

# ICC-ES Evaluation Report

**ESR-2574\***

Issued September 1, 2009

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**DIVISION: 03—CONCRETE**  
**Section: 03310—Structural Concrete**  
**Section: 03313—Structural Lightweight Concrete**

**REPORT HOLDER:**

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**EVALUATION SUBJECT:****ELEMIX® TYPE XE AND GREY XE CONCRETE ADDITIVE****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)

**Properties evaluated:**

- Physical
- Mechanical
- Durability
- Combustibility

**2.0 USES**

Elemix® Type XE and Grey XE concrete additive is used as a partial replacement for conventional code-complying fine or coarse aggregate to reduce structural plain concrete or reinforced concrete unit weight. The concrete with the additive at, or below, the dosage noted in this report is considered noncombustible. The Elemix® Type XE and Grey XE concrete additive in concrete has been evaluated for use in non-fire-resistance-rated construction.

**3.0 DESCRIPTION**

Elemix® Type XE and Grey XE concrete additive consists of expanded polystyrene spheres with a closed cell inner structure containing air. Maximum sphere diameter is 0.25 inch (6.4 mm), bulk density is 1.40 lb/ft<sup>3</sup> (23.5 kg/m<sup>3</sup>) to 1.50 lb/ft<sup>3</sup> (25.2 kg/m<sup>3</sup>) and specific gravity is 0.042. The product is delivered in a dry state, and is available either in white (Type XE) or grey (Grey XE) colors. Storage of the product must be in the sealed packaging provided, or in covered bins or silos. The product is inert and does not have a limit on shelf life if stored in accordance with the manufacturer's recommendations.

**4.0 DESIGN AND INSTALLATION****4.1 Design:**

Concrete mixtures must be designed with the addition of Elemix® Type XE or Grey XE concrete additive as a replacement for fine or coarse aggregate. The maximum permitted replacement amount is 17.9 percent by volume of the concrete mix, which is equivalent to 12.7 lb/yd<sup>3</sup> (7.5 kg/m<sup>3</sup>) by weight. The Elemix® Type XE and Grey XE concrete additive has maximum 5.5 percent water absorption by weight in accordance with ASTM C 128. Plain or reinforced concrete systems containing the additive must be designed as structural lightweight concrete in accordance with the provisions of Chapters 16 and 19 of the IBC, and ACI 318-05.

**4.2 Installation:**

Elemix® Type XE and Grey XE concrete additive must be added to concrete batches by weight, in accordance with the manufacturer's instructions, at the end of the concrete batching process. Procedures in accordance with the manufacturer's instructions must be followed to obtain a properly and uniformly mixed concrete.

**5.0 CONDITIONS OF USE**

The Elemix® Type XE and Grey XE concrete additive described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** The Elemix® Type XE and Grey XE concrete additive must be added to the concrete batches in accordance with the manufacturer's instructions and this report.
- 5.2** Use of Elemix® Type XE and Grey XE additive in structural concrete must be approved by the project engineer or architect. Trial mixtures may be required to show strength and durability. Concrete quality must comply with Section 1905 of IBC.
- 5.3** Plain or reinforced concrete systems must be designed in accordance with the provisions of Chapter 16 and 19 of the IBC, and ACI 318-05. For structural design purposes, concrete containing Elemix® Type XE or Grey XE concrete additive must be considered as structural lightweight concrete.
- 5.4** In addition to the items noted in Section 16.1 of ASTM C 94, the delivery ticket from the ready-mix plant shall include the type and amount of lightweight synthetic particles (Elemix® Type XE or Grey XE) added to the concrete mixture.

**\*Revised May 2010**

- 5.5 For applications where computed deflections contain long-term deflections due to sustained loads, creep effects shall be considered in design, based on creep test results, which must be submitted to the code official for approval
- 5.6 For each project, the evaluation report holder must disclose to the registered design professional the amount of water-soluble chloride in the synthetic particles.
- 5.7 The Elemix<sup>®</sup> Type XE and Grey XE concrete additive is manufactured in Leetsdale, Pennsylvania, with follow-up inspections by Underwriters Laboratories.

## 6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES Acceptance Criteria for Structural Concrete with Lightweight Synthetic Particles (AC408), dated March 1, 2009; and quality documentation. The following tests were modified to measure the properties of concrete with the lightweight synthetic particles (Elemix<sup>®</sup> Type XE or Grey XE): ASTM C 136 (the required weight was reduced to give a sample of equivalent volume, and the sample did not require oven-

drying to reach constant mass); ASTM C 29 (the sample container was vibrated for 15 seconds during the filling step, and the sample did not require oven-drying to reach constant mass); ASTM C 128 (due to the density of the particles, the required weight was reduced to give a sample of equivalent volume, and the sample was oven-dried to constant mass at 160°F instead of 230°F); ASTM C 1524 (due to the sample density and buoyancy, the modifications included using a sample mass of 0.5 gram, glass wool to seal the particulate in the thimble, and a glass weight to prevent the sample-filled thimbles from floating); and ASTM C 567 (4-by-8-inch cylinders were used instead of 6-by-12-inch cylinders).

## 7.0 IDENTIFICATION

Each container of Elemix<sup>®</sup> Type XE and Grey XE concrete additive is identified with the manufacturing location (Leetsdale, Pennsylvania), the registered product trade name (Elemix<sup>®</sup> XE or Elemix<sup>®</sup> Grey XE Concrete Additive), the name or mark of the inspection agency (Underwriters Laboratories, Inc.) and the evaluation report number (ESR-2574).