

## DIVISION 700 TRAFFIC CONTROL FACILITIES

## SECTION 700

## GENERAL

**700.01 GENERAL.** It is the Resident Engineer's responsibility to see that items constructed under this Division of the Specifications are closely coordinated with the following AHTD Divisions in the Central Offices:

- Roadway Design Division
- Bridge Design Division
- Materials Division
- Maintenance Division
- Construction Division

The Resident Engineer should review the Specifications and the Manual of Field Sampling and Testing on these items and assure that the required approved documents are on file prior to their being installed and paid for. THE APPROVAL OF THE ACTUAL MATERIALS INCORPORATED INTO THE PROJECT SHOULD BE HANDLED IN ACCORDANCE WITH THE MANUAL OF FIELD SAMPLING AND TESTING PROCEDURES.

**(a) Roadway Design Division.** There are several items in Division 700 of the Specifications that require approval of AHTD Roadway Design Division. The Resident Engineer should review the Specifications on Division 700 items and assure that the Roadway Design Division's approval of Design characteristics is on file prior to their installation. Generally, the items that must be submitted for review include those items from Sections 701 to 707 and 733 of the Standard Specifications and any signalization items covered by a Special Provision in the Contract.

**(b) Bridge Design Division.** Bridge Design Division reviews and approves shop drawings for structural members such as overhead and cantilever sign structures. Often the submittals for these are sent directly from the supplier to the Bridge Design Engineer.

**(c) Materials Division.** It is the responsibility of the Materials Division to assist the Resident Engineer on seeing that ALL materials are tested and approved prior to the Resident Engineer's signing the Materials Certificate.

**(d) Maintenance Division.** The Maintenance Division performs studies relating to traffic control as requested and performs inspections of installed traffic signal equipment to ensure that they are in proper working order prior to their acceptance.

**(e) Construction Division.** The Staff Construction Engineer acts as liaison for all contact with other divisions regarding Division 700 items and assists in timely and appropriate responses to requests for reviews of data, field inspection of equipment, etc. In addition, the Construction Office facilitates answers to any construction related questions.

**700.02 COORDINATION AND COMMUNICATION.** The Contractor is to be advised, at the preconstruction conference, to submit all Certifications, brochures, designs, etc., required by the Specifications to the Resident Engineer. The Resident Engineer shall send these to the Construction Office for forwarding to other divisions for review and approval. (Normally these are forwarded to the Roadway Design Division.)

**NOTE:** The Resident Engineer does not submit traffic signal pole design and certifications. These are the responsibility of the Resident Engineer to review.

After their review, the Roadway Design Division will send the submittals, along with their comments and/or approval, to the Construction Office. They will be then be forwarded to the Materials or other Divisions for review if deemed appropriate. Following review by all appropriate Divisions, Construction will return submittals to the Resident Engineer with appropriate comments from the Construction Office regarding their acceptability.

The Resident Engineer will notify the Contractor by letter of the results of the review. If the items are determined to be acceptable, the Resident Engineer will clearly state in his letter that these details have been reviewed and approved as noted FOR DESIGN CHARACTERISTICS ONLY, and the items shall not be installed until all required certified test reports have been submitted and approved per the Manual of Field Sampling and Testing.

## **SECTION 701 ACTUATED CONTROLLER**

**701.01 GENERAL.** This item consists of furnishing and installing actuated controllers in accordance with the plans and specifications. A large portion of this specification describes the requirements for the components to be used. It should be used as a reference. Also, the Contractor is required to submit the following items to the Resident Engineer:

- Three (3) copies (minimum) of the cabinet wiring diagram (transmitted prior to acceptance of project),
- The controller manual (transmitted prior to acceptance of project),
- Certification of compliance (from Contractor's supplier) with NEMA and AHTD Specifications (transmitted prior to acceptance of project),
- Brochures (Manufacturer's Specifications) for the actuated controller (as required by the plans). (The Resident Engineer, after review, sends all copies received to the Construction Office for Central Office review and approval prior to installation. Refer to *Section 700* of this Manual for

the details regarding review, approval, and distribution procedures involved.)

- Copies of any and all written warranties for equipment covered (transmitted prior to acceptance of project),
- A letter from the Contractor explaining any and all unwritten warranties for equipment covered (transmitted prior to acceptance of project).

One copy of all documents are retained in the Resident Engineer's files. One copy of the wiring diagram, along with the controller manual, is to be placed in the controller cabinet. The Resident Engineer is to also furnish one copy of the approved wiring diagram to the City or County (as applicable) and one copy to Roadway Design Division prior to the final inspection.

**NOTE:** Refer to *Section 717* of this Manual and the Specifications concerning the required "Traffic Signal Equipment Performance Test"

**701.02 METHOD OF MEASUREMENT.** "Actuated Controllers (\_\_\_Phases)" is measured by the unit ("Each").

**701.03 DOCUMENTATION - CURRENT ESTIMATES.** All traffic signal equipment should be included for full payment on the first current estimate following the date of installation. For payment purposes, installation does NOT require that the item be placed in operation. Partial payment may be made for partial installation (foundation pad, cabinet, etc.) Documentation for payment of this item on Current Estimates shall be a properly completed "Report of Work Performed" (RWP) marked "Current Estimate".

