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PCI Technical BULLETIN

Transfer and Development Length in Upper Strands

SUMMARY

Industry research has raised questions as to whether prestressing strands located near the as-cast upper surfaces of precast concrete elements may exhibit greater transfer and development lengths than may have been assumed in design calculations. The effect was observed primarily with high flow concrete mixes (such as SCC) and with strands located within eight inches of the as-cast upper surfaces.

BACKGROUND

The research in question, which is described in the May/June issue of the PCI Journal (see <http://www.pci.org/pdf/publications/journal/Peterman.pdf>), involved measurement of strand slip following detensioning of prestressed concrete elements. Some of these measurements implied that transfer lengths for prestressing strands located within the upper region (as-cast) of a precast concrete element may be greater than those for strands located lower in the element, and possibly greater than calculated transfer lengths. The strand used in this research was pre-qualified using the large block pullout test to eliminate any effects due to bond properties of the strand.

Greater transfer lengths imply greater development lengths than may have been assumed in design calculations. While this phenomenon has been observed in both conventional concrete and SCC, it appears to be more pronounced in SCC. PCI is unaware of any case where this effect has led to failure of precast elements or systems.

RECOMMENDATIONS

PCI producers are advised to examine strand slip for prestressing strands located within the upper region (as-cast) of their products. Attention should be focused on products such as horizontally cast columns, horizontally cast spandrels, wall panels, thin slabs, piles, and on cantilever elements and other designs where increased development lengths in the uppermost (as-cast) strands could adversely impact expected performance. If excessive slip in uppermost (as-cast) strands relative to other strands is noted, the potential effect on the performance of the design should be evaluated.

Technical contact:

PCI will continue to monitor this situation. Questions or comments may be directed to:

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