

ITS CEI TRAINING: Microwave Vehicle Detection System (MVDS)

Module 3 – Installation

Welcome

Welcome to the Intelligent Transportation Systems Construction Engineering and Inspection Training for Microwave Vehicle Detection Systems, Module 3, Installation.

MVDS Pole Installation

It is important for the Construction Engineering and Inspection, or CEI, personnel to know the proper way to install the MVDS pole while ensuring Maintenance of Traffic, or MOT, standards and guidelines. These are two MOT scenarios:

1. A shoulder closure on an Interstate highway, following MOT standards.
2. A travel lane closure on an interstate highway exit ramp, following MOT standards.

The MVDS Pole is delivered to the installation site using a flatbed truck or trailer.

A drilling rig is used to position an auger to drill a hole in the ground to install the MVDS pole.

The auger drills a hole for the MVDS pole.

A crane is then used to hoist and place the MVDS pole in the drilled hole for MVDS installation.

The MVDS pole is held in place in the recently-drilled hole, while the conduit is being installed both underground and above ground.

Before pouring the concrete to set the pole in place, MVDS above-ground conduits for the cabinet and ground conductors are attached to the MVDS pole.

Concrete is poured around the MVDS pole into the hole after mounting the above-ground conduit a few feet above ground level. The disturbed ground around the MVDS pole is leveled, grass is seeded, and all other measures are taken to bring the area around the base to its original or better condition.

Based on roadway embankment issues, MVDS poles installed on the roadway embankment may lead to concrete run-off issues. In such situations, a steel casing may be used to prevent concrete run-off. In places where the concrete run-off disturbed the ground around the MVDS pole, the surface is leveled, grass is seeded, and all other measures are taken to bring the area to its original or better condition.

MVDS poles must be of the correct height and must be placed at the right location. MVDS pole height and location are designed based on several conditions as previously explained. If the MVDS pole provided is shorter than that required for the MVDS mounting height, then the MVDS pole must be replaced in most cases.

An MVDS pole that was previously installed with concrete fill is being held in place with a crane while being cut for removal and replacement. The crane lifts the MVDS pole after being cut from its position.

There is a need for safety when delivering MVDS poles to the site location.

If any accidents or safety violations occur while transporting MVDS or other ITS poles from a staging or pick-up area to the pole site, then the project CEI team needs to be involved to alleviate the problem and otherwise resolve the issue with concerned authorities.

For example, a CCTV pole may break a signal strain pole while being delivered from a project staging area to a site location. The incident took place within ITS project limits. Although it is a driving incident, the project CEI team becomes involved and co-ordinates with all related authorities. Therefore, safety during the ITS project structure delivery should also be monitored and inspected by the project CEI team.

MVDS Pole Cabinet Installation

The MVDS cabinet may be co-located with other ITS or traffic device cabinets. The cabinet installation for a stand-alone pole-mounted MVDS unit is displayed here.

The MVDS cabinet is delivered to the site, and specifications are verified before installation. The cabinet is fully prepped for installation, including applying the stainless-steel straps before the cabinet is attached to the MVDS pole.

The cabinet is placed into position on the pole using a crane. The crane cables holding up the cabinet are just visible. The cabinet position is oriented to ensure that technicians working on the MVDS unit in the future can see the traffic on travel lanes monitored by the MDVS unit. The cabinet is secured onto the pole using the stainless-steel straps.

Installing MVDS

On the freeways, most MVDS units are installed on concrete poles and are many times co-located with Closed Circuit Television cameras on the same pole. Depending on the District, geometry, roadway constraints, and the number of lanes covered, the mounting height and offset may vary. This is typically designed by the Engineer of Record, or EOR, to provide better microwave vehicle detection. In addition, the material of the pole may either be concrete or steel.

MVDS units are mounted at heights that can be accessed by the bucket truck. On city streets, the units are mounted on traffic signal mast arms.

It is important to check to see if the MVDS pole offset meets the designed offset and if the MVDS pole is meeting the designed mounting height. The proper installation technique is to attach the mounting bracket to the pole at the designed mounting height. Next, attach the sensor to the mounting bracket. The next step is to tilt and align the sensor to the roadway travel lanes.

Next, install the MVDS pole air terminal, and connect it to the grounding system as detailed in the design plans.

Then, install and run the MVDS cable inside the pole, via an egress hole protected by a weather head apparatus, up to the MVDS mounting bracket location. Using conduit, connect the MVDS cable from the MVDS pole into the cabinet.

Next, the MVDS unit is installed onto the MVDS pole by a technician using a bucket truck. Note the MVDS air terminal located at the top of the pole.

