Water Quality and Joint Performance

Shawn Coombs, P.E.

Water Management Solutions (WMS)

…and Love it!


FOLTZ
Concrete Pipe Company
A division of ADS
500 LBS
H


Bad Day!!!

TOTAL SOLUTIONS FOR AIRPORT PROJECTS

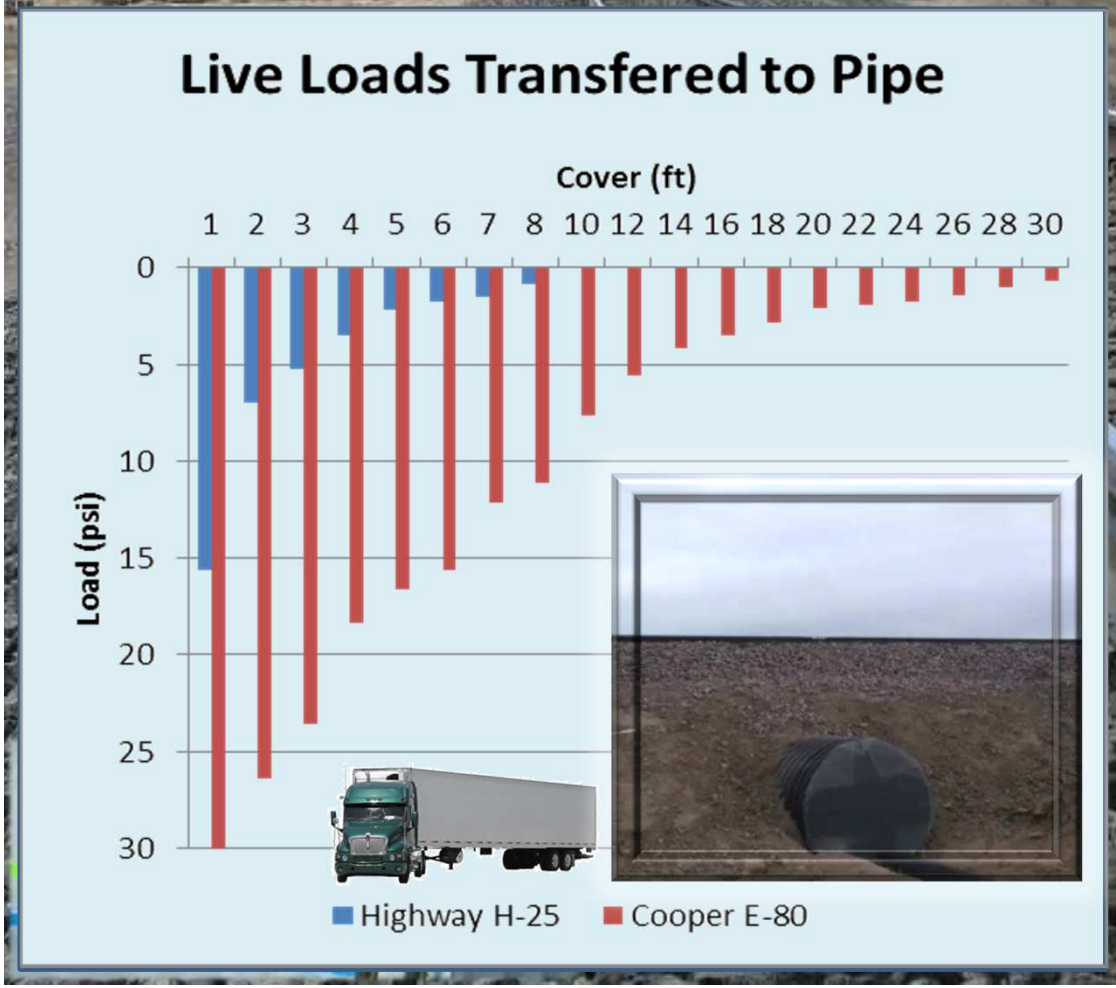
US Army Corps of Engineers®

NAVFAC Naval Facilities Engineering Command

HDPE & PP are Approved for Under Track

AREMA

American Railway Engineering and Maintenance-of-Way Association



TDOT Approved

HDPE in 2013

and

PP in 2015

Byhalia Road Widening Project

Cleveland, TN

Industrial Drive Culvert Pipe

