TRAFFIC SPECIAL PROVISIONS

GENERAL REQUIREMENTS

8-20 ILLUMINATION, TRAFFIC SIGNAL SYSTEMS, AND ELECTRICAL
Materials
Section 8-20.2(1); Equipment List and Drawings
This section is supplemented with the following:

Within the first ten days following the execution of the Contract, the Contractor shall provide copies of purchase orders for items deemed critical. Critical items include but are not limited to traffic signal poles, traffic signal controller, traffic signal controller cabinet, illumination poles, and video detection.

Construction Requirements
Section 8-20.3(3); Removing and Replacing Improvements
This section is supplemented with the following:

Commercial Class concrete shall be used to replace concrete sidewalks or parking strips removed for any reason by the Contractor to facilitate the installation of the systems, and work and material therefore shall be considered incidental.

Class 4000 concrete shall be used to replace concrete driveways or roadways removed for any reason by the Contractor to facilitate the installation of the electrical system. A curing period of 24 hours must be allowed before vehicular traffic shall be allowed to cross any pavement replacement using Class 4000 concrete. The concrete shall be protected by either appropriate barricades or a ramp approved by the Engineer. The pavement must have reached a strength of 2500 psi before traffic will be allowed upon it.

As directed by the Engineer, Class B asphalt concrete shall be used to restore parking strips or roadways to replace bituminous mat pavement removed for any reason by the Contractor to facilitate the installation of the electrical system. Work and material therefore shall be considered incidental.

All bituminous mat pavements to be removed from the bases or the trenches shall be cut with a jackhammer, a spade, or a saw. The Engineer shall be consulted by the Contractor as to which method to use and the Engineer shall make the ultimate decision.

Section 8-20.3(4); Foundations
This section is supplemented with the following:

Concrete shall be placed against undisturbed earth, if possible. Before placing the concrete, the Contractor shall block out around any other underground utilities that may lie in the excavated base so that the concrete will not adhere to the utility line.

Concrete foundations shall be troweled, brushed, edged and finished in a workmanlike manner; and it is the Contractor's responsibility to protect green concrete from vandalism. Concrete shall be promptly cleaned from anchor bolts and conduit after placement. Class 4000 concrete for all foundations.

After a curing period of one week, the Contractor may install the 10' pedestal poles; and after a curing period of two weeks, when tests indicate the concrete has achieved design strength, the Contractor may install the traffic signal mast arm poles.

The locations of all pedestal and mast arm signal poles are indicated on the plans. Pole locations may be revised in the field by the Engineer for maximum effectiveness or due to unforeseen conflicts with existing facilities. The Engineer, prior to excavation for the foundations, shall approve all pole locations.

The approximate location of the traffic signal controller cabinet is indicated on the plans. Final placement shall be determined in the field by the Engineer prior to construction.

The foundation for the traffic signal controller is shown on the plans.

The foundation for the mast arm signal poles shall be as specified below:

Mast Arm Length	Foundation Depth (min.)
15' – 30'	3' x 3' x 7' deep
31' – 55'	3' x 3' x 9' deep

Round bases shall not be allowed.

Anchor bolts shall be those specified on the plans.

Where mast arm, pedestal, or luminaire poles are located in the sidewalk area, the foundation shall be set flush with the finish sidewalk grade.

A ¾" through expansion joint shall be provided between the foundation and both the back of curb and sidewalk. The rectangular portion shall be integrally cast with the foundation. The top of the foundation shall be flush with the sidewalk grade.

Section 8-20.3(5); Conduit
This section is supplemented with the following:

Conduit installed for future use shall have pull wire installed.

The ends of all conduits in j-boxes, traffic signal poles, and street light poles shall be equipped with molded plugs. The molded plugs shall be made of polyethylene, the purpose of which is to prevent moisture and foreign material from entering the conduit. The polyethylene-molded plugs shall meet the following specifications:

Density:	2.0 lbs/cu. ft.
Tensile Strength:	25 psi
Water Absorption:	0.5% by volume
Compression Deflection:	25% at 8 psi
Compression Recovery (% min.):	90

The following table lists the conduit size and the size of molded plug to be used.

Conduit Size	Molded Plug Amount Larger	Length
½" – 1 ¼"	¼"	2" – 3"
1 ½" – 2 ½"	½"	3"
3" – 4"	½"	4"

Approximately 1/3 of the plug length shall remain exposed after installation.

Section 8-20.3(6); Junction Boxes
This section is supplemented with the following:

All locations of junction boxes as shown on the plans are diagrammatic and can be adjusted in the field per the Engineer's approval. The inscription on the cover of all junction boxes shall be "Traffic".

