lighting Specifications

## Measurements Summary Sheet

### *How to Measure Lighting Specifications.*

*EXAMPLE:* Zone "A" Upper, Clearing the Right of Way Measurements**.**

**1. Test all modules distributing light 45° right and 45° left at 5° increments** (19 test points, total).

**2. Add all 19 test points together for each module and add these modules together.**

*For example:*
A rotating lamp has the same reading at all 19 points
(i.e. 120 candela seconds in red) 19 x 120 = 2280.
There are four of these identical rotators in Zone "A" 4 x 2280 = 9120.
There is also one clear rotator in Zone "A" that produces 600 candela. 19 x 600 x 1 = 11400.
Add 11400 to the four identical rotators (9120) for a total of 20520.
To convert to candela-second/minutes, multiply 20520 x 1.25 (Hz) x 60 (seconds).
The total is 1,539,000 candela-second/minutes.

**3. There is a minimum requirement in Zone "A" for each of the 19 test points. (10,000 candela-sec./min.)**

*For example:* 20° left:
Four red rotators produce 220 candela seconds at 20° and one clear rotator produces 600 candela seconds at 20° for a total of 1080 candela seconds. Multiply 1080 by 1.25 (Hz) and multiply by 60 (seconds) for a total of 81,000 candela-second/minutes.

**4. The final test requirement for this zone is to check 5° up and 5° down at all 19 test points.**

The minimum requirement for these areas is 3500 candela-second/minutes.
*For example:* at 35° left, 5° down:
All four identical red rotators get 40 candela seconds.
One clear rotator gets 200 candela seconds.
40 x 4 + 200 x 1.25 (Hz) x 60 (seconds) equals 27,000 candela-second/minutes.

**5. Other requirements to keep in mind:**

For large & small apparatus photometric requirements & color requirements by zones see charts.

**6. Load Management** (refer to NFPA 1901 Standards Section 9-3.5, Appendix 9-3.5.1)

Often the electrical requirements of all appliances operating at the same time exceed the output capacity of the alternator. To prevent deep discharge of the vehicles batteries, appliance malfunction, or possible engine shut down, it is required to automatically disconnect non-critical loads in order to equalize the alternator output capacity.
The purchaser and apparatus manufacturer must work together to determine the load management priority assigned to each piece of equipment on the apparatus. Certain equipment including the emergency lighting required to meet the minimum photometric zone requirements cannot be load managed, *additional emergency lighting equipment can be installed on the apparatus, however this equipment should be connected to an automatic load manager.*

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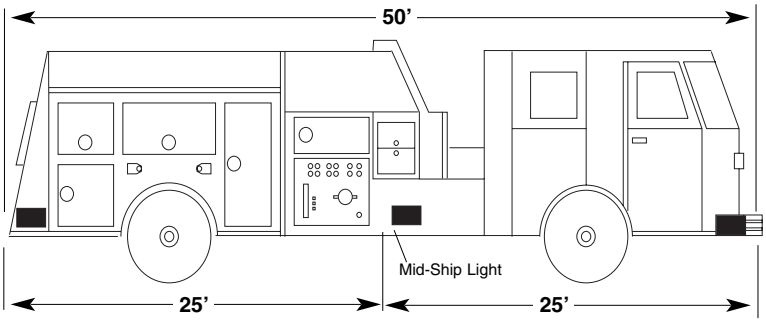
***How to determine the quantity of mid-ship lights needed to adequately light the lower B&D zones of Large Apparatus.***

Additional mid-ship lights must be added so that you always maintain a horizontal distance of 25 feet or less between all centers of the lower level warning lights.

*For example:*
You have a piece of apparatus 30 feet long. In Zone B lower you are using 3 warning lights.
(1 front bumper area, 1 rear of the apparatus, and 1 mid-ship light in the center of the apparatus).

The distance from the mid-ship light to the front light or the rear light must not exceed a distance of 25 feet. As you can see, you will not exceed the 25 foot requirement from the mid-ship light to the front bumper light. If you exceed 25 feet, you must add an additional mid-ship light, for a total of four lower level lights. Then you may draw an average of 50 amps for all upper & lower level warning lights combined. If you require 3 mid-ship warning lights, for a total of five lower level lights, then you may draw an average of 55 amps for all upper & lower level warning lights combined.