**701.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be a properly completed RWP marked "Final Document". The "Basis of Estimate" for this item should be "Actual Field Count". This count should be contained on this RWP.

## SECTION 702 PRETIMED CONTROLLER

Refer to *Section 701* of this Manual. Information contained in it is also applicable to this item.

## SECTION 703

### FLASHING BEACON CONTROLLER

Refer to *Section 701* of this Manual. Information contained in it is also applicable to this item.

## SECTION 704

### LOOP DETECTOR

**704.01 GENERAL.** This Specification consists of furnishing and installing vehicle detectors and wiring in accordance with the plans and Specifications.

Prior to installation, the Contractor is required to submit applicable brochures, certifications, and warranties as required by the plans and Specifications on all items under this Specification to the Resident Engineer. Refer to *Section 700* of this Manual for the details regarding review, approval, and distribution procedures involved. Also, refer to the *Manual of Field Sampling and Testing Procedures* " for procedures required for materials approval of this item.

**NOTE:** "Preformed Loops" must be on the QPL.

**704.02 METHOD OF MEASUREMENT.** "Vehicle Detector", "Vehicle Detector With Count", "Preformed Detector Loop (\_\_\_x\_\_\_)", "Vehicle Detector – Rack Mount" and "Vehicle Detector – Rack Mount, with Count" are measured by the unit ("Each"). "Loop Wiring" and "Feeder Wire" are measured by the Linear Foot (Meter).

**704.03 DOCUMENTATION - CURRENT ESTIMATES.** All traffic signal equipment should be included for full payment on the first current estimate following the date of installation. For payment purposes, installation does NOT require that the item be placed in operation.

Documentation for payment of this item on Current Estimates shall be a properly completed "Report of Work Performed" (RWP) marked "Current Estimate."

**704.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for these items shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Count" for items measured by the unit (each) and "Actual Field Measurement" for "Loop Wiring" and "Feeder Wire". The measurement shall be shown on the applicable RWP(s) or on attached sheets.

**NOTE:** A sketch of the layout and measurement for "Loop Wiring" and "Feeder Wire" should be attached or placed on the RWP. See Figures 704-1 and 2.



ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED

ITEM Vehicle Detector Loop Wiring QUICK CODE 0731

JOB NO. 00001 FAP NO. State-Job JOB NAME Hwy 12 West

CURRENT ESTIMATE  
 FINAL DOCUMENT DATE 10-9-94 REPORT NO. L.F. Final

PAY QUANTITY	UNIT	DESCRIPTION, LOCATION
710	L.F.	Rock Street
1682	L.F.	Hwy 12
2392	L.F.	TOTAL TODAY
0		PREVIOUS TOTAL
2392	L.F.	TOTAL TO DATE

BASIS OF ESTIMATE: Field Measured (See Attach Drawing)

REPORTED BY: Jim Cook CHECKED BY: Sam Wilson

FIGURE 704-2

**SECTION 713 SECTION 705  
LOOP WIRING IN DUCT**

Refer to *Section 704* of this Manual. The information in it concerning "Loop Wiring" is also applicable to this item.

**NOTE:** The sealant used shall be listed on the QPL.

**SECTION 706  
TRAFFIC SIGNAL HEAD**

**706.01 GENERAL.** This item consists of furnishing and installing Traffic Signal Heads in accordance with the plans and Specifications. The Contractor is required to submit applicable brochures, certifications, and warranties as required by the plans and Specifications, to the Resident Engineer prior to installation. Refer to *Section 700* of this Manual for the details regarding review, approval, and distribution procedures involved.

**706.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 701* of this Manual. The information in it concerning Measurement and documentation is also applicable to this item.

**SECTION 707  
PEDESTRIAN SIGNAL HEAD**

Refer to *Section 706* of this Manual. The information in it is also applicable to this item.

**SECTION 708  
TRAFFIC SIGNAL CABLE**

Refer to *Section 704* of this Manual. The information in it concerning "Loop Wiring" is also applicable to this item. (It is not necessary for the Contractor to submit brochures on this item.)

**SECTION 709  
GALVANIZED STEEL CONDUIT**

Refer to *Section 704* of this Manual. The information in it concerning "Loop Wiring" is also applicable to this item. (It is not necessary for the Contractor to submit brochures on this item.)

**SECTION 710  
NONMETALLIC CONDUIT**

Refer to *Section 704* of this Manual. The information in it concerning "Loop Wiring" is also applicable to this item. (It is not necessary for the Contractor to submit brochures on this item.)

**SECTION 711  
CONCRETE PULL BOX**

**711.01 GENERAL.** This item consists of furnishing and installing precast concrete pull boxes in accordance with the plans and Specifications. Refer to the *Manual of Field Sampling and Testing Procedures* for procedures required for materials approval of this item.

