

**Material Specification for
LED Traffic Signal Lamp Modules****Table of Contents**

TTS 808.220.01	SCOPE	2
TTS 808.220.02	REFERENCES	2
TTS 808.220.03	DEFINITIONS	2
TTS 808.220.04	DESIGN AND SUBMISSION REQUIREMENTS.....	2
TTS 808.220.04.01	Submission Requirements	2
TTS 808.220.04.02	LED Colour Compliance.....	3
TTS 808.220.05	MATERIALS.....	3
TTS 808.220.05.01	General.....	3
TTS 808.220.05.02	LED Traffic Signal Modules.....	4
TTS 808.220.05.02.01	Pedestrian Modules	4
TTS 808.220.05.02.02	Pedestrian Countdown Modules	4
TTS 808.220.05.02.03	Compatibility	5
TTS 808.220.05.02.04	Non-ITE Compliant Modules	5
TTS 808.220.05.02.05	Module Appearance.....	5
TTS 808.220.05.03	Electrical	6
TTS 808.220.05.04	Environmental.....	6
TTS 808.220.06	EQUIPMENT – Not Used	7
TTS 808.220.07	PRODUCTION.....	7
TTS 808.220.07.01	Assembly	7
TTS 808.220.07.02	Module Identification	7
TTS 808.220.07.03	Packaging and Shipment	7
TTS 808.220.08	QUALITY ASSURANCE.....	8
TTS 808.220.08.01	LED Module Warranty.....	8
TTS 808.220.09	OWNER PURCHASE OF MATERIAL	8
TTS 808.220.09.01	Measurement and Payment	8

TTS 808.220.01 SCOPE

This specification covers the requirements for Light Emitting Diode (LED) traffic signal lamp modules, including all vehicle red, amber, and green indications, bimodal arrows, arrows, pedestrian signal displays, countdown pedestrian signals (PCS) and transit bars.

TTS 808.220.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

City of Toronto Standard Specifications

TTS 808.210 Material Specification for Traffic Signal Head

Institute of Transportation Engineers

ST-052 Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement, June 27, 2005

ST-054 Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED Vehicle Arrows Traffic Signal Supplement, January 2008

Pedestrian Traffic Control Signal Indications – Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules, March 29, 2004

National Electrical Manufacturers Association

NEMA TS1 Traffic Control Systems (Not recommended for New Designs)

NEMA TS2 Traffic Controller Assemblies with NTCIP Requirements

Other

IMSA International Municipal Signal Association (IMSA)

HTA Ontario Highway Traffic Act R.S.O 1990

OTM Book 12 Ontario Traffic Manual (OTM) Book 12 – Traffic Signals

TTS 808.220.03 DEFINITIONS

For the purpose of this specification the definitions included in ITE VTCSH Standard shall apply to this specification.

TTS 808.220.04 DESIGN AND SUBMISSION REQUIREMENTS

TTS 808.220.04.01 Submission Requirements

Specification sheets for vehicle signal and pedestrian signal heads and accessories shall be submitted to the Contract Administrator for review and acceptance.

Two samples of each type of assembled component shall be submitted for review and potential destructive testing at no extra cost to the City. Such testing shall be done by the Contractor and witnessed by the Contract Administrator to determine conformance with the design requirements of this specification. The samples of the assembly will be retained by the City. This testing and evaluation shall be within 30 Working Days from the date of receipt of the samples.

TTS 808.220.04.02 LED Colour Compliance

LED colour compliance shall be according to Table 1:

Table 1: LED colour compliance

ITE specification compliant	Item	Size and colour
Yes	1	300 mm red LED lamp module
Yes	2	200 mm red LED lamp module
Yes ¹	3	300 mm amber LED lamp module
Yes ¹	4	200 mm amber LED lamp module
Yes	5	300 mm green LED lamp module
Yes	6	200 mm green LED lamp module
Yes	7	300 mm green arrow LED lamp module
No	8	200 mm green arrow LED lamp module
Yes ¹	9	300 mm bi-model green / amber arrow LED lamp module
No	10	300 mm bi-model pedestrian lamp module (round)
No	11	300 mm bi-model pedestrian lamp module (square)
No	12	300 mm pedestrian countdown lamp module (round)
No	13	300 mm pedestrian countdown lamp module (square)
No	14	300 mm vertical white bar (transit bar)
No	15	200 mm vertical white bar (transit bar)

¹ If ITE compliant and Caltrans compliant Ambers are available, either or both should be submitted. A detailed explanation shall be submitted with any non-ITE compliant Amber samples clearly indicating any deviations from ITE specification and justification for use of non-ITE spec product.

