

**FIELD SAMPLING AND TESTING MANUAL**

**SECTION 700**

**MISCELLANEOUS CONSTRUCTION**



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**Section 704****TRAFFIC CONTROL****704.01 DESCRIPTION.**

This work consists of furnishing, installing, and maintaining all required traffic control devices according to the traffic control details shown on the Plans. This includes Specifications providing for watch persons, flaggers, pilot cars, and all necessary precautions for protecting the public, the workers, and the work.

**704.02 ACCEPTANCE.**

This work is accepted by certification stating that all traffic control devices meet the NDDOT Specifications.



**Section 708**  
**EROSION CONTROL**

**708.01 DESCRIPTION.**

This work consists of furnishing and installing erosion control measures which include seeding, placing sod, mulch cover, soil retention blankets, riprap, formed fabric, concrete slope protection and other measures as specified.

**708.02 GENERAL.**

**A. SEEDING.**

All seed is accepted on certification after testing at an approved laboratory. Retest seed not used for nine months after original testing. A new certification is required.

**B. MULCHING.**

Obtain two samples of the emulsion from every load delivered to the project and submit these to the District Laboratory (the contractor obtains these).

**C. FABRIC FORMED SLOPE PROTECTION.**

Cast one set of 28-day cylinders (one at approximately the 1/3 point and the other at approximately the 2/3 point) from each day's pour. Perform air tests when cylinders are cast.

The contractor supplies the Department with a copy of the manufacturer's recommended installation procedure along with a certification for the fabric.

**D. CONCRETE SLOPE PROTECTION.**

**1. Required Tests and Frequency.**

- a. Acceptance Samples and Testing--Field Laboratory Testing.** Perform sieve analysis tests as aggregate is delivered to the site, or ready mix plant (see Section 816.04 of this manual for procedure). The aggregate may be sampled when charging the aggregate bins.

Cast compression test cylinders at the rate required in Table 1 of Section 602.2 (see Section 802.03 E. of this manual for casting procedure).

Perform one slump and air test from the first load each day (see Section 802.03 of this manual for procedure). After the initial load, perform air, slump, and yield tests each time a compression test cylinder is cast.

Submit a minimum of one random cement sample per project to the Materials and Research Division (see Section 804.02 for procedure).

Perform at least one moisture test on the coarse and fine aggregate before the first pour each day (see Section 816.04 of this manual for procedure).

Submit SFN 10072 to the District Materials Coordinator.

**b. Independent Assurance Samples and Testing.**

- 1. District Laboratory Testing.** Obtain one sample of both fine and coarse aggregate for each 150 C.Y. of concrete. Perform Independent Assurance tests with equipment other than that used by the project personnel. Record the results of air, slump, and yield tests on SFN 10069.
- 2. Materials and Research Division Testing.** Submit one sample of every source of water used. Water known to be of potable quality may be used without testing.

Submit one sample of both coarse and fine aggregate per project.

- 2. Reinforcing Steel and Welded Wire Fabric.** Refer to Section 836 for acceptance.
- 3. Preformed Expansion Joint Material.** Preformed expansion joint material is accepted by certification.

## SECTION 709

### GEOTEXTILE MATERIALS

#### 709 DESCRIPTION

This section relates to field sampling of geotextile material.

#### 709.1 DEFINITIONS

1. **Lot:** The NDDOT considers a lot to be a shipment of material delivered to the location of work. If there is documentation showing that the shipment came from different production plants or was manufactured using different materials or procedures, the different parts of the shipment will be considered separate lots.
2. **Samples:** For geotextile, the samples are taken from the shipping units (i.e., rolls of fabric) making up a lot. The property variables of the samples must represent the entire lot. These samples will be submitted for acceptance testing.
3. **Certificate of Compliance:** As outlined and detailed in Section 106.01 of *NDDOT Standard Specifications*, it states that the material fully comply with the Contract requirements.

#### 709.2 DOCUMENTATION

The Engineer or designated field personnel shall obtain a valid Certificate of Compliance from the contractor and verify that it meets the requirements in Section 858 of NDDOT Standard Specifications. If the material properties stated on the Certificate do not meet the specifications, the material is not acceptable. If it is verified that the properties stated on the Certificate comply with Section 858, the Engineer shall contact Materials and Research for inquires on historical test information. If any of the criteria listed below are met, then the Engineer may elect to proceed with sampling.