Cleveland, TN

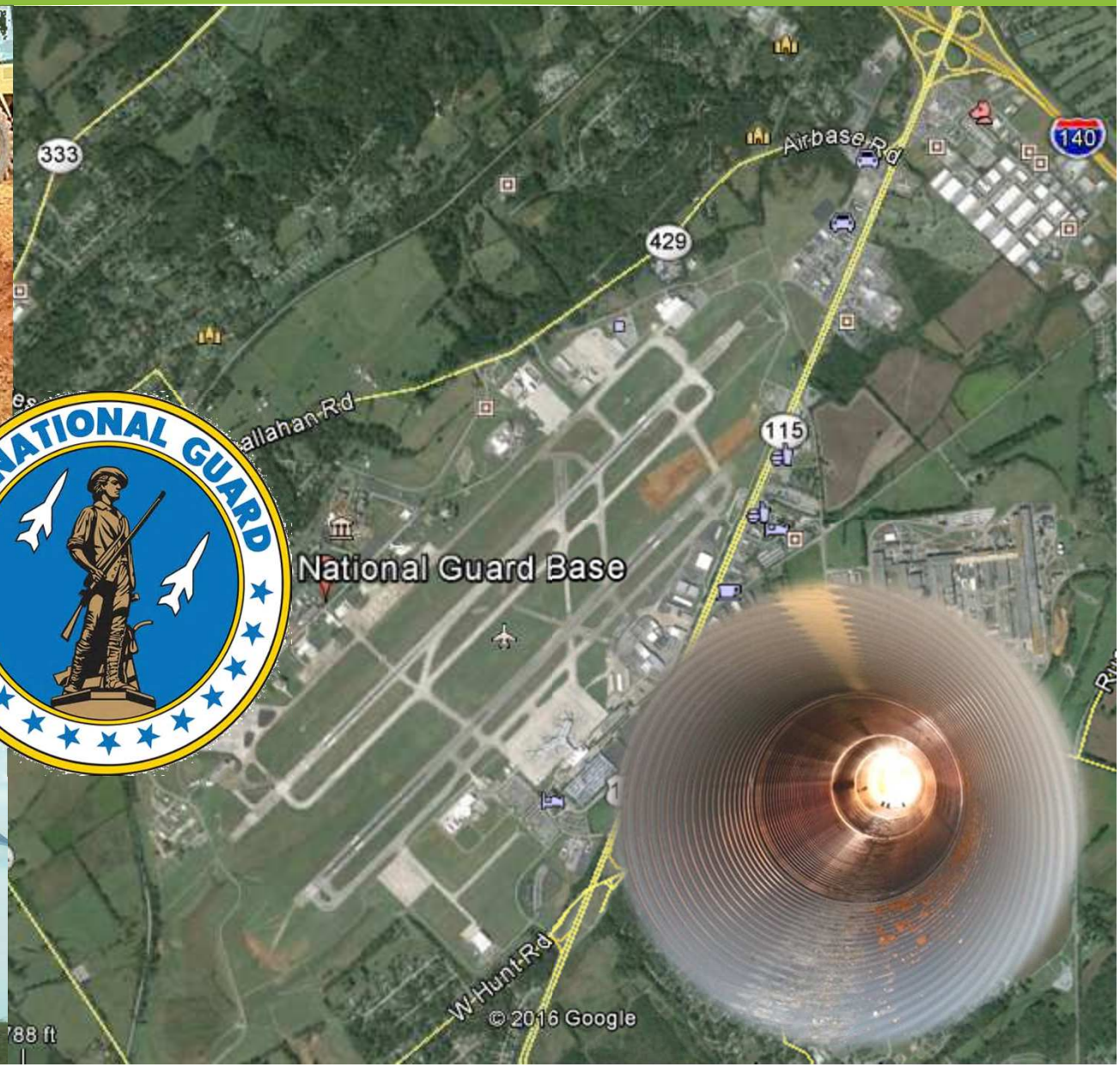
Fairgrounds Connector Road

Greeneville, TN

ADS N-12 HDPE Pipe
3,120' of 18"
300' of 24"
280' of 30"
80' of 36"

McGee Tyson Air National Guard

Louisville, TN

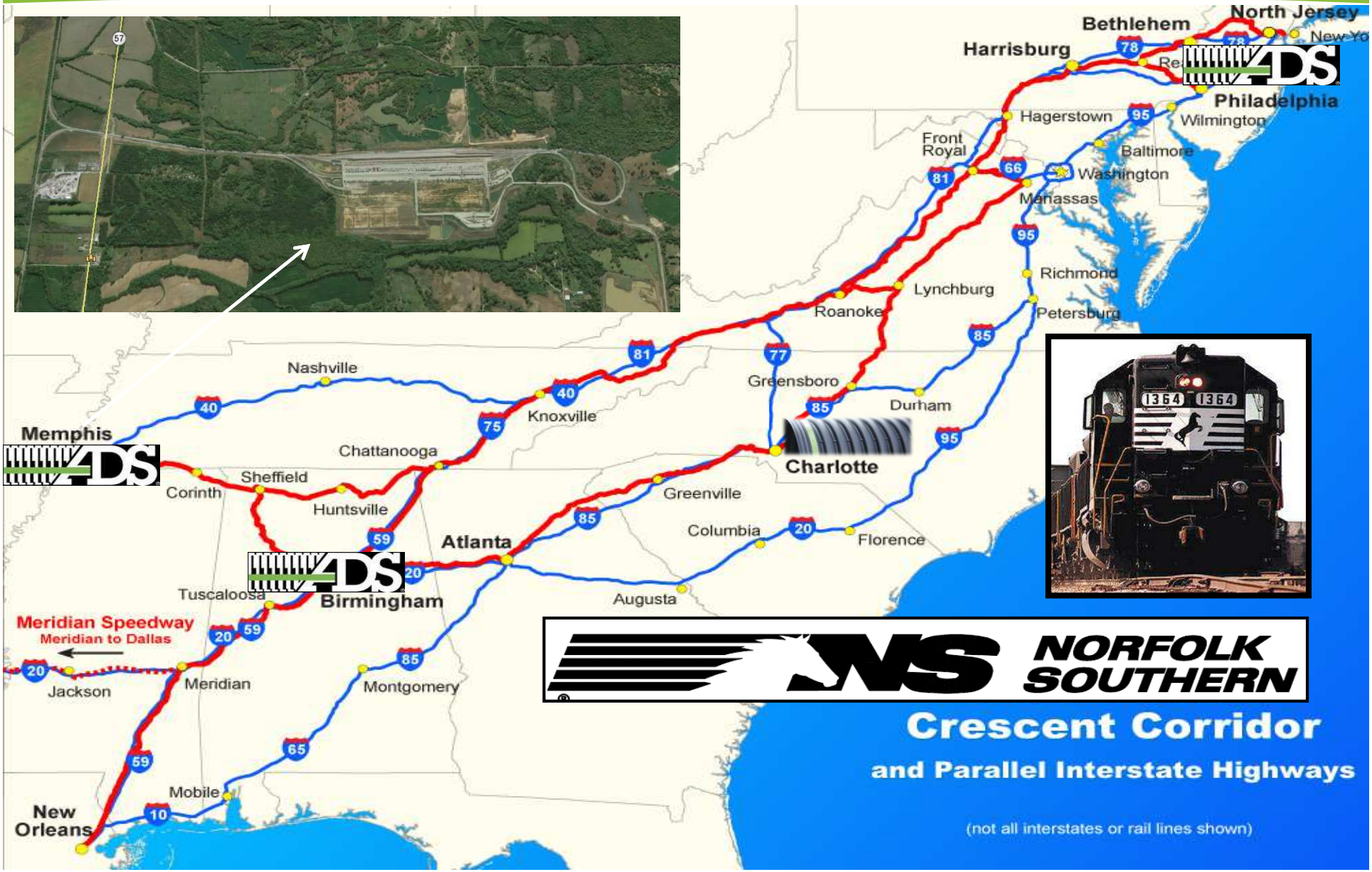


Franklin County Airport

Sewanee, TN

Norfolk Southern Regional Intermodal

Memphis, TN



Norfolk Southern Regional Intermodal

Memphis, TN

Norfolk Southern Regional Intermodal

Memphis, TN

Working for YOU in Tennessee

Chattanooga, TN

What PROJECTS can WE help you with?