Section 8-20.3(8); Wiring
This section is supplemented with the following:

Splices for illumination circuits, including two way, three way, and four way splices shall be unfused SEC connectors, or approved equal. SEC connector kits shall be capable of being disconnected without damage and shall be equipped with an outer body that shall provide 600-volt insulation. The entire assembly shall be constructed such that a watertight connection is formed to prevent moisture from reaching the fuse or conductor connections.

Splices for induction loop circuits shall use 3M 3800 "SuperCan" or approved equal.

Each traffic signal system wire shall be labeled at each end, except at traffic signal heads, pedestrian signal heads, and pedestrian push buttons. The following are the guidelines on the message on the labels.

Terminal Cabinet Located on Traffic Signal Poles:
These wires shall be labeled as shown on the plans, except the abbreviation C.C. shall be omitted. For example, the plans indicate a wire being labeled C.C.642, the wire shall be labeled 642.

Detector Loop Homerun Cables:
These shall be labeled on both ends as show on the plans. For example, 1-6.

Traffic Signal Controller Cabinet:
If the end of the wires is in a terminal cabinet located on a traffic signal pole or a homerun cable, it should be labeled as above. All other field wires shall be labeled according to the field-wiring chart contained in these specifications.

All wires terminated at the terminal block shall have an open end, crimp-style, solderless terminal. All terminals shall be installed with a tool designed for the installation of this type of terminal; and crimping with pliers, wire cutters, etc., will not be allowed. All wiring inside the controller cabinet and at intermediate points shall be trimmed and cabled together to make a neat and clean-appearing installation.

Section 8-20.3(10); Service
This section is supplemented with the following:

The Contractor shall obtain all permits required to install the service. All associated costs shall be considered incidental.

Illumination Systems
Section 8-20.3(13)A; Light Standards
This section is supplemented with the following:

The street light standard shall consist of a vertical, round, tapered aluminum pole; an arm bracket; a luminaire; anchor bolts and nuts; and associated pole hardware.

The light standard shall be designed to support street lighting luminaires with a minimum weight of 60 pounds each and to withstand pressures caused by wind loads of 100 miles per hour with a gust factor of 1.3.

All pole shafts shall be provided with a 3 ½" x 6" (minimum dimensions) flush hand hole near the base designed to prevent loss of shaft strength and provided with a metal cover secured with stainless steel screws or bolts.

Signal Systems
Section 8-20.3(14)B; Signal Heads
This section is supplemented with the following:

All signal heads shall be 12" diameter, aluminum, painted green and shall be equipped with aluminum visors and flat black polycarbonate backplates.

Each signal head shall have a ½" drain hole in its base. All signal heads shall have square doors and shall be equipped with 5" border backplates. All lenses shall be glass. All left turn indications, green, yellow, and red shall be equipped with arrow lenses.

The position of the signal heads shall be as specified on the plans.

Section 8-20.3(14)C; Induction Loop Vehicle Detectors
This section is supplemented with the following:

Round loops shall be constructed in accordance with the requirements noted for Method A (Circular Saw) or Method B (Core Drill). Construction shall conform to Standard Plan J-8a as modified by the following:

Method A (Circular Saw)

1. Loop conductor and loop lead-in cable shall conform to Section 9-29.3.

2. Round sawcuts shall be 6 feet in diameter and shall be constructed using a equipment designed for cutting round loops. The equipment shall utilize a concave, diamond segmented blade. The saw-cuts shall be vertical and shall be a minimum of ¼ inch wide. The sawcut shall be a minimum of 3 inches deep, measured at any point along the perimeter of the sawcut. Other methods of constructing the round saw-cut such as anchoring a router or flat blade saw will not be allowed.

3. The bottom of the sawcut shall be smooth. No edges created by differences in sawcut depths will be allowed.

4. All sawcut corners shall be rounded to a minimum 1 ½ inch radius.

5. All sawcuts shall be cleaned with a high pressure washer. Wash water and slurry shall be vacuumed out or blown dry with compressed air.

6. Loops shall be installed after all grinding and prior to paving the final lift of asphalt designated in the Plans.

7. The loop shall be constructed using 4 turns of conductor. The conductor shall be installed one turn on top of the previous turn. All turns shall be installed in a clockwise direction. The conductors shall be secured to prevent floating with 2 inch lengths of high temperature foam backer rod sized for a snug fit and spaced at 2 foot intervals around the perimeter of the sawcut and at corners.

8. Loop sealant shall be installed in 2 layers. The first layer shall be allowed to cool before the second layer is applied. Installation of the sealant shall completely encapsulate the loop conductors. A minimum of 1 inch of sealant shall be provided between the top of the conductors and the top of the saw-cut. Installation of the twisted polypropylene rope noted on Standard Plan J-8a is not required, nor will it be allowed.

9. The Contractor shall furnish to the Contracting Agency a warranty for the loop installation for defects in workmanship and construction for a period of 5 years from date of installation.

