

1 (April 15, 2024)

2 **Smart Work Zone System**

3 Where shown on an approved traffic control plan, the Contractor shall provide,
4 operate, maintain, and remove a Smart Work Zone System. A Smart Work Zone
5 System (SWZS) uses portable roadside sensor information to display real-time
6 dynamic work zone traffic information and instructions to motorists on a series of
7 Portable Changeable Message Signs (PCMSs) approaching a work zone.

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9 The SWZS shall be capable of communicating three types of work zone traffic
10 information:

- 11
12 1. **Queue detection warning** for slowed or queued traffic ahead.
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14 2. **Dynamic lane merge** guidance to use all open lanes up to the lane closure
15 tapers and zipper merge instructions during times of congestion.
16
17 3. **Work zone travel delay** for current work zone delays in minutes.
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19 In locations with multiple SWZS setups each setup shall be capable of operating
20 independently. One SWZS Technician may operate all systems concurrently.
21

22 **Vendor**

23 The Contractor shall select an independent vendor listed below to provide the SWZS
24 as shown on an approved SWZS Plan:

25
26 **Highway Specialties LLC**

27 Phone: (360) 437-1900

28 Website: <https://www.highwayspecialties.com>
29

30 **Hill and Smith Inc.**

31 Phone: (302) 328-3220

32 Website: https://www.hillandsmith.com/portfolio_category/its-smart-work-zone/
33

34 **ICONE by ICONE Products**

35 Phone: (315) 626-6800

36 Website: <http://iconeproducts.com/>
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38 **Road-Tech Safety Services, Inc.**

39 Phone: (888) 762-3832

40 Website: <https://www.road-tech.com/>
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42 **SolarTech**

43 Phone: (610) 391-8600

44 Website: <http://solartechnology.com/>
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46 **Street Smart**

47 Phone: (888) 653-6800

48 Website: <https://www.streetsmartrental.com/smart-work-zones/>
49

50 **Superior Traffic Services**

51 Phone: (888) 928-5999

52 <https://www.superiortrafficservices.com/>

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2 **Ver-Mac**

3 Phone: (888) 488-7446

4 Website: <https://www.ver-mac.com/en/jamlogic-software/smart-work-zones>

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6 **WANCO**

7 Phone: (800) 972-0755

8 Website: <https://www.wanco.com>

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10 **Devices and Communications**

11 The Contractor and/or Vendor shall provide all devices necessary to operate the
12 system in accordance with the accepted traffic control plans and these specifications.

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14 The traffic sensors shown in the traffic control plans in advance of lane closure tapers
15 are used to operate the SWZS by detecting vehicle speed approaching the lane
16 closures, where queuing is expected. Typically, these traffic sensors use Doppler
17 radar technology.

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19 Separate side-fire traffic sensor(s), Wavetronix SmartSensor HD or similar accepted
20 by the Engineer, shall be post-mounted or trailer-mounted to obtain traffic
21 volume/speed data where shown in the traffic control plans. If not shown, then the
22 side-fire traffic sensor shall be placed after the final lane closure taper but before
23 lanes are reopened or any open on-ramps to measure the following:

- 24
25 1. Traffic volume, in vehicles per hour per open lane
26
27 2. Speed – time graph used to determine the median & 85th percentile speed
28 in each open lane
29

30 The Contractor shall use and relocate as necessary side-fire traffic sensor(s) at
31 locations compatible with lane closures. As an alternative, multiple side-fire traffic
32 sensors can be used throughout the project limits provide the traffic volume/speed
33 data remains accurate.

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35 A vendor website or other wireless remote system is required for monitoring SWZS
36 functions and remote management of PCMS messages.

37
38 **Technician**

39 The Vendor shall provide a technician skilled in the operation of all system equipment
40 and software. The technician may be an employee of the Vendor or someone trained
41 and authorized by the Vendor to operate the system. The technician shall be
42 independent of the Contractor and Traffic Control Supervisor but shall collaborate
43 and coordinate as appropriate. The technician shall be on site while the SWZS is in
44 use and able to respond to system issues in person.

45
46 Duties of the Technician include, but are not limited to, the following:

- 47
48 1. Program the automated, real-time operation of the SWZS with traffic sensor
49 trigger speed thresholds and PCMS messages shown on the approved
50 SWZS Plan.
51
52 2. Service, debug, troubleshoot, and maintain all SWZS components.

