**SECTION 669**

**AUTOMATED TRAFFIC RECORDERS**

Special Provisions

**669-1.01 DESCRIPTION.** This work shall consist of reconstruction, refurbishing, and installation of Automated Traffic Recorder (ATR) station.

ATR consists of inductive loop sensors connected to a traffic counter. In each traffic lane, two inductive loops are separated by a specific travel distance and buried beneath the pavement. Lead wires run in underground conduit from the sensors to a cabinet located at the side of the road. Inside the cabinet, the lead wires connect to the traffic counter. The traffic counter, installed by others, detects the presence and speed of passing vehicles from inductive loop signals. ATR stations are operated and maintained by personnel of the MSB Pre-Design and Engineering Division (PD&E); main office located at 350 E Dahlia Ave, Palmer, phone 907-861-7723.

The locations of traffic detection sensors and cabinets, shown on the Plans are approximate and the Engineer will establish the exact locations in the field after consultation with PD&E.

**669-1.02 REGULATIONS AND CODE.** Use materials and workmanship that conforms to the standards of the Underwriter's Laboratories, Inc. and the National Electrical Safety Code and local safety code requirements, where applicable.

Use electrical equipment that conforms to the standards of the National Electrical Manufacturer's Association, where applicable.

**669-2.01 MATERIALS.** Provide all new materials that meet the following requirements:

1. Wiring. Subsection 660‑3.05, Wiring. Use single wire conductors and cables that have clear, distinctive and permanent markings on the outer surface throughout the entire length giving the manufacturer's name or trademark, insulation type-letter designation, conductor size, voltage rating and the number of conductors if a cable. Home run label all wires and cables in each junction box and cabinet; for example, W1SLA (for wire) and GaSLA (for cable) as shown on the Plans.

2. Conduit. Subsection 660‑3.03, Conduit. Use galvanized rigid metal for conduits, except for PVC conduit forming the inductive loops. Provide grounding bushings with plastic‑sleeves to minimize the potential for insulation damage during wire pulls.

3. Junction Boxes. Subsection 660‑3.04, Junction Boxes. Label the covers of all junction boxes used for loops or sensor wires 'TRAFFIC'. Label the covers of all junction boxes used to provide electrical service to ATR installations 'ELECTRIC’. Keep junction boxes for 120V/240V electrical service completely separate from junction boxes containing loop or sensor wiring

4. Terminal Blocks. Mount Terminal Blocks as shown in the plans. Use terminal blocks with nickel, silver or cadmium plated brass binder-head screw terminals. Use barrier type terminal blocks rated 600 VAC at 20 Amps, sized for 12‑18 AWG wire with removable shorting bars in each position and with integral type marking strips.

5. Presence Loops. Use UL listed IMSA specification #51-5-1984 single conductor PVC nylon with tube jacket, type THHN, #14 AWG conductors for detector presence loops.

Use twisted pairs of 18 AWG stranded tinned copper wire for multiple pair loop lead‑in cable. Each twisted pair shall have its own 20AWG tinned copper drain wire. An aluminum foil shield shall surround each individual bundle of twisted pair and drain wire. Multiple pair loop lead‑in cable shall have an overall PVC or PE outer jacket.

1. Electrical Load Centers. Use NEMA Type 3R Electrical Load Centers and provide a 120/240V 100 amp single-phase, three-wire-circuit electrical service.
2. Style CBA1 Cabinets. Cabinets shall meet or exceed a UL 50, NEMA Type 3R rating. CBA1 cabinet shall be a Hoffman #131JF, 24X17X15 or equal. Construct the cabinet and hinged door from 5052-H32 or better unpainted sheet aluminum alloy with a minimum thickness of 1/8 inch and a smooth grain finish on the exterior. Corbin #2 Key Lock. One (1) adjustable shelf. Drip Shield. Interior has four (4) instruct channels for installing adjustable shelves. Grounding points included on body and door. Door latching mechanism is a single point PowerGlide padlocking handle system which secures the door in the middle. A door stay is included at the bottom of the door with three positions: 90, 120, and 180 degrees. Ensure that welds are neatly formed and free of cracks, blowholes and other irregularities. Ensure inside and outside edges of the cabinet are free of burrs. Design the cabinet with a sloped top to prevent the accumulation of water on its top surface.

