The linked image cannot be displayed. The file may have been moved, renamed, or deleted. Verify that the link points to the correct file and location.

Surety Risk Assessment

Utility Pipeline Failure Case History – Tyndall, SD

Presented by: American Concrete Pipe Association

Scott Hofer

Hancock Concrete Products

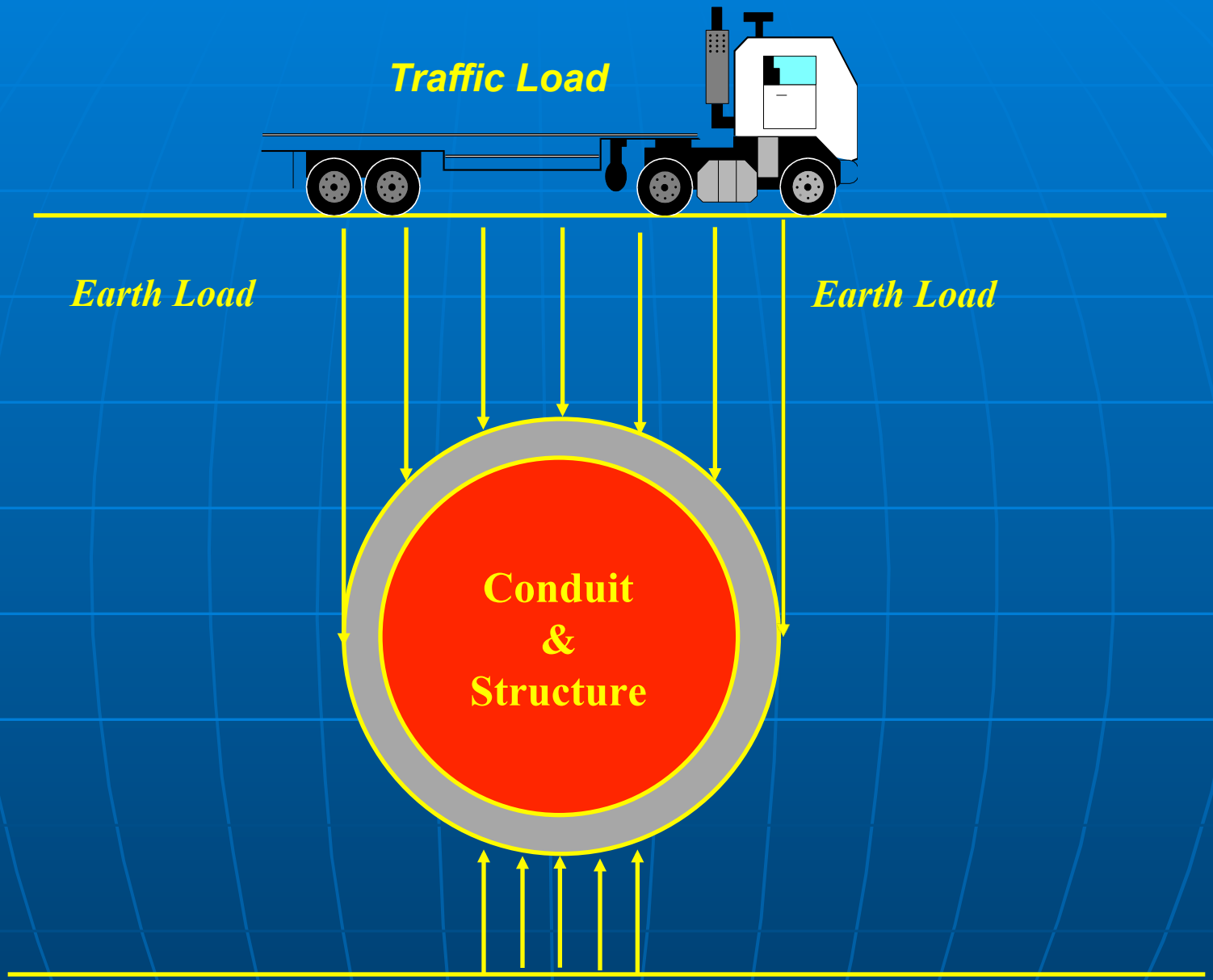
PRESENTER BIOGRAPHY SLIDE

- Scott Hofer is the Sales Manager for Hancock Concrete Products a Manufacturer of Pre-Cast concrete pipe and products with 6 locations in the upper Midwest. He is a 30 year veteran of the concrete products industry and also spent 8 years in distribution of water, sewer and fire protection products.

