CAST IN PLACE DETECTABLE/TACTILE WARNING SURFACE TILE

Section 32 17 26

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 Detectable/Tactile Warning Surface tiles where indicated.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.

B. Samples for Verification Purposes: Submit one (1) 12" x 12" size tile sample.

C. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, fastener and anchor locations, 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 laboratories 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 Warning tile (or approved equal) as certified by a qualified independent testing laboratory.

E. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Warning tile and accessory as required.

1.04 QUALITY ASSURANCE

A. Provide Cast in Place Warning tiles and accessories as produced by a single manufacturer with a minimum of three (3) years' experience in the manufacturing of Cast in Place Warning tiles.

B. Installer's Qualifications: Engage an experienced installer certified in writing by Cast in Place Warning tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for the project.

C. Provide Cast in Place Warning tiles which are in compliance with the following standards (or most recent):

    a. Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA STANDARDS FOR ACCESSIBLE DESIGN, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).
    b. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Chapter 2,

Section 202 definition of ”Detectable Warning”. Section 11B-247 and 11B-705 “Detectable Warnings And Detectable Directional Texture”

D. Vitrified Polymer Composite (VPC) Cast in Place Warning tiles shall include: continuous strand woven fiberglass sheet matrix embedded within an epoxy polymer composition with a ultra-violet coating employing aluminum oxide particles in the truncated domes; “Armor Tile” as distributed under license by Engineered Plastics Inc. (1-800-682-2525) or equivalent product approved in writing during bidding process.

E. Dimensions: The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2” height, 0.9” base diameter, 0.45” top diameter spaced center-to-center 2.35” as measured on a diagonal and 1.67” as measured side by side in-line; except for tiles installed in California. Tiles installed in California shall incorporate an in-line pattern of truncated domes measuring nominal 0.2” height, 0.9” base diameter, 0.45” top diameter spaced center-to-center 2.35” as measured side by side in-line as required by the California Building Code, Title 24. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045” high, per square inch. Cast in Place Warning tiles shall be held within the following dimensions and tolerances:

Part No.	Size [in x in]
ADA-C-1212	12 x 12
ADA-C-2424	24 x 24
ADA-C-2436	24 x 36
ADA-C-2448	24 x 48
ADA-C-2460	24 x 60
ADA-C-3648W	36 x 48
ADA-C-3660W	36 x 60
Note: Dimensional tolerances ± 5%	

F. Product Data: Vitrified Polymer Composite (VPC) Cast in Place Warning tiles shall meet or exceed the following test criteria:

ASTM Reference	Test Description	Value
ASTM D 695	Compressive Strength	≥ 28,000 psi
ASTM D 790	Flexural Strength	≥ 25,000 psi
ASTM D 638	Tensile Strength	≥ 19,000 psi
ASTM D 5420	Impact Resistance	≥ 550 in-lbf/in
ASTM D 696	Coefficient of Thermal Expansion	$2.78 \times 10^{-6}/^{o}F$

ASTM C 1028	Static Coefficient of Friction	≥ 0.80
ASTM E 84	Flame Spread Index	≤ 25
ASTM D 570	Water Absorption	≤ 0.05%
ASTM C 501	Abrasive Wear Index Iw	≥ 500
ASTM D 2486	Abrasive Scrub Test	≤ 0.06
ASTM B 117	Salt Spray (300 hrs)	No Failure
ASTM D 1037	Accelerated Aging Cycle Testing	No Failure
ASTM D 543	Chemical Resistance	No Failure
ASTM G 155	Accelerated Weathering	ΔE < 3

1.05 DELIVERY, STORAGE AND HANDLING

A. Cast in Place Warning tiles shall be suitably packaged or crated to prevent damage in shipment and handling. Finished surfaces shall be protected by sturdy plastic wrappings to protect tile from concrete residue during installation and tile type shall be identified by part number.

B. Cast in Place Warning tiles 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 41°F in spaces to receive Cast in Place Warning tiles 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 MANUFACTURER'S WARRANTY

A. Cast in Place Warning tile shall be warranted in writing for a period of five (5) years from date of substantial completion. The guarantee includes factory defects, breakage, and deformation.

1.08 INSTALLATION WARRANTY

A. Cast in Place Warning tile installation shall be warranted in writing for a period of two (2) years. Alternate products approved during the tendering process must be guaranteed for an additional three (3) years. Product must be guaranteed from defective work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Vitrified Polymer Composite (VPC) Cast in Place Detectable/Tactile Warning Surface tile specified is based on Armor Tile as distributed under license by Engineered Plastics Inc. (1-800-682-2525). 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: Color shall be homogeneous throughout the tile.

Color	Federal Color No.
Federal Yellow	33538
Light Gray	26280
Dark Gray	36118
Onyx Black	17038
Pearl White	37835
Brick Red	22144
Ocean Blue	15817
Ochre Yellow	23594
Colonial Red (Brown)	20109

PART 3 EXECUTION

3.01 INSTALLATION

A. During Cast in Place Detectable/Tactile Warning Surface tile 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 Warning tile 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 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 inches to permit solid placement of the Cast in Place

Warning tile system. An overly wet mix may cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or 25 lb sandbags 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 non-marring rubber mallet are specific to the installation of the Cast in Place Warning tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.

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 Warning tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the 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 (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

I. In cold weather climates it is recommended that the Cast In Place Warning tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.

J. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.

K. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.

L. 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.

M. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.

N. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete

bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

O. If desired, individual tiles can be bolted together using 1/4" 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.

3.02 CLEANING, PROTECTING AND MAINTENANCE

A. Protect tiles against damage during construction period to comply with Warning tile manufacturer's specification.

B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.

C. Clean 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 tile by method specified by tile manufacturer.

D. Comply with manufacturer's maintenance manual for cleaning and maintaining tile surface and it is recommended to perform annual inspections for safety and integrity.

END OF SECTION