

LOAD TESTING OF A NONPROPRIETARY UHPC AND HPC SUPERSTRUCTURE

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1 Abstract

Ultra-high performance concrete (UHPC) provides superior properties compared to conventional concretes. However, due to the high cost of materials and lack of familiarity and design codes, the use of UHPC is still limited in structural applications. Research at New Mexico State University (NMSU) has developed nonproprietary UHPC using materials local to New Mexico, USA. The mixture proportions reduce costs while improving sustainability and maintaining the advanced mechanical and durability properties characteristic of UHPC. The superstructure of Bridge 9706, a two-span bridge near Anthony, New Mexico, was recently constructed to incorporate one span using nonproprietary UHPC and one span using high-performance concrete (HPC). To investigate the behavior of the bridge, load tests were conducted. External sensors were attached to the girders of both spans to measure strains during testing. Additionally, digital image correlation (DIC) was used on the sides of the exterior girders to measure deflections and strains. Loaded trucks were used to apply a load to the bridge through different load paths and configurations. Results of the load tests are presented and the behavior of the UHPC and HPC span under similar load conditions are compared.

Keywords: load test; Ultra high performance concrete; High-performance concrete; Digital image correlation; strain; displacement.

2 Introduction

Ultra-high performance concrete (UHPC) is an advanced material that provides high compressive strength, good durability, and ductility. Due to the

addition of the steel fibers, UHPC has increased post-cracking strength which allows for the reduction or elimination of mild steel reinforcement in structural members. The widespread use of UHPC is limited due to the high costs and the lack of