Method B (Core Drill)

1. Loop conductor and loop lead-in cable shall conform to Section 9-29.3.

2. Round sawcuts shall be constructed using a 6 foot diameter core drill bit with diamond impregnated segments. The sawcut shall be vertical and shall be a minimum of ½ inch wide and a minimum of 3 inches deep measured anywhere along the perimeter of the sawcut. Other methods of constructing the round sawcut such as anchoring a router or flat blade saw will not be allowed.

3. The bottom of the sawcut shall be smooth. No edges created by differences in sawcut depths will be allowed.

4. All sawcut corners shall be rounded to a minimum 1 ½ inch radius.

5. All sawcuts shall be cleaned with a high pressure washer. Wash water and slurry shall be vacuumed out or blown dry with compressed air.

6. Loops shall be installed after all grinding and prior to paving the final lift of asphalt designated in the Plans.

7. The loop shall be constructed using 4 turns of conductor. The conductors shall be installed one turn on top of the previous turn. All

turns shall be installed in a clockwise direction. The conductors shall be secured to each other and shall be secured to prevent floating with 2 inch lengths of high temperature foam backer rod sized for a snug fit and spaced at 2 foot intervals around the perimeter of the sawcut and at corners.

8. Loop sealant shall be installed in 2 layers. The first layer if sealant shall be allowed to cool 5 minutes before the second layer is applied. Installation of the sealant shall be completely encapsulate the loop conductors. A minimum of 1 inch of sealant shall be provided between the top of the conductors and the top of the sawcut. Installation of the twisted polypropylene rope noted on Standard Plan J-8a is not required, nor will it be allowed.

9. The Contractor shall furnish to the Contracting Agency a warranty for the loop installation for defects in workmanship and construction for a period of 5 years from date of installation.

Section 8-20.3(14)E; Signal Standards
This section is supplemented with the following:

Field drilling will be allowed on signal mast arms for the installation of video detection cameras.

Foundations shall be constructed to provide that the mast arm is perpendicular to the centerline of the roadway from which it is stationed, unless otherwise noted on the plans, or instructed by the Engineer.

The space between the concrete base and the bottom of the pole flange shall be filled with grout to completely fill the space under the flange and around the conduits and shall be neatly troweled to the contour of the pole flange. A plastic drain hose (½") shall be inserted through the grout to provide drainage from the interior of the pole base and shall be trimmed flush with the interior and exterior surface of the grout.

All traffic signal standards shall be 8 sided and equipped with an internal terminal cabinet. The internal terminal cabinet shall be equipped with two 24 lug terminal strips and the cover shall conform to the following:

The cover shall be manufactured from Stainless Steel Grade 304. Its thickness shall be a minimum of 14 gauge. The cover shall be hinged to the galvanized terminal compartment on the pole using a one-piece stainless steel hinge measuring 23" in length. The cover shall have a one-inch lip that will extend to cover the protruding portion of the internal terminal compartment. This lip shall be completely welded to the cover. The cover shall have a 1" x ½" Closed Cell Neoprene Sponge (CCNS) gasket with PSA (adhesive) on one side. This gasket shall surround the interior door of the cover to afford a water-resistant closure. The cover shall be lockable using a standard Best Lock, which shall be mounted flush into the face of the door. The cover shall measure 30.5" x 7.75", with the ends contoured to fit the rounded shape of the internal terminal compartment. Cover sample must be pre-approved by the Engineer prior to use.

9-28 SIGNING MATERIALS AND FABRICATION

Section 9-28.12; Reflective Sheetings
This section is replaced with the following:

Reflecting sheeting shall be 3M VIP Diamond Grade or approved equal.

Section 9-28.14; Sign Support Structure
This section is supplemented with the following:

Rectangular Tubing Sign Posts

All post mounted signs shall use a Unistrut Sign Support System, or approved equal.

Materials

Tubing in galvanized finish is rolled from 12 gauge (0.105") strip steel (structural quality), ASTM Spec. No. A446, Grade A.

Shape

The cross section of the post shall be square tube formed of 12 gauge (0.105" U.S.S. Gauge) steel, rolled to size and welded in the corner.

Fabrication

The furnished members shall be straight and shall have a smooth uniform finish. It shall be possible to telescope consecutive sizes of tubes freely with a minimum amount of play. All holes and cut off ends shall be free from burs.

Galvanized Finished

All posts shall be weather protected by galvanizing. Posts shall be formed from hot-rolled steel strip which has been zinc coated, conforming to ASTM Specification A525 coating designation G90 (previous coating class 1.25 commercial).

9-29 ILLUMINATION, SIGNAL, ELECTRICAL

Section 9-29.7; Luminaire Fusing and Electrical Connections at Light Standard Bases
This section is supplemented with the following:

Quick disconnect fused connectors for illumination shall be 10 amperes and shall be TRON In-line fuse holder HEB - ##, or approved equal.

