| **Task 1: Apply 49 CFR Part 234, Subpart D, Maintenance, Inspection, and Testing** | | |
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| **Performance**  **Tasks** | **Conditions**  **Tools, Equipment, Documents**, **Practice** | **Standards**  **Time, Completeness, or Accuracy** |
| **Task 1-1: Ground tests (234.249)** Test for and detect circuit grounds. | Given a VOM meter, and the applicable circuit plan, the employee must be able to demonstrate the ability to: | Determine which circuits affect the proper function of the warning system.  Detect any circuit ground or combination of grounds that permit a current flow of 75 percent or more of the release value of any relay or electromagnet device in the circuit.  Troubleshoot, locate, and eliminate the ground or grounds.  Alternatively, if the ground(s) cannot be eliminated or reduced to less than 75 percent of the release value of any relay or electromagnet device in the circuit, take appropriate action(s) to warn highway traffic and railroad employees.  Reference: 49 CFR §§ 234.213 and 234.103. |
| **Task 1-2: Standby power (234.251)** Test standby power system for proper function and capacity. | Given a highway-rail grade crossing warning system circuit plan, an accurate timing device, and a VOM , hydrometer, or a peak hold meter the employee must be able to demonstrate the ability to: | Determine if the standby power system provides sufficient capacity to operate the warning system for the time that is specified on the location circuit plans.  Reference: 49 CFR § 234.215. |
| **Task 1-3: Flashing light units and lamp voltage (234.253)**  Test and inspect flashing light units and lamp voltage. | Given a VOM, an accurate timing device, and appropriate hand tools, the employee must be able to demonstrate the ability to:  This standard must be successfully completed on at least three warning systems. If three systems are not available, the task must be completed three times on the same warning system on three different inspections. | Determine if each flashing light unit is positioned and aligned properly and visible to highway users approaching the crossing.  Determine that each flashing light unit is sealed properly to prevent dust and moisture from entering the unit.  Determine that all light units flash alternately at a rate between 35 and 65 flashes per minute.  Determine that the voltage to each lamp is maintained at not less than 85 percent of the rated voltage for each incandescent lamp or LED.  Clean lenses as needed.  Reference: 49 CFR §§ 234.217 and 234.221. |
| **Task 1-4: Gate arm and gate mechanism (234.255)**  Test each gate arm and gate mechanism. | Given an accurate watch or other timing device and necessary hand tools, the employee must be able to demonstrate the ability to:  This standard must be successfully completed on at least three warning systems. If three systems are not available, the task must be completed three times on the same warning system on three different inspections. | Determine that each gate arm extends across each lane of approaching highway traffic.  Ensure that the gate arm is maintained in a condition sufficient to be clearly seen by an approaching motorist or pedestrian.  Determine that the gate arm starts downward movement after a delay of at least 3 seconds of the activation of the warning system.  Ensure that the gate arm is in its full horizontal position no less than 5 seconds before the arrival of a normal train movement.  Determine the proper function of each gate mechanism’s hold clear device.  Reference: 49 CFR § 234.223. |
| **Task 1-5: Warning system operation (234.257)**  Operationally test the highway-rail grade crossing system. | Given an accurate watch or other timing device and a .06 ohm shunt, the employee must be able to demonstrate the ability to: | Confirm that each direct current (DC), alternating current (AC), and electronic track circuit within the system detects the presents of a .06 ohm shunt across the rails.  Determine if sand, rust, dirt, grease, or other foreign matter is preventing effective train detection and take appropriate action to ensure the safety of motorist and pedestrians.  Reference: 49 CFR §§ 234.105, 234.227, and 234.229. |
| **Task 1-6: Warning time (234.259)** Operationally confirm the warning time of the highway-rail grade crossing system. | Given a watch or other accurate timing device, the employee must be able to demonstrate the ability to: | Determine that the warning system activates no less than 20 seconds before the crossing is occupied by rail traffic.  This can be accomplished by observation, calculation, or shunt simulation.  Reference: 49 CFR § 234.225. |
| **Task 1-7: Highway traffic signal pre-emption (234.261)**  Operationally confirm the proper operation of any highway traffic signal pre-emption interconnections. | Given the appropriate circuit plans, the employee must be able to demonstrate the ability to: | Determine that the appropriate output is being provided to the highway traffic signal systems. |