**711.02 METHOD OF MEASUREMENT.** "Concrete Pull Box" is measured by the unit ("Each").

**711.03 DOCUMENTATION - CURRENT ESTIMATES.** All traffic signal equipment should be included for full payment on the first current estimate following the date of installation. For payment purposes, installation does NOT require that the item be placed in operation.

Documentation for payment of this item on Current Estimates shall be a properly completed "Report of Work Performed" (RWP) marked "Current Estimate".

**711.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be a properly completed RWP marked "Final Document". The "Basis of Estimate" for this item should be "Actual Field Count". The count shall be shown on the RWP.

**SECTION 712**  
**SPAN WIRE SUPPORT POLE WITH FOUNDATION**

**712.01 GENERAL.** This item consists of furnishing and erecting steel span wire support poles with foundations in accordance with the plans and Specifications. The Resident Engineer should become familiar with this specification and use it as a reference when questions arise.

Prior to fabrication, the Contractor should submit details for the "Span Wire Support Pole" to the Resident Engineer. Included with these details, the Specifications (Subsection 712.03) require the Contractor to submit a certification regarding the Design and materials used in fabrication of this item.

**NOTE:** The Professional Engineer certifying the pole's design and materials must be a Registered Professional Engineer in one of the United States. This Engineer does not have to be registered in Arkansas.

**NOTE:** THE RESIDENT ENGINEER SHOULD NOT SUBMIT POLE DESIGN/CERTIFICATION CONTRACTOR SUBMISSIONS TO THE CONSTRUCTION OFFICE FOR REVIEW. IT IS THE RESIDENT ENGINEER'S RESPONSIBILITY TO REVIEW THIS.

Prior to installation, the Contractor shall submit certified test reports on all materials other than concrete and reinforcing steel incorporated into this item.

Class S Concrete shall be used. (Refer to Section 802 of the Specifications.) The Department performs Acceptance sampling and testing on this concrete.

Grade 40 Reinforcing Steel shall be used. (Refer to *Section 804* of the Specifications.)

Refer to the *Manual of Field Sampling and Testing Procedures* for procedures required for further information on materials approval of this item.

**712.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 711* of this Manual. Information contained in it is also applicable to this item. Partial payment may be made for partial completion (foundation, pole, etc.).

**SPAN WIRE ASSEMBLY**

**713.01 GENERAL.** This item consists of furnishing and installing span wire assemblies in accordance with the plans and Specifications.

Prior to installation, the Contractor should submit shop drawings to the Resident Engineer if required by the plans and Specifications. Refer to *Section 700* of this Manual for the details regarding review, approval, and distribution procedures involved. In addition, he must supply a Manufacturer's certification for the span wire. Also, refer to

the *Manual of Field Sampling and Testing Procedures* for procedures required for materials approval of this item.

**713.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 711* of this Manual. Information contained in it is also applicable to this item.

**SECTION 714  
TRAFFIC SIGNAL MAST ARM AND POLE WITH FOUNDATION**

Refer to *Section 712* of this Manual. Information contained in it is also applicable to this item.

**NOTE:** Class S concrete is specified. The Department performs Acceptance sampling and testing on this.

**SECTION 715  
TRAFFIC SIGNAL POLE WITH FOUNDATION**

Refer to *Section 712* of this Manual. Information contained in it is also applicable to this item.

**NOTE:** Class S concrete is specified. The Department performs Acceptance sampling and testing on this.

**SECTION 716  
TREATED WOOD POLE**

**716.01 GENERAL.** This item consists of furnishing and erecting Treated Wood Poles in accordance with the plans and Specifications.

**716.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 711* of this Manual. Information contained in it is also applicable to this item.

**SECTION 717  
TRAFFIC SIGNAL EQUIPMENT PERFORMANCE TEST**

**717.01 GENERAL.** The "Traffic Signal Performance Test" is required on all traffic signal equipment. It consists of two parts:

- (a) **Performance Test.** The traffic signal is to operate for thirty (30) days continuously without a major malfunction. If during the "Performance Test" the signal has a major malfunction, a new "Performance Test" is to begin after the Contractor makes appropriate repairs.
- (b) **Warranty Period.** This is in addition to any other warranties the Contractor provides. After the "Performance Test" has been successfully completed, the Contractor must maintain the Traffic Signal Equipment for six (6) months.

**NOTE:** A minimum of 14 days prior to initiating the Performance Test, the Resident Engineer should notify the Maintenance Division Staff in order for them to provide the Resident Engineer with appropriate time settings for the traffic controller operation.

The Resident Engineer is to note in the Construction Diary the dates of the beginning and ending of both the "Performance Test" and "Warranty Period". On SiteManager projects, these dates should also be entered in the Key Dates window. See the section entitled "*Key Dates for Traffic Signals*" in the *SM Users Guide for Resident Engineer Offices*. Any repairs needed are to be performed by the Contractor in a timely manner and documented in the Construction Diary.