3. Maintain SWZS equipment maintenance logs.
4. Collect and process system data and provide data as described below:
 - a. **System Data** – System data shall include:
 - i. Data in table format of traffic volume (vehicles per hour per each open lane), 50th-percentile traffic speed of all open lanes, and 85th-percentile traffic speed of all open lanes for 15-minute intervals organized by Day and Hour of day for each SWZS implementation measured by the side-fire traffic sensor.
 - ii. Day and Hour of day each traffic sensor was triggered, and the message displayed on each PCMS while the SWZS is in use.
 - b. **Agency Access to System Data** – Provide password protected access to the Engineer and identified Agency personnel to the System Data via a dedicated website or other wireless remote system.
 - c. **Provide System Data to Agency** – At the completion of the Project, provide System Data logs in an electronic format approved by the Engineer.
5. Immediately respond to all system failures in accordance with the **Smart Work Zone System Failure Protocol** section of these Specifications.

Operation

Operate the SWZS according to the following:

Scheduled Use

Use a dynamic lane merge, queue detection warning, and work zone travel delay system on the following roadway(s), locations, and work operations:

*** \$\$1\$\$ ***

Installation, Relocation, Removal, and Storage

The Contractor shall store, install, relocate, and remove all the SWZS components as follows:

1. Install all components with the SWZS Technician's concurrence at least 30 minutes prior to commencing the first lane closure
2. Relocate components as necessary with the SWZS Technician's concurrence
3. Assist the Technician as needed when the Smart Work Zone System Failure Protocol occurs

4. Remove all components within the Work Zone Clear Zone within 60 minutes when no longer required unless components are placed behind guardrail or barrier.

Initial SWZS Turn-On Meeting

The Contractor shall arrange a meeting at least one week before the initial system turn-on.

The meeting shall include the Contractor, Traffic Control Manager, Traffic Control Supervisor, Alternative Traffic Control Supervisor (if applicable), SWZS Technician, and WSDOT Project Engineering Office staff.

During this meeting, the following topics should be discussed at a minimum:

1. Provide and review the approved traffic control plans, including lane closure plans and the associated SWZS plan that will be used.
2. Review roles and responsibilities for implementation of the SWZS.
3. Provide contact information for critical personnel.
4. Provide a schedule of the anticipated operation times, dates and durations for the initial operation.
5. Review Measurement and Payment for duties related to SWZS installation, operation, and removal.

SWZS Operation Coordination and Collaboration

The Contractor shall notify the Engineer at least 72 hours in advance of using the SWZS including providing a schedule of the anticipated operation times, dates and durations for each subsequent operation.

The Contractor's Traffic Control Management shall coordinate and collaborate as needed for the successful implementation of the SWZS and associated lane closures. Any delays and associated costs due to implementing the SWZS shall be at the Contractor's expense.

Smart Work Zone System Failure Protocol

In the event of a failure, perform the following protocol:

1. **SWZS Technician** – Upon discovery of the malfunction, perform the following:
 - a. Immediately notify Contractor Traffic Control Management.
 - b. Begin troubleshooting the SWZS to address the malfunction.
 - c. If the malfunction is not resolved within 15 minutes, notify Contractor Traffic Control Management. The SWZS shall be taken out of service and repaired within 12 hours of the malfunction.

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- 2. **Contractor Traffic Management** – After receiving the initial notification of the malfunction, perform the following:
 - a. Notify the Traffic Control Supervisor.
 - b. Prepare crews to immediately implement the Emergency PCMS Implementation if the malfunction is not resolved within 15 minutes.
 - c. Notify the Engineer of the malfunction and failure protocol status.
 - d. Collaborate with SWZS Technician to provide replacement parts needed to make repairs to the SWZS within 12 hours of the system or a system component malfunction.
- 3. **Emergency PCMS Implementation** – If the SWZS Technician has not resolved the issue within 15 minutes, perform following failure protocol:
 - a. Install two PCMSs as described below until the SWZS is repaired, functioning properly, and back in service or until all lane closures have been reopened. The PCMSs may be from the SWZS if needed.
 - i. PCMS #1: Maintain positioned $0.5 \pm$ mile in advance of traffic queue, relocated as necessary, except when no traffic queue is present. PCMS #1 may be truck-mounted.

<u>Phase 1</u>	<u>Phase 2</u>
SLOW OR	NEXT
STOPPED	#
TRAFFIC	MILES

Where “#” is the approximate queue length
rounded up to the nearest mile
 - ii. PCMS #2: Place $1.5 \pm$ mile in advance of first lane closure taper. Program message as appropriate. Phase 1 is to describe the current lane closure in place. Phase 2 is to describe the distance ahead to the beginning of the first lane closure rounded up to the nearest 0.5 mile interval. For example, if a double right lane closure is 1.5 mile ahead, the PCMS message would be: “2 RIGHT LANES CLOSED” / “1.5 MILE AHEAD”.