Control Equipment
Section 9-29.11(2); Photoelectric Controls
This section is supplemented with the following:

Each luminaire shall be equipped with a photoelectric cell and shall be a Fisher Pierce Model N7790B or approved equal.

Electrical Splice Materials
Section 9-29.12(2); Traffic Signal Splice Material
This section is supplemented with the following:

Splices for induction loop circuits shall use 3M 3800 "SuperCan" or approved equal.

Section 9-29.13; Traffic Signal Controllers
This section is replaced with the following:

The City of Longview has declared that the traffic signal controller, cabinet, radio interconnect equipment to be sole source using equipment manufactured by PEEK Industries and Northwest Signal Supply Company.

The traffic signal controller equipment shall be the City of Longview standard as designated on the plans.

The City of Kelso may designate a standard other than the City of Longview.

Section 9-29.18; Vehicle Detector
This section is supplemented with the following:

Video Detection

Hardware

1. Physical Dimensions
Overall physical dimensions must be no larger than 5.36"H x 13.06"W x 11.25"D (136x332x286mm). The chassis shall be designed to accommodate up to 10 VME modules and a VME power supply.

2. Modules/Bus
The VTU shall utilize the VME (Versa Module Europe) bus. All modules must be 3U (160mm x 100mm) and plug into the VME bus. All modules must have slot ejectors.

3. Input Power
The VTU shall be powered by 120VAC/60Hz or 240VAC/50Hz with an automatic voltage sensing power supply. A typical 3-wire removable computer style plug shall provide power to the unit.

4. Environmental
The VTU must meet or exceed NEMA TS-1 and TS-2, as well as Type 170/179 environmental specifications, and operate between the ambient temperature range of-40C to +85C, 0 to 95% non-condensing humidity.

5. Operational Status Indicators
The VTU must have an illuminated power switch and LED status indicators for easy visual verification of unit operation.

6. RS-232 Communications
The VTU must have a minimum of two (2) RS-232 ports for serial communications. These ports must support baud rates from 1200bps to 115.2Kbps. The RS-232 ports shall use standard RJ-45 connectors. These ports are to be used for communications to a modem, laptop, computer, controller, etc. They must also provide a mechanism that allows extraction of real-time data via a published ATMS (Advanced Traffic Management System) communications protocol. This protocol shall be available from the VTU manufacturer for use in third party software development projects.

7. RS-485 Communications
The VTU shall have an RS-485 port for interfacing to a NEMA TS-2 controller or to a TS-2 BIU.

8. Input/Output Modules
The VTU shall accommodate up to 2 I/O modules. Each I/O module must be capable of 32 outputs and 16 inputs via a 'D' sub connector that interfaces directly to cabinet terminals and facilities. I/O modules shall have a jumper setting that allows either 12V or 24V operation.

9. Detection Outputs
The video detection system must allow flexible output programming so that the outputs may be programmed to correspond to vehicle detectors, incident detectors, or a combination of detector types. All outputs should be monitored by internal diagnostics for proper operation.

10. Cabinet Inputs
The system must provide inputs that can be used to monitor signal phase status for detector functions, law enforcement, and other functions as might be necessary.

11. Video Input/Output
The VTU shall be able to accommodate 2 Video Processing Modules (VPMs) in operation for a total of 10 video inputs and 2 video outputs.

12. Video Connections
Field video cables should be terminated to lightning protection devices with BNC connectors on the VTU Interface Panel. From the Interface Panel, a micro-coax cable shall be used to allow clean, easy routing of the cable to the VTU. The micro-coax cable shall connect to the VTU via a single connector.

13. Video Indicators
LED's on the front of the VTU shall indicate if a video signal is present and valid, and if the video picture is useable to provide quick verification of system status.

Video
1. Video Inputs
The VTU must accept up to 8 video inputs for analysis and detection from video cameras or videotape players. One (2) additional video inputs shall be provided

2. Video Input Sources
Video inputs can be either monochrome or color. The system must be capable of detecting objects in RS-170 (monochrome) and NTSC (color), or CCIR (monochrome) and PAL (color) video signals.

3. Video Outputs
The VTU must allow any of the ten 30 frame per second video (camera) inputs to be routed to a video output. The output shall provide real-time analog video and not require D/A (Digital to Analog) conversion. The system must be capable of automatically routing each of the input signals to the outputs in a user programmed sequence for convenient field monitoring of camera signals.

4. Digital Video
The VTU shall be capable of transmitting digitized video, via serial communications, from any of the eight digitized video inputs. Built-in software CODECS (COmpress/DECompress) shall provide maximum frame rates for a given communication medium.