| **Task 1-8: Relays (234.263)**  Test relays for proper operation. | Given the appropriate relay test device and the appropriate manufacturer’s design specification and condemning limits, the employee must be able to demonstrate the ability to:  **Note:** This test is required:  Every 4 years for DC relays,  Every 2 years for AC relays, and  Every year for AC centrifugal relays.  Maintaining proficiency at this task may be problematic. Hence, retraining may be required before repeating this task. | Test at least 10 DC relays to ensure that they are operating within the manufacturer’s design parameters (if applicable).  Test at least 10 AC vane-type relays to ensure that they are operating within the manufacturer’s design parameters (if applicable).  Test at least 10 AC centrifugal relays to ensure that they are operating within the manufacturer’s design parameters (if applicable).  If a relay fails to function in accordance with the manufacturer’s design parameters, remove the device from service.  The employee should observe the relay for improperly installed or burnt ribbons and contacts, moisture, or foreign materials within the relay.  The employee must complete this task with 100-percent accuracy.  Reference: 49 CFR § 234.247. |
| **Task 1-9: Timing relays and timing devices (234.265)**  Test timing relays and timing devices. | Given a watch or other accurate timing device, the employee must be able to demonstrate the ability to:  This standard must be successfully completed on at least three warning systems. If three systems are not available, the task must be completed three times on the same warning system on three different inspections. | Determine that timing relays and timing devices are maintained such that the timed intervals are no less than 90 percent and not more than 110 percent of the value as indicated on the circuit plans.  If the timing relay or timing device fails to function as intended, make the necessary adjustment, repair, replacement, or other action to ensure the safety of motorists and pedestrians.  Reference: 49 CFR § 234.247. |
| **Task 1-10: Insulation resistance tests, wires in trunking and cables (234.267)**  Test insulation resistance of wires in trunking and cables. | Given a megohmmeter or other high- voltage resistance-checking device, the employee must be able to demonstrate the ability to:  **Note:** This test is required every 10 years. Maintaining proficiency at this task may be problematic. Hence, retraining may be required before repeating this task. | Determine if wires, cables, and insulation are dry.  Determine the insulation resistance value of at least 10 conductors, between each other and between each conductor and the ground.  Take action to repair or replace any wire or cable with resistance between any wires or between any wires and the ground is less than 500,000 ohms.  Immediately remove from service any wire or cable with insulation resistance between wires or between any wire and the ground is less than 200,000 ohms.  If the trunking or cable fails to function as required above, make the necessary repair or replacement, or take action as required by 49 CFR § 234.247.  This task must be successfully completed on at least one trunking or one multiconductor cable. |
| **Task 1-11: Cut-out circuits (234.269)**  Operationally test each cut-out circuit. | Given a highway-rail grade crossing warning system, the appropriate circuit plan, and a switch obstruction gauge (if necessary) the employee must be able to:  This standard must be successfully completed on at least three warning systems. If three systems are not available, the task must be completed three times on the same warning system on three different inspections. | Determine that each cut-out circuit is functioning as intended. If the cut-out circuit is used to detect a reversed switch, it must only cut out the warning system when the switch point is within one-half inch of the full reverse position.  Reference: 49 CFR § 234.237. |
| **Task 1-12 Insulted rail joints, bond wires, and track connections (234.271)**  Ensure the physical integrity and functionality of insulated rail joints, bond connections, and track connections. | Given a highway-rail grade crossing warning system installation and the appropriate circuit plans, the employee must be able to:  This standard must be successfully completed on at least three warning systems. If three systems are not available, the task must be completed three times on the same warning system on three different inspections. | Inspect the highway-rail grade crossing warning to ensure that all fouling wires consist of two discrete conductors and that each conductor is of sufficient conductivity to ensure proper operation of the warning system when the train detection circuit is shunted.  Inspect the highway-rail grade crossing warning to ensure that each noninsulated rail joint in the train detection circuit is bonded and maintained in such condition as to ensure conductivity.  Inspect and/or test all insulated joints in the warning system to ensure that no current is flowing between rails separated by the insulated joint sufficient to interfere with the proper function of the warning system.  Reference: 49 CFR §§ 234.231, 234.233, and 234.235. |