It’s just pipe…

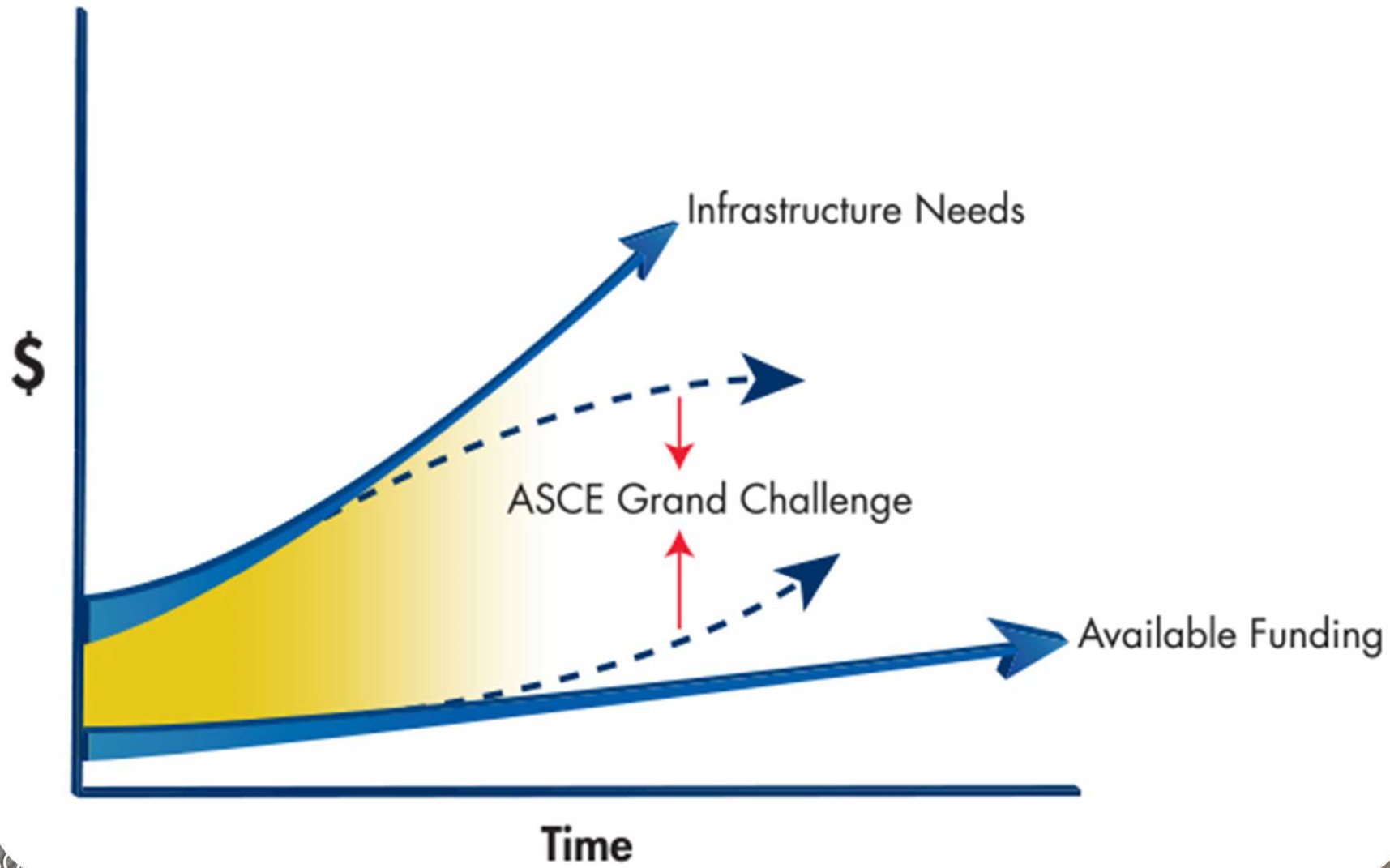
What’s the Big Deal?


04/08/2013


29 8:09AM


AUG 9 2002

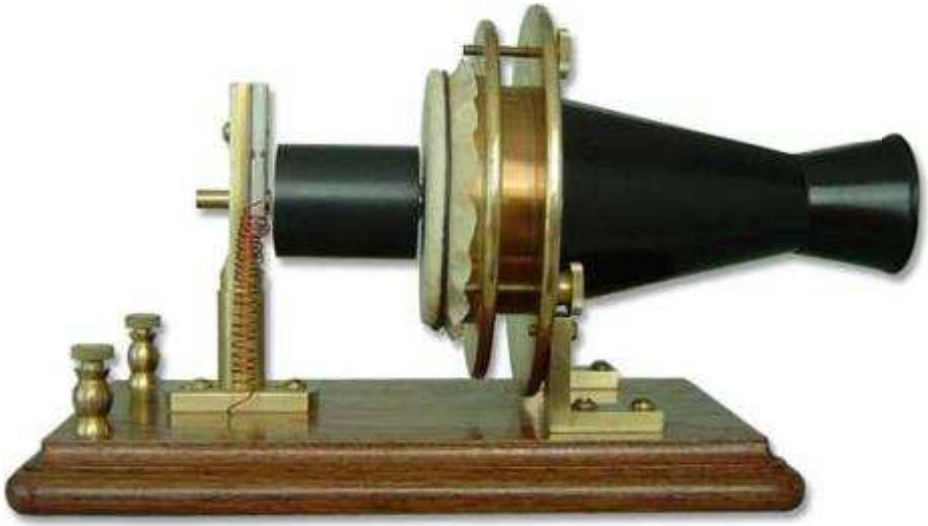
Closing Infrastructure Gap



PERSPECTIVE

"The telephone has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us."

Western Union Internal Memo in 1876



Three (3) keys to pipe design and performance:

- **Under Stand Backfill** is needed for all gravity flow storm drainage systems.
- **Joint Performance** is critical to pipe longevity.
- **Installation Inspection** is key to establish accountability

Joints

FOLTZ Concrete Pipe Company
A division of ADS

Were joints designed to leak?

