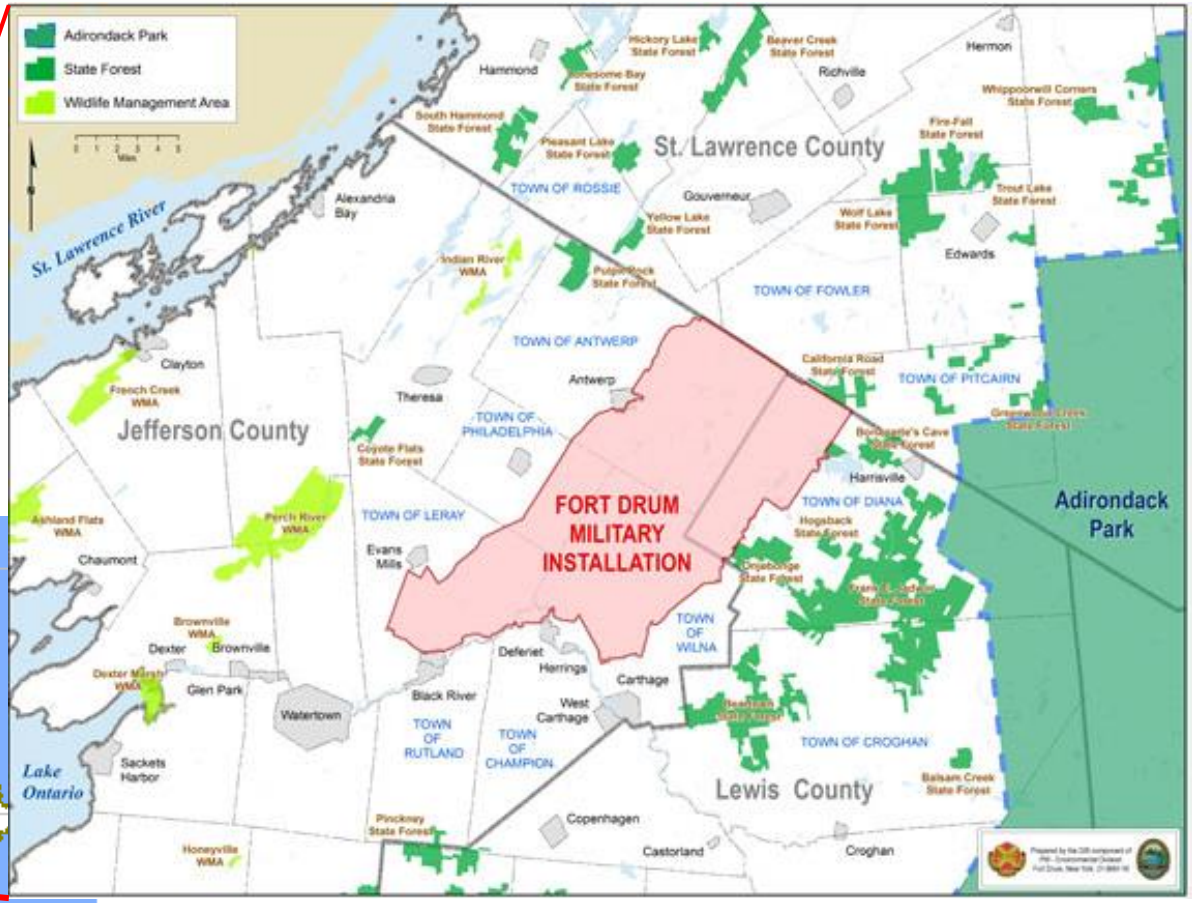
Fort Drum Rehabilitates Four Large Road-Supporting Parallel Pipes

Tom Perry

Multi Utilities Ventures

- 25.4 square mile U.S. military reservation
- Aging infrastructure, supporting military and residential activities
- Requires ongoing maintenance and rehabilitation programs and projects