5. Viewing Video
The system shall provide a mechanism to remotely monitor VTU operation using a real time video stream of digitized images on a computer or laptop at some given frame rate (a function of the communication medium and computer speed). The system must also allow the user to view a detector overlay on full motion analog video. Full motion analog video (NTSC=30 fps/PAL=25fps) and overlay requires a computer with an appropriate digitizer board. Detection activity shall be indicated on the PC display by a change in the detector's color.

6. VCR Style Operation
The software on the host Personal Computer used for system setup and monitoring (PC) must provide a mechanism for recording and storing digital video and still frames. The detection system software shall allow video to be stored to some device or media, such as a hard drive, for later playback.

Tracking and Detection

1. Tracking
The VTU must be a tracking-based system utilizing multi-resolution processing. The VTU must allow the user to define lane boundaries and other areas of interest using tracking strips. The system shall accommodate up to 5 tracking strips per Field of View (FOV) for tracking vehicles based on flow and direction.

2. TrackingStrips
Tracking strips may be of various sizes and orientations within each FOV and are typically associated with a lane, shoulder, or other area of interest. Tracking strips should be polygons comprised of 4 to 8 points. The system must have the abilit y to program the expected flow direction of traffic within a tracking strip to allow the processor to identify objects traveling in the wrong direction.

3. Image Contrast Failsafe
The VTU must have the capability to detect image contrast failures or poor quality video images from each camera. The VTU must be capable of entering a failsafe state if the camera FOV does not contain some minimum amount of contrast.

4. Stabilization
The VTU must be able to compensate for minor vibration or sway of the camera. Detection algorithms shall be designed to accommodate minor camera motion without the need for special hardware or programming.

5. Field of View Calibration
The VTU shall allow FOV calibration for accommodating perspective variations due to varying camera heights and angles. By defining 4 existing objects or points within the FOV and providing connecting distances in actual ground coordinates, the VTU shall adjusts certain calculations for perspective.

6. Detection Zones
The VTU must be capable of providing 32 detection zones per camera FOV, for a total of 256 zones per unit (8 camera detection unit). A detection zone shall consist of a line or polygon drawn on a video image. The system must allow detection zones to be drawn using 2, 3, and 4 points. The system must allow detection zones to overlap and intersect and span multiple tracking strips.

7. Detector Types Statistics
The system shall allow detection zones to be programmed as standard vehicle detectors or as incident detectors. All zone types must b e capable of collecting and recording traffic data (volume, average speed, occupancy, etc.).

8. Statistics
Each detection zone shall be capable of logging the following statistics:

- Volume/counts (# of vehicles)
- Lane Occupancy (% time lane is occupied)
- Speed (average speed in mph or kph)
- Density (average density = volume/speed)
- Headway (average headway in seconds)
- Length (average vehicle length in ft/meters)
- Vehicle Classification by user-selectable lengths (5 bins)
- Delay (average delay in seconds)
- Queue Length

The system shall allow data to be stored in selectable time periods of 10, 20, or 30 seconds; or 1, 5, 10, 15, 30, or 60 minutes. The system must be able to provide traffic data via RS-232 in real-time and also be capable of storing data in the VTU. The number of zones selected for storage and time slice determines the maximum storage time (days, weeks). RS-232 real-time statistics shall be viewable within the PC software provided with the system and must also be available for real-time monitoring via a published protocol designed for use by third party software developers who may choose to integrate video detection into a larger traffic management system.

9. Incidents
The VTU shall allow any detection zone to be configured for automatic incident detection and output. Incident detection zones must be capable of recording traffic data (volume, speed, occupancy, etc.) and also monitor for the following incidents:Vehicle presence for 'n' minutes or seconds

- Vehicle speed (under speed, over speed, or speed within specific range)
- Wrong way detection
- Queue Length exceeded
- Delay exceeded
- Occupancy exceeded (low occupancy, high occupancy, or within a specific range)
- Red traffic signal runners

For some incidents, the system must provide the user an option to select whether incident zone activation is based upon "individual vehicle" data or "period average" data. Incidents based on "individual vehicle" data will trigger any time that a single vehicle meets the incident criteria. Incidents based on "period average" data will trigger any time that data gathered over the statistics time slice meets the incident criteria. For instance, this option may be used to trigger speed incidents based upon either individual vehicle speed or average vehicle speeds over the programmed statistics time slice. All incident detectors must have the ability to turn on an output and also log the incident.

10. Output Assignments
The system shall allow detection zones to be assigned to any combination of outputs, independent of logging and reporting capabilities. The system must allow more than one zone to be assigned to an output with the use of a logical operator. Selections must include OR, AND, NOR and NAND. The default operator shall be OR.

11. Detector Types
The system must allow a detector to simply operate as a presence detector; however, it must also allow several additional detector types and options that may be programmed by the user. The various types of detector operations are described below.