PIPE Joints Matter!!!

Open Joint

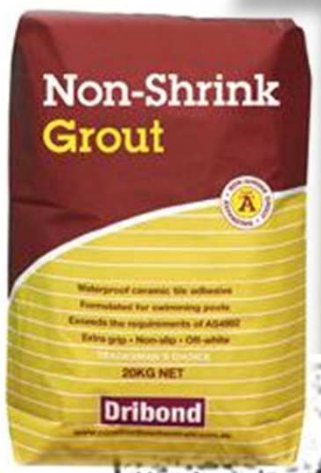
Brownfield

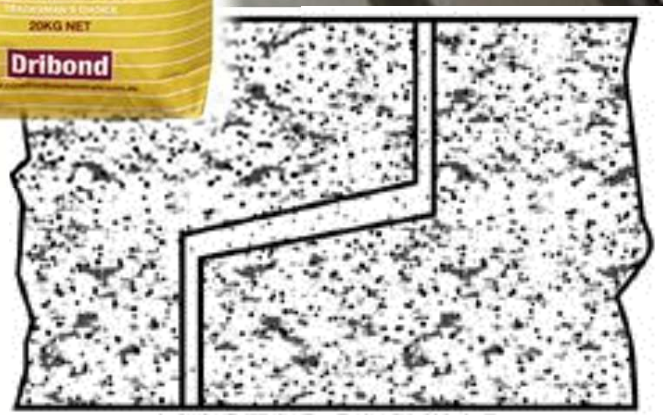
Soil Intrusion

Reinforced Concrete Pipe Connections

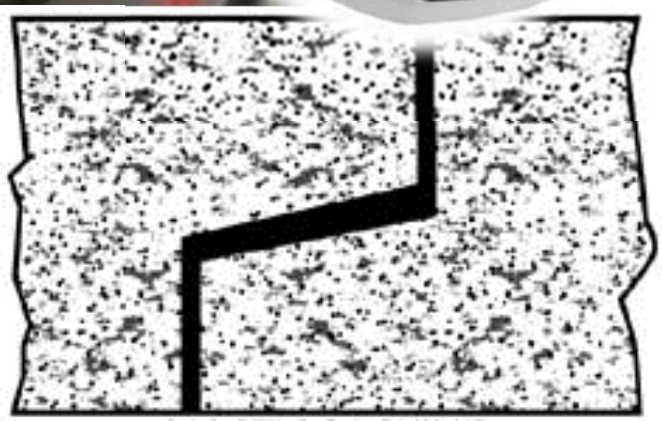
Mortar

Mastic





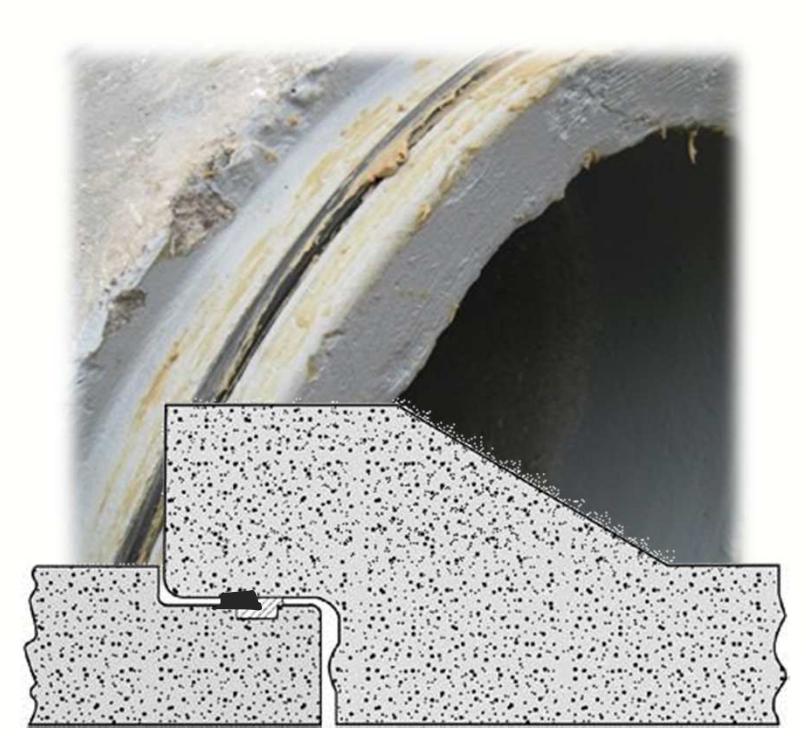
MORTOR PACKING



MASTIC PACKING

Reinforced Concrete Pipe Connections

Recommended



O-Ring

ASTM C361 / ASTM C443 / **ASTM C1628**

Single Offset w/ Rubber Gasket

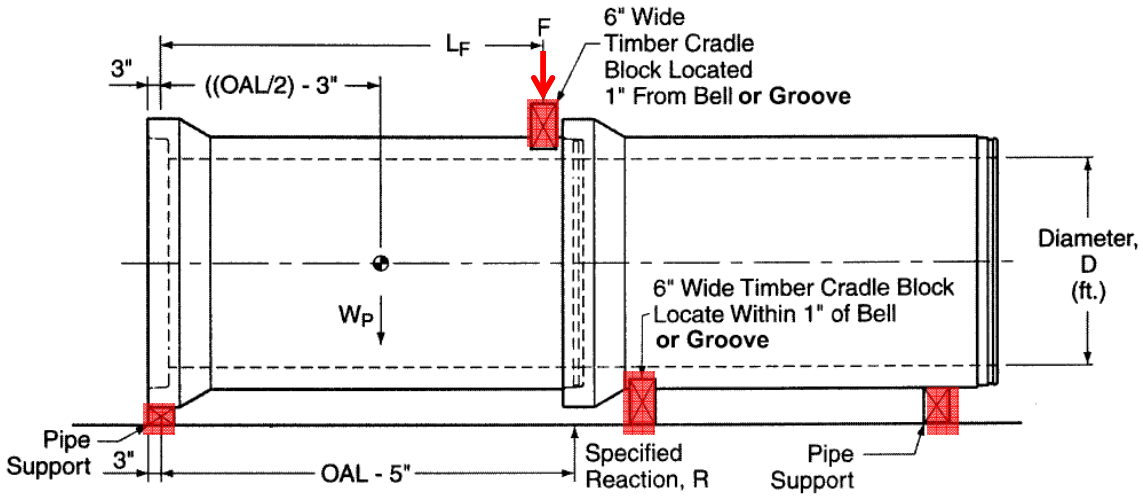
ASTM C443 / **ASTM C1628**

Improve RCP Joints

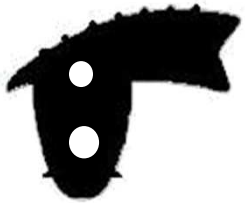
ASTM C443 tests for: 1 & 2

ASTM C1628 tests for: 1, 2, & 3

1) Straight @ 13 psi for 10 minutes.
2) Angled ½" @ 10 psi for 10 minutes.
3) Offset w/ Shear Forces @ 13 psi for 10 minutes.



HDPE (WT) Joint



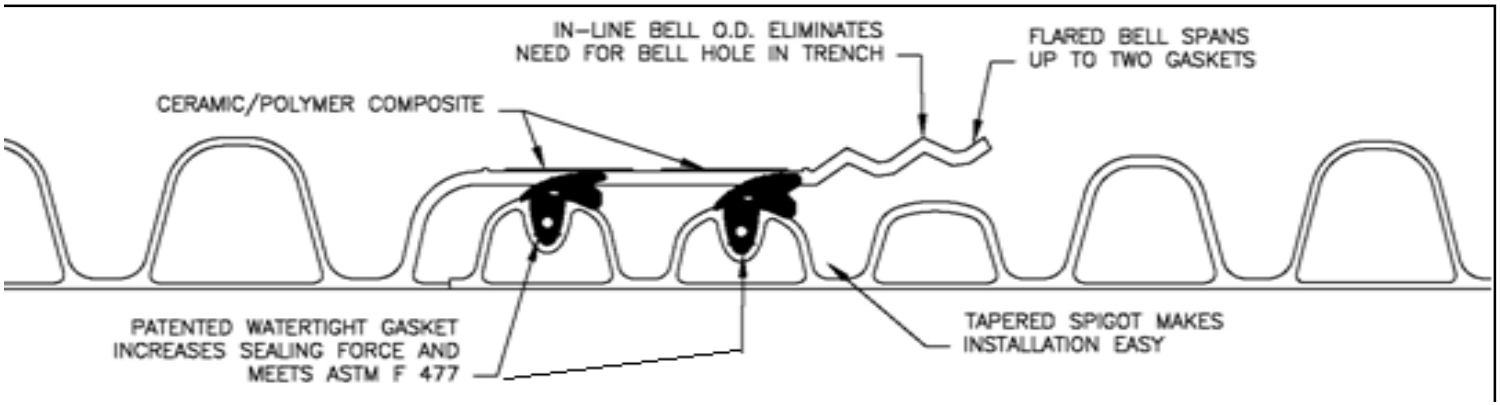
ASTM F477

Lab testable to exceed 10.8 PSI per ASTM D3212

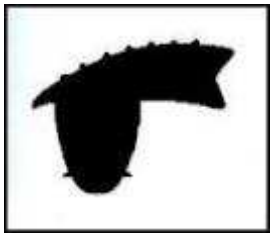
Field testable per ASTM F2487 or ASTM F1417

Joint Integrity

- *Longer Integral Bell and Spigot then HDPE N12 with Ceramic Polymer Composite Reinforcement*
- Two Gaskets on Spigot
  - *Lowers risk for leaks due to construction errors and joint offsets*

