10.1.1 Introduction

System detector stations collect real time data on freeway traffic flow. The data is used for traffic management functions such as detecting incidents, traffic flow information, and archiving for planning and historical analysis. System detector stations typically provide real-time information into a system; they do not collect data for use in a closed system (e.g. signalized intersection)

Each system detector station is typically configured to measure and collect three standard traffic flow parameters on a lane-by-lane basis:

- Volume
- Occupancy (similar to traffic "density")
- Speed

10.1.2 Needs Assessment

If there is a need to monitor traffic flow on the system, SDS should be used. Prior to determining the type and location of a system detector station, various data needs to be collected, such as:

- Mainline peak hour volume-to-capacity ratio for proposed location(s)
- Corridor spacing requirements (½ -mile spacing is typically used in congested urban areas, where the mainline peak hour volume-to-capacity ratio is 0.70 or greater; 1-mile spacing is typically used in moderately congested areas, where the mainline peak hour volume-to-capacity ration is 0.50 or greater, and 2-3 mile spacing is used in rural areas where the peak hour volume-to-capacity ratio is less than 0.50. Spot location detection may be used in rural interchanges where mainline and ramp data is collected for historical purposes for planning uses.
- Site-specific issues or concerns based on an initial site visit (right-of-way, utilities, landscape, and pavement condition)
- New roadway construction project or existing pavement

The location of the detector station based on spacing requirements is affected by the placement of mainline detectors along a corridor. Mainline detection for ramp meters must be considered when determining locations for system detector stations. If urban interchanges are spaced approximately 1 mile apart, then one bi-directional detector station would be placed approximately halfway between the interchanges. While the directional ramp meter mainline loops may be a few hundred feet apart (near the ramp meters), the goal of detector station spacing is to get an overall average close to the spacing requirements, not precise distances upstream and downstream to the nearest detectors.

10.1.2.1 Types

Within Wisconsin, two different types of detector stations have been implemented on large scales to measure various traffic parameters:

- Loop Detector Stations - Loop detectors configured in a "trap" configuration, spaced at a consistent distance apart (typically 16-ft) leading edge to leading edge, are used for permanent detection statewide.
- Microwave Detector Stations - Microwave detectors are above-ground units mounted either over a traffic lane (e.g., on a bridge overpass), or along the side of the freeway mounted on a pole, in a "side-fire" configuration approximately 15 feet high. For microwave detectors mounted over a traffic lane, speed can be measured, whereas via side-fire configuration, the speed parameter is calculated. The side-fire configurations, however, have proven to be more accurate than the overhead position. Microwave detectors are typically used for temporary installations to provide traffic data during construction projects, or in a permanent configuration where the freeway pavement is relatively new. Additional types of detector stations may be implemented based on new technology, case-specific needs, or evaluation

purposes.

10.1.2.2 Other Types

At times, other types of detection may be advantageous to deploy in place or in addition to the traditional system detector stations. These other types may act as stand alone devices or may not integrate directly with the system; however, the data that these systems collect can be beneficial for both operations and planning.

- Probe data, including the use of cellular probes
- Automatic Traffic Recorders – typically only record volume, but may gather additional data such as classification.

For specific procurement product information, see Chapter 70.5 State Supplied List. Contact the BHO-STOC for product information.

Follow the System Detector Station Design Process checklist shown in Table 10.1

Table 10.1 System Detector Station Design Process Checklist

Collect initial data required for the proposed system detector station location	
Determine the **detector station type** required for the design location	
Determine the **location of the controller cabinet** and meter service pedestal	
Prepare the **underground infrastructure**, including detectors, conduit, and pullboxes	
Perform **cable routing** to provide hardwire interconnection between the controller cabinet and detector station devices such as detectors, electrical service, etc.	
Determine the **communications medium** used for the proposed location (See Chapter 50, Communication Systems.)	
Revisit steps 3 through 6 until final design is complete	
Begin the process to **establish electrical service** for the proposed location with the local power company. This should be done early in the design process to establish an acceptable electrical service location.	
Determine the **construction details** needed for the proposed design, details which **need to be modified**, and new details which **need to be created** to provide a complete construction plan.	
Determine the **special provisions** needed for the proposed design, special provisions which **need to be modified**, and new special provisions which **need to be created** to provide a complete construction plan.	
Determine the **standard specification bid items** and **procurement items** that will need to be included in the estimate and miscellaneous quantities to provide a complete construction plan.	