If no pay items remain on the project, the Resident Engineer may declare it "Substantially Complete" at the beginning of the Performance Test. In this case, completion of a daily Diary during the Performance Test and Warranty Period is not required, except when there are notable occurrences. (See *Subsection 108.09* of this Manual.)

Once work on the intersection configuration has been accomplished sufficiently and the completed signal installation has been placed into full operation, the Resident Engineer shall begin the Performance Test and IMMEDIATELY notify the Maintenance Division directly so that appropriate testing/inspecting can be initiated during the Performance Test. If deficiencies are found during this field inspection, the deficiencies shall be corrected and, if deemed necessary, the 30 day Performance Test restarted. The items that Maintenance Division checks on traffic signal installations are found in the form of checklists in *Figures 717-1 and 717-2*. To avoid delays in acceptance, Resident Engineer personnel should become familiar with these and precheck the installation as much as possible prior to the Maintenance Division inspection.

Any Contractor performed testing required by the plans and/or specifications shall be satisfactorily completed prior to the start of the 30 day Performance Test. If no pay items remain on the project, the Resident Engineer, after consulting the District Engineer and the Staff Construction Engineer, shall schedule a Semi-Final Inspection after the end of the 30 day Performance Test. The Resident Engineer shall insure that the

Maintenance Division is provided notice of this scheduled inspection at least one week in advance.

Final acceptance will not be made until after the 6 month warranty period has elapsed. At that time, generally, the Final Inspection is made by the Resident Engineer and/or the District Engineer, and the appropriate Construction Inspection Report is submitted by the District Engineer. However, the Resident Engineer may consider the project substantially complete and cease time assessment when the signal is placed in operation, if all other pay items are also complete in accordance with *Subsection 105.09* of this Manual.

**717.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** This work is not measured directly. It is considered subsidiary to the other items of work. No documentation is necessary for this item other than the Diary notes mentioned above.

## AHTD TRAFFIC SIGNAL INSPECTION

## I. Controller Cabinet

## A. Cabinet --

1. proper door filter element (washable electro. W. metal frame);
2. thermostatically controller vent fan;
3. light with door switch;
4. manual push switch;
5. grouting around base and drain hole.

## B. Grounding

1. unbroken #8 solid from panel to ground rod;
2. safety ground to all devices (#8 green; 2002 spec)
3. wire from pole to rod on all corners;
4. fusion weld to ground rods.
5. ground resistance test less than 30 ohms in series with utility neutral.
6. ground current/noise less than one amp

## C. Phase capability -- (check number plugs on controller)

- 2 Ph.: "A" plug and 4 load sockets;  
 3/4 Ph.: "A" & "B" plugs and 6 load sockets;  
 5/8 Ph.: "A", "B" and "C" plugs and 12  
 load sockets.  
 TS 1 or TS 2 T2

## D. Duplex receptacles- GFI for tech; and NON GFI for devices (Radio, Master &amp; etc)

## E. Disconnect-External to controller-by City or Contractor.

## F. Lightning suppression on line, detectors, field terminals and interconnect.

## G. Documentation --

1. Controller manual, wiring diagram and plan sheet;
2. Timing chart (verify times in controller).

## II. Detectors

- A. All loops working (2 pulses or long hold on presence)
- B. Detector switches – momentary on door panel
- C. Type wire and sealant
- D. Depth of wire: standard loop = 2 ½"; preformed = 4 ½"

FIGURE 717-1

## AHTD TRAFFIC SIGNAL INSPECTION

- E. Meg test --
    - (1) list from contractor;
    - (2) Retest sample of loops; if failed, test all.  
BE SURE TO RESET amp. After testing loop.
  - F. Delay detectors where required, delay override working.
  - G. If radar, does it false call on vehicles leaving intersection
  - H. LED Opto. Isolators required on radar outputs and remote inputs (remote detectors, preempt and etc.
  - I. Splices of Feeder and Loop properly sealed in pull box. No splices are allowed in feeder. If feeder wire jacket is left unsealed and water is allowed to enter jacket, contractor will be required to replace feeder at no cost to the Department.
  - J. Feeder wires and Detector harnesses or detector rack positions marked for loop number or direction.
  - K. Detector Input to proper controller channell
  - L. Drain wires are grounded.
  - M. Video Zones assigned to correct channels and input to proper controller input
- III. Pre-empt
- A. City connection on fire pre-empt (City notified?)
  - B. Test for proper operation (is test switch in place?)
- IV. Hardware
- A. Bolt covers
  - B. Pole grouting and general finish
  - C. Signal head placement (allow for future L.T.S.?)
  - D. Signs for left turns and peds.

FIGURE 717-1 (Ctd.)

**AHTD TRAFFIC SIGNAL INSPECTION****E. Span Wire Assemblies**

1. Tether spans tight with extension where necessary;
2. Assemblies and guys to wood poles grounded;
3. Guy guards in place where sidewalks are present.

**V. Communication Systems****A. Multi-Conductor Hard-Wired Systems**

1. Terminal block;
2. Check for sync. pulse;
3. Do local controllers follow master to all timing plans;
4. Check for exact synchronization.