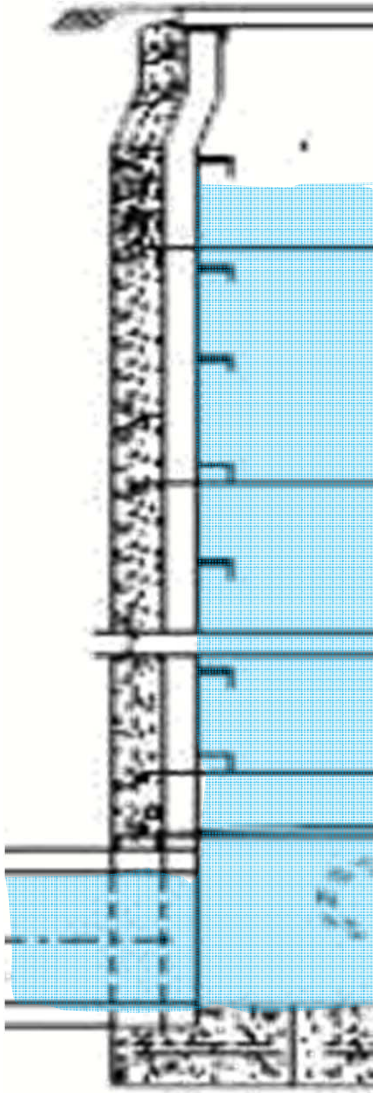


ASTM F477 Gasket



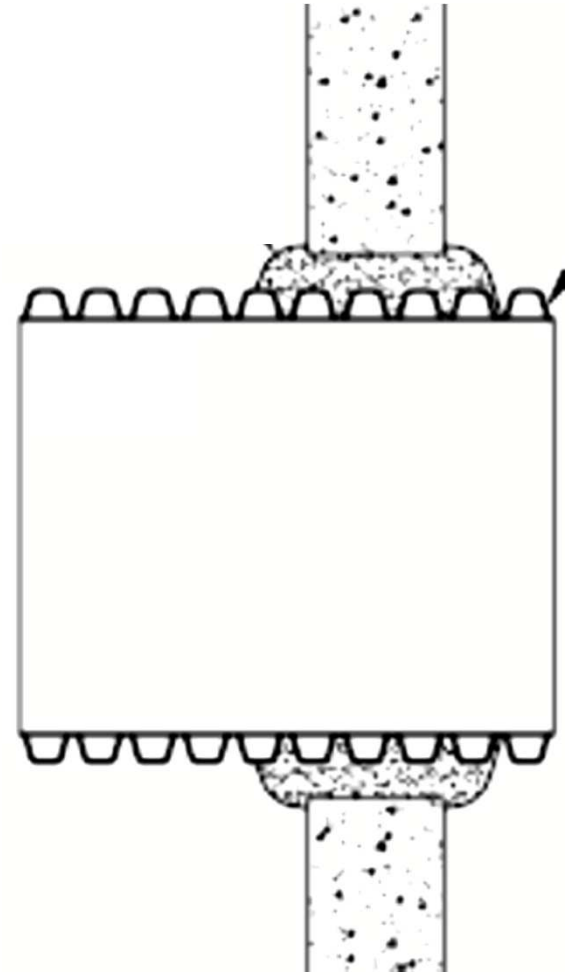
Connections to RCP pipe and FES

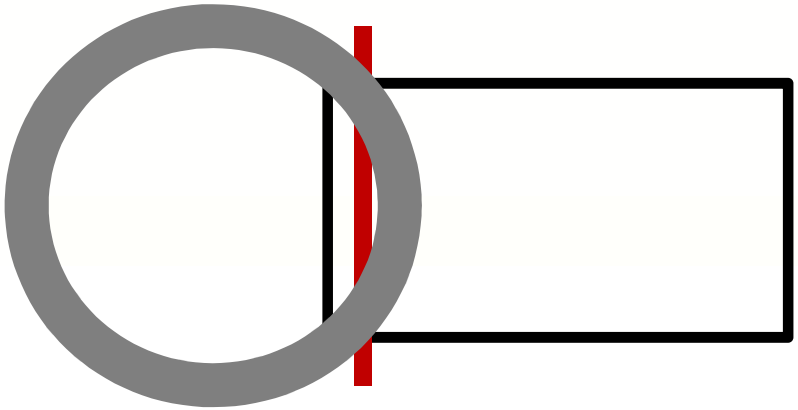
Hydrostatic testing – ASTM C969 or C1214

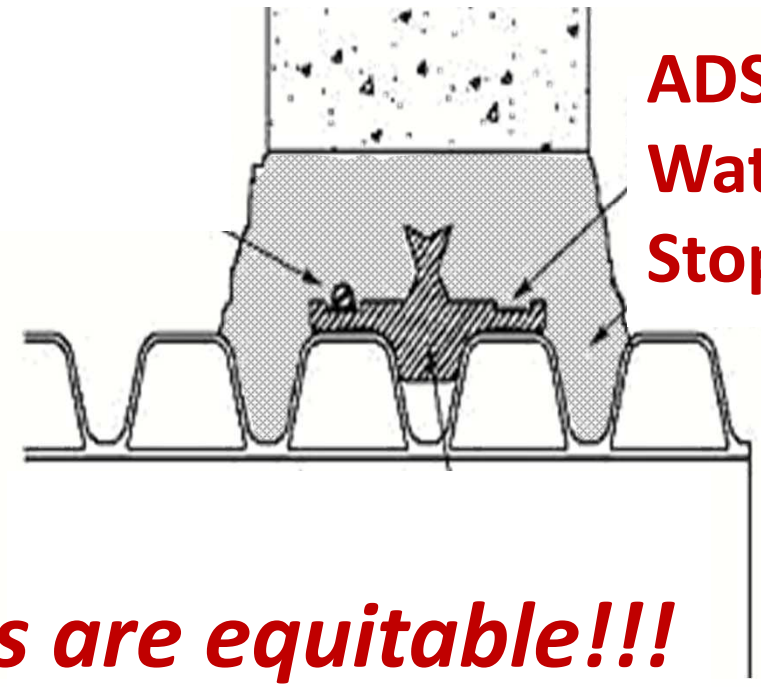


Make sure standards are equitable.