TTS 808.220.05 MATERIALS

TTS 808.220.05.01 General

All LED traffic signal modules shall be according to the latest ITE Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement, Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, and this specification.

The LED module shall be a self-contained device, not requiring on-site assembly for installation into existing traffic signal housings.

The power supply shall be integral to the unit.

All supplied LED modules shall conform to relevant sections of the *Highway Traffic Act* and OTM Book 12.

All LED modules shall be CSA or equivalent approved. The appropriate certification stickers shall be attached to each LED module.

As a minimum, the materials shall be rated for a minimum service period of 72 months.

TTS 808.220.05.02 LED Traffic Signal Modules

TTS 808.220.05.02.01 Pedestrian Modules

Combination hand/walking person LED Pedestrian (round or square display) modules shall be a single unit and should incorporate Lunar-white LED walking person and the Portland-orange hand symbol in one unit. The symbols shall be according to O.Reg. 626 conform to Regulation 626 of the HTA and as specified in OTM Book 12.

TTS 808.220.05.02.02 Pedestrian Countdown Modules

The numbers 00 to 99 on the numerical display shall have 2 rows of LEDs that are side-by-side and height range of 175 mm (min) to 225 mm (max). The dimensions of the numerical display for the round and square modules shall not differ by more than 10 per cent. The 2-row countdown digit portion shall have sufficient LEDs to ensure even illumination and visibility.

The numeral “1” shall always be formed using the right-most segments of the display.

All LEDs shall be Portland-Orange AlInGaP technology or equal and rated for 100,000 hours or more at 25°C and 20 mA.

Basic operation of the pedestrian countdown modules shall be as follows:

- Clearance Cycle Countdown Mode – The module will start counting when the “Flashing Don’t Walk” turns on and will countdown to “0” and turn off when the steady “Don’t Walk” signal is displayed.
- Modules will “learn” during the first cycle and begin countdown operation during the second cycle.
- Countdown display will be of a “solid” or “transitional” type not “flashing”. During the countdown operation, only the individual segments of the digital display shall clear, not the complete numerical display.
- The countdown duration shall be determined by measuring the duration of the “flashing don’t walk”, in seconds, using an internal timer, and not by counting the number of “don’t walk” flashes. Module must operate correctly for any “flashing don’t walk” flash rate of 1.0 seconds (0.5 s on / 0.5 s off) +/- 20%.

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- The equipment must maintain a consistent countdown during short power failures, less than one second. A longer failure or an absence of signal greater than one (1) second must turn off display and trigger a restart, remaining blank while relearning the time values.

TTS 808.220.05.02.03 Compatibility

LED modules shall fit securely in the housing, and shall be sealed using a one-piece neoprene, soft rubber or silicone gasket.

The LED module shall connect directly to the existing electrical wiring, in accordance with the requirements of this specification.

Modules must be compatible with vehicle signal and pedestrian signal heads according to TTS 808.210.

All LED modules must be operationally compatible with traffic controller assemblies, conflict monitors, flashers, and load switches meeting the NEMA Standards publications TS1 and TS2. No further circuit modifications shall be required for system operation.

All arrow modules shall be omni directional, suitable for installation in any direction. Bi-modal arrows shall comply with both “green” and “amber” ITE specification requirements.

LED modules shall be capable of retrofitting and replacing the incandescent signal lamps and reflector assembly without modifications to a standard vehicle or pedestrian signal head and shall not require special tools.

Installation of a retrofit LED module shall only require the removal of the existing lens, lamp, reflector assembly and gasket.

TTS 808.220.05.02.04 Non-ITE Compliant Modules

All modules not requiring ITE compliance shall comply with the following sections of ITE ST-052:

Section 3: Physical & Mechanical Requirements

Section 5: Electrical

Section 6: Quality Assurance – only tests confirming compliance with requirements of section 3 and 5. As there are no photometric testing requirements only 3 modules of each type need be tested—not six as ITE specification indicates.

