TRIFORCE

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Titan America

Pennsuco Cement Plant

TriForce™ Cement Technical Data Sheet

TriForce™ cement, from the Titan America Pennsuco cement plant, is formulated with portland cement, limestone, and a natural pozzolan for high performance at a low CO_2 footprint. TriForce cement is designed for the concrete industry, offering low water demand, fast strength development, and the ability to batch SCMs at the concrete plant.

Features

- Meets ASTM C595 and AASHTO M240
- Low water demand
- Fast setting
- Fast strength development
- Excellent durability
- Low heat of hydration
- Low embodied CO_2
- Highly consistent (not a by-product)

Approvals - Codes & Specifications

TriForce cement can substitute Type I/II and IL cement. Since TriForce Cement contains pozzolan while maintaining a strength development profile similar to that of Type I/II and IL, TriForce Cement may provide a range of options depending on mix design requirements, including:

- Reduce or eliminate SCM addition at concrete batch plant
- Maintain SCM addition at concrete batch plant for even greater durability and CO_2 reduction

Sustainability

The embodied CO2 of TriForce Cement from the Pennsuco Cement Plant is 36% lower compared to the industry-wide average for Type I/II, according to a third-party validated EPD. The higher durability of concrete made with TriForce cement may result in longer service life, leading to additional life-cycle CO_2 savings.

Benefits

- Reduced concrete CO_2 footprint
- Improved durability associated with SCMs while maintaining setting and strength development associated with portland cement
- Simplified SCM sourcing
- Continued ability to add SCMs at the concrete batch plant

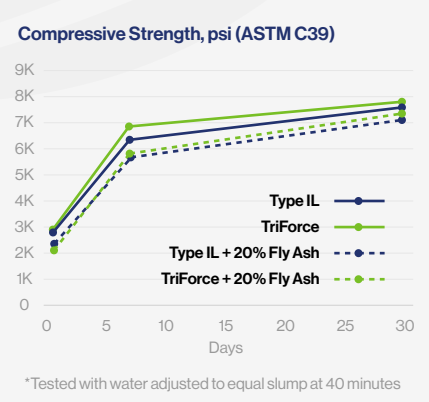
Usage

The use of TriForce cement is allowed in the following:

- ACI 318 Building Code Requirements for Structural Concrete
- ACI 301 Specifications for Concrete Construction
- ACI 350.5 Specifications for Environmental Concrete Structures
- ASTM C94 Standard Specification for Ready Mixed Concrete
- ASTM C90 Standard Specification for Load bearing Concrete Masonry Units
- Florida Building Code
- FL Department of Transportation
- US Army Corps of Engineers
- Masterspec®

Concrete Performance

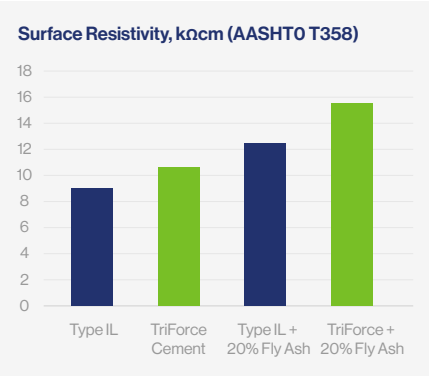
TriForce cement develops a strength profile similar to that of Type I/II and IL cements, both with and without additional SCMs. The low water demand of TriForce Cement contributes to higher performance.



*Tested with water adjusted to equal slump at 40 minutes

Durability

TriForce cement results in higher surface resistivity, similar to the inclusion of fly ash, indicating higher resistance to the penetration of water, chlorides, sulfates, and other aggressive chemicals. The combination of fly ash and TriForce Cement results in further improvements in surface resistivity.