- If the material is unknown to the NDDOT, or has a history of test failures, samples will be required.
- If a significant quantity of geotextile material is being used, or the project has been selected for random testing, samples may be required.
- If the Engineer is concerned about the quality of the geotextile, or that the Certificate does not represent the material on site, sampling and testing may be ordered at the direction of the Engineer.

### 709.3 GENERAL PROCEDURES

#### A. Sampling Overview

1. Sampling Frequency: To determine the number of samples to obtain for acceptance testing, consider the total units (i.e., rolls) of the lot or lots delivered to the work location. All geotextiles shall be sampled randomly. Refer to the following table (Table A) for lot sampling frequency.

Table A

Numbers of Rolls in the Lot	Number of Samples Selected
1 to 2	1
3 to 8	2
9 to 27	3
28 to 64	4
65 to 125	5
126 to 216	6
217 to 343	7
344 to 512	8
513 to 729	9
730 to 1000	10
1000 or more	11

2. Sample Size: When cutting a sample from a geotextile roll, do not sample the first 3 feet or the last 3 feet of the roll. Obtain a sample extending the width of the roll and approximately 6 feet in length.

#### B. Sewn Geotextiles

- Samples shall be taken of geotextiles which have been joined by a sewn-seam. Tests will be completed to verify that the requirements stated in Section 858 of *NDDOT Standard Specifications* are met.
- Sample size shall be a minimum 6 feet in length and 3 feet on each side of the sewn-seam.
- Sampling frequency: Take a minimum of one sample per project. Further sampling shall be at the discretion of the Project Engineer.

#### C. Precut Geotextiles

- Individual rolls may be cut to pre-selected widths prior to delivery to the project. Each of these cut portions must be labeled in a manner that allows identification of its original position within the previous full-width roll.

The contractor shall provide lists identifying the original full-width rolls and the portions cut from those rolls.

- The contractor is responsible for assuring all portions of the original rolls are readily accessible and identifiable for sampling. Sampling is conducted by taking the required sample length of each portion as if it were the original roll. The composition of these cut portions are considered one sample.
- The total number of original rolls shall be used to determine how many samples are needed and is determined from Table A.

#### D. Sample Identification

Field samples submitted to Materials and Research for testing shall include the following:

1. A valid Certificate of Compliance conforming to Section 106.01 of *NDDOT Standard Specifications*.
2. Samples shall have the following information physically attached to each sample.
  - a) Project number
  - b) Sampled by
  - c) Date sampled
  - d) Manufacturer's name
  - e) Product name or style
  - f) Assign a unique number to identify the sample (whether provided or created).



## SECTION 714

### CULVERTS, STORM DRAINS, EDGE DRAINS, AND UNDERDRAINS

#### 714 DESCRIPTION

This work consists of constructing culverts, storm drains, edge drains, and underdrains and shall include excavation and backfilling.

#### 714.1 ACCEPTANCE SAMPLES AND TESTS

- **Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts, Corrugated Aluminum Alloy Culverts, and Smooth-Wall Steel Pipe Culverts:** Accept all of these materials by certification. The certification must show the project number, contractor, kind of material, size, gauge, quantity of material, and must state that the listed materials conform to the requirements outlined in the applicable specifications. Do not install pipe that is not covered by an approved certification. After the material has been delivered to the project, the Engineer will examine it for the following markings and record the information in his diary or the Pipe Book:

1. Location of the installation - Sta., etc.
2. Name of sheet manufacturer.
3. Brand name and type of base material.
4. Galvanized sheet thickness.
5. Weight of coating.
6. Coating lot numbers.
7. AASHTO or ASTM specification number.
8. Diameter and lengths.

Also examine each item for damage in transit and general workmanship. Document the reason for rejection. The following defects are specified as constituting poor workmanship and the presence of any or all of them in any individual culvert pipe constitute rejection:

1. Uneven laps.
2. Elliptical shaping - unless ordered in this shape.
3. Variation from straight centerline.
4. Ragged or diagonal sheared edges.
5. Loose, unevenly lined or spaced rivets or spot welds.
6. Poorly formed rivet heads or loose seams.
7. Unfinished ends.
8. Illegible brands.
9. Lack of rigidity.
10. Bruised, sealed, or broken spelter coating.
11. Dents, bends, or holes in the metal itself.