Detect Always

This option shall be the default state of all "detector" type detection zones. It should be selected if simple presence detector functionality is desired. When a vehicle enters a zone, it will activate immediately and remain active for the entire time that the vehicle is present. When the vehicle leaves the zone, the zone will immediately de-activate. This operation requires no phase associations or constraints.

Conditional Detector

The system must provide a feature that allows detector operation to be conditional upon an associated phase state (Red, Yellow, or Green). With a conditional phase association, the detector will only report detections while the assigned phase (input) is active.

Extend / Delay

Detectors must be capable of being programmed to Extend or Delay activation and any associated output. An entry field shall be provided in the setup software that allows the user to define a time period (in seconds) that the detection zone activation is either extended or delayed.

The Extend function shall force a zone to remain active for a user defined time period after the last vehicle has exited the zone. The maximum extend time must be 25.5 seconds or greater. This operation should be associated with a particular phase

The Delay function shall force a zone to remain inactive for a user defined time period after a vehicle enters and remains in the zone. If the vehicle remains in the zone, it activates once the programmed delay time has elapsed. The maximum delay time shall be 30 seconds or greater. This operation should be associated with a particular phase state.

12. Occlusion Compensation

The system must include a feature designed to allow improved multi-lane freeway count accuracy when using less than ideal camera locations. This feature should operate on the premise that adjacent lane over counting on multi-lane freeways is often due to occlusion by large vehicles (tractor trailers, buses, and other large trucks). These vehicles visually appear to occupy the adjacent lane away from the camera.

Assuming that these vehicles are usually long, as well as tall, the adjacent lane detector should de-activated while the truck is occluding the adjacent lane. Without occlusion compensation, both detectors would count the truck. With occlusion compensation, the detector covering the lane on the far side of the truck is deactivated and does not count (or provide an associated output) until the truck exits the detector in its own lane.

13. Camera Mounting
The system should optimally detect vehicle presence when the camera is mounted 30 feet (10 meters) or higher above the roadway, when the camera is directly adjacent to or over the center of the desired coverage area, and when the length of the field of view is not greater tha n ten (10) times the mounting height of the camera. Cameras should be mounted as close as possible to the center of the traffic lanes to be viewed, in order to diminish the effects of cross lane, adjacent lane, and same lane occlusion.

14. Per Vehicle Records (Academia Mode)
A Per Vehicle record function should be available to interested parties. This feature provides access to the actual "per vehicle records" (PVR's) for a specified camera. At each request (as fast as the PC can request data up to 115,200 baud), the VTU will send back information for every vehicle being tracked within the specified field of view. Information returned should include vehicle ID, time tracked, current X-Y coordinates, length, speed, and uncertainties, as well as several o ther parameters.

15. Detection Accuracy
Using a camera mounted as defined in section 5 and in the location as defined in section 3.13, the system shall be able to count vehicles with less than four (4) percent error rate under normal conditions and less than seven (7) percent error rate under artifact conditions caused by shadows, fog, rain, and snow or other environmental conditions. This accuracy shall be based on volume count for the entire field of view compiled over multiple time intervals that contain a minimum of 100 vehicles to ensure statistical significance.

16. Two Independent Configurations
The database for each VTU shall contain two complete and independent configuration settings. These configurations should be referred to as either Config #1 or Config #2. Each database must contain a complete set of strip and zone layouts, tracking parameters, and calibration points for each Field of View. Each configuration must also contain its own unique output assignment information.

In some cases, it is desired to switch between these two configurations to perform certain advanced functions. For instance, in applications where lanes may be reversed during certain periods, the user may desire to change the placement and function of detection or incide nt zones accordingly. To accomplish this, the system must allow the user to select a configuration change based upon Time of Day, Input, Output, or Zone State.

Switching by Time of Day
At the specified T.O.D., the VTU shall automatically switch to the Config #2 settings.

Switching by Input

To implement, an input must be selected and also defined as to the desired state of ON or OFF when active. When the specified input is in the programmed state, the VTU shall automatically switch to the Config #2 settings.

Switching by Output

To implement, an output must be selected and also defined as to the desired state of ON or OFF when active. When the specified output is in the programmed state, the VTU shall automatically switch to the Config #2 settings.

Switching by Zone

To implement, select the desired state of the zone by selecting either ON or OFF in the selection box provided. When the specified zone is in the programmed state, the field unit shall automatically switch to the Config #2 settings.

Personal Computer (PC)

1. Computer Interconnection

A Personal Computer Interface (PC) provides a user-friendly interface to the VTU via an RS-232 connection.

2. Computer Requirements

The PC can be any portable, or laptop computer that runs Windows 95, Windows98, or Windows NT. The host PC must be a Pentium or higher with 96MB RAM and a minimum 30GB available on the hard drive. A 16550 UART, standard on all new computers, is required for serial communications. The specifications for the PC shall be approved by the Engineer.

