

CAST IN PLACE 3" X 48" ADVANCED WARNING STRIP

SECTION 09614

DETECTABLE/TACTILE WARNING SURFACES

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SECTION 09614 DETECTABLE/TACTILE WARNING SURFACES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specifications Section, apply to this Section.

1.02 DESCRIPTION

- A. This Section specifies furnishing and installing Cast In Place Advanced Warning Strip where indicated. The Cast In Place Advanced Warning Strip is designed to provide distinct color contrast between the Cast In Place Detectable/Tactile Warning Surface and the adjacent walking surface. Not recommended for asphalt applications.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.
- B. Samples for Verification Purposes: Submit two (2) samples, minimum 3" x 6", of Cast In Place Advanced Warning Strips of the kind proposed for use.
- C. Shop drawings are required for products specified showing fabrication details, composite structural system, reinforcement flange spacing, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.
- D. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratory's to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Cast In Place Detectable/Tactile Warning Surface Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.
- E. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Detectable Warning Surface Tile and accessory as required.

1.04 QUALITY ASSURANCE

- A. Provide Cast In Place Advanced Warning Strips and accessories as produced by a single manufacturer. The manufacturer shall have a minimum of two (2) years experience in the manufacture of Advanced Warning Strips.
- B. Installer's Qualifications: Engage an experienced Installer certified in writing by tactile manufacturer as qualified for installation, who has successfully completed tile installations similar in material, design, and extent to that indicated for Project. Manufacturer's supervisor shall be present at all times during the installation of the Advanced Warning Strips.
- C. Vitrified Polymer Composite (VPC) Cast In Place Advanced Warning Strips shall be an epoxy polymer composition employing aluminum oxide particles in the tile face.
 - 1. Tile Dimensions: Nominal 3" by 48" by 0.1875 inches thick. Tiles shall be formed with 1/8" thick structural flanges which extend below the surface a minimum of 1".
 - 2. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
 - 3. Slip Resistance of Tile when tested by ASTM C 1028-96 the combined Wet and Dry Static Co-Efficients of Friction not to be less than 0.80 on top of domes and field area.
 - 4. Compressive Strength of Tile when tested by ASTM D 695-02a not to be less than 28,000 psi.
 - 5. Tensile Strength of Tile when tested by ASTM D 638-03 not to be less than 19,000 psi.
 - 6. Flexural Strength of Tile when tested by ASTM D 790-03 not to be less than 25,000 psi.
 - 7. Chemical Stain Resistance of Tile when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel

- fuel and motor oil.
8. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00 with reciprocating linear motion of $37 \pm$ cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.060 after 1000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample.
 9. Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.
 10. Fire Resistance of Tile when tested to ASTM E 84-05 flame spread shall be less than 15.
 11. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen.
 12. Accelerated Weathering of Tile when tested by ASTM G 155-05a for 3000 hours shall exhibit the following result – $\Delta E < 4.5$, as well as no deterioration, fading or chalking of surface of tile color No 33538
 13. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.
 14. Salt and Spray Performance of Tile when tested to ASTM B 117-03 not to show any deterioration or other defects after 200 hours of exposure.
 15. AASHTO HB-17 single wheel HS20-44 loading "Standard Specifications for Highways and Bridges". The Cast In Place Tile shall be mounted on a concrete platform with a 1/2" airspace at the underside of the tile top plate then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8000 lb individual wheel load and a 30% impact factor. The tile shall exhibit no visible damage at the maximum load of 10,400 lbs.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Cast In Place Advanced Warning Strips shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings and tile type shall be identified by part number.
- B. Cast In Place Advanced Warning Strips shall be delivered to location at building site for storage prior to installation.

1.06 SITE CONDITIONS

- A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F in spaces to receive Cast In Place Advanced Warning Strips for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.
- B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

1.07 GUARANTEE

- A. Cast In Place Advanced Warning Strips shall be guaranteed in writing for a period of five (5) years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and loosening of tiles.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The Vitrified Polymer Composite (VPC) Cast In Place Advanced Warning Strips specified is based on Armor-Tile manufactured by Engineered Plastics Inc. (800-682-2525). Existing engineered and field tested products, which have been in successful service for a period of three (3) years are subject to compliance with requirements, may be incorporated in the work and shall meet or exceed the specified test criteria and characteristics.

- B. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the tile. Tiles are also available in Light Grey (Federal Color No. 26280), Dark Grey (Federal Color No. 36118), Onyx Black (Federal Color No. 17038), Pearl White (Federal Color No. 37875), Brick Red (Federal Color No. 22144), Ocean Blue (Federal Color No. 15187), Ochre Yellow (Federal Color No. 23594), and Colonial Red (Federal Color No. 20109).

PART 3 EXECUTION

3.01 INSTALLATION

- A. During Cast In Place Advanced Warning Strip installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. Prior to placement of the Cast In Place Advanced Warning Strip system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.
- C. The specifications of the structural embedment flange anchoring system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.
- D. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 - 7 to permit solid placement of the Cast In Place Advanced Warning Strip system. An overly wet mix will cause the Cast In Place Advanced Warning Strip system to float, therefore under all conditions suitable weights such as a concrete block or sandbag (25 lb) shall be placed on each tile.
- E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large white rubber mallet are specific to the installation of the Cast In Place Advanced Warning Strip system.
- F. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.
- G. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.
- H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast In Place Advanced Warning Strip shall be tamped into the fresh concrete to ensure that the field level of tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes. The tolerance for elevation differences between tile and adjacent surface is 1/16".
- H. Immediately after tile placement, the tile elevation is to be checked to adjacent concrete. The tile elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates.
- I. While concrete is workable a steel trowel shall be used to float the concrete around the tiles perimeter flush to the field level of tile and a small radius edging tool (3/8") used around the perimeter of the tile to create a finished concrete edge.
- J. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.
- K. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets, suitable weight shall be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- L. If concrete bled on the tile a soft brass wire brush will clean the residue without damage to the tile surface.
- M. If desired, individual tiles can be bolted together using 1/4 inch or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to

ensure that the tile surface remains free of concrete during the installation process.

- N. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

3.02 CLEANING, PROTECTING AND MAINTENANCE

- A. Protect tiles against damage during construction period to comply with Tactile Tile manufacturer's specification.
- B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.
- C. Clean Tactile Tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Tactile Tile by method specified by Tactile Tile manufacturer.
- D. Comply with manufacturers maintenance manual for cleaning and maintaining tile surface and it is recommended to perform annual inspections for safety and tile integrity.

END OF SECTION