**B. Twisted pair (Shielded twisted pair)**

1. Terminal block
2. Do local controllers follow master to all timing plans;
3. Check for exact synchronization;
4. Shield ground properly.

**C. Radio Communications**

1. Reflection Test less than 10%
2. Signal strength better than -90dbm
3. Signal to Noise ratio > 24 db
4. Lightning suppressors on Coax
5. Lightning suppression between radio and controller/master
6. Antenna aligned with master antenna

**D. Fiber Optic Systems**

1. Fiber line loss tests (see chart)

**VI. Street Lights**

- A. Separate or proper disconnect
- B. Proper wire size
- C. 24 hour constant burn test

FIGURE 717-1 (Ctd.)

## AHTD TRAFFIC SIGNAL INSPECTION SHORT FORM

- I.  Controller Cabinet
  - A. filter element
  - B. vent fan;
  - C. light with door switch
  - D. manual push switch
  - E. grouting
  - F. receptacles
- II. Cabinet Grounding
  - A. #8 solid to ground rod
  - B. safety ground
  - C. pole ground
  - D. ground resistance
  - E. ground current/noise
- III. Phase Capability
  - A. "A-B-C" connectors
  - B. Load Sockets
  - C. TS1 or TS2 T2
- IV. Power
  - A. External Disconnects
  - B. Lightning suppression
- V. Documentation
  - A. Controller Manual
  - B. Plan and Timing sheets
  - C. Test (MEG) results by contractor
- VI. Detectors
  - A. All loops working
  - B. Detector switches
  - C. Wire type and sealant
  - D. Depth
  - E. Drain wires grounded
  - F. Detector Inputs
  - G. Detector controller programming
  - H. Verify Meg/Cont test
  - I. Delay detector setup
  - J. Video Zones assignment
- VII. Pre-empt
  - A. Connected to fire or RR
  - B. Tested/Programmed
- VIII. Hardware
  - A. Bolt covers
  - B. Pole grouting & finish
  - C. Sig head placement
  - D. Signs for LTs and Peds
  - E. Test Ped Operation
  - F. Span Wire Assemblies
    - 1. Tether
    - 2. guys grounded
    - 3. guy guards
    - 4. s/w guys
- IX. Comm Systems
  - A. Hard-Wired Systems
    - 1. Term blocks
    - 2. sync pulse
    - 3. local operation
    - 4. synchronization
  - B. Twisted pair
    - 1. Term blocks
    - 2. Proper Plan
    - 3. synchronization
    - 4. grounded shield
  - C. Radio Comm.
    - 1. Suppressors
    - 2. Ant. alignment
    - 3. Reflection test
    - 4. Signal strength
    - 5. S/N ratio
  - D. Fiber Optic
    - 1. line loss test
  - E. Street Lights
    - 1. disconnect
    - 2. wire size
    - 3. 24 hr burn
    - 4. off in daylight

**FIGURE 717-2  
SECTION 718**

**REFLECTORIZED PAINT PAVEMENT MARKING**

**718.01 GENERAL.** This item consists of furnishing and placing reflectorized paint pavement markings. This Section of the Specifications should be used as a reference when reflectorized paint pavement marking is called for on the plans. Among the items which the Resident Engineer should note:

- The Resident Engineer should verify and document that materials comply with the Specifications as per the *Manual of Field Sampling and Testing Procedures* prior to use. (The paint is a QPL item. The Contractor must furnish a certification that each lot of paint is "formulated the same as the material tested for QPL listing. The Contractor must also provide a manufacturer certification of compliance for each batch of glass beads.)
- It is the Resident Engineer's responsibility to locate no passing zones. It is the Contractor's responsibility to "spot" the pavement as necessary for striping.
- The Resident Engineer should check the rate of application of the paint to assure that the required thickness of paint is obtained.
- Line removal, when required, is to be complete and removal operations shall not unduly damage the pavement.
- Substitution of Permanent Marking Tape or Thermoplastic Pavement Marking is permitted in lieu of painted lines.

**718.02 METHOD OF MEASUREMENT.** The various reflectorized paint pavement markings (stripes or lines) will be measured by the Linear Foot (Meter) of marking actually placed.

Reflectorized paint pavement marking words, arrows, and railroad emblems will be measured by the unit ("each").

Pavement marking removal will be measured by the linear foot.

**718.03 DOCUMENTATION - CURRENT ESTIMATES.** Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity within specified station limits, approximate field measurement, reference to the appropriate "Final Document" (OSD), etc. Current Estimate documentation for all items covered under this Specification will be recorded on the "Report of Work Performed" and marked "Current Estimate".