TTS 808.220.05.02.05 Module Appearance

All circular ball LED modules and green arrows shall have an expanded view and have an “incandescent” look, providing a softened and more uniform appearance. Suppliers must provide “Minimum Maintained Luminous Intensity Values” tables – as per applicable ITE specification – for LED modules with their submitted samples.

The red and amber module shall have a tinted lens. All other modules shall have a clear lens. The outside lens shall have a hard coat to provide front surface abrasion resistance. The lens surface shall be smooth to reduce the collection of debris, snow and to facilitate cleaning.

TTS 808.220.05.03 Electrical

Wiring shall be a minimum of #18 AWG stranded copper type TEW. All wiring shall be according to the Ontario Electrical Safety Code and applicable bulletins. Wiring leads shall be at least one metre in length. The end of all wiring leads shall have 15 mm of insulation removed and be tinned for use with twist-on type connectors for field wiring connection in the head.

LED Module maximum power consumption in Watts shall be as shown in Table 2 below.

Table 2: LED power consumption

Module type	Maximum wattage (-40°C to +74°C)	Nominal wattage (at 25°C)
300 mm red	17	11
200 mm red	13	8
300 mm amber	25	22
200 mm amber	16	13
300 mm green	15	15
200 mm green	12	12
300 mm green arrow	11	11
300 mm bi-modal green / amber arrow	12	10
300 mm hand	12	10
300 mm bi-modal pedestrian	12	10

TTS 808.220.05.04 Environmental

All exposed parts of a module shall be suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

A module shall be rated for use throughout an ambient operating temperature range, measured at the exposed rear of the module, of -40°C to +74°C.

TTS 808.220.06 EQUIPMENT – Not Used

TTS 808.220.07 PRODUCTION

TTS 808.220.07.01 Assembly

The assembly and manufacturing process for a module shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration due to high winds and other sources.

All modules shall be shipped suitably packaged to avoid damage and to ensure that all parts are delivered as an entity. All packaging is to be marked to clearly indicate contents.

TTS 808.220.07.02 Module Identification

Each module shall be permanently labelled by the manufacturer with the following information on the backside:

- Manufacturer
- Type of Indication (red ball, green arrow, etc.)
- Size (diameter of module) in mm
- Model number
- Nominal operating voltage
- Wattage (Typical) in watts
- Current Flow @ 25°C in mA
- Batch number
- Date of manufacture
- Warranty period – 72 months from date of order whichever is more recent
- Serial number
- Country of manufacture
- Meets “insert applicable ITE specification” (if applicable)

The following information shall be included on the manufacturer's label or a supplementary permanent label installed by the Supplier:

- Date of order
- TTS 808.220 — including the latest version date

Modules shall have a prominent and permanent vertical indexing indicator, that is to say Up Arrow, or the word UP or TOP, for correct indexing and orientation in the signal housing.

TTS 808.220.07.03 Packaging and Shipment

All materials shall be shipped suitably packaged to avoid damage and to ensure that all parts are delivered as an entity.

All packaging is to be marked to clearly indicate contents.

Delivery shall take place during normal business hours (8 a.m. to 4 p.m., Monday to Friday) to a location determined by the City.

TTS 808.220.08 QUALITY ASSURANCE**TTS 808.220.08.01 LED Module Warranty**

All LED modules supplied are to be guaranteed by the manufacturer to be free of material or workmanship defects, for a period of 72 months from the date of manufacture or the order date, whichever is more recent. Any equipment, which is proven to be defective in material or workmanship, will be replaced by the manufacturer at no extra cost to City. Warranty replacement shall include all shipping and handling charges for both defective and new material. A LED Signal module shall be considered to have failed when any one LED pixel is out, or the indication is distorted in any way.

In the event of a recall of any of the supplied components or equipment, whether by the manufacturer or the distributor, the manufacturer, at their expense and at no extra cost to the City, shall be responsible for all necessary labour, Equipment and Material costs including the City's sub-contractors, police and other agencies required to comply with the recall, and to correct or replace the recalled components or equipment.

TTS 808.220.09 OWNER PURCHASE OF MATERIAL**TTS 808.220.09.01 Measurement and Payment**

For payment purposes, a count shall be made of the number of LED traffic signal lamp modules delivered and accepted.

Payment at the price specified in the purchasing order shall be for the supply of LED modules delivered to the destination on the date and time specified.