- **Concrete Pipe:** Refer to the section “Quality Assurance Program for Prestressed and Precast Concrete Products” in this manual.
- **Plastic, PVC, and Polyethylene Pipe:** Pipes manufactured from these materials are accepted by certification.
- **Underdrain Granular Fill Material:**

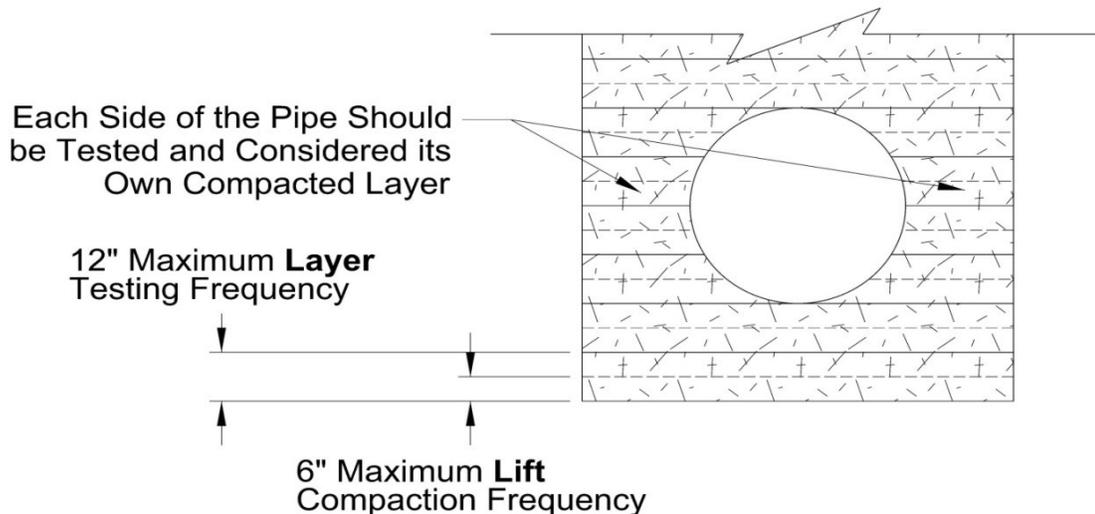
**Field Laboratory Testing:** The Engineer obtains one sample for every 15,000 lineal feet placed for sieve analysis. Obtain the sample according to AASHTO T 2, “Sampling of Aggregate,” split the sample according to AASHTO T 248, “Reducing Samples of Aggregate to Testing Size,” and run the sieve analysis according to AASHTO T 11, “Materials Finer than No. 200 Sieve in Mineral Aggregate by Washing,” and AASHTO T 27, “Sieve Analysis of Fine and Coarse Aggregates.” Obtain a minimum of two samples per project.
- **Grates, Frames, and Boxes:** These items are accepted by certification.

#### 714.2 ACCEPTANCE SAMPLES AND TESTS FOR COMPACTION CONTROL FOR PIPE BACKFILL

The Engineer, or Representative, must obtain one aggregate sample for sieve analysis of select backfill or foundation fill for every source used. The samples are obtained according to AASHTO T 2, “Sampling of Aggregates,” and tested according to AASHTO T 27, “Sieve Analysis of Fine and Coarse Aggregates.” Compute the sieve analysis results on SFN 9987, “Aggregate Sample Worksheet.”

The Engineer, or Representative, must conduct a minimum of one moisture and density test for each layer of compacted aggregate. A layer of compacted aggregate is defined by a thickness of 12 inches and a maximum length of 200 lineal feet. The width shall be defined by the trench width except each side of the pipe shall be considered as separate layers.

The sketch on page 3 of this section illustrates the testing and compaction intervals.



Conduct tests according to ASTM D 4643, "Determination of Water Content of Soil by Microwave Oven Method"; AASHTO T 255, "Total Evaporable Moisture of Aggregate by Drying"; AASHTO T 191, "Density of Soil In-Place by Sand-Cone Method"; or AASHTO D 2167, "Density and Unit Weight of Soil in Place by the Rubber-Balloon Method."

Compare the results derived from these tests to the compaction curve developed from a multi-point Proctor test derived from AASHTO T 180, "Moisture-Density Relations of Soils." Establish a new compaction curve for each type of material encountered.

### 714.3 INDEPENDENT ASSURANCE SAMPLES AND TESTS COMPACTION CONTROL FOR PIPE BACKFILL

The District Materials Coordinator, or Representative, must conduct a moisture and density test at a minimum rate of one test for every 1,000 lineal feet or fraction thereof. Independent assurance testing must be completed using the same tests conducted for acceptance. For quantities less than 1,000 lineal feet, no specified number of tests is required. It shall be to the District Materials Coordinators discretion to make this determination.

