Fort Smith Reservoir Intake Tower

Location
Mountainburg, Arkansas

General contractor
Granite Construction, Inc.

Engineering firm
Burns & McDonnell

Distributor
Multiurethanes Inc.

Product used
Azo-Grout™ 424 by
Azon USA, Inc.

Figure 1 The concrete intake tower at Lake Fort Smith State Park.

Situation

The concrete intake tower for a new reservoir at Lake Fort Smith State Park was experiencing leakage at construction joints in the substructure.

As the water reservoir was filled, various leaks were occurring at different elevations, causing dampness and calcite to form inside the access well of the concrete structure.

The contractor required a repair method that would accommodate the reservoir's ultimate water head of approximately 100 feet.

Even though the substructure where the leaks formed was designed with double waterstops and walls more than 5 feet thick, water was bypassing the waterstops through various shrinkage cracks, including fractures and form tie holes adjacent to the horizontal construction joints.

Action plan

The engineering firm of Burns & McDonnell contacted Multiurethanes Inc. grout expert Peter White who proposed the following strategy and timeline for the project.

- Three days of setup for contractor Granite Construction, Inc. to install lighting and scaffolding, and to map out rebar in the repair areas.
- Five days to drill and flush injection holes and inject Azo-Grout™ 424 polyurethane using special injection equipment and deep-drilling techniques.
- A two-day cleanup for Granite Construction.

About the product

Azo-Grout™ 424 by Azon is a powerful water cut-off system designed to stop water leaks in cracks, joints and pipe seals. By forming a resilient, flexible foam when reacted with water, this hydrophobic polyurethane is Azon's most versatile product for the majority of water cut-off challenges—even meeting approval for contact with potable water.

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The drilling, flushing and injection process

Step 1 Drilling injection holes

- Holes were drilled 3/8 inches in diameter by 36 inches deep.
- The hole depth was achieved in three stages: 10 inches to 22 inches to 36 inches.

Step 2 Flushing of injection holes, cracks and joints

- Using a steel brake line, holes were flushed clean with water to remove any residual dust left after drilling the holes.
- Plastic injection packers were installed at the collar of each hole.
- A 5 percent phosphoric acid solution was injected to flush out the cracks and joints, followed by a flushing with clean water.

Step 3 Azo-Grout™ 424 injection

- Polyurethane was injected along the horizontal construction joints and principal cracks at a rate of 0.13 gallons per foot.
- Additional polyurethane was injected into the leaking form tie holes to prevent water from traveling through the wall at these locations.

Observations

- Because polyurethane foam extruded from the principal cracks, it is likely these cracks enabled water to bypass around the cast-in-place waterstops.
- No polyurethane foam was extruded from the construction joints, indicating the original waterstops were likely still intact.

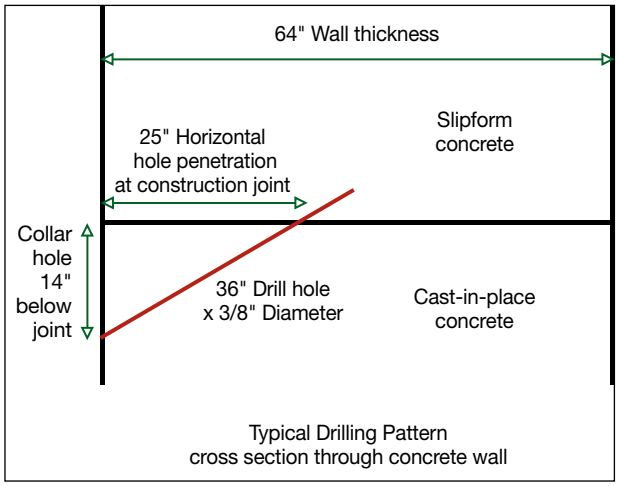

Figure 2 Sample diagram of injection holes.

Figure 3 Drilling continues along the construction joint.

Outcome

The concrete walls appeared dry and (any further) water leakage at the construction joints was abated.

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