**669‑3.01 CONSTRUCTION REQUIREMENTS.**

1. Wiring.

* 1. Referenced Requirements. Subsection 660‑3.05, Wiring.
	2. Termination. Terminate unused pairs at junction boxes within splices. Terminate unused pairs in terminal blocks at cabinets. Terminate and solder conductors, including unused spares to “spade” type terminal lugs at terminal blocks.
	3. Relief. Provide at least 2 feet of slack cable for wiring in each junction box and at least 6 feet of slack cable available in the equipment cabinet before the terminal block.
	4. Labeling. Label wiring in junction boxes and at terminal blocks.

2. Conduit.

1. Referenced Requirements. Subsection 660‑3.03, Conduit, or as indicated on the Plans.
2. Pull Cords. Leave nylon pull cords in all conduits larger than 1 inch and in spare conduits.
3. Bushings. Ensure that plastic or plastic‑sleeved bushings are in place before wire pulls are performed.

3. Junction Boxes.

1. Referenced Requirements. Subsection 660‑3.04, Junction Boxes, or as indicated on the Plans.
2. Voltage Limitation. Junction boxes used for ATR installations shall not contain wiring of 24 V.

4. Terminal Blocks.

1. Terminal Block Placement. Mount terminal blocks within cabinets so that terminals are easily accessible from the front of the cabinet.
2. Labeling. Clearly label terminal blocks and wire pairs on the block.
3. Termination. Terminate and solder conductors, including unused spares to "spade" type terminal lugs

5. Presence Loops.

1. Placement Design Adherence. The Plans are not schematics; installation of the presence loops shall closely conform to the location and layout of conduit runs shown in the Plans. The contractor shall notify the Project Engineer 14 days prior to saw cutting the pavement for approval of the site layout.
2. Presence Loop Dimensions. Unless otherwise noted on the plans, form presence loops using four turns of wire, making 6 feet square with a tolerance of ± 1 inch.
3. Presence Loop Dimensions for On-Ramps and Off-Ramps. Form presence loops in On‑Ramps and Off‑Ramps using four turns of wire, making a rectangular 8 feet wide and 6 inch long with a tolerance of ± 1 inch.
4. Lead‑in Conduit. Place lead‑in conduits straight and perpendicular to the centerline of the road from the edge of pavement to the presence loops.
5. Presence Loop Alignment. Center presence detector loops in the traffic lane with a tolerance of ± 1 inch.
6. Presence Loops in Asphalt.
7. Loop Placement. Locate presence loops 16 feet from leading edge to leading edge unless otherwise noted on the Plans with a tolerance of ± 1 inch. Align presence loops in adjacent lanes within a tolerance of ± 1 inch.
8. Compaction tests. Compaction test requirements are at the discretion of the Engineer.

6. Cabinets.

* 1. Cabinet Placement and Orientation. Install cabinets out of the Clear Zone with the doors facing away from the road. Unless the orientation is otherwise noted on the plans.
	2. Conduit Entry. Install conduit entries for above‑ground enclosure through the bottom of the enclosure. No conduit runs shall be cut through the sides or top of above‑ground enclosure.

7. Utilities.

1. Asphalt Pavement Roughness. No transverse seams, joints or roughness within 50 feet of any inductive loops placed in asphalt pavement section is allowed. Test the finished surface of the asphalt with a straightedge 10 feet long. Ensure that the surface does not vary more than ¼ inch from the lower edge of the straightedge within 50 feet of sensors at the ATR installations. At the Engineer’s discretion, run an inertial profiler or a profilograph equipped with a chart recorder down each wheelpath of each lane for a distance of 50 feet before and after each ATR installation. HDS will supply the profilograph for the Contractor’s personnel to operate. Ensure that the asphalt surface as recorded by the chart recorder does not vary more than ¼ inch in 10 feet.
2. Field Inspection. Notify the Engineer in writing a minimum of 3 working days in advance (excluding Saturday, Sunday and State or Federal Holidays) before installing conduit/wiring, inductive loops, bending plate equipment, piezoelectric cable, axle sensors, and cabinets. The Engineer will be present to approve the installation before backfill placement and paving. At the Contractor's expense, correct and allow the Engineer to re-inspect unacceptable installations for completeness prior to backfill placement and paving. The