A minimum of one comparison Proctor test shall be conducted according to AASHTO T 180, "Moisture-Density Relations of Soils," for every source used. For a quantity less than 1,000 lineal feet, no specified number of tests is required.

#### **714.4 INDEPENDENT ASSURANCE (IA) SAMPLES AND TESTS FOR UNDERDRAIN**

##### **Granular Fill Material:**

**District Laboratory Testing:** The District Materials Coordinator obtains one sample from each project for sieve analysis. Obtain the sample according to AASHTO T 2, "Sampling of Aggregate," split the sample according to AASHTO T 248, "Reducing Samples of Aggregate to Testing Size," and run the sieve analysis according to AASHTO T 11, "Materials Finer than No. 200 Sieve in Mineral Aggregate by Washing," and AASHTO T 27, "Sieve Analysis of Fine and Coarse Aggregate."

**Section 720**

**MONUMENTS AND RIGHT OF WAY MARKERS**

**720.01 DESCRIPTION.**

This work consists of furnishing and installing concrete monuments and right of way markers.

**720.02 ACCEPTANCE.**

Material covered by this section is accepted by certification.

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**Section 722****MANHOLES, CATCH BASINS, AND INLETS****722.01 DESCRIPTION.**

This work consists of constructing and adjusting manholes, catch basins, and inlets, including the furnishing or resetting of necessary metal frames, covers or grates, valve boxes, or other accessories to new lines and grades where such accessories are public property.

**722.02 ACCEPTANCE.**

Acceptance procedures for cast-in-place concrete are outlined in Section 602 of this manual.

If precast concrete, see Quality Assurance Program for Prestressed and Precast Concrete Products in Appendix A of this manual.

The brick and block are accepted by certification. Examine in the field for freedom from cracks, warpage, stones, pebbles, or particles of lime that would affect the serviceability of the brick. Check brick for a rectangular cross section with substantially square corners.

Reinforcing steel is accepted by certification.

Cast iron frames, tops, covers and grates are accepted by certification.

**Section 724**

**WATER MAINS, WATER LINES, AND SEWER LINES**

**724.01 DESCRIPTION.**

This work consists of furnishing and installing water and sewer lines and appurtenances of the types and sizes required, in full compliance with the requirements of the North Dakota State Plumbing Code, the North Dakota State Health Department, and applicable City ordinances.

**724.02 ACCEPTANCE.**

All materials (other than concrete) are accepted by certification.

**Section 740**

**DAMPPROOFING AND FABRIC WATERPROOFING**

**740.01 DESCRIPTION.**

This work consists of furnishing materials and placing dampproofing and fabric waterproofing on surfaces and areas specified.

**740.02 ACCEPTANCE.**

All materials are accepted by certification.

**Section 744**

**INSULATION BOARD (POLYSTYRENE)**

**744.01 DESCRIPTION.**

This work consists of furnishing and installing extruded polystyrene insulation board.

**744.02 ACCEPTANCE.**

The insulation board is accepted by certification.

Section 748

CURB AND GUTTER

**748.01 DESCRIPTION.**

This work consists of constructing curb, gutter, or combination curb and gutter.

**748.02 REQUIRED TESTS AND FREQUENCY.**

**A. Acceptance Samples and Tests--Field Laboratory Testing.** Perform sufficient sieve analysis of aggregates taken at an appropriate stage to ensure the continuing quality as specified (see Section 816.4 of this manual for procedures). The type of mixing operation determines the sample timing, place, and frequency. This is at the discretion of the engineer/manager.

Report the results on SFN 10072 and submit to the District Materials Coordinator.

Perform one moisture test on aggregates per day (see Section 816.04 A. of this manual for procedure).

For each pour, cast one set of compression test cylinders for every 50 C.Y. up to 100 C.Y. Cast one set of compression test cylinders for every 100 C.Y. thereafter. (See Section 802.03 E. of this manual for casting procedure).

At a minimum, perform one air, slump, and yield test for each concrete sample from which cylinders are cast (see Section 802.03 of this manual for procedure).

Submit a minimum of one random sample of cement per project to the Materials and Research Division.

**B. Independent Assurance Samples and Tests**

**1. District Laboratory Testing.** The District Materials Coordinator or a designated representative must obtain these samples and conduct these tests.