**718.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for these items shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" should be "Actual Field Count" or "Actual Field Measurement", as appropriate. The measurement shall be shown on the applicable RWP(s) or on attached sheets. RWP's documenting striping measurements shall contain the station limits of this work. See *Figure 718-1*.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT  
CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED

ITEM ReflectORIZED Pavement Marking Yellow (4") QUICK CODE 0000  
 JOB NO. 12345 FAP NO. State Job JOB NAME  Hwy 1 - North  
 { } CURRENT ESTIMATE DATE 11-14-93 REPORT NO. 2  
 { } FINAL DOCUMENT

PAY QUANTITY	UNIT	DESCRIPTION, LOCATION
<u>6750</u>	<u>L.F.</u>	<u>See below</u>
<u>6750</u>	<u>L.F.</u>	TOTAL TODAY
<u>4000</u>	<u>L.F.</u>	PREVIOUS TOTAL
<u>10750</u>	<u>L.F.</u>	TOTAL TO DATE

*Note: Example for project with Specification that does not contain incentive*

BASIS OF ESTIMATE: Actual Field Measurement (Hwy Volume Rd)

Sta	Sta	Measured Quant.		Date Marking		Comments
		Skip	Solid	Oblit	Installed	
<u>120+15</u>	<u>160+00</u>	<u>1000*</u>	<u>0</u>	<u>11-1</u>	<u>11-8</u>	<u>* OVER 3 day limit - No Pay</u>
<u>160+00</u>	<u>175+00</u>	<u>380</u>	<u>1500</u>	<u>11-4</u>	<u>11-8</u>	<u>11-7 warm day 3 and Sunday</u>
<u>175+00</u>	<u>185+00</u>	<u>0</u>	<u>2000</u>	<u>11-4</u>	<u>11-8</u>	<u>" "</u>
<u>185+00</u>	<u>200+00</u>	<u>370</u>	<u>1500</u>	<u>11-4</u>	<u>11-8</u>	<u>" "</u>
<u>200+00</u>	<u>240+00</u>	<u>1000</u>	<u>0</u>	<u>11-8</u>	<u>11-8</u>	
		<u>1750</u>	<u>5000</u>			

REPORTED BY: Super-Lo CHECKED BY: Off. Tok

FIGURE 718-1

**SECTION 719**  
**THERMOPLASTIC PAVEMENT MARKING**

**719.01 GENERAL.** This item consists of furnishing and placing thermoplastic pavement markings in accordance with the plans and Specifications. This Section of the Specifications should be used as a reference when thermoplastic pavement marking is called for on the plans. Among the items which the Resident Engineer should note:

- The Resident Engineer should verify and document that materials comply with the Specifications as per the *Manual of Field Sampling and Testing Procedures* prior to use. (This material is a QPL item.)
- Thermoplastic pavement markings shall not be applied if the pavement surface temperature is less than 10° C (50° F) or if there is any evidence of moisture.
- The thickness of the dried markings shall be checked and should be recorded (and retained in Resident Engineer Office) to assure compliance with the Specifications.
- It is the Resident Engineer's responsibility to locate no passing zones. It is the Contractor's responsibility to "spot" the pavement as necessary for striping.

**719.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 718* of this Manual. Thermoplastic Pavement Markings are measured and documented in the same manner as Reflectorized Paint Pavement Markings.

**SECTION 720**  
**PERMANENT PAVEMENT MARKING TAPE**

**720.01 GENERAL.** This item consists of furnishing and placing pavement marking tape in accordance with the plans and Specifications. This Section of the Specifications should be used as a reference when pavement marking tape is called for on the plans. Among the items which the Resident Engineer should note:

- The Resident Engineer should verify and document that materials comply with the Specifications as per the *Manual of Field Sampling and Testing Procedures* prior to use.
- Type 4 Retroreflective preformed pavement marking tape (removable) is the same as "Removable Non-permanent Pavement Markings" found in Subsection 604.02(e) of the Specifications.

**720.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 718*. Retroreflective preformed pavement marking tape is measured and documented in the same manner as Reflectorized Paint Pavement Markings.

**SECTION 721  
RAISED PAVEMENT MARKER**

**721.01 GENERAL.** This item consists of furnishing and installing raised pavement markers in accordance with the plans and Specifications. Materials used should be approved prior to use. (Refer to the *Manual of Field Sampling and Testing Procedures*.)

**721.02 METHOD OF MEASUREMENT.** This item will be measured by the unit ("Each").

**721.03 DOCUMENTATION - CURRENT ESTIMATES.** Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity within specified station limits, approximate field measurement, reference to the appropriate "Final Document" (OSD), etc. Current Estimate documentation will be recorded on the "Report of Work Performed" and marked "Current Estimate".

**721.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Count". The count shall be shown on the "Final Document" RWP(s) or on attached sheets.

**SECTION 722  
PLOWABLE PAVEMENT MARKER**

Refer to *Section 721* of this Manual. Information contained in it is also applicable to this item.

**SECTION 723  
GENERAL REQUIREMENTS FOR SIGNS**

**723.01 GENERAL.** This section of the Specifications deals with the various requirements for signs. It should be used as a reference. Among the items which the Resident Engineer should note:

- The Contractor must provide Manufacturer's Certified Tests for the sign panels to the Resident Engineer.
- The Resident Engineer should verify and document that materials comply with the Specifications as per the *Manual of Field Sampling and Testing Procedures* prior to use.
- Shop Drawings submittals are required from the Contractor to the Resident Engineer. These are submitted to the Construction Office in Little Rock who will obtain the proper review/approvals and return same to the Resident Engineer. (Shop Drawings for signs are reviewed and

approved by Maintenance Division and structural sign supports [trusses, etc] are reviewed and approved by Bridge Design Division.)

