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**PLANTS FOR PRODUCTION OF  
PRECAST CONCRETE BARRIER**

**GENERAL**

Concrete barriers shall conform to the applicable requirements set forth in the Standard Road Design Plans (RE-71 and RE-72), shop drawings and Article 2513 of the Standard Specifications of the Iowa Department of Transportation and shall be fabricated at a State-approved plant.

Basic requirements for plant approval are as follows:

1. Quality Control Procedures/Manual
2. Qualified quality control personnel
3. Fabrication procedures that include, but are not limited to:
  - a. Material source approval
  - b. Concrete mix design approval
  - c. Concrete proportions
  - d. Concrete curing
  - e. Fabrication equipment (proportioning & mixing)
  - f. Tolerances
  - g. Handling & storage

Approval may be withdrawn on the basis of unsatisfactory procedures found during inspections or non-compliant test results on monitor samples. Concrete barrier producers approved to furnish barrier and special sections are listed in Appendix A.

**PLANT APPROVAL**

The District Materials Engineer (DME) responsible for the inspection of the plant will issue concrete barrier plant approval in writing. Plant approval will include the following requirements:

1. Quality control procedures used shall be submitted in writing to the engineer for approval. Failure to abide by approved quality control procedures shall be considered sufficient cause for suspension or termination of plant approval.

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2. A copy of reports of approved materials, cement, aggregate, and admixture certifications, Mill Test Reports for steel reinforcement, etc., shall be kept on file by the producer and be available for examination for at least one calendar year after manufacture of the rail.
  3. The facilities and equipment for materials proportioning, weighing, mixing, placement of reinforcement steel, placing, curing, removal of forms, finishing, handling, storage, and hauling precast units shall comply with the requirements of the Specification and shall have the approval of the District Materials Engineer. Any changes in the method of barrier production, mix proportions, or materials sources without prior notice and approval of the District Materials Engineer shall be considered sufficient cause for suspension or termination of plant approval.
  4. The barrier producer shall have a sufficient number of qualified and trained personnel to produce a quality product. This includes, but is not limited to, such activities as insuring proper placement of steel reinforcement, material identification and handling, concrete proportioning, handling and consolidation, fabrication, barrier marking, curing, and finishing.
  5. Approval to furnish special sections will be limited to what the District Materials Engineer preapproves and authorizes at the fabricating plant.
  6. Concrete barrier producers shall keep non-compliant or deficient barrier units separated from approved stock.

#### Nebraska DOR's Concrete Protection Barriers

Temporary barrier rails produced by the approved manufacturers of Nebraska DOR such as Coreslab and Concrete Industries will be accepted by the Iowa DOT. The contractor shall provide a document to the engineer showing the TBRs were inspected by the Nebraska state inspector on fabrication site and a certification showing the TBRs were made in accordance with the Nebraska Department of Roads Special Plan C, dated September 23, 2003. For other approved manufacturers, the contractor shall provide a document showing that the manufacturer is approved by the Nebraska DOR, in addition to the above mentioned requirements.

#### **MONITOR SAMPLING & TESTING**

The District Materials Engineer will be responsible for establishing and performing the monitor sampling and testing program for each concrete barrier plant. A copy of all material testing results, and a copy of the report of each monitor plant inspection trip, will be provided to the producer.

#### **IDENTIFICATION**

##### A. Temporary Concrete Barrier

Temporary concrete barriers shall have an identification, as described below, imbedded into

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one end of each rail, near the top of the rail, or other permanent marking approved by the engineer:

1. Manufacturer identification
2. Date manufactured (month and year)
3. Letter representing the design used at the time of manufacturing

The Iowa DOT District Materials Engineer shall stamp all approved barriers.

B. Permanent Concrete Barrier

The Iowa DOT District Materials Engineer shall stamp all approved barriers.

**MATERIALS**

A. Cement

Section 4101 shall apply. Type I or Type III Portland Cement may be used.