Obtain one sieve analysis and physical properties sample of coarse and one sample of fine aggregate for each 150 C.Y. of concrete.

Cast one set of compression test cylinders for each 200 C.Y. of concrete (see Section 802.03 E. of this manual for procedure).

- 2. Materials and Research Division Testing.** Submit one sample for every source of water used. Water known to be of potable quality may be used without testing.

Submit one sample for each lot of hot applied joint sealant used.

- C. OTHER.** The precast concrete curbing is accepted by certification. Inspect each section for damage from transit. Do not install any section that has serious damage.

Reinforcing steel, cold applied joint material, joint filler, and curing materials are accepted by certification.

**SECTION 750**

**SIDEWALKS AND DRIVEWAYS**

**750.01 DESCRIPTION.**

This work consists of constructing concrete sidewalks and driveways.

**750.02 ACCEPTANCE.**

These items are cast in-place. The acceptance procedures are the same as for cast in-place concrete curbing outlined in Section 748 of this Manual.

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## Section 752

### FENCING--INSTALLATION AND RESETTING

#### 752.01 DESCRIPTION.

This work consists of constructing fences and gates including the removal of existing fences and resetting of fences in locations shown on the Plans or as directed by the engineer/manager.

#### 752.02 REQUIRED TESTS AND FREQUENCY.

**A. Acceptance Samples and Tests--Field or District Laboratory Testing.** Chain link fence, barbed wire, woven wire, staples, and posts (both steel and wood) are accepted by certification.

Examine each spool of barbed wire for the following markings:

1. Style of barbed wire.
2. Class of coating
3. Length
4. ASTM A 121
5. Name or mark of manufacturer.

If this information is lacking, do not install the wire until a determination is made that it meets specification requirements.

Inspect the steel posts for damaged coating. Touch up damaged coatings. Inspect wood posts for size, soundness, and straightness as outlined in Section 860 of the Standard Specifications.

The woven wire and chain link fencing must be tightly rolled and firmly tied. Each roll must carry a tag showing:

1. Style of fence.
2. Length of fencing on the roll.
3. Class of coating.
4. ASTM or AASHTO designation.
5. Name or mark of the manufacturer.

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**Section 754**  
**HIGHWAY SIGNS**

**754.01 DESCRIPTION.**

This work consists of furnishing, fabricating, and installing highway signs, delineators, and supporting structures.

**754.02 ACCEPTANCE.**

All metal items and sheeting are accepted by certification and inspected for compliance according to Section 754 of the Standard Specifications.

**A. Concrete Testing.**

- 1. Field Tests.** Obtain one sieve analysis sample of each size aggregate for each 150 C.Y. of concrete.

Perform one air, slump, and yield test near the beginning of the operation and when approximately one-half of the Plan quantity of concrete has been placed.

Cast compression test cylinders per Table 1 in Section 602 of this Manual.

A delivery ticket must accompany each load of concrete. The producer must state the class of concrete being furnished, and the weights of cement, aggregate, and water used in the batch at the time of batching.

Submit one random sample of cement per project to the Materials and Research Division.

- 2. District Laboratory Tests.** Obtain one sieve analysis and physical properties sample of both fine and coarse aggregate for each 150 C.Y. of concrete.
- 3. Materials and Research Division Tests.** Obtain one sample for each source of water used. Water known to be of potable quality may be used without testing.

Reinforcing steel is accepted by certification.

**Section 762****PAVEMENT MARKING****762.01 DESCRIPTION.**

This work shall consist of furnishing and installing specified pavement markings at the designated locations.

**762.02 REQUIRED TESTS AND FREQUENCY.**

**A. Acceptance Samples and Tests--Field or District Laboratory Testing.** All items are accepted by certification.

**B. Materials and Research Division Testing.** Submit to the Materials and Research Division for testing 100 pounds of glass beads for every 10,000 pounds shipped. Submit Glass bead samples in unopened bags.

**762.03 SAMPLING, TESTING, AND ACCEPTANCE.****A. Sampling Pavement Marking Paint from 55 gallon Drums.**

- 1. Conditions.** Temperature range of 60° to 80°F.
- 2. Sampling.** All sampling equipment, sample cans, and labor is provided by the Contractor. Randomly select the two 55-gal drums from each lot to be sampled. Record the date of manufacture and the lot number.

Open the selected drums and stir any settlings with a boat paddle, making sure to loosen the settlings on the bottom of each drum.

