



Submittal #AB13:

**IMPROVING SUSTAINABILITY OF CONCRETE INFRASTRUCTURE
THROUGH USE OF LOW-CARBON CEMENTS: CURRENT STATE AND
RESEARCH NEEDS**

Abstract:

Given that we are facing increasing number of adverse climatic events that have potential to severely deteriorate and damage our infrastructure, it is undeniable that Portland cement and concrete can play a vital role in improving the resiliency of our infrastructure, while achieving this in a sustainable manner. Largely driven by the recognition of the carbon intensive nature of cement production process and the need to address this important environmental issue to improve sustainability, the Portland Cement Association (PCA) has developed a roadmap to achieve carbon neutrality across the cement and concrete value chain by 2050. Among the strategies to address these needs, the cement industry is developing solutions that are focused on reducing the clinker factor in modern cements, while trying to achieve performance characteristics that are on par with traditional Portland cements. Portland Limestone Cement (PLC), Type IL cement (ASTM C595, AASHTO M240) is a result of this endeavor, wherein the clinker content of the cement can be reduced by as much as 15%, by replacing it with finely ground limestone. Also, increasingly blended cements such as Type IP, Type IS, Type IT and LC3 cements are also gaining market recognition as a lower carbon alternatives. The concrete industry has performed product-development testing and field application evaluations to measure Type IL performance attributes, which indicate use of Type IL cement has similar fresh and hardened concrete performance properties compared to traditional Type I/II cements, at specified w/b ratios. However, the robustness of these mixtures in field and specific attributes of concrete made with Type IL cement such as wear resistance, plastic shrinkage, and compatibility with other conventional and emerging pozzolans as well as structural reinforcement materials remains uncertain and need additional research. This presentation will highlight the current state-of-the-practice of Type IL cement, its key performance characteristics and specific research needs where additional knowledge is needed to highlight the impact on durability and therefore sustainability and/or resiliency.

Speaker:

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Bio:

Prasad Rangaraju is a Professor of Civil Engineering at Clemson University, with research interests in material science and engineering of cement and concrete materials, with specific interest in developing sustainable low-carbon binders, improving durability of cementitious systems, and development of HPC and UHPC mixtures among others. He is a fellow of the ACI and member of several ACI/ASTM committees and has served on technical panels with FHWA, NCHRP, DOE, AAAS, FAA, NSF, and Industry. He is a registered PE in MN.