- Mr. Hofer is a past president of the South Dakota Associated General Contractors of America and past chairman of the SE South Dakota Chapter of the American Public Works Association. He is a past winner of the American Concrete Pipe Association's Presidents Award for Marketing Excellence and is a current member of the City of Sioux Falls Infrastructure Review Advisory Board. Scott and his wife Becky reside in Sioux Falls, SD. They have 4 children and 3 grandchildren.

Risk Assessment
Underground Utility Construction

- Pipe - Product Options
- Engineering 101 Buried Flexible & Rigid Pipe Design
- Case History – Tyndall, SD Storm Drain Pipe Failure
- Lessons Learned


Traffic Load
Earth Load
Earth Load
Conduit
&
Structure

Pipe Product Options

Rigid Pipe

RCP
(Reinforced Concrete Pipe)

Flexible Pipe

HDPE
High Density Polyethylene

PVC
Polyvinyl Chloride

CMP
Corrugated Metal Pipe

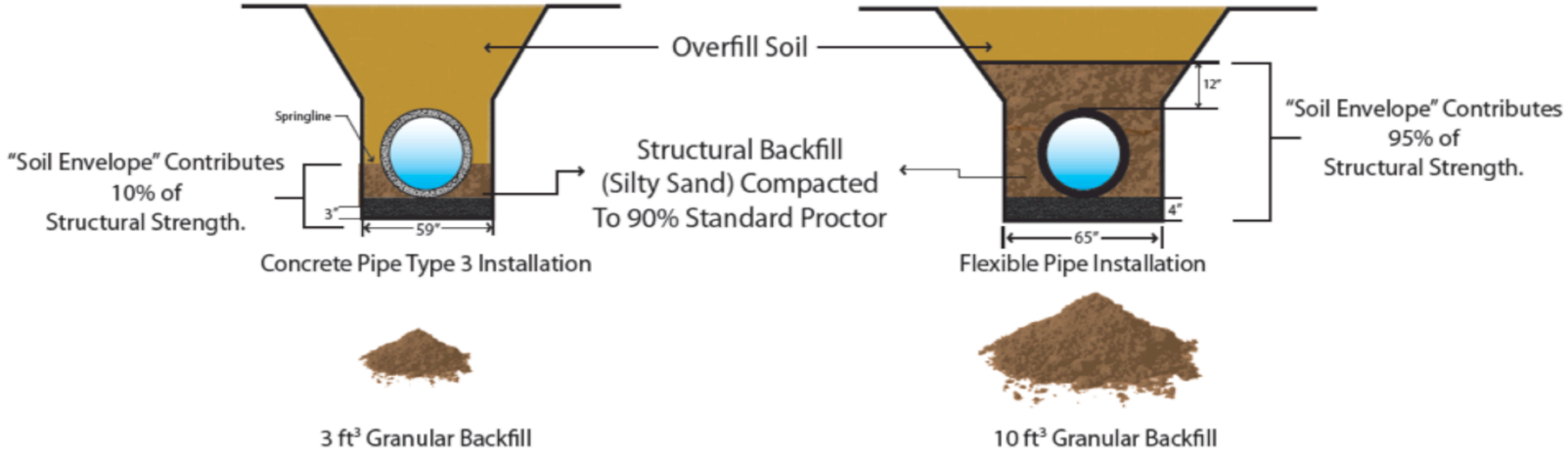
Concrete and Flexible Pipe Installation Considerations

For Inspectors and Contractors

System Strength

There are fundamental differences between concrete pipe (rigid pipe) and plastic pipe (flexible pipe). One fundamental difference is that rigid pipe is a structure whereas flexible pipe is essentially a liner and the structure is built in the field.

Example: 36" concrete and plastic pipe installed in a trench with 6' of cover over top of pipe.



Reinforced Concrete Pipe Load TEST

48” ASTM C-76 Class IV 8’

$D_{0.01}$ = 2000

D_{ULT} = 3000

Total Load Required:

$D_{0.01}$ = (48/12)(8)(2000)