Mix the paint for 5 minutes with an electric or air-driven mechanical mixer affixed to the drum. After the 5-minute mixing period, check for settlings on the bottom of the drum by stirring with a boat paddle.

If no settlings are present, obtain a 1-pt paint sample from each drum. When sampling water-borne paint use epoxy-lined cans.

If settlings are present, continue to stir with the paddle to loosen the settlings and engage the mechanical mixer for an additional 5 minutes of mixing. Obtain samples after this mixing.

Ship the samples in well sealed cans to the Materials and Research Division.

**B. Glass Beads Sampling and Testing.** Conduct sampling and testing according to AASHTO M 247. The summary and exceptions follow:

- 1. Sampling.** If packaged in 50-lb bags, sample the glass beads randomly at a ratio of 100 lbs of sample (in full bags) per 10,000 lbs shipped. Submit the total sample or reduce with a sample splitter to an approximate size of one liter.

When beads are delivered in drums, obtain one sample per 10,000 lbs shipped or fraction thereof. Randomly select drums for testing. Obtain the sample by inserting a sample probe vertically into the drum. Insert the probe as many times as necessary to obtain a sample approximately one liter in size.

Submit the samples and certification to the Materials and Research Division.

**Section 764**

**GUARDRAIL**

**764.01 DESCRIPTION.**

This work consists of installing, removing, and resetting guardrail and box beam median barrier.

**764.02 ACCEPTANCE.**

All materials covered by this Section are accepted by certification.

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**Section 770**  
**HIGHWAY LIGHTING**

**770.01 DESCRIPTION.**

This work consists of furnishing and installing highway and street lighting.

**770.02 REQUIRED TESTS AND FREQUENCY.**

**A. Acceptance Samples and Tests--Field or District Laboratory Testing.** Shop drawings are required for the following items:

1. Conductors.
2. Pull Boxes.
3. Feed Point Equipment including:
  - a. Circuit breakers (enclosed in a load center-type panel board).
  - b. Enclosed relay (normally open).
  - c. Cabinet.
  - d. Photoelectric cell.
4. Light Standard including:
  - a. Luminaries
  - b. Fusehold.
  - c. All necessary calculations and drawings used in the design of these poles.
5. Sign Lighting including:
  - a. Loadcenter.
  - b. Luminaire.
  - c. Ballast.
6. High Mast Lighting Assembly including:
  - a. Pole.
  - b. Lowering Device.
  - c. Head Frame Assembly
  - d. Luminaire Ring Assembly
  - e. Winch and Hoisting Assembly including all cables.
  - f. Portable Power Unit.
  - g. Luminaries.
  - h. All necessary calculations and drawings used in designing high mast poles.

The shop drawings are to indicate the quality of the proposed material. The materials are considered for Specification compliance after review by the project engineer/manager.

**Section 772****HIGHWAY TRAFFIC SIGNALS****772.01 DESCRIPTION.**

This work consists of furnishing and installing flashing beacons and traffic signals.

**772.02 REQUIRED TESTS AND FREQUENCY.**

**A. Acceptance Samples and Tests--Field or District Laboratory Testing.** Shop drawings are required for the following items:

1. Conductors.
2. Pull Box.
3. Saw Slot Sealant.
4. Feed Point Equipment including:
  - a. Safety switch and lighting protection device.
  - b. Flasher.
  - c. Time Clock.
  - d. Cabinet.
5. Traffic Signal Standards including all necessary calculations and drawings used in designing these poles.
6. Combination Standards including all necessary calculations and drawings used in designing these poles.
7. Traffic Signal Heads.
8. Beacon Heads.
9. Pedestrian Signal Heads.
10. Pedestrian Push Button.
11. Detector Cabinet.
12. Traffic Signal Controller with all components including, when required:
  - a. Controller.
  - b. Flasher.
  - c. Conflict Monitor.
  - d. Coordination Equipment.
  - e. External Logic Unit.
  - f. Solid State Load Switches.
  - g. Detector Amplifier.
  - h. Lightning Protection Device.
  - i. Cabinet.
13. Emergency Vehicle Pre-Emotion Equipment.

The shop drawings are to indicate the quality of the proposed materials. The materials are considered for Specification compliance after review by the construction engineer. An approved shop drawing or catalog description is

considered acceptance of each respective material. Inspect for obvious defects on the project.

Conduit is accepted by certification.

Paint for traffic signals, conduit and saw slot sealant are accepted by certification.