3. User Interface

The PC shall run a Windows™ program for programming and monitoring of the VTU. This Windows™ program shall enable system setup and monitoring of the VTU and provides the interface for real time viewing and system operation without the need of specialized peripherals.

4. System Configuration

The PC and video detection system software shall be used in conjunction with a mouse or other pointing device, to draw and configure tracking

strips, detection zones, and other features required for configuration and setup of the VTU. Live digital video, a single digitized frame, and live analog video with a custom digitizer card of the actual camera FOV may be utilized in this setup.

1. System Monitoring
A standard PC using software provided with the VTU shall be used for watching real-time operation of any camera, by utilizing compressed digital video transmitted via a serial communication link. Multiple VTU's and multiple cameras can be viewed in different windows. Detection zone and incident detection zone activity must be indicated on the VGA display of the PC as traffic moves through the scene.

2. Digital Movies
The PC and video detection system software shall provide a mechanism for capturing and storing digitized video for later playback, in essence providing a VCR type recording mechanism for storing critical events.

7. Database and Addressing
The PC and video detection system software shall provide a mechanism for programming and storing all parameters required for operation of the VTU. In addition, the software must be capable of uploading or downloading any of this data in user selectable portions. All VTU's must be addressable.

8. Statistics
The PC and video detection system software must have the capability of retrieving, displaying, and storing traffic statistics from the VTU. This data may be manually retrieved or scheduled for automatic retrieval. The video detection system software shall include a wizard that guides the user through creating several different types of graphs, charts, and reports for presentation of the statistics.

6. Security
There shall be at least 2 levels of security in the VTU field unit: Read/Write and Read Only access. Read/Write access allows access to any function, including downloads, resets, and other "write" functions. Read Only access allows a user to only access "read" functions.

Once a password is programmed, the user shall be prompted to enter his/her password any time that communications between the PC and VTU is established, either through Direct Connect or by modem. Upon entering a proper password, communications should be established.

10. Program Updates
The VTU must allow program code to be updated via a download from the PC. The program shall reside in FEPROM with a protected boot sector. This feature enables the user to download a program update without interrupting operation of the unit. A hard reset must be performed to implement new software.

Camera System
1. Camera Specification
The VTU shall operate properly with either medium or high-resolution 1/3" or 1/2" monochrome CCD cameras. Each camera must provide a minimum of 383 lines of resolution. The camera may use a fixed focal length lens selected uniquely for each site or a zoom lens. The lens must have Auto-Iris capability. The VTU shall be capable of using RS-170 and NTSC, or CCIR and PAL video signals. Cameras must meet or exceed the VTU manufacturer's performance criteria. Utilization of cameras other than those recommended by the VTU manufacturer voids all system performance warranties.

2. IR Filtering
Cameras must be equipped with an IR blocking filter that, at minimum, attenuates 600nm-1400nm to 10%.

3. Enclosures/Housings
The camera must be housed in a NEMA Type IV water resistant, dustproof enclosure. The enclosure shall include a heater and a desiccant packet to prevent internal and external moisture. A sunshield must also be provided to help cool the enclosure and also guard against unwanted glare and reflection.

4. Field Interconnection
The camera enclosure must utilize a single MS-connector for interconnection to video and power cables.

5. Camera Mounts
The camera may be installed in the field with the use of a 'J' bracket or Pedestal mount. The mount and mounting location must be secure and care must be taken to minimize sway and motion.

6. Cabinet Interconnection
The field video cables shall terminate in the traffic cabinet on the VTU Camera Interface Panel (CIP). This panel must provide lightning protection and terminating junctions for cables from the cabinet to the cameras.

Technical Support

1. Site Survey

A detailed site survey by a factory trained and certified representative must conducted prior to the deployment of the VTU. This site survey ensures that the choice of camera(s), camera locations, optics, and data/video interconnect is appropriate for the application.

2. Technical Support

Technical support for VTU elements shall be immediately available. On site support must also be available through a global distribution and service network.

Warranty

1.Warranty

The manufacturer shall warrant this product against manufacturing defects in materials and workmanship for two years from the date of shipment from the factory. Specific contracts and regional laws may vary or alter these terms. Extended service and warranty plans must be available from the VTU manufacturer. VTU deployment with cameras other than those recommended by the manufacturer shall void any guarantees or claims made regarding the performance accuracy of the system, but will not affect the warranty on the VTU chassis and video processing electronics. The manufacturer's products are protected by one or more U.S. and international patents and patents pending. Warranty registration must be completed by the end-user within 30-days from product receipt to receive complimentary product enhancements and upgrades within the first year.

2. Certification of Compliance-NEMA

The manufacturer shall warrant this product to be in full compliance with all NEMA hardware environmental requirements, and must be able to produce independent laboratory product certification upon request.