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Concrete Mix Design

A concrete testing program is recommended to optimize and validate performance, including field mock-ups where relevant. The following other changes should be considered when adjusting concrete mix designs:

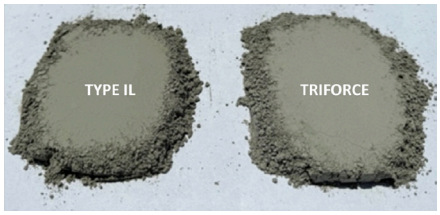
- Pozzolan content may eliminate the need for SCMs addition during concrete batching; however, TriForce Cement is compatible with further SCM added during concrete batching.
- Low water demand and good slump retention may enable reduced water content, resulting in improved hardened concrete performance.
- Routine adjustments to air entraining and other admixtures may be needed.
- Lower density of TriForce Cement results in less aggregate needed to achieve yield.
- Performance is further enhanced at 56-days and beyond due to ongoing pozzolanic reactions.

Natural Pozzolan

- TriForce cement contains a high quality, highly reactive natural pozzolan meeting the requirements of ASTM C618 Class N. This material is a volcanic ash mined from a consistent deposit in Greece. It is interground during the cement manufacturing process.

Color

- Differences in color are typically similar or less than other routine changes in materials and mix design.

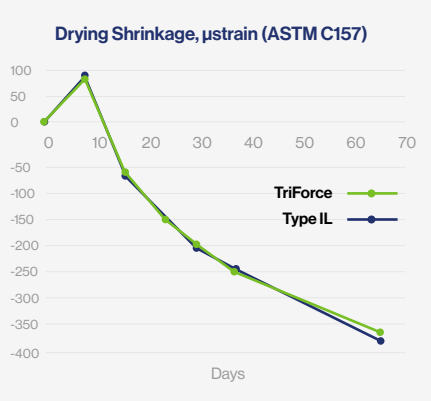


Compatibility

TriForce cement is compatible with other cementitious materials, chemical admixtures, and aggregates meeting ASTM requirements for use in concrete. TriForce Cement is not compatible with naphthalene-sulfonate-based water reducers.

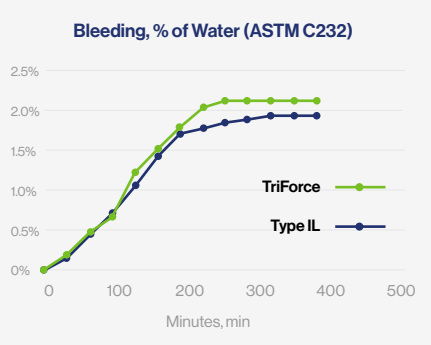
Shrinkage

Concrete shrinkage is similar for TriForce Cement, I/II & IL.



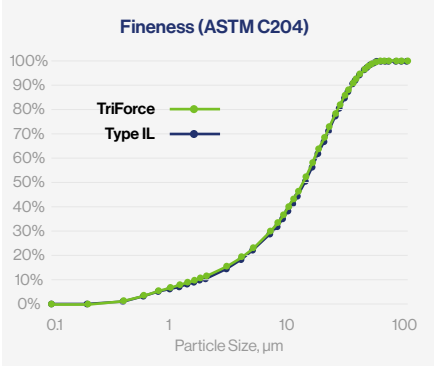
Placing & finishing

Concrete with TriForce cement has similar placing and finishing characteristics as with Type IL and I/II, including setting time and bleeding.



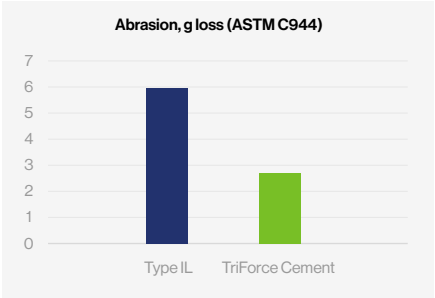
Fineness

TriForce cement has similar particle size distribution as Type I/II and IL. Per ASTM C204, Blaine should not be used to compare different cement types.



Abrasion

TriForce cement has equivalent or higher abrasion resistance when compared to Type I/II and IL cements.



Additional Resources

For more information, including Mill Certificates and Safety Data Sheets (SDS), contact your sales or technical service representative or visit TitanAmerica.com

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