B. Fly Ash & GGBFS

The conditions and allowable rates of fly ash and GGBFS substitutions shall be in accordance with Article 2513.03B.

C. Aggregates

- Coarse Aggregate: Class 2 or better durability coarse aggregates shall be used unless otherwise specified and shall be from an approved source, and shall meet the requirements of Section 4115.
- Fine Aggregate: Shall meet the requirements of Section 4110, and approved source shall be required.
- The combination of aggregates shall be well graded in accordance with IM 532. The fabricator is required to provide a target gradation for approval by the engineer.

D. Admixtures

Approved air-entraining admixtures can be used. Other approved admixtures can be used with the approval of the Engineer. Section 4103 shall apply. **NOTE:** Admixtures containing more than 1% chloride shall not be allowed.

E. Bolts, Anchors & Other Fasteners

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Article 2407.02G shall apply.

F. Steel Reinforcement

Section 2404 shall apply.

**NOTE:** Connecting loops on all units shall not be frayed, stretched or deformed and shall be true to dimensions.

**CONCRETE**

- Concrete shall be proportioned, mixed, placed and cured in accordance with pre-approved procedures.
- The District Materials Engineer shall approve concrete mix design. (Class D Concrete or equivalent)
- Air content of fresh unvibrated concrete shall be 6.5% as a target value with a maximum variation of  $\pm 1.0\%$ .

Temporary Concrete Barrier

- Strength requirements before form stripping and moving from casting bed is 1750 psi (minimum).
- Strength at 28 days is 5000 psi (minimum).
- Strength before storing in multi-layers or shipping shall be equivalent to 28-day strength requirements or higher.
- Aggregate Gradation

Fine Aggregates: Requirement of Section 4110 shall apply and Gradation #1.

Coarse Aggregates: Requirement of Section 4115 shall apply and well-graded aggregate combination (in accordance with the requirements of IM 532 shall apply or as approved by the Engineer.

- Curing Section 2513.06 of the Standard Specifications shall apply. Clear curing compound shall be applied to the concrete barrier rail within 15 minutes after final finishing, provided that the free water (sheen) has appreciably disappeared from the concrete surface.

Permanent Concrete Barrier

- Concrete – Section 2513.03B shall apply.

- Aggregate Gradation – As specified in Section 2513.03B or as approved by the Engineer.
- Curing – A clear curing compound shall be used and the requirements of Section 2513.06 shall apply.

Tolerances

Newly fabricated units of temporary and permanent barrier rail shall be free from honeycomb, surface defects and surface spalling. Corner breaks and bottom spalls after shipping and placement shall not exceed 1.0 ft. <sup>2</sup> (0.1 m<sup>2</sup>) of total surface area, which includes the base.

Tolerances for concrete barrier shall be as follows:

<u>ITEM</u>	<u>PRECAST, PERMANENT or TEMPORARY</u>	<u>CAST-IN-PLACE or SLIP FORM INSTALLATION</u>
Length	± 3/4 inch (± 19 mm)	----
Width	± 1/4 inch (± 6 mm)	As required by contract Documents
Height	± 1/4 inch (± 6 mm)	As required by contract Documents
Horizontal Straightness (Sweep)	1/2-inch max, in 10 ft. (12 mm max. in 3 m)	3/4 inch max. in 10 ft. (19 mm max. in 3 m)
Top Straightness (Vertical)	1/4-inch max, in 10 ft. (6 mm max. in 3 m)	3/4 inch max. in 10 ft. (9 mm max. in 3 m)
Exposed Ends (Deviation from Square)	± 1/4 inch (± 6 mm)	3/4 inch max. in 10 ft. (19 mm max. in 3 m)

**NOTE:** Installation of permanent precast barrier shall include shimming and grouting such that adjoining match within 1/4 inch (6 mm) on the sides and top and the finished height is not less than required by the contract documents.