**NOTE:** This does not apply to "Standard" signs meeting the requirements of Standard Drawing TC-1.

- The Resident Engineer is required to make a night inspection of the signing to determine if the signing reflects appropriately. The Resident Engineer should document this inspection in his Resident Engineer Construction Diary.

**723.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** This work is not measured; it is considered subsidiary to the other items of work.

## SECTION 724

### OVERHEAD, BRIDGE MOUNTED, AND CANTILEVER SIGN STRUCTURES

**724.01 GENERAL.** These items consist of furnishing and installing sign structures in accordance with the plans and Specifications.

The Contractor, per the specification, is required to submit shop drawings for these structures. (**NOTE:** Often these are sent directly to the Bridge Engineer, who forwards approved copies to the Resident Engineer and the Construction Engineer.) The Contractor may propose to use commercial alternates to that on the plans, subject to the AHTD approval. If proposed, the Contractor must provide a complete set of design calculations by a Professional Engineer for the AHTD to review.

In addition, the Contractor is required to provide Manufacturers Certifications for appropriate materials, along with a certification that welding and fabrication are in accordance with governing Specifications, to the Resident Engineer. The Resident Engineer should refer to the *Manual of Field Sampling and Testing Procedures* to ensure these are handled properly and that all materials are approved prior to use.

Class S concrete and Grade 60 reinforcing steel shall be used. (Refer to Sections 802 and 804 of the Specifications.)

**NOTE:** The Department performs Acceptance sampling and testing on Concrete used in conjunction with this item.

**724.02 METHOD OF MEASUREMENT.** This item is measured by the unit ("Each").

**NOTE:** Furnishing and installing signs on this item is not considered a part of this pay item. They are to be measured under Section 725 of the Specifications.

**724.03 DOCUMENTATION - CURRENT ESTIMATES.** Current Estimate documentation for this item shall be a properly completed RWP marked "Current Estimate". The "Basis of Estimate" should be based upon as estimate of the proportion of work that has been completed. While this is normally an estimated percentage, other

methods may be used as long as the method used is understandable, accurate, and clearly stated on the RWP.

**724.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Count". The count shall be shown on the "Final Document" RWP(s) or on attached sheets.

## **SECTION 725 GUIDE SIGN**

**725.01 GENERAL.** This item consists of furnishing and installing Guide Sign(s) in accordance with the plans and Specifications. This item must conform to the requirements of Section 723 of the Specifications.

**725.02 METHOD OF MEASUREMENT.** This item is measured by the Square Foot (Square Meter) to the nearest 0.1 square foot (0.01 square meter). No deduction is to be made for the radii on the signs' corners or for the mounting holes.

**725.03 DOCUMENTATION - CURRENT ESTIMATES.** Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity within specified station limits, approximate field measurement, reference to the appropriate "Final Document" (OSD), etc. Current Estimate documentation will be recorded on the "Report of Work Performed" and marked "Current Estimate".

**725.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Measurement". The measurements shall be shown on or attached to the "Final Document" RWP(s).

**SECTION 726  
STANDARD SIGN**

Refer to *Section 725* of this Manual. Information contained in it is also applicable to this item.

**NOTE:** The area of octagonal signs, U.S. Shields, and Interstate shields will be computed as the area of the circumscribing square. The area of triangular signs will be computed as the area of the triangle. The area of circular signs will be computed as the area of the circle. The sign supports are measured and paid for separately.

**SECTION 727  
EXIT NUMBER PANEL**

Refer to *Section 725* of this Manual. Information contained in it is also applicable to this item.

**SECTION 728  
DELINEATORS**

**728.01 GENERAL.** This item consists of furnishing and installing galvanized steel posts with delineators in accordance with the plans and Specifications. Materials used should be approved prior to use. (Refer to the *Manual of Field Sampling and Testing Procedures*.)

**728.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 721* of this Manual. Information contained in it is also applicable to this item.

**SECTION 729  
CHANNEL POST SIGN SUPPORT**

**729.01 GENERAL.** This item consists of furnishing and installing channel post sign supports for roadside mounted signs as per plans or as the Engineer directs. The Contractor shall furnish Certified mill tests on these. All materials should be approved prior to use in accordance with the *Manual of Field Sampling and Testing Procedures*.

**729.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 721* of this Manual. Information contained in it is also applicable to this item. The general location of each sign support should be included with the "Actual Field Count" on the "Final Document" RWP.

**SECTION 730  
BREAKAWAY SIGN SUPPORT**

**730.01 GENERAL.** This item consists of furnishing and installing breakaway sign supports in accordance with the plans and Specifications.