Section 9-29.19; Pedestrian Push Button

Paragraph 2 is replaced with the following:

Where noted in the contract, pedestrian push buttons of substantially tamper-proof construction shall be furnished and installed. They shall be Cascade Signal's "Bumble Bee" or approved equal.

Section 9-29.19

This section is supplemented with the following:

Before installing the pushbuttons and signs, the Contractor shall check with the Engineer for final positioning.

Section 9-29.20; Pedestrian Signal
This section is replaced with the following:

General
Pedestrian signals shall be type C incandescent and shall display the international symbols (hand and walking person).

The pedestrian signal shall be designed to fit the Type E mounting brackets unless specified on the plans.

The housing shall be a single piece of case aluminum.

The maximum overall dimension of the pedestrian signal shall be 18 ½" wide, 18 ¾" high and 9" deep, including the eggcrate-type visor and hinges. The distance between the mounting surfaces of the upper and lower openings shall be 15 ¾".

Double Parabolic Reflector
A single piece double parabolic reflector shall be vacuum formed form ¼" minimum thickness textured polycarbonate plastic sheets. The texture shall be on the light bulb side of the reflector and shall conform to C-64 or C-66 pattern or equivalent for light uniformity.

The lamp side of the reflector shall be reflectorized by vacuum deposition of an aluminum coating which shall in turn be protected by a hard wear resistant coating.

The two sections of the reflector shall be divided by a full depth of 0.040 inches aluminum divider that properly mates with the message lenses to effectively prevent light spillage from one section to the other.

Lamps and Lamp Sockets
The pedestrian signal shall be completely equipped with traffic signal lamps and sockets tone set for each of the two sections of the double parabolic reflector. Each lamp shall be V-beam, clear, group replacement A21, 8000-hour-rated life, horizontal with medium base. Each lamp socket shall be accurately positioned so as to be centered and prefocused in its respective section of the reflector when the above-described lamps are installed.

Mounting shall be die cast aluminum case so as to efficiently conduct heat away form the respective socket.

The lamp socket may be made of molded bakelite, molded phenolic, or ceramic and shall be provided with a brass screw with lamp grip. An optional socket rotating mechanism with a minimum of 8 spring loaded detents shall be available to allow positioning of the opening of the lamp filament upwards.

Each lamp socket shall be provided with one colored lead (non-white and non-green) from the socket and one white lead from the shell. Leads shall be 18 AWG and shall be wired to respective terminals of a three terminal pair screw type terminal block. The two white wires shall be connected to a common terminal. The terminal block shall be located on the head half of the clamshell mounting hardware or inside the pedestrian signal housing when post top or bracket type mounting is employed.

Eggcrate Visor

Each signal shall be provided with an eggcrate type visor. The eggcrate visor assembly shall be held in place by the use of stainless steel screws.

The eggcrate assembly shall consist of 15 vertical members and 26 horizontal members plus two anti-vandal integral locking strips. The completed eggcrate portion shall be 1 ½ inches deep.

The basic material used in construction of the eggcrate shall be nominally 0.030 inches thick and shall be 100% impregnated black polycarbonate plastic processed with a flat finish on both sides.

The assembly shall be enclosed in a mounting frame constructed of 0.040 minimum thickness aluminum or polycarbonate plastic. This frame shall be 1 ½ inches deep and shall contain mounting holes for direct insertion in the pedestrian signal door frames.

Case

The case shall be a one piece corrosion resistant aluminum alloy die casting complete with integrally cast top, bottom, sides and back. Four (4) integrally cast hinge lug pairs, two at the top and two at the bottom of each case, shall be provided for operation of a swing door.

The case shall provide a dustproof and weatherproof enclosure. The case shall be supplied with clamshell mounting hardware for installation of "pole left of message".

Door Frame

The door frame shall be a one piece corrosion resistant aluminum alloy die casting, complete with two hinge lugs cast at the bottom and two latch slots cast at the top of each door. The door shall be attached to the case by means of two Type 304 stainless steel spring pins. Two stainless steel hinged bolts with captive stainless steel wing nuts and washers shall be attached to the top of the case with the use of stainless steel spring pins. Hence, latching or unlatching of the door shall require no tools.

Painting
Prior to final assembly; the case, door frame, and eggcrate visor (aluminum portion only) shall be thoroughly cleaned and a chromate conversion coating applied inside and out per Military Specification MilC-5541. A synthetic enamel conforming to Military Specification TTE529 shall then be electrostatically applied. The color and gloss of the case shall be gloss black. The color of the eggcrate visor shall be flat black. The finish shall be oven cured for a minimum of 20 minutes at 350 degrees Fahrenheit

Section 9-33; Construction Geotextile

Geotextile application for structures & pipe foundations shall meet the requirements of section 9-33.2(1) table 1 & 2.