Cities with the Highest Snow Accumulation

1 Aomori City, Japan

2 Sapporo, Japan

3 Toyama, Japan

4 Newfoundland, Canada

5 Syracuse, NY

8 Rochester, NY

9 Buffalo NY

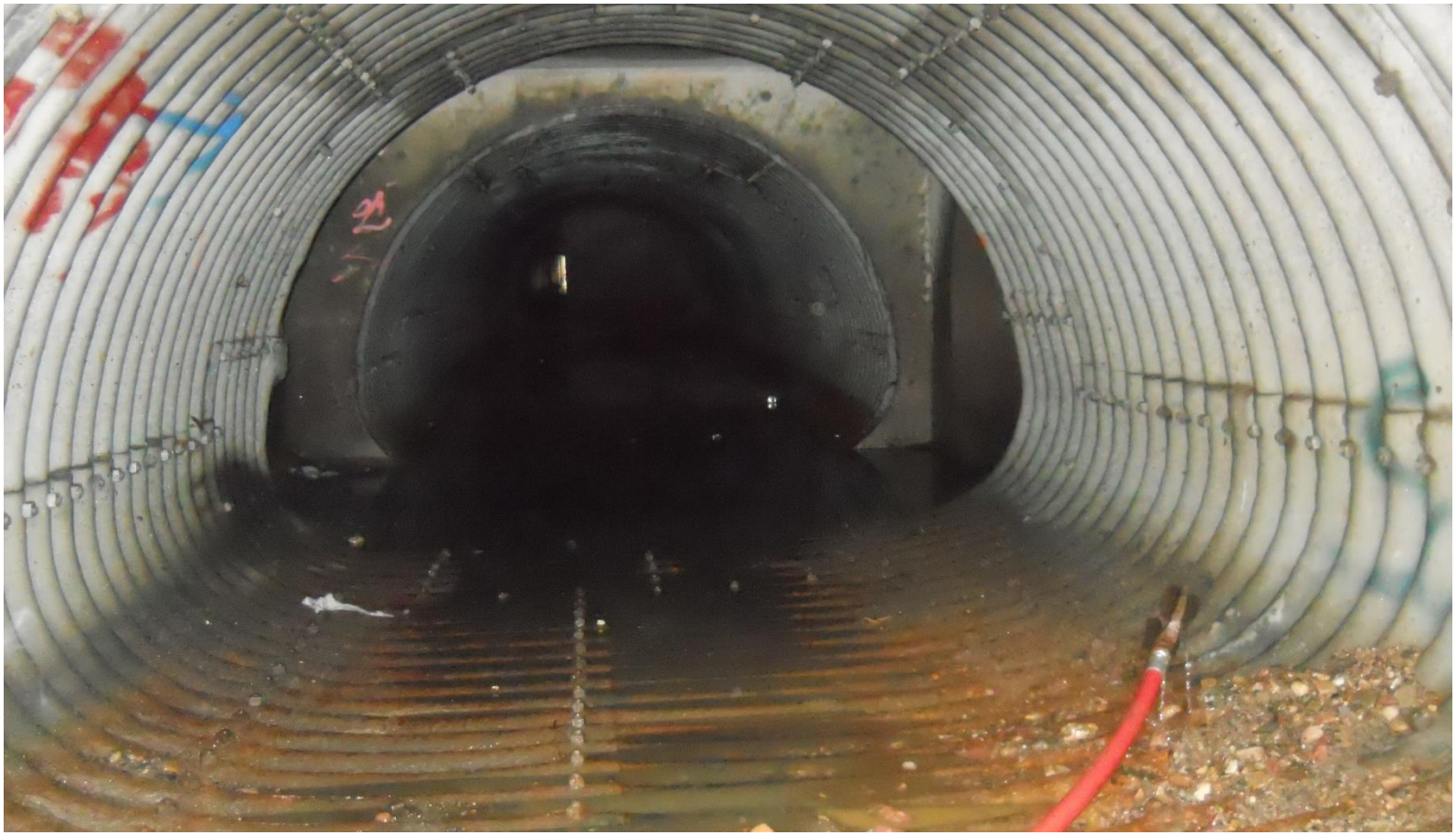
Source: Accuweather.com

Brine and Rock Salt Usage

Fort Drum “Buried Bridge” Culverts

- Four large parallel 142” by 91” arched CMP pipes, supporting a roadway over a trout stream
- Separation of 3’-0” between each barrel
- Total span of 56.3 feet.