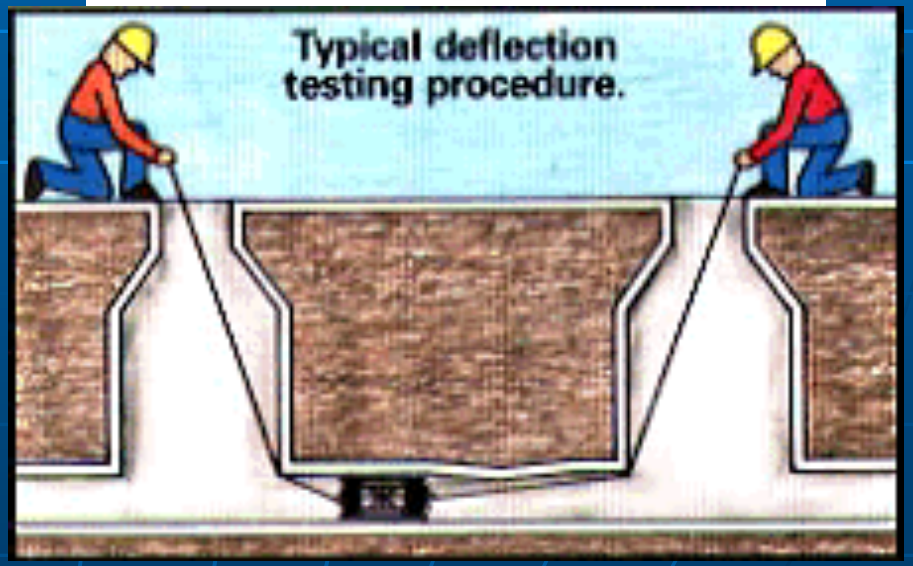
= 64,000 lbs.

D_{ULT} = (48/12)(8)(3000)

= 96,000 lbs.

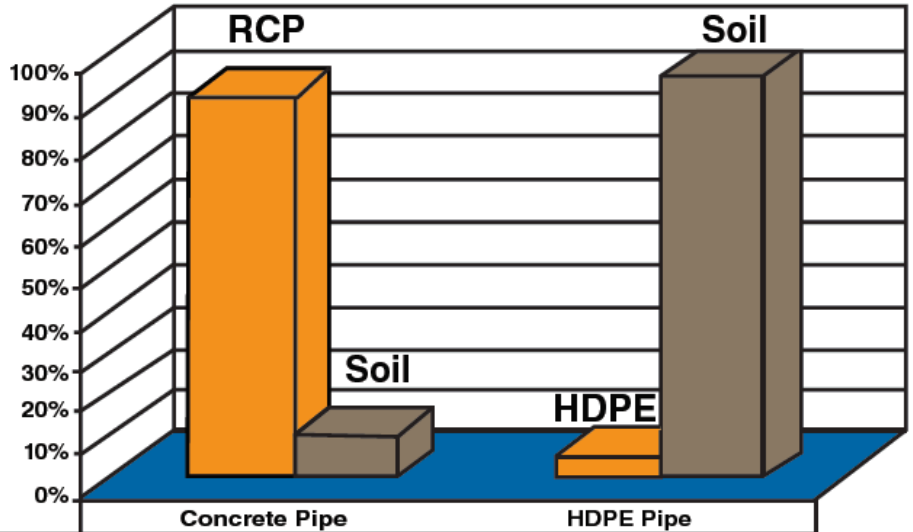
FLEXIBLE PIPE IN FIELD TESTING

- Go-No-Go device (Mandrel)
- 5% Deflection
- Stuck if deflection exceeded
- Pipe Portion repaired and retested
- 30+Days
- Prior to Final Acceptance



How Critical is Installation?

Installation is critical to the strength of the flexible soil / pipe system. In this example HDPE pipe only contributes 5% whereas RCP contributes 90% of the structural strength of the soil/pipe system. Therefore, post installation inspection is imperative to ensure the constructed flexible soil / pipe system was properly built.



