



Transportation

Ports & Maritime

Client
Carnival Corporation

Location
Grand Turk, Turks and Caicos,
British West Indies

Cruise Pier Engineering and Design

CH2M HILL was selected to design an advanced, multi-stage cruise pier in Grand Turk, Turks and Caicos, British West Indies, for a new cruise port in the Caribbean. The \$12.1 million USD project, capable of supporting the daily berthing requirements of the world's largest cruise ships, was completed in approximately 18 months and the new pier accepted its first cruise ship in February 2006. The fendering and mooring systems are designed for a Spirit Class vessel: 76,600 MT (LOA = 960 ft, Draft = 29 ft).

The port of call pier is a pile-supported concrete and steel structure. The design approach and construction methods used meet the needs for resisting hurricane generated wind and wave loads resulting from a threshold Category 5 hurricane—the first Caribbean pier built to withstand these thresholds. A separate timber dock was designed and constructed for the tour boats.

Construction began with dredging approximately 450,000 cubic yards of material to provide a footprint of adequate depth for the pier and ship berthing. One of the world's most spectacular reefs is located on the edge of a 7,000-foot deep cut into the Grand Turk passage. CH2M HILL coordinated complex, international environmental issues to identify a location where the least amount of required dredging could take place with minimal impact to the coral reef to complete dredging in a 30-day period.

Design and construction complications included variable rock foundation strata that were inconsistent in depth, thickness, and consistency. The pier construction included driving steel pipe piles into the sea bed penetrating rock and encased drilling of the pipe piles for clean out and filling with concrete or sand and maximizing the use of pre-cast concrete elements because of the short supply of ready-mix concrete on the island.

Strategically located piles were drilled into the bedrock beneath the pile tip to place reinforcing steel bars and in situ concrete in the resulting cavity to form an anchor (rock socket). The out-of-water construction of the pier deck included placing in situ concrete and pre-cast concrete elements on the top of the concrete-filled pipe piles. The new pier is protected from corrosion by using sacrificial cathodic anodes and marine grade coating for the steel pipe piles, and by using high-quality concrete and adequate concrete cover of steel reinforcement to meet the design life requirements.