Chapter 11
Mass Concrete and Roller Compacted Concrete

11-1. General

a. This section covers the use of architectural concrete in conjunction with the production of mass concrete and roller-compacted concrete (RCC). In recent years, the U.S. Army Corps of Engineers has been more responsive to communities' desires to provide a more pleasing appearance to concrete structures.

b. The architectural treatment of concrete may become an important issue when the structure is located in a populated area or in a tourist site. The appearance of mass concrete structures can be improved with minimum or no additional costs to the project. A little imagination and attention to details are all that are required to achieve an attractive appearance. The following examples illustrate a few possibilities which have been used successfully in converting otherwise plain and dull structures into interesting structures.

11-2. Possible Approaches

Three structures will be highlighted here as examples of possible approaches to the use of architectural concrete.

a. Example 1, architectural concrete, New Orleans floodwall

(1) Around certain areas of the city, it was desirable to make the floodwall more visually pleasing. In coordination with community representatives, both general arch designs and specific pictorial designs were selected for inclusion into the walls at specific locations.

(2) The arch design required no additional structural design. The original design thickness of the wall was maintained as the reusable forms added concrete to surfaces exposed to the general public, providing the arch effect.

(3) Typical sandblasting procedures were followed to give the central arch portion an exposed aggregate appearance, while other sections were painted, providing more variety to the simple design. Figures 11-1 and 11-2 show arch designs with sandblasting to expose aggregate and the painting of arches.

(4) Near many of the street entrances through the flood wall, special designs depicting artistic scenes were captured in the concrete surfaces using forms incorporating fractured rib. Figure 11-3 illustrates incorporation of artistic design.

b. Example 2, exposed aggregate RCC at Addicks and Barker Dam

(1) Sections of Addicks and Barker Dam near Houston, TX were constructed under the supervision of the Galveston District of the U.S. Army Corps of Engineers. An 0.2-m-(8-in.-) thick RCC was placed on the ends of each dam to protect the uncontrolled spillway sections from erosion and unraveling in the event of severe flooding.

(2) Exposed aggregate surface treatment was given the RCC in an attempt to make the materials more aesthetically acceptable to the residential and commercial developments along these highly-developed ends of the dams.

(3) Various surface treatments were tried during the construction of the test section to obtain a visually suitable appearance with minimal cost. Additional trials were attempted during initial placements in areas not readily visible by the public. It was found that a high pressure wash 30 min to 2 hr after concrete placement gave a pleasing exposed aggregate appearance at an additional cost of \$2.22/m^2 (\$1.86/yd^2). Areas requiring exposed aggregate surface treatments required that within 2 hr following final compaction of the RCC on the slopes of the embankments, portions of the surfaces of the upstream and downstream slopes would be washed in a manner approved by the Contracting Officer to expose the coarse aggregate of the mixture. Washing was accomplished with a hand-held hose having an adjustable nozzle. The surface treatment would not begin for at least 1 hr following placement of the RCC, unless otherwise approved by the Contracting Officer, and the pressure and angle of impact of the water spray were controlled and adjusted as needed to remove the fines from the RCC surface without

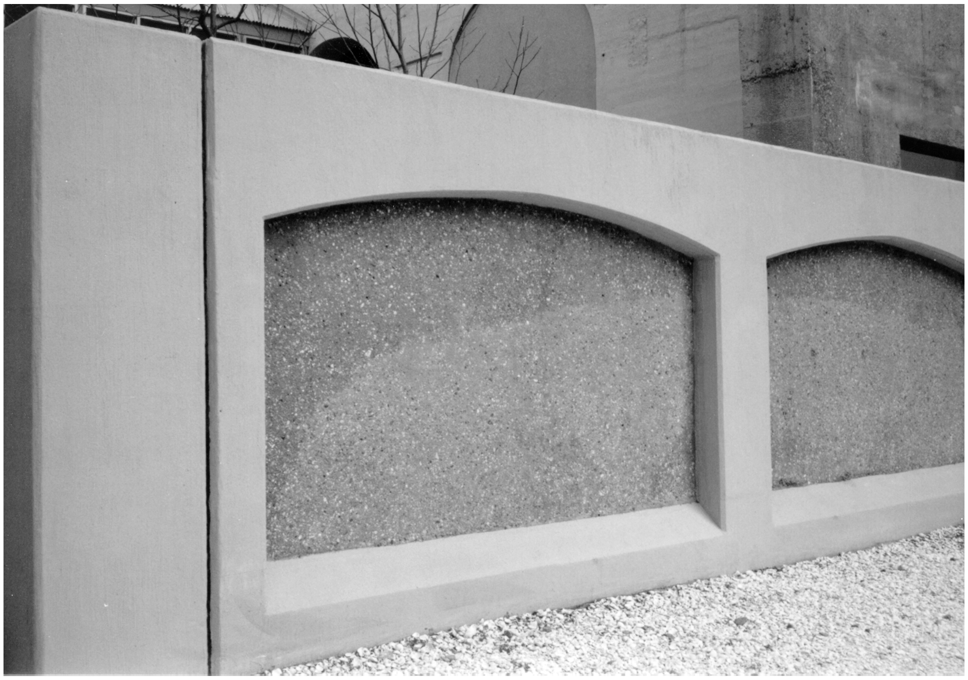

Figure 11-1. Architectural arch design in flood wall

Figure 11-2. Painting of concrete highlights arches in floodwall

excessive erosion of the surface and/or dislodging and removal of the coarse aggregate. The Contractor exercised care to avoid previously exposed aggregate surface to the extent practicable and to avoid previously exposed aggregate surfaces on the lower portions of the slope from being contaminated with cementitious fines washed from higher portions of the slope. Care was also exercised to keep wash water from flowing onto