Rusted, Failing Invert



Military Loading Classification

Project Requirement: Meeting the existing structure's military loading classification (MLC) for wheeled and tracked vehicle traffic

Fort Drum 10th Mountain Division

Military Loading Classification

Classified for wheeled traffic of 41 tons for one direction traffic and 27 tons for two direction traffic; for tracked vehicles it was classified as 37 tons and 25 tons, respectively

NYS DOT Material Testing

Compressive Strength

Adhesion

Freeze Thaw Less than 1% Allowable

Abrasion

Chloride Permeability less than 100

Determining the required minimum wall thickness…

- Is there any long-term structural value in the host pipe structure?
- How does the lining system perform with the host structure?
- What loads, if any, are likely to come onto the lining after its installation?
- What is the likely load-response mode of the liner to be?

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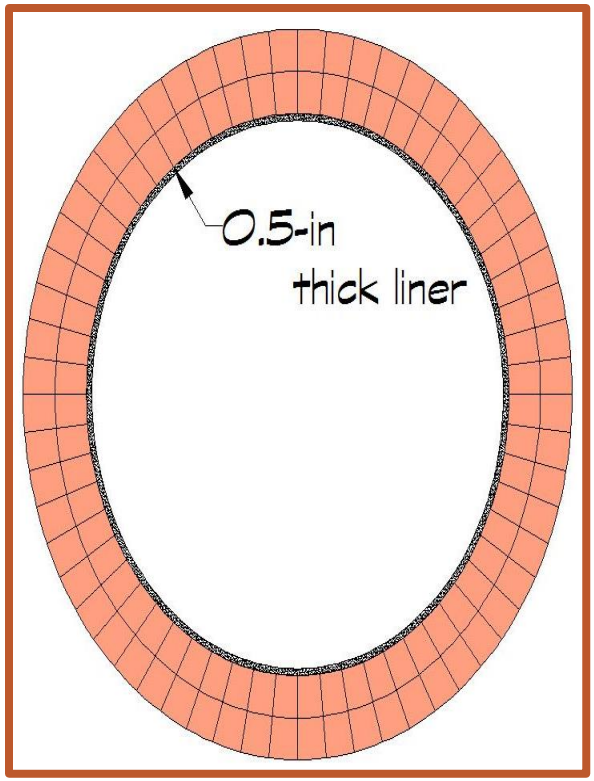

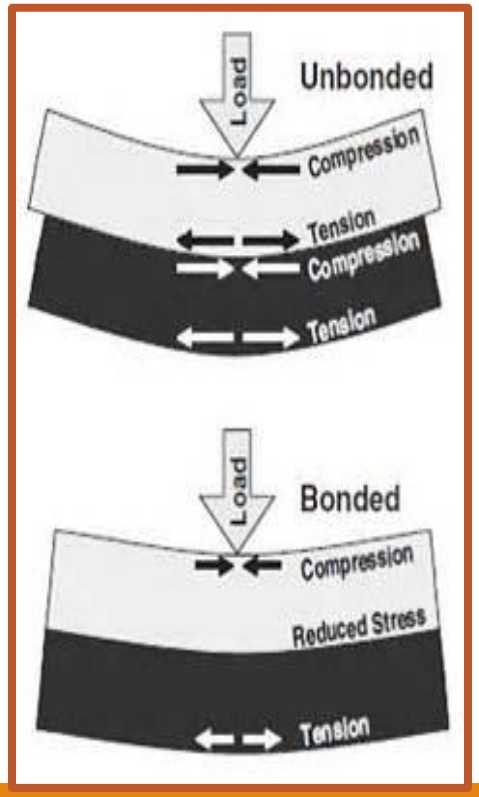

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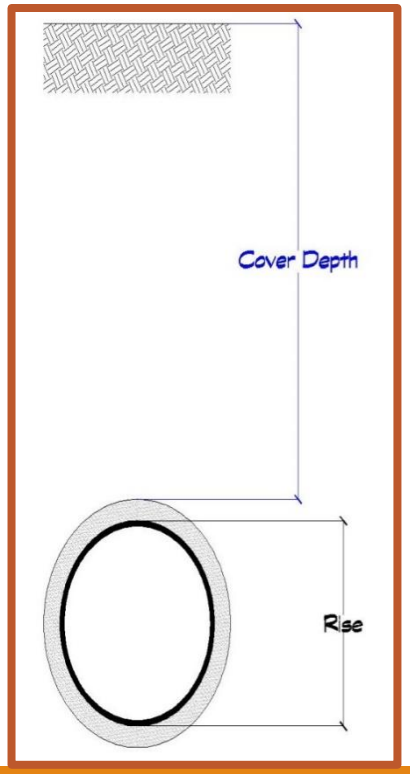

