TRIFORCE

DURABLE. SUSTAINABLE. RESILIENT.

Frequently Asked Questions

TriForce™ Cement

How does TriForce cement contribute to sustainability?

TriForce™ cement integrates natural pozzolan, reducing its embodied CO_2 by approximately 36% compared to traditional Type I/II cements according to a third-party validated EPD. TriForce's enhanced durability may extend the service life of structures, contributing to additional lifecycle CO_2 savings.

Does TriForce cement improve the durability of concrete against water and chemical damage?

Yes, TriForce cement enhances durability by increasing surface resistivity, which reduces water penetration and protects against chlorides, sulfates, and other aggressive chemicals. Similar to fly ash, TriForce improves resistance to these elements, and when combined with fly ash, it provides even greater protection, making it an excellent choice for resilient concrete structures.

What is the advantage of adding pozzolan at the cement mill versus at the concrete batch plant?

Natural pozzolan is a mined material that requires grinding to perform as a cementitious material. The cement grinding process enhances natural pozzolan fineness and reactivity, leading to higher performance. Additional SCMs can be used at the batch plant, incorporating pozzolan during cement manufacturing optimizes the combined system.

What is the water demand for TriForce cement?

Water demand for TriForce cement is generally similar to that of Type I/II cements based on recent test results. Users are advised to conduct trial mixes and adjust admixture dosages as needed.

Is TriForce cement compatible with admixtures?

TriForce cement is compatible with a range of chemical admixtures, including air-entraining agents, water reducers, and high-range water reducers. TriForce is not compatible with naphthalene-sulfonatebased water reducers. It is recommended that users work in accordance with the admixture manufacturer's recommendations.

Can TriForce cement be used with supplementary cementitious materials (SCMs) like fly ash?

Yes, TriForce cement is suitable for use with additional SCMs, such as fly ash, slag, or silica fume. The natural pozzolan content in TriForce may allow for increased total SCM content when combined with further SCMs at the concrete plant, potentially enhancing durability and reducing the carbon footprint of the mix. Adjustments to sand content, water-cement ratio, and admixtures may be required to ensure optimal performance. Users are advised to conduct thorough testing to validate the mix design.

Is TriForce cement temperature-sensitive?

TriForce cement requires adherence to industry-standard protocols for hot and cold weather concreting. In cold conditions, accelerating admixtures and controlled curing may be necessary to ensure hydration. Conversely, retarding admixtures may be required in hot conditions to manage setting times. Users are encouraged to follow ACI 305 (Hot Weather Concreting) and ACI 306 (Cold Weather Concreting) for best practices.

What is the alkali content of TriForce?

The alkali content of portland cement and pozzolan can have differing impacts on Alkali-Silica Reaction (ASR). The pozzolan can mitigate ASR even though the alkali content of the pozzolan is typically higher than that of cement. ASTM C595 mandates that the alkali content of the portland cement and pozzolan be reported separately on the mill certificate for TriForce. This should be considered when evaluating alkali limits. Refer to ASTM C1778 for additional information.

In which applications is TriForce cement approved for use?

TriForce cement complies with multiple industry standards and is suitable for various structural and environmental applications. It is approved under the following codes and specifications:

- 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 Loadbearing Concrete Masonry Units
- Florida Building Code
- Florida Department of Transportation (FDOT)
- U.S. Army Corps of Engineers Standards
- MasterSpec®

Are there specific precautions for handling and storing TriForce cement?

Yes, TriForce cement must be stored in a dry, cool environment, protected from moisture to avoid premature hydration. Users are required to follow safe handling practices as detailed in the Safety Data Sheet (SDS). The SDS is available at www.titanamerica.com or through Titan Florida Technical Services.

How does Type IT cement affect concrete shrinkage and color?

Concrete shrinkage with TriForce is generally comparable to that of Type I/II and IL cements. Mix design adjustments may be needed based on specific project requirements. TriForce also offers similar color consistency to Type IL. Variations in concrete color are possible due to differences in raw materials and mix design.

Does TriForce mitigate ASR?

The natural pozzolan content in TriForce can help mitigate ASR, but the extent depends on the reactivity of the aggregates and exposure conditions.

How does the Blaine compare to Type I/II and Type IL?	Blaine fineness should not be used to compare different cement types such as TriForce cement, IL, and I/II. Blaine testing is an indirect measure of fineness for conventional portland cements. ASTM C204 cautions against using blaine for cross-com pa risen.
What is the Bogue composition (C3A, C3S, C2S, C4AF) of TriForce cement?	Bogue calculations and limits are specific to ASTM C150. These values are not relevant for ASTM C595 cements like TriForce. ASTM C595 relies on performance testing instead of Bogue value limits for heat of hydration and sulfate resistance.
How much natural pozzolan and limestone are in TriForce cement?	ASTM C595 requires the target percentages of limestone and pozzolan to be listed in parentheses in the Type designation, e.g., Type IT(XL)(YP). Refer to the mill certificate for the exact amounts.
Is the limestone and pozzolan interground or blended?	TriForce Cement uses an interground method. ASTM C595 permits both blending and intergrinding for blended cements.
Do maximum SCM limits include the natural pozzolan in TriForce?	When relevant, the natural pozzolan in TriForce is included in the total SCM content. Maximum SCM limits often relate to concerns about freeze-thaw performance; testing for these properties is advised before exceeding standard limits.
What is a natural pozzolan, and why does the mill certificate state "pozzolan"?	A natural pozzolan is an alumina-silicate material that reacts with portland cement, contributing to strength and durability. This material is a natural volcanic ash mined from a consistent deposit in Greece meeting the requirements of ASTM C618 Class N. The mill certificate uses "pozzolan" as a general term, following ASTM C595 standards.
What is the difference between portland cement, blended cement, and hydraulic cement?	ASTM C595 defines "blended hydraulic cement" as a mix containing portland cement, pozzolan and/or slag, and up to 15% limestone. TriForce is considered a blended cement, but contains portland cement.

Titan Florida LLC
11000 NW 121st Way
Medley, FL 33178

941-650-3770
www.titanamerica.com