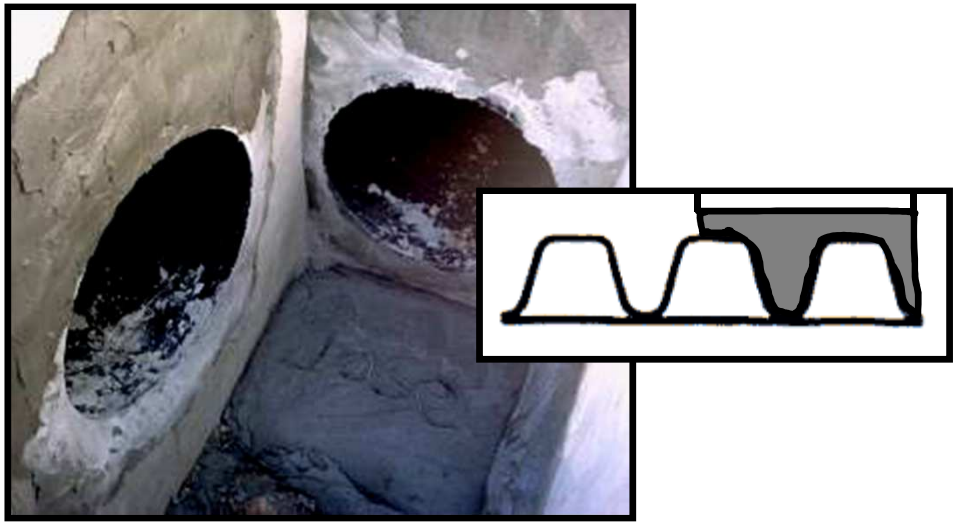
Manhole Connections…



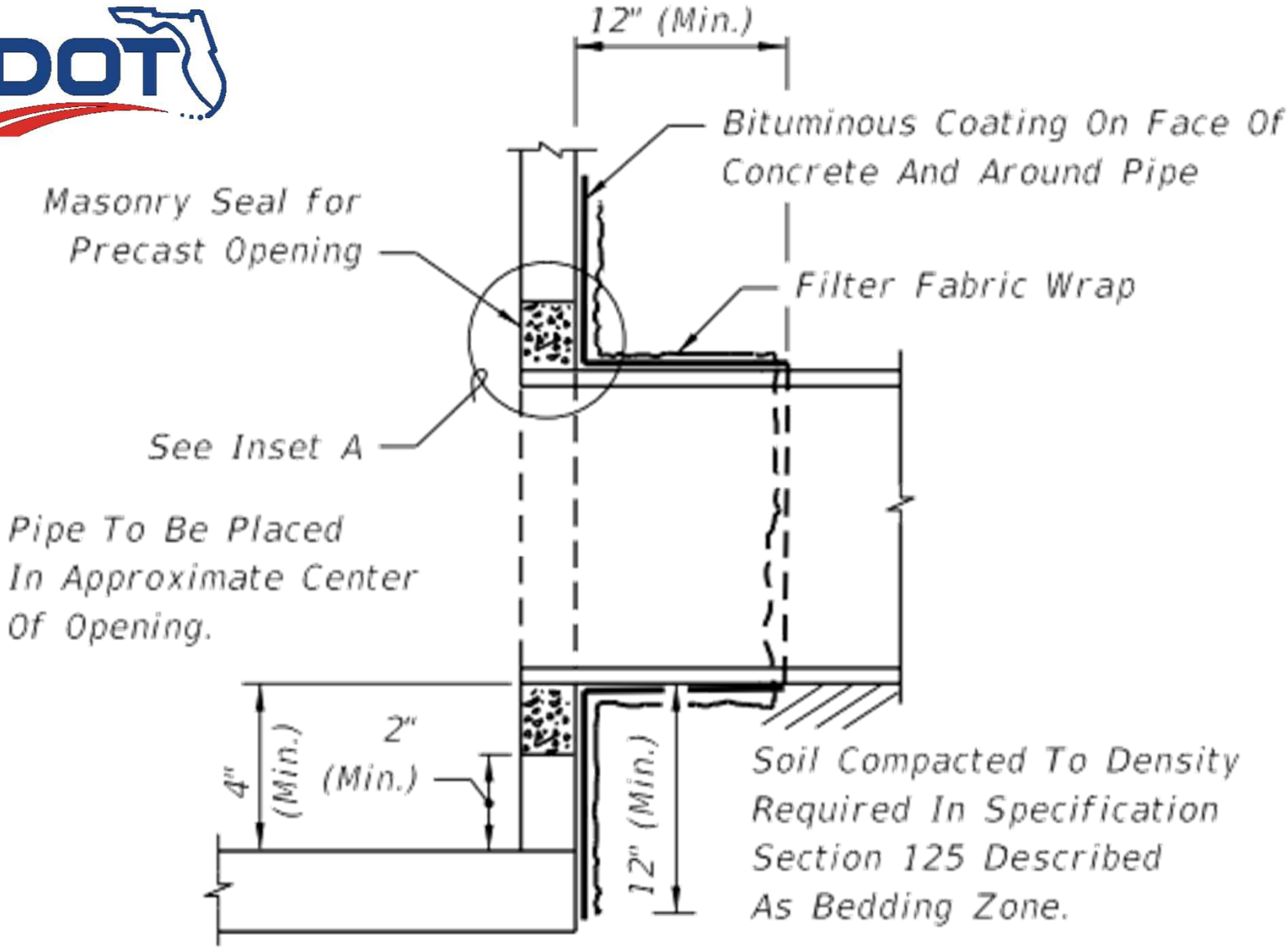




…Make sure standards are equitable!!!



- **Use Non-Shrink Grout at Joint.**
- **Fully engage corrugation with grout.**
