Perspectives
ACPA Positions and Perspectives on Key Issues

Portland-Limestone Cements for Pavement Applications

(May 11, 2020) The American Concrete Pavement Association (ACPA) supports and encourages the acceptance and use of portland-limestone cement (PLC), known as Type IL, as the primary cementitious material in concrete mixtures for paving applications when its use provides economic and environmental benefits.

Background – PLC is an innovative cement that contains between 5% and 15% finely ground limestone, which can help reduce the carbon footprint of cement production by about 10% relative to ordinary portland cement (OPC). PLC's are produced and optimized to give equivalent performance to OPC's in both plastic and hardened concrete properties, and they generally do not require any modification to mix designs. PLC is generally available in the United States, although may be limited in some regions.

PLC was originally produced and sold in accordance with ASTM C1157, but since is now accepted in the blended cement specifications of both AASHTO M 240 and ASTM C595 under the designation of Type IL. Figure 1 shows PLC acceptance by state departments of transportation and the Federal Aviation Administration as of April 2020 (after Innis 2018).

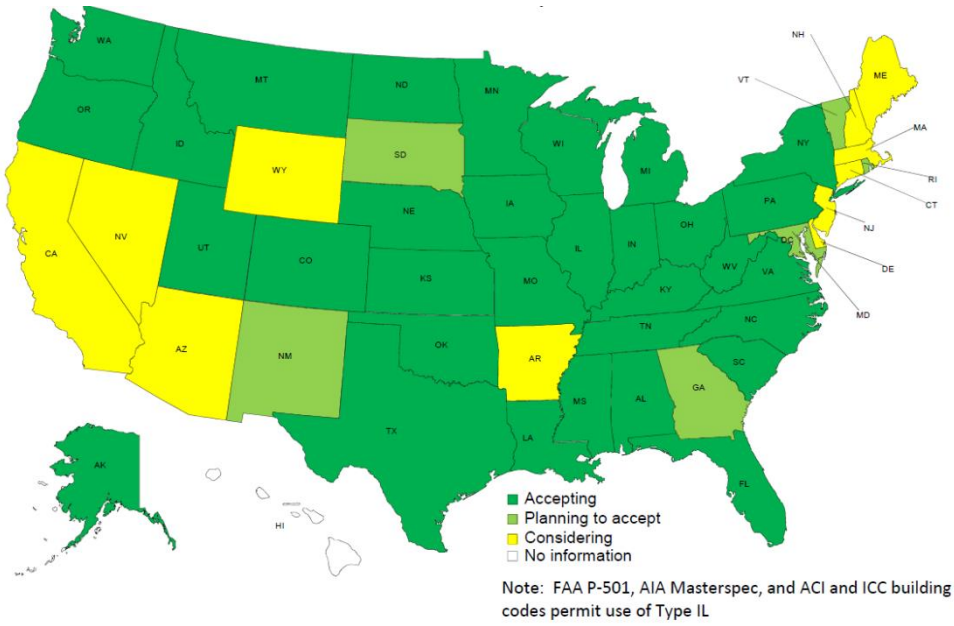

Figure 1 Acceptance of PLC by state DOTs and the FAA as of 2020 (after Innis 2018).
See https://www.cement.org/cement-concrete-applications/cement-and-concrete-basics-faqs

Numerous studies have investigated the performance of limestone cements in concrete (for example, Hooton et al. 2007, Thomas et al. 2010, and Tennis et al. 2011). The primary benefit of comparable performance is that PLC can replace OPC and still be used with other supplementary cementitious materials, thus further reducing the environmental impact of producing concrete (Innis 2018).

PLC has been widely used in Europe since the 1960's but was not commercially produced in the U.S. until 2005. The first U.S. paving application took place in Colorado in 2007. Since this first section, over 800 lane miles of concrete pavement has been placed in Colorado alone (Innis 2018). Concrete made using PLC is now the standard for paving mixtures in Colorado and there have been no known differences in performance of pavements placed with concrete containing PLC versus OPC. Other states also have built projects, including over 100 miles in Utah and Oklahoma (Innis 2018).

Summary – Long-term, the goal for all state agencies should be to actively implement innovations for concrete paving applications. The Federal Highway Administration's Sustainable Pavements Technical Working Group (SPTWG) encourages the application of PLC as part of a DOT's implementation of innovative technology to produce more sustainable concrete pavements (Van Dam et al 2015). Per FHWA, the purpose of the SPTWG is to provide technical input to the FHWA specific to sustainability and environmental aspects of pavements and materials and to serve as a forum for information sharing and exchange. The members of the SPTWG reflect a diverse group of stakeholders from public and private industry who are experts in the fields of pavements, environment, optimization, and economics.

ACPA encourages state DOTs and other agencies to allow PLC as a paving contractor option on concrete paving projects and encourages contractors to apply the option where and when it makes sense economically and environmentally. The environmental benefits on the material production side of PLC relative to OPC are evident. Agencies that are interested in the application of PLCs for paving mixtures should contact their local ACPA representative and contractors for information on local availability and cost.

References

1. Hooton, R.D., Nokken, M., and Thomas, M.D.A. 2007. "Portland–Limestone Cement: State of the Art Report and Gap Analysis for CSA A 3000." Cement Association of Canada, sn 3053, 59 pages.
2. Innis, A. 2018. *Portland-Limestone Cement after 10 Years in the Field*. "Moving Advancements into Practice" (MAP Brief). National Concrete Pavement Technology Center, Iowa State University, Ames, IA. http://www.cproadmap.org/publications/MAPbriefOctober2018.pdf
3. Tennis, P.D., Thomas, M.D.A., and Weiss, W.J. 2011. "State of-the-Art Report on the Use of Limestone in Cements at Levels of up to 15%." Portland Cement Association, PCA R&D SN3148, 78 pages.
4. Thomas, M.D.A., and Hooton, R.D., 2010. "The Durability of Concrete Produced with Portland Limestone Cement: Canadian Studies." Portland Cement Association, PCA R&D SN3142, 28 pages.
5. Van Dam, T.J., Harvey, J.T., Muench, S.T., Smith, K.D., Snyder, M.B., Al-Qadi, I.L., Ozer, H., Meijer, J., Ram, P.V., Roesler, J.R., Kendall, A. 2015. "Towards Sustainable Pavement Systems: A Reference Document." Federal Highway Administration. FHWA-HIF-15-002. Washington, D.C. https://www.fhwa.dot.gov/pavement/sustainability/hif15002/hif15002.pdf