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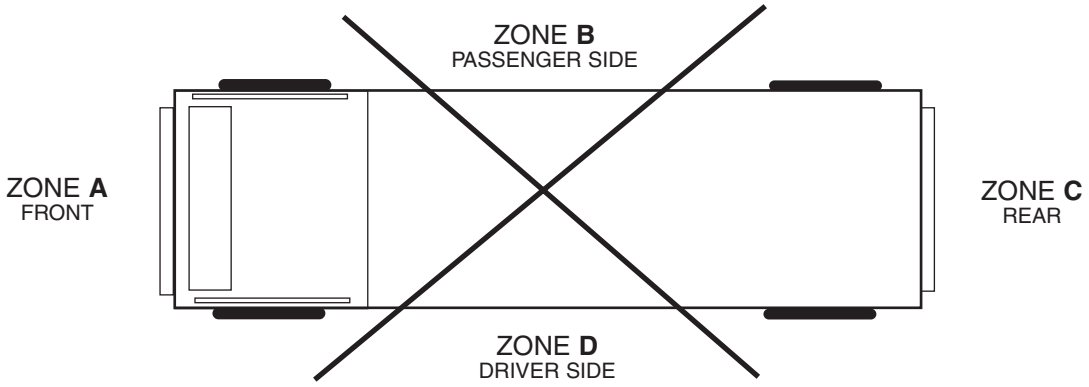
FORM# N0497

## Minimum requirements

The warning system is configured to have two operating modes.
Calling Right of Way (Responding) and Blocking Right of Way (At the Scene)




**Large apparatus** is defined as an apparatus that has a bumper to bumper length of 22 feet or greater. On large apparatus, the minimum optical warning system will draw no more than an average of 45 amps total for all upper & lower level warning lights combined. There may be the need to exceed the over all average amperage draw of 45 amps when additional lower zone mid-ship lights are needed.

### Large Apparatus - 22' or greater

| | | CALLING FOR RIGHT OF WAY | | | BLOCKING RIGHT OF WAY | | |
|---|---|---|---|---|---|---|---|
| ZONE | LEVEL | H | ANY H POINT | +/-5 ANY H | H | ANY H POINT | +/-5 ANY H |
| A | UPPER | 1,000,000 | 10,000 | 3,500 | 400,000 | 10,000 | 3,500 |
| | LOWER | 150,000 | 3,750 | 1,300 | 150,000 | 3,750 | 1,300 |
| B | UPPER | 400,000 | 10,000 | 3,500 | 400,000 | 10,000 | 3,500 |
| | LOWER | 150,000 | 3,750 | 1,300 | 150,000 | 3,750 | 1,300 |
| C | UPPER | 400,000 | 10,000 | 3,500 | 800,000 | 10,000 | 3,500 |
| | LOWER | 150,000 | 3,750 | 1,300 | 150,000 | 3,750 | 1,300 |
| D | UPPER | 400,000 | 10,000 | 3,500 | 400,000 | 10,000 | 3,500 |
| | LOWER | 150,000 | 3,750 | 1,300 | 150,000 | 3,750 | 1,300 |

NOTE: All values are in candela-seconds/minute. H= Horizontal plane passing through the optical center.

### Zone Colors

| COLOR | CALLING FOR RIGHT OF WAY | BLOCKING RIGHT OF WAY |
|---|---|---|
| RED | ANY ZONE | ANY ZONE |
| BLUE | ANY ZONE | ANY ZONE |
| AMBER | ANY ZONE EXCEPT A (FRONT) | ANY ZONE |
| CLEAR | ANY ZONE EXCEPT C (REAR) | NOT PERMITTED ANY ZONE |

**Small apparatus** is defined as an apparatus that has a bumper to bumper length of less than 22 feet. On small apparatus, the minimum optical warning system will draw no more than an average of 35 amps total for all upper & lower level warning lights combined. The photometric requirements for small apparatus does not separate the upper & lower zones. Upper and lower zones are combined on small apparatus.

### Small Apparatus - Less than 22'

| | | CALLING FOR RIGHT OF WAY | | | BLOCKING RIGHT OF WAY | | |
|---|---|---|---|---|---|---|---|
| ZONE | LEVEL | H | ANY H POINT | +/-5 ANY H | H | ANY H POINT | +/-5 ANY H |
| A | UPPER & LOWER Combined | 1,000,000 | 10,000 | 3,500 | 400,000 | 10,000 | 3,500 |
| B | UPPER & LOWER Combined | 200,000 | 8,000 | 3,500 | 200,000 | 10,000 | 3,500 |
| C | UPPER LOWER Combined | 400,000 | 10,000 | 3,500 | 800,000 | 10,000 | 3,500 |
| D | UPPER & LOWER Combined | 200,000 | 8,000 | 3,500 | 200,000 | 10,000 | 3,500 |

NOTE: All values are in candela-seconds/minute. H= Horizontal plane passing through the optical center.

### Zone Colors

| COLOR | CALLING FOR RIGHT OF WAY | BLOCKING RIGHT OF WAY |
|---|---|---|
| RED | ANY ZONE | ANY ZONE |
| BLUE | ANY ZONE | ANY ZONE |
| AMBER | ANY ZONE EXCEPT A (FRONT) | ANY ZONE |
| CLEAR | ANY ZONE EXCEPT C (REAR) | NOT PERMITTED ANY ZONE |