- **Cut bell from end of pipe.**
- **Never use the bell to create a manhole connection. Internal hydrostatic pressure will fail the connection.**



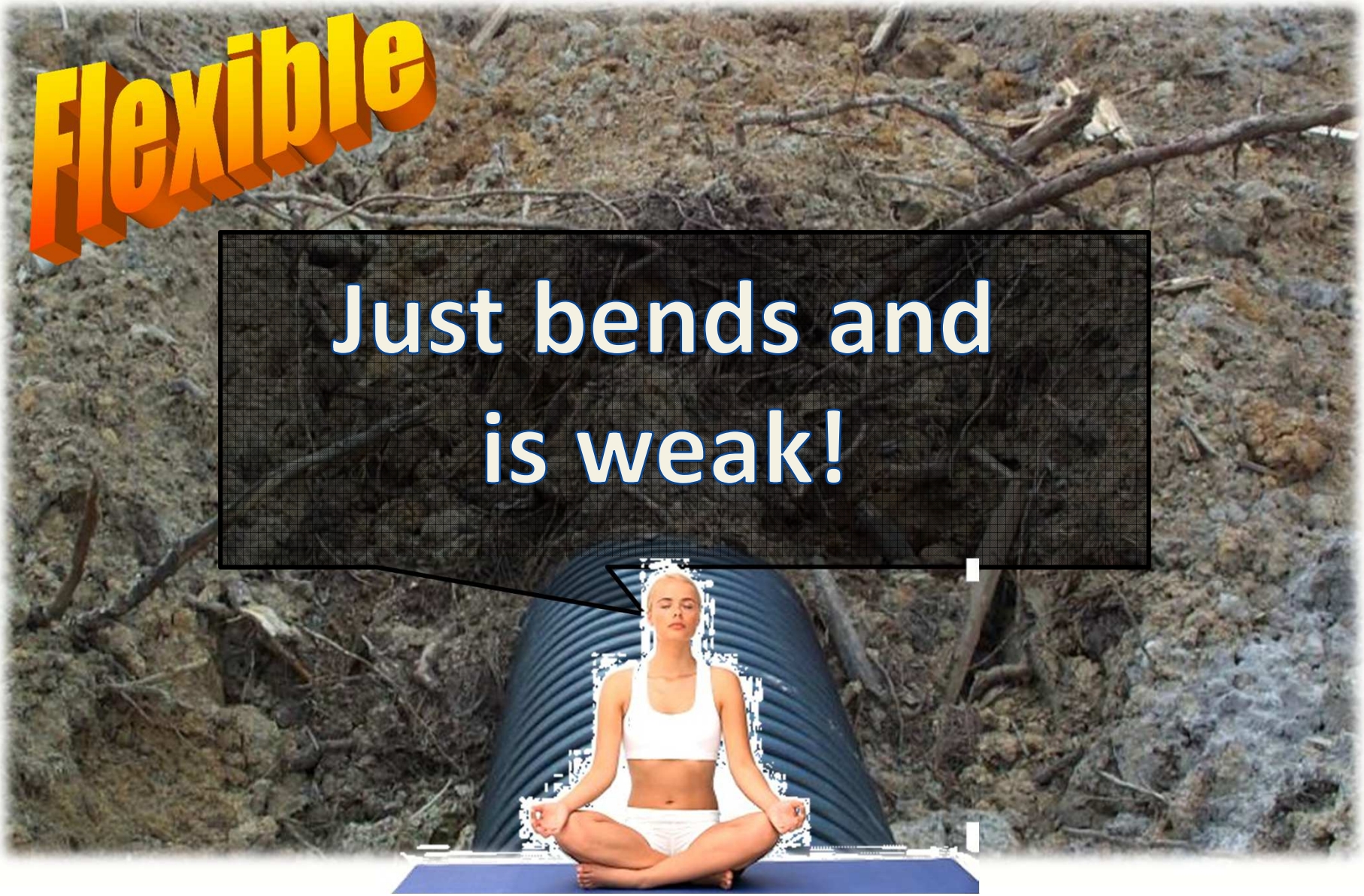
FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT

Quality Backfill doesn't matter!!!

MISUNDERSTANDING

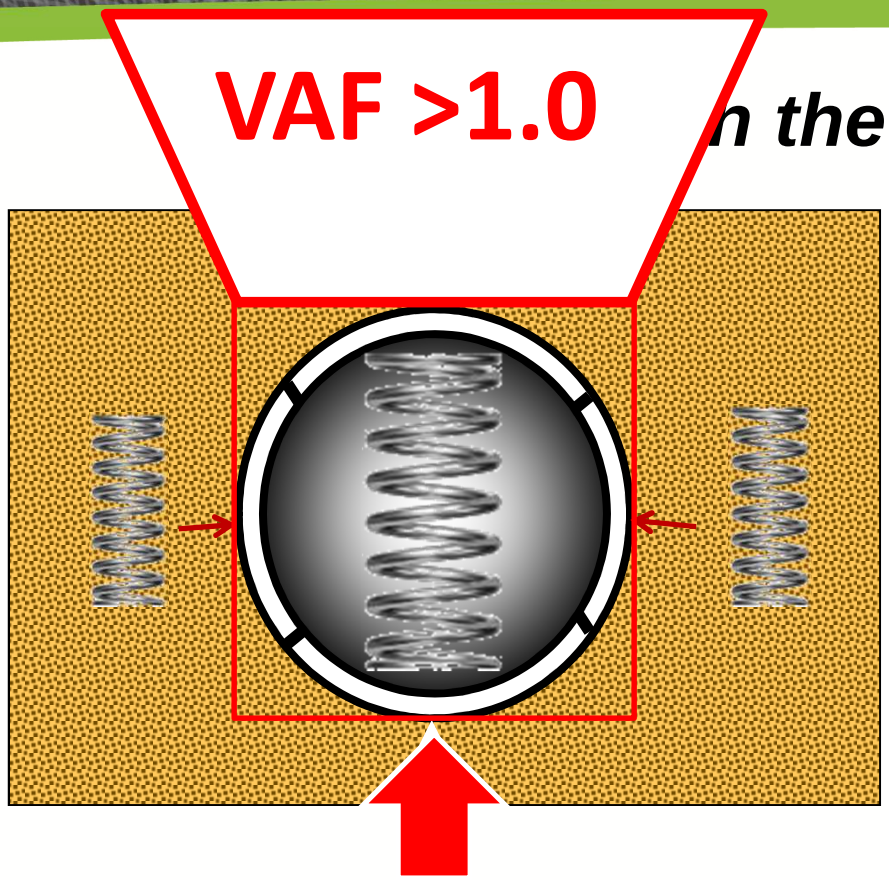
Backfill is all that maters!!!

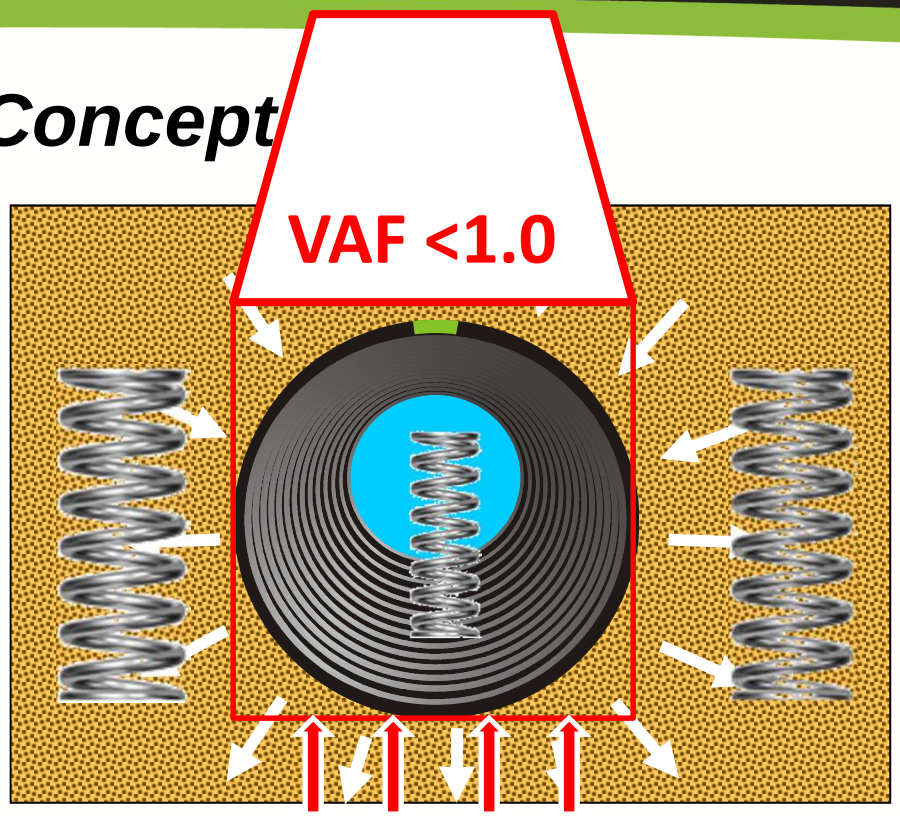
MISUNDERSTANDING



Rigid verses Flexible

n the Concept

