DESIGN AND CONSTRUCTION BEST PRACTICES FOR UTILITY PIPELINES NEAR DAMS

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DAM AND PIPELINE COLLABORATION IN TEXAS

FNI’s Water Resources Team:
- 65+ staff focused on dams, levees, and hydraulic structures
- 80+ dam rehabilitations in past 15 years

FNI’s Water Utilities Team –
- 100+ staff focused on utility design and rehabilitation
- Designed over 220 miles of water and wastewater line in 2017

Collaboration is key!

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DAMS OVERVIEW

- >7,000 dams in Texas
- Benefits:
  - Flood control
  - Water Supply
  - Hydropower
  - Recreation
  - Sediment Control
- Average age > 50 years
- Rural vs. Urban
DAM REGULATIONS IN TEXAS

• Significant consequences associated with failure
• Dam safety regulated by TCEQ
• Major regulations for existing dams
  o Meet certain technical safety criteria (e.g. stability, hydraulic adequacy)
  o Emergency Action Plan
  o O&M Plan
  o Modifications require approval by TCEQ
• Generally, modifications will require oversight by a licensed PE with specialty expertise on dams
WHO IS REGULATED?

Anyone working on the dam for the Owner:

“The owner shall submit final construction plans and specifications, which are sealed by a professional engineer, to the TCEQ for review and approval before commencing construction of a proposed dam or reconstruction, modification, enlargement, rehabilitation, alteration, or repair of an existing dam.”

Anyone working near the dam:

“When a person proposes one of the following activities near the owner's dam, the owner or TCEQ may request that the person have a professional engineer perform an evaluation to determine if the integrity of the dam would be compromised.

If the person has a report prepared by a professional engineer, the person shall submit the evaluation report to the TCEQ and the owner for review and approval before any work is performed for a proposal to:

2. install a utility line or pipeline in the dam or in the spillways that requires significant excavation in the dam or spillways;
HOW DOES A DAM LOOK?

Photo: Mario Ortiz (CC BY-SA 4.0)
DAM FOOTPRINT – AUXILIARY SPILLWAY

Auxiliary (Emergency) Spillway
TYPICAL PHOTOS

Embankment Crest (from West)

Auxiliary Spillway Approach

Embankment Crest (from East)

Auxiliary Spillway Exit Channel
OVERVIEW OF PIPELINES INSTALLATION METHODS

• All pipeline excavation through and near dams should be coordinated to ensure the integrity of the dam is not compromised.

• Installation methods should take pipeline and dam into consideration:
  o Open cut installation
  o Trenchless installation

• Backfill materials should take pipeline and dam into consideration:
  o Backfill with insitu or imported soil
  o Backfill with impermeable material
  o Backfill with structural material
DESIGN BEST PRACTICES

- Alignment study
- Additional geotechnical investigation
- Dam engineering coordination
- Dam owner coordination
- TCEQ coordination
PIPEDLINE DESIGN CONSIDERATIONS

- TCEQ Requirements
- Local Entity Requirements
- Pipe Deflection Calculations
- Buoyancy Calculations
- Corrosion Protection Requirements
- Backfill Design
PIPELINE DESIGN CONSIDERATIONS

- Construction under dam structure
- Construction in auxiliary spillway
- Construction in impoundment area
- Construction at toe of dam
- Possible concrete cap or riprap to prevent weak spot for erosion
- Backfilling- structural or impermeable backfill
CONSTRUCTION CONSIDERATIONS

- Trenchless pipeline installation
- Proper compaction
- Elevated construction inspection and documentation
- Planning for extended construction schedule
CASE STUDY - SARA GRAYTOWN
WASTEWATER SYSTEM – PHASE 3

• 30-ft excavation for installation of 18-inch wastewater pipeline at toe of spillway
CASE STUDY – UPPER BRUSHY CREEK DAM
7 REHABILITATION

Relocation of 15-inch PVC wastewater pipeline around rehabilitated dam
CASE STUDY – LAKE CONROE DAM

- San Jacinto River Authority installed treatment plant and other infrastructure along the toe of the dam.
- Specific technical design criteria developed to avoid adverse impacts on dam safety:
  - Foundation considerations
  - Excavation constraints
  - Care of water
  - Floodplain considerations
  - Access and maintenance
  - Construction oversight
TAKE-AWAYS FOR FUTURE PROJECTS

• Dams have specific regulations for technical design criteria and modification
• It is important to be able to recognize dams when siting utilities
• Early coordination with dam owner
• Early coordination with dam engineer
• Early coordination with TCEQ if required
• Good pipeline design practices near dams
QUESTIONS?