Innovations Using Roller Compacted Concrete

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RCC - Materials

- Zero Slump Concrete
- Economic and Rapid Placement
  - Uses Traditional Soil Placement Methods
  - Placed in Thin (12-inch) Horizontal Lifts
- Component Materials
  - Cement – Low or High Cementitious
  - Fly ash, slag, or natural Pozzolans
  - Water – Minimize for workability (low w/c ratio)
  - Admixtures – Set retarding / Water Reducing
RCC – Economic Construction
RCC – Traditional Applications

- Dam Safety Rehabilitation
- Embankment Dam Armoring
- Concrete Dam Buttressing
- New Dams
- Concrete Gravity Dams
RCC Typical Placing Equipment
RCC Innovation at Oroville Spillways
RCC Innovation at Oroville Spillways
Main Spillway Recovery-2017

- 259 m Patching
- 198 m Upper Chute – New Reinforced Concrete Chute & Walls
- 335 m Middle Chute – New RCC Chute & Walls
- 122 m Lower Chute – New Reinforced Concrete Chute & Walls
Emergency Spillway Recovery

Roller-Compacted Concrete Splashpad

Roller-Compacted Concrete Buttress

Emergency Spillway

Underground Cut-off Wall (Secant pile wall)
1,450 ft long
35 - 65 ft deep
RCC Innovations at Oroville Spillways

- RCC for Foundation Replacement
  - Replaces only necessary foundation
- RCC Materials
  - Use of Eroded Rock for Aggregates to limited on-site borrow
  - Supplemented by Spillway Excavation Materials
- RCC for 4:1 Slope
  - Rough Form Slope with Horizontal Lifts
  - Specialized Hilfiker Wall Forms for Vertical Walls on Sloping Chute
  - Innovative Placement on 4:1 Chute for Final Surface
- Schedule .... Schedule .... Schedule
  - Adaptable Design
  - Use of Vibratable RCC and GEVR in Rough Rock
RCC Foundation Replacement

Oroville Dam
Grout Enriched Vibratable RCC

“GEVR”
RCC Dental Concrete

- GEVR with Plate Vibration
  - Grout on Rock
  - RCC Placement
  - Immersion Vibration
  - Plate Vibration

- Advantages over CVC Dental
  - Match Concrete Properties
  - Speed of Placement
  - Adaptable to Rugged Rock
Vibratable RCC in Tight Quarters
RCC – Unformed 1:1 Slopes
RCC Walls – Oroville Main Spillway

- 1100-ft long
  - Hilfiker System
  - Shotcrete Face
- RCC Chute;
  - Capacity=100,000 cfs
  - Width=188 feet
  - Slope=4:1
- High Strength RCC Overlay
  - Sloping Placement
  - Single Placement
RCC Walls

Hilfiker Wall System
Hilfiker (Basket) Wall Forming System
4:1 Slope
Rough Grade
Preparations of Final RCC Chute
RCC Placement Over the Walls
Enriched RCC Placement on 4:1 Slope
FINAL Finishing of 4:1 Slope

350,000 CY in 105 days!
RCC for Dam Raises
RCC for Dam Raises
Thank you!

Photos courtesy of California DWR and San Diego County Water Authority