Prior to installation, the Contractor should submit shop drawings to the Resident Engineer for review. Refer to *Section 700* of this Manual for the details regarding review, approval, and distribution procedures involved. Also, refer to the *Manual of Field Sampling and Testing Procedures* for procedures required for materials approval of this item.

**NOTE:** Class S Concrete is specified for footings on this item. The Department performs Acceptance sampling and testing on Concrete used in conjunction with this item.

**730.02 METHOD OF MEASUREMENT.** This item is measured by the Pound (Kilogram). Pay Quantity is computed by measuring the length of sign support installed and multiplying by the weight per unit of length.

**730.03 DOCUMENTATION - CURRENT ESTIMATES.** Current Estimate documentation for this item shall be a properly completed RWP marked "Current Estimate". The "Basis of Estimate" should be based upon as estimate of the proportion of work that has been completed. While this is normally an estimated percentage, other methods may be used as long as the method used is understandable, accurate, and clearly stated on the RWP.

**730.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Measure". Refer to *Figure 730-1*.

**SECTION 731  
IMPACT ATTENUATION BARRIER**

**731.01 GENERAL.** This item consists of constructing a foundation pad and furnishing and installing plastic "barrels" in accordance with the plans and Specifications.

**NOTE:** The contractor must provide the Resident Engineer with a manufacturer certification that this item meets the requirements of NCHRP-350 – Level 3.

If a rigid foundation pad is constructed, Class M concrete is used.

**NOTE:** The Department performs Acceptance sampling and testing on Concrete used in conjunction with this item.

If a flexible foundation pad is used, Class 1 Aggregate and ACHM Surface Course are to be used. (Full depth ACHM Surface Course is also acceptable, at the Contractor's option.)

Refer to the *Manual of Field Sampling and Testing Procedures* for procedures required for materials approval of this item.

**731.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 721* of this Manual. Information contained in it is also applicable to this item.

### SECTION 732 CRASH CUSHIONS

**732.01 GENERAL.** This item consists of constructing a foundation pad and furnishing and backup wall and installing a crash cushion in accordance with the plans and Specifications.

**NOTE:** The contractor must provide the Resident Engineer with a manufacturer certification that this item meets the requirements of NCHRP-350 – Level 3.

Refer to the *Manual of Field Sampling and Testing Procedures* for procedures required for materials approval of this item.

**NOTE:** The Specifications specify Class M concrete to be used. The Department performs Acceptance sampling and testing on Concrete used in conjunction with this item.

**732.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES.** Refer to *Section 721* of this Manual. Information contained in it is also applicable to this item.

### SECTION 733 VIDEO DETECTOR WITH RADIO INTERFACE

**733.01 GENERAL.** This item consists of installing a video detection system in conjunction with traffic signal controller(s) in accordance with the plans and specifications.

**NOTE:** While brochure (Catalogue cut sheets) submittals are not required for this item, the Resident Engineer should be in close contact with the Construction Office (who in turn will contact Roadway Design and Maintenance Divisions) with information on this item to assure that the Contractor provides equipment that complies with this Specification.

**733.02 METHOD OF MEASUREMENT.** "Video Cable" is measured by the Linear Foot (Meter)." The remaining items covered by this Specification are measured by the unit ("Each").

**733.03 DOCUMENTATION - CURRENT ESTIMATES.** This equipment should be included for full payment on the first current estimate following the date of

installation. For payment purposes, installation does NOT require that the item be placed in operation.

Documentation for payment of this item on Current Estimates shall be a properly completed "Report of Work Performed" (RWP) marked "Current Estimate."

**733.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for these items shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Count" for items measured by the unit (each) and "Actual Field Measurement" for "Video Cable". The measurement shall be shown on the applicable RWP(s) or on attached sheets.

### **SECTION 734 BRIDGE END TERMINAL**

**734.01 GENERAL.** This item consists of furnishing and installing a crashworthy attenuator at bridge ends in accordance with the plans and specifications.

**NOTE:** The contractor must provide the Resident Engineer with a manufacturer certification that this item meets the requirements of NCHRP-350 – Level 3.

Refer to the *Manual of Field Sampling and Testing Procedures* for procedures required for materials approval of this item.

**NOTE:** The Specifications specify Class A, S, or PCCP concrete to be used.. The Department performs Acceptance sampling and testing on Concrete used in conjunction with this item.

**734.02 METHOD OF MEASUREMENT.** This item will be measured by the unit ("Each").

**734.03 DOCUMENTATION - CURRENT ESTIMATES.** Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity within specified station limits, approximate field measurement, reference to the appropriate "Final Document" (OSD), etc. Current Estimate documentation will be recorded on the "Report of Work Performed" and marked "Current Estimate".

**NOTE:** The Resident Engineer may authorize partial payment for an uncompleted "Bridge End Terminal" based upon the work accomplished at the time of a Current Estimate.

**734.04 DOCUMENTATION - FINAL ESTIMATES.** Final Estimate documentation for this item shall be properly completed RWP's marked "Final Document". The "Basis of Estimate" for should be "Actual Field Count". The count shall be shown on the "Final Document" RWP(s) or on attached sheets.