At this stage, the technician needs to verify the cables to the multiconductor cable are connected properly. It is also important to verify the power cable is connected to the power surge protector, Ethernet cable, or other data cables connected to Ethernet surge protector or other serial Surge Protective Device, or SPD. Also check to see if the RS-232 cable is terminated into the RS-232 SPD and then into a connector for MVDS laptop access.

Verify that all the “exposed” cables entering the cabinet are protected by a surge protector. The MVDS usually receives 24 VDC. Please make sure that proper surge protection and AC to DC power conversion is provided. Please make sure the Ethernet cables from the MVDS device server are connected to the Ethernet switch in the cabinet.

MVDS Cabinet Device Installation

Displayed here is an MVDS cabinet and MVDS power surge protection provided. The MVDS device server Ethernet cable is then connected to the Ethernet switch in the cabinet. The MVDS device server converts the serial signal to the Ethernet format.

Displayed here is a Managed Field Ethernet Switch, or MFES, in the cabinet, and a surge protector for the MVDS power cable.

MVDS Installation Site (caution)

The MVDS should not be installed behind a sound wall, vegetation, or near a signing pole. Displayed here is an MVDS installed behind a sound wall.

The guard rails opposite the MVDS will sometimes cause reflection of MVDS radio waves and may require the MVDS device to be installed at a non-oblique, limited skew angle to the guard rail or other metal reflecting surface.

MVDS Co-located with Other Devices

These are a few examples of MVDS units co-located with other devices on the same structure or pole. This picture shows the MVDS co-located with wireless point-to-point radios. Multiple MVDS units and a CCTV camera are installed and co-located on the same pole.

Here, an MVDS unit is located on a DMS structure. A few feet of extended arm are provided for the MVDS installation. It is recommended not to co-locate MVDS devices onto signs or DMS structures. The overhead steel structure of a DMS or sign structure may interfere with the MVDS operational accuracy.

Here, an MVDS is co-located with a CCTV on a CCTV pole. The CCTV is installed with a Camera Lowering Device, or CLD. The MVDS is installed on the side of the CCTV pole so that the MVDS does not obstruct or hit the camera while the CCTV camera is lowered using the CLD.

An MVDS can also be co-located with a travel time system blue tooth device..

End of Lesson

This concludes the Intelligent Transportation Systems Construction Engineering and Inspection Training, for Microwave Vehicle Detection Systems, Module 3, Installation. Please continue to the next lesson, Module 4, Testing and Acceptance.

Knowledge Check

1. The best method of installing MVDS units involves:
 - a. mounting the MVDS unit on solid fixed structures such as sound walls.
 - b. mounting the MVDS unit directly on highways signs affixed to I-beam supports.
 - c. **mounting the MVDS unit on light/camera poles, at the proper height and offset measures.**
 - d. mounting the MVDS unit directly on bridge sides and solid abutment structures.

2. Determine whether the following statement is TRUE or FALSE.
“Instead of metal conduit, above-ground installations of MVDS wiring can use plastic (PVC) piping.”
 - a. True
 - b. **False**

3. When a mistake is made regarding the MVDS pole height and it is found to be too short, in most cases this will involve:
 - a. leaving the old pole in place and erecting a new pole with the proper height next to it and joining them together with stainless steel bands.
 - b. leaving the old pole in place and welding an additional length of pole material to the top to add the needed height.
 - c. removing the old pole by cutting it near the base so that it free-falls away from the shoulder and lanes of traffic.
 - d. **removing the old pole by cutting it near the base while a crane is used to hold the pole in place and to remove it.**

4. Determine whether the following statement is TRUE or FALSE.
“The CEI reports safety violations only if damage to the infrastructure occurs.”
 - a. True
 - b. **False**

5. Determine whether the following statement is TRUE or FALSE.
“MVDS equipment may be co-located within other ITS or traffic device cabinets that are in good operating condition.”
- a. True
 - b. **False**
6. Determine the proper order for the six MVDS installation steps below. Fill in the blanks with the letters corresponding to the proper order.
- a. Measure the Offset and Mounting Height **(1)**
 - b. Install the MVDS cable from MVDS to Cabinet **(6)**
 - c. Install the Air-terminal **(5)**
 - d. Attach the Mount Bracket to the Pole **(2)**
 - e. Attach the Sensor to the Mount Bracket **(3)**
 - f. Align the Sensor to the Roadway **(4)**
7. Determine which installation option below should never be chosen.
- a. Multiple MVDS units co-located on the same pole
 - b. MVDS units co-located with wireless point-to-point radios on the same pole
 - c. MVDS units co-located with CCTV units on the same pole
 - d. **MVDS units located on poles behind sound walls**