 Contractor shall be required to excavate, remove, and replace all installations backfilled or paved without prior approval by the Engineer at the Contractor’s expense.

**669‑3.02 DELIVERABLES.** Submit deliverables to PD&E before final approval of the work or as otherwise called for herein.

1. Materials Submittal.

* + 1. Format and Contents. Provide a Materials Submittal of proposed equipment and materials for the ATR installations. The portfolio shall contain information of sufficient detail to determine the suitability of the equipment and materials proposed.
		2. Table of Contents. Each portfolio shall include a table of contents listing each item's intended uses, item description, product name, manufacturer, model or part number and reference to associated information within the portfolio.
		3. Reference Drawings. The Materials Submittal shall include a detailed shop drawing of each equipment cabinet showing the location of mounted components.
		4. Delivery Interval. Deliver Materials Submittal through the Engineer for review and approval of PD&E within thirty days following award of the Contract.
		5. Liability. The MSB will not be liable for any materials purchased, labor performed, equipment used or delay to the work before equipment and materials have been reviewed and approved.

2. As‑Built Plans.

1. Prepare a complete sets of as‑built plans, which will be current with the construction. These as‑built plans shall detail construction changes made to the ATR design and include the following information on the appropriate sheets:
2. Location and depth of inductive loops, and conduit runs.
3. Locations of equipment cabinets and junction boxes.
4. Station and offset of junction boxes
5. Present electronic as‑built plans to the Engineer in .pdf file format.
6. Redlines of full size construction plans will be acceptable as-builts.

3. Photographs.

1. Provide digital photographs documenting sensor installations.
2. The photographs shall show the inductive loops and conduit in place before covering with gravel and pavement for asphalt pavement sites. The photographs shall include:
3. Two or more overall views of each ATR installation showing placement of the inductive loops.
4. One or more views of each loop showing the loop and the conduit to the nearest junction box.

4. Test Results. Written or printed copies of the final results of tests, signed by the Contractor, shall be provided to the Engineer before acceptance of the Automated Traffic Recorder Installation.

5. Manuals. Provide through the Engineer to PD&E installation, repair, and operation manuals for equipment supplied by the Contractor.

**669‑4.01 METHOD OF MEASUREMENT.** Section 109.

Automated Traffic Recorder sites will be measured Lump Sum.

**669‑5.01 BASIS OF PAYMENT.**

The Contract unit price for Automated Traffic Recorder installations shall be full compensation for furnishing all equipment, labor and subsidiary materials required for completion of a site for which there is no specific item in the Plans is subsidiary to the 669 item. This includes but is not limited to:

* backfill materials,
* clearing and grubbing for utilities,
* seeding,
* topsoil,
* removal of structures and obstructions,
* structural excavation for conduits and minor structures,
* work in support of utilities as specified in Subsection 105-1.06,
* as-built plans,
* providing the manufacturer’s representative,
* acceptance testing,
* j-boxes,
* CBA cabinets,
* portable heater and cooling fan,
* tilt poles,
* rigid conduit,
* load centers,
* demolition of CBA cabinet foundations and associated utility lines/conduits/appurtenances,
* loops,
* piezoelectric sensors,
* radar sensors,
* TDP's,
* surface temperature probes,
* ambient air sensors,
* AVCs
* ATR equipment or work as shown on the plans or specifications.

Wet cutting with a concrete saw for piezoelectric sensor installations are subsidiary to 669 items.

Payment will be made under:

Pay Item No. Pay Item Pay Unit

669 (1) Automated Traffic Recorder Lump Sum

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