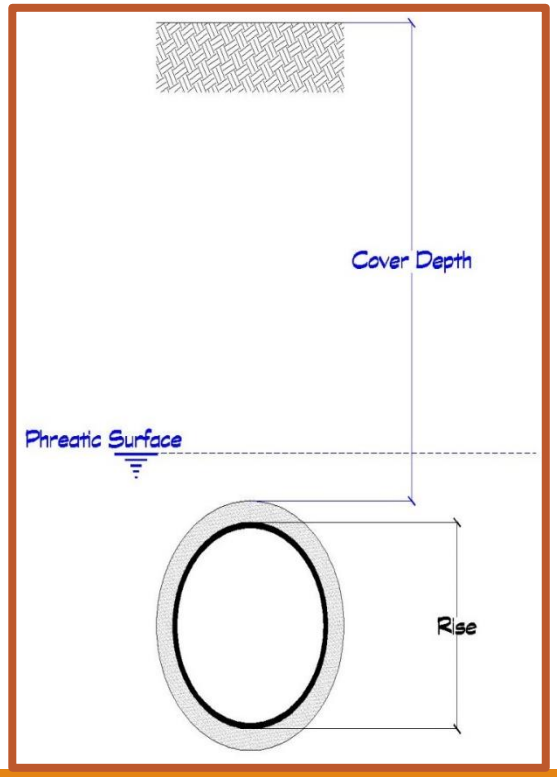

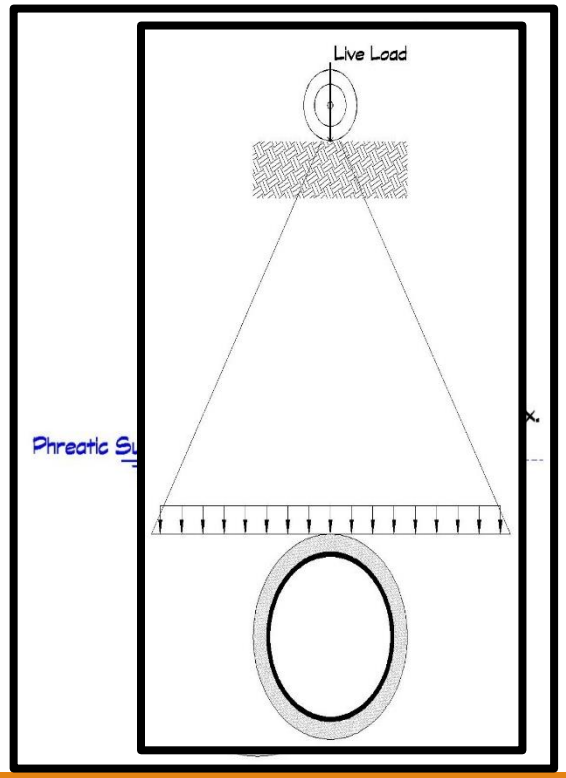

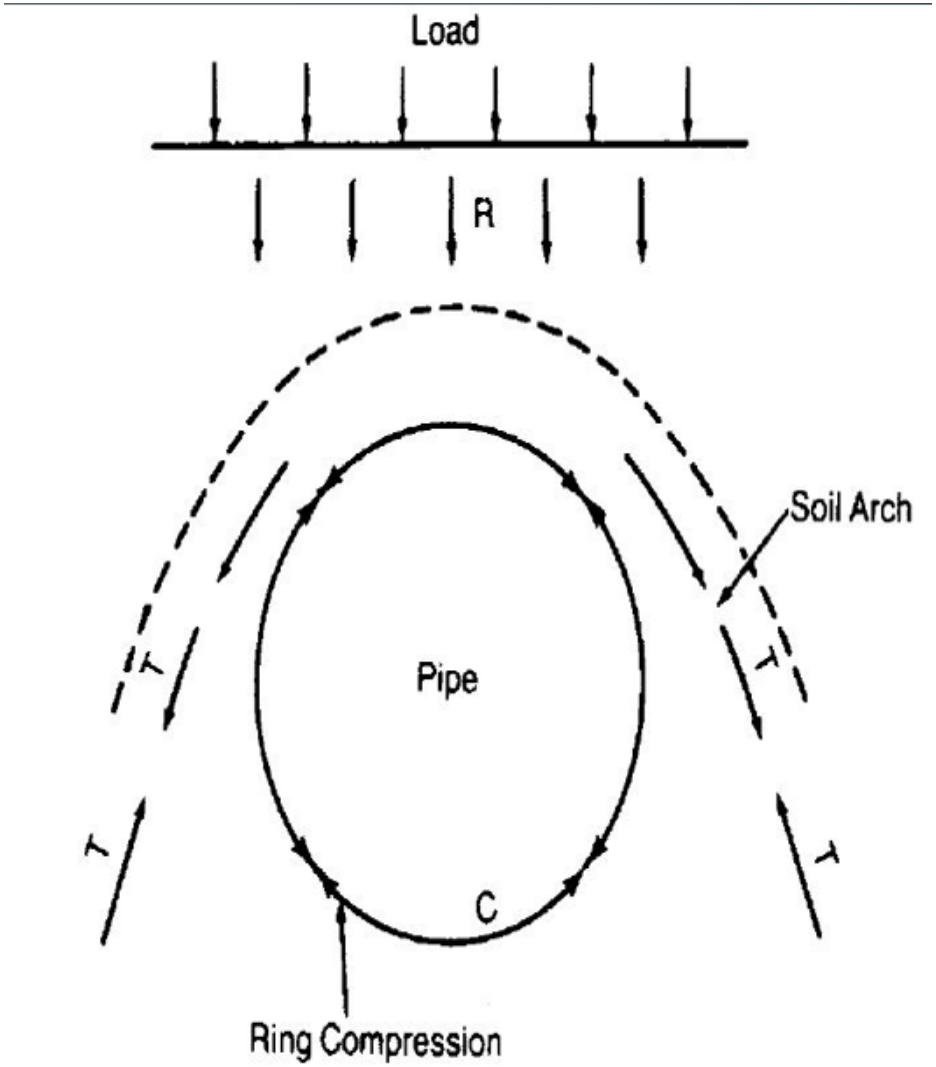
Load
R
Soil Arch
T
T
T
T
Pipe
