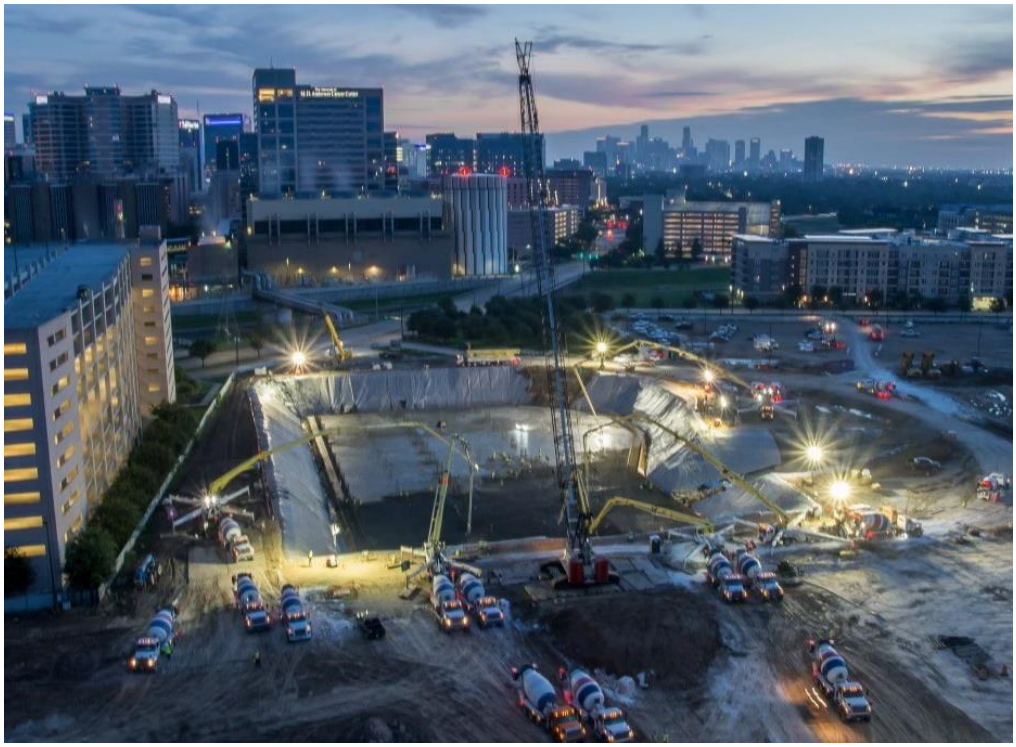
SERVICE PROFILE

Mass Concrete Consulting

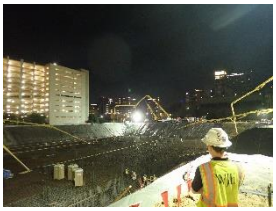


- Thermal control plans
- Concrete mixture design
- Mass concrete specification review
- Performance-based temperature limit development
- Post-cooling plans (i.e., cooling pipes)
- Delayed ettringite formation evaluation

Mass concrete can generate substantial heat during the initial hydration of the cementitious material. These high internal temperatures can later cause delayed ettringite formation (DEF), a condition that can cause expansion and cracking of the hardened concrete. In addition, thermal cracks can occur in early-age concrete as the surface of the concrete element cools while the temperature of the core of the element remains relatively high. WJE engineers have extensive experience assisting owners, contractors, and materials suppliers with their mass concrete projects.

Mass concrete specifications typically limit the maximum internal temperature and limit the temperature difference between the surface and the interior core of the element. The maximum concrete temperature is typically limited to mitigate the potential for DEF, which can later cause cracking in the concrete after it is placed into service. The maximum temperature differential difference is typically limited to minimize the risk of early-age thermal cracking.

WJE engineers generate project-specific thermal control plans based on thermal analysis of the concrete elements. Our engineers can assist contractors with RFIs related to mass concrete specifications. In addition, WJE can develop low-heat concrete mixtures to help ready-mix suppliers and contractors minimize the costs of precooling the concrete. If necessary, post-cooling plans can also be provided to accelerate construction schedules.



From 8-foot-diameter columns to 9,000-cubic-yard placements, WJE provides a wide range of consulting services for projects with mass concrete elements.

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

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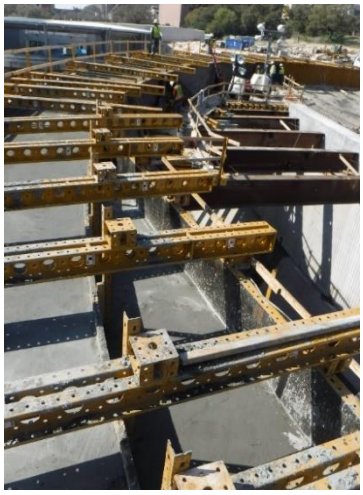

REPRESENTATIVE PROJECTS

- The Allen Hotel - Houston, TX: Thermal control plan for 10-foot-thick mass concrete pile cap for thirty-four-story tower
- SHINE Medical Isotope Production Facility - Janesville, WI: Thermal control plans for cast-in-place mass concrete foundation, slab-on-ground, and wall elements for medical facility
- Hanover Republic Square - Austin, TX: Thermal control plan for mass concrete foundation for forty-four-story tower
- Satilla River Bridge - Hortense, GA: Thermal control plan for mass concrete bent cap
- Petit Caillou Lock Structure - Chauvin, LA: Thermal control plan for mass concrete base slab
- Waterloo Park Artwork Infrastructure - Austin, TX: Thermal control plan for architectural mass concrete curved beam
- Chemical Plant - Gulf Coast Region: Evaluation of delayed ettringite formation (DEF) due to elevated internal temperatures
- TMC3 Detention Tank - Houston, TX: Thermal control plan for 9,000-cubic-yard mat foundation
- CTA West Station, Los Angeles International Airport - Los Angeles, CA: Thermal control plan and cooling pipe design for mass concrete parking structure elements
- Brushy Creek Regional Wastewater System - Round Rock, TX: Thermal control plan and concrete mixture development for mass concrete base slabs and walls
- Northeast Water Purification Plant Expansion - Humble, TX: Thermal control plan and construction-period consulting services for mass concrete base slab
- SoNo Collection - Norwalk, CT: Thermal control plan for mass concrete foundation elements
- Tug River Bridge - Matewan, WV: Thermal control plan for mass concrete rail bridge transfer beams
- University of Arkansas Medical Sciences Radiology and Oncology Center - Little Rock, AR: Thermal control plan for multiple mass concrete elements

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