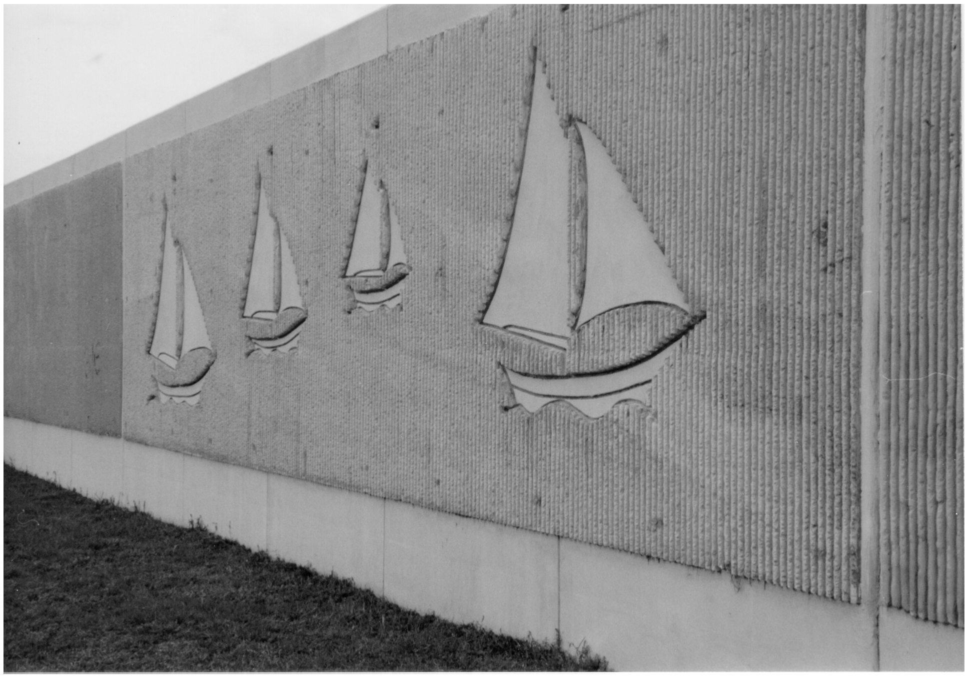

Figure 11-3. Use of fractured ribs highlights artistic design

prepared foundation surfaces to receive RCC and onto areas being used as haul routes for personnel and construction equipment.

c. Example 3, precast concrete panel forms, Cuchillo Negro Dam.

(1) Precast panel systems may be used for vertical faces in lieu of facing concrete and formwork. Figure 11-4 illustrates precast concrete panels used as forms. The Contractor shall design a suitable system of panels, anchorages, and bracing and submit details for approval. The submittal shall include initial panel bracing and successive panel bracing. Concrete leveling pads are not required. Atypical panel systems were interlocked panels measuring 1.4 m (4 ft) by as much as 4.9 m (16 ft), were a minimum of 100 mm (4 in.) thick, and were anchored at four locations. Panel anchors extended into the RCC at the lift joints. Figure 11-5 illustrates an anchor system. Anchor bars, straps, and connections were oversized or treated to compensate for deterioration due to exposure to moisture. RCC was compacted directly against panels requiring no facing concrete.

(2) Use of a precast panel system changes the appearance of the RCC. However, these plain panels could be made more attractive if simple patterns were cast on the surface. Since the panels are mass-produced from the same casting beds, additional cost would be minimal.

d. Example 4, step placement, Cuchillo Negro Dam

(1) Downstream stepped slope construction originally proposed for the main dam was not done during the placement. However, the auxiliary spillway and slope protection of the right abutment above the crest elevation comprised of RCC were placed providing a stepped appearance. Figure 11-6 illustrates the appearance of RCC using stepped placement.

(2) RCC was placed in 300-mm (12-in.) lifts. Surfaces were compacted using a 9-Mg (10-ton) doublerum, vibratory roller. Typical roller action was 2 to 3 passes with the roller to achieve density ranging from five to seven passes for the less workable RCC mixes. A walk-behind roller was used where access was

Figure 11-4. Precast concrete forms remain in place in RCC placement

difficult for the larger rollers and at the downstream face.

(3) The downstream slopes of each lift required special treatment. Each lift was dozed and compacted, leaving an uncompacted sloping face. Following placement, laborers manually trimmed the slope correcting alignment problems and generally shaping and tamping the surface.

Figure 11-5. Form anchors in RCC placement

Figure 11-6. Step placement for RCC provides a natural bedded appearance