C
Ring Compression

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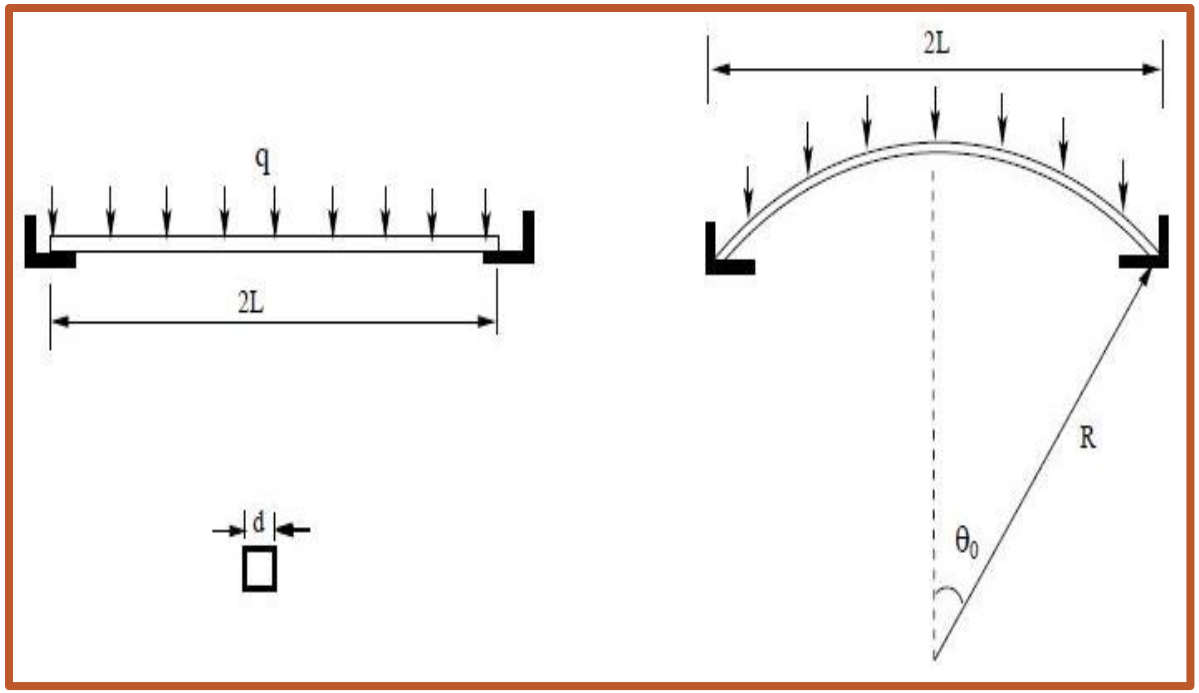
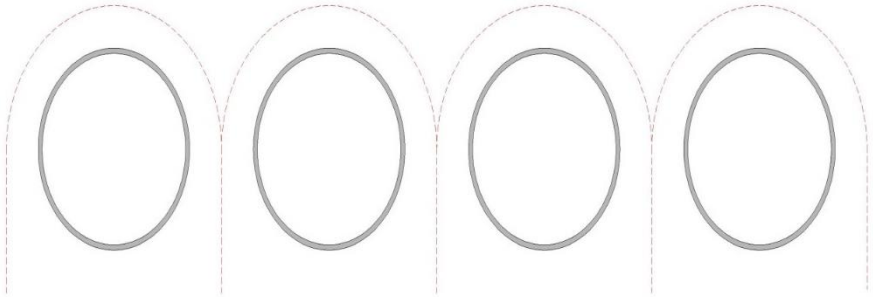


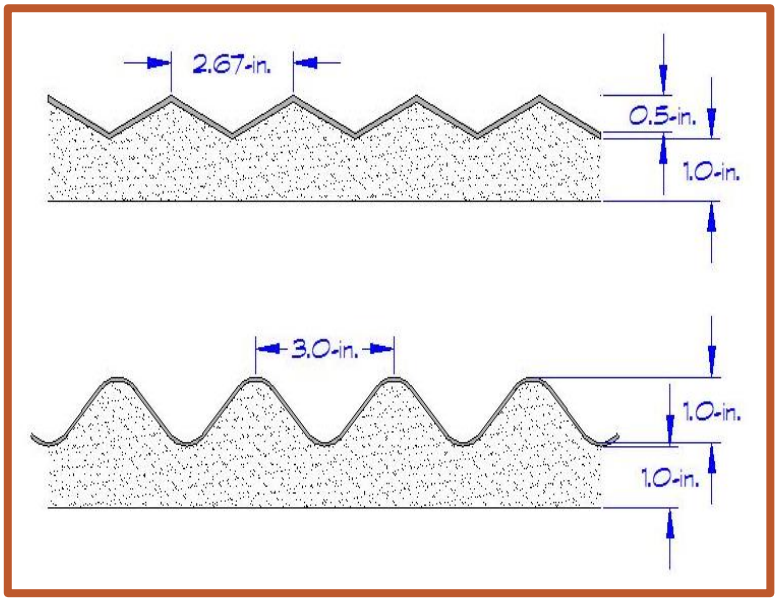
Establishing the Load Response Behavior of the pipe structure…

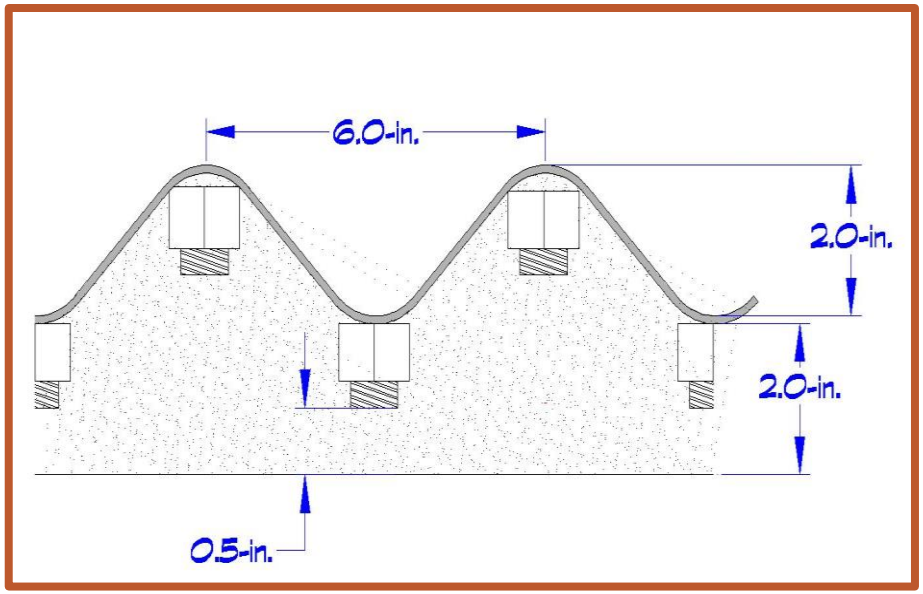
Use of the Arch Rise Parameter… $\lambda = \alpha^2 R/h$