	Concrete Pipe	HDPE Pipe
Pipe Strength	90%	5%
Soil Strength	10%	95%

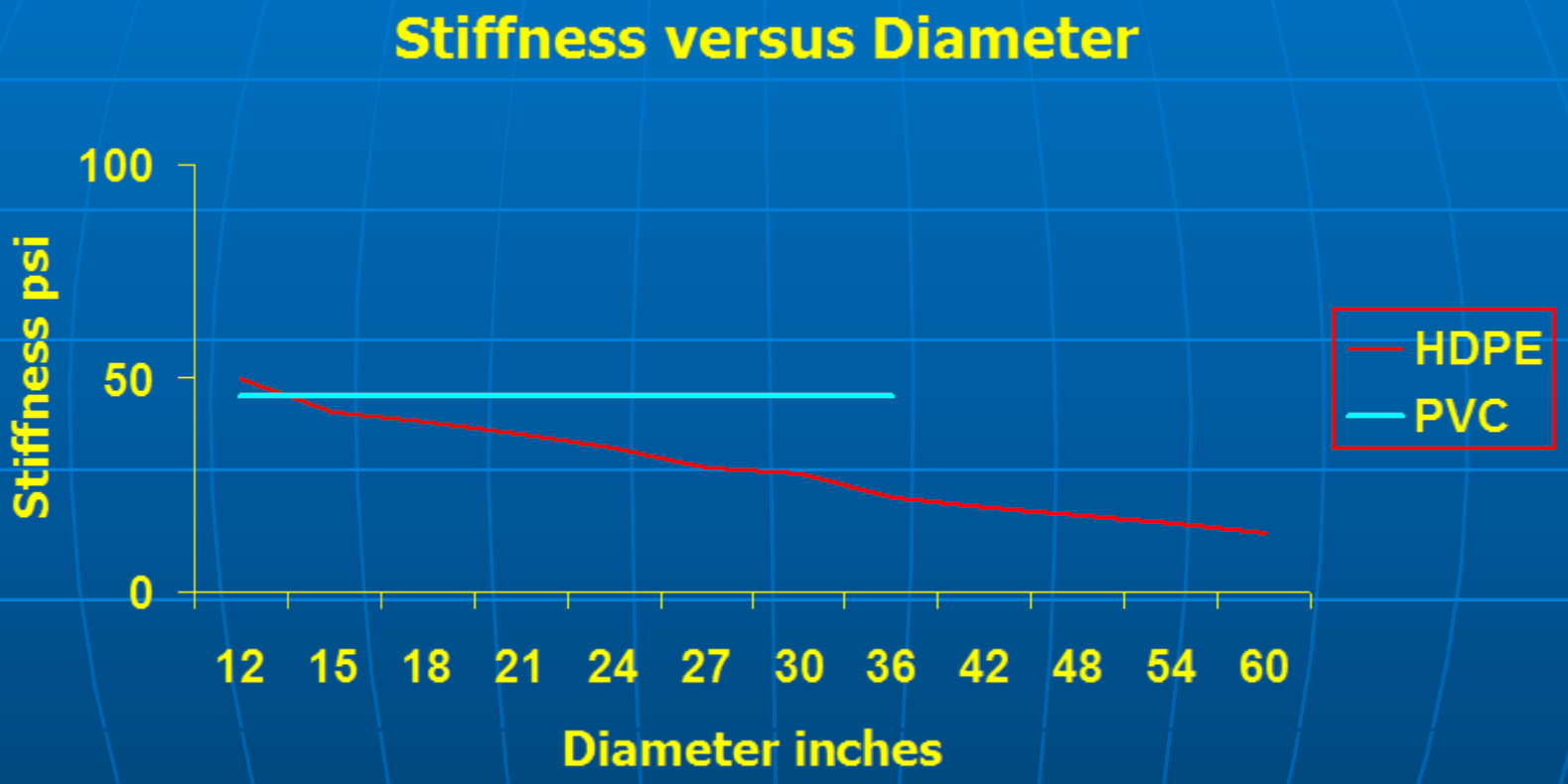
Installation Checklist*

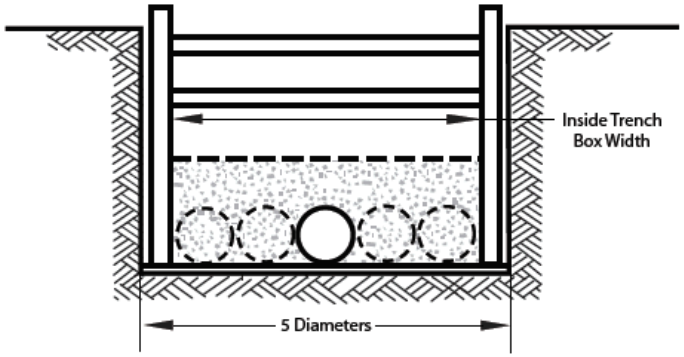
Concrete trench width O.D. x 1.3	HDPE trench width O.D. x 1.5+12"
☐ trench width O.D./6	☐ trench width O.D. +16" or O.D. x 1.25 +12"
☐ in-situ embedment	☐ imported granular embedment
☐ 3" bedding	☐ 4" bedding
☐ compact haunch to 85-95% Std. Proctor.	☐ compact haunch to ≥ 90% Std. Proctor.
☐ compact backfill in 8" lifts to spring-line	☐ compact backfill in 6" lifts to 12" above pipe
☐ minimum cover designed	☐ 2' minimum cover

*Checklist based on minimum requirements. The Contract Documents may be more stringent.