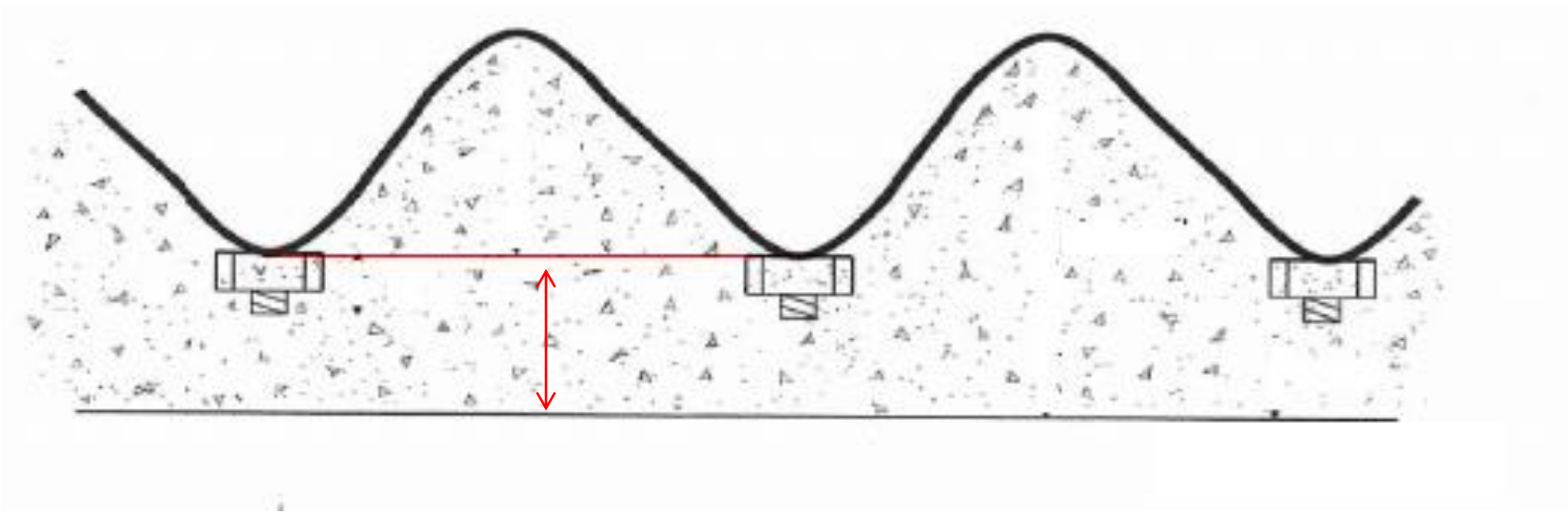
Basis for the thickness found…

Peaks of the surface profile for smooth wall pipes or the crests of the corrugations or projecting rivets and bolts for CMP.





CMP / Liner Plates
Wall Design



Based on engineered calculations the design thickness varies to maintain loading requirements.

Specifying Best Solution

Centrifugally cast concrete pipe (CCCP):

- Selected and designed for the key arc elements
- The design intricacies and the material properties ensured a structurally sound, watertight, rehabilitated buried bridge structure that meets the MLC
- Specified Solution: CentriPipe®

Material Specification:
PL-8000 Fine Aggregate Composite Concrete

- Strength characteristics
- Low permeability
- Good freeze/thaw characteristics
- The right thixotropy and thin shell toughness

Combining these characteristics makes PL-8000, applied with CentriPipe® spincaster a great choice for culverts and buried bridges

The Black Trout River

- Because the Black River is a trout stream, care had to be taken with dewatering and diverting the stream
- Additionally, the project called for a fish ladder to be installed

Dewatering and Site Prep

Minimal Staging Area

Small Footprint Provides Versatility for Variety of Sites

Centrifugally casting new pipe

Rehabilitated Culvert

Post-Rehabilitation Inspection ….

… On a very snowy day in Upstate NY!

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Thank you
Questions & Discussion

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