PVC (SDR 35) VS HDPE

MINIMUM PIPE STIFFNESS AT 5% DEFLECTION





Plastic Pipe Trench Box Detail

"If it is necessary for a trench box to be dragged through a trench, do not raise the box more than 24" above the work surface. Another alternative for when the box will be dragged is to use a well-graded granular backfill material at least two diameters on either side of the pipe and compact it to a minimum of 90% standard Proctor density before moving the box." *ADS Technical Note, TN 5.01, March 2009*

Failure to adhere to these trench box requirements or other HDPE manufacturer recommended procedures could void the product's warranty, increase the project's risk of failure, and jeopardize your professional liability.

- How many contractors know the difference between how a rigid pipe and a flexible pipe perform?
- How many contractors know that less than 10% of a flexible pipes design strength comes from the flexible pipe?
- Do all contractors know that backfill techniques for flexible pipe are more demanding than those for rigid pipe?
- How many contractors monitor the shape of a flexible pipe during backfill?
- How many contractors know that large diameter HDPE has less structural stiffness than small diameter pipe.

City of Tyndall, SD

- South Main Street Utility and Street Improvements
  Schedule A, B, C and D

- Ivy Street Storm Sewer Improvements
  Schedule E and F

- 4,400 LF – 48” STORM SEWER

- Engineering Firm: 45 Years Experience
- Contractor: Over 20 Years Experience

DISCUSSION POINTS

ISSUES RAISED WITH THE ENGINEER PRIOR TO THE BID

- 48” diameter HDPE stiffness is less than in smaller diameters. As the pipe diameter. increases the stiffness of the pipe decreases.
- The twin line of 48” was particularly difficult to construct due to the large trench width.
- Post installation deflection testing was not specified.
- Inspection during construction would be vital and would be very expensive. Often municipalities limit the amount of inspection they will pay for.
- Very little of this size HDPE pipe has been used in this area.
- Most contractors bidding this job have had no experience with this size of flexible pipe.
- The cost difference between HDPE and RCP is minimal if you take into consideration the material & labor it takes to build the soil envelope.

ENGINEER’S RESPONSE

- We prefer to use Concrete Pipe, but its more expensive than HDPE and the City of Tyndall has limited funds for the project.

2 Yr Old Asphalt Street
Initial signs of pipeline failure

- Depressions in roadway
- Cracks along roadway above pipeline

Failed HDPE Pipe

- Severe Deflection
- Buckling
- Cracking

Removing Failed HDPE

Installing New RCP

Disposal of Failed HDPE Landfill

Who was affected by the Tyndall, SD Pipeline Failure?

- The Contractor
  - Litigation Costs
  - Settlement ?
  - Reputation
- The Engineer
  - Litigation Costs
  - Settlement?
  - Reputation
- The Pipe Manufacturer
  - Litigation Costs
  - Settlement?
  - Product Reputation
- The Pipe Supplier
  - Litigation Costs
  - Settlement?
- The City of Tyndall
  - Litigation Costs
  - Disruption to Traveling Public
- The Home Owners (near the project)
  - Road Closure
  - Construction Activity (again)
- The Surety Company
  - Litigation Costs
  - Bond Claim
  - Settlement?
- The Bonding Agent
  - Loss of Potential Profit Sharing with Surety Company.
  - Loss of Relationship with Customer

LESSONS LEARNED

- You must be aware of the types of products being specified on all projects.
- Not all pipe products are equal. There is a big difference in how flexible and rigid pipe is to be installed. Successful installation of some flexible products is 95% dependent on the Contractor installing it correctly.
- A Contractor's knowledge or experience with large diameter flexible products may be limited. Its important to know what experience your client has with specific pipe products.
- It is important to become educated on the risk involved on projects, including the depth at which pipe is to be installed.
- Inspection during construction is important, but everyone should understand that the Inspector is there for the benefit of the owner not to stop or correct a mistake as it happens. In many cases the Inspector is documenting the construction activity and may use that if problems arise.
- While cost is a concern, limiting risk should be paramount. What could go wrong? What will it take to fix it.

YOUR QUESTIONS?

If you do not have the opportunity to have your question addressed during the seminar, you may contact the presenter directly:

Scott Hofer
Hancock Concrete Products
Scott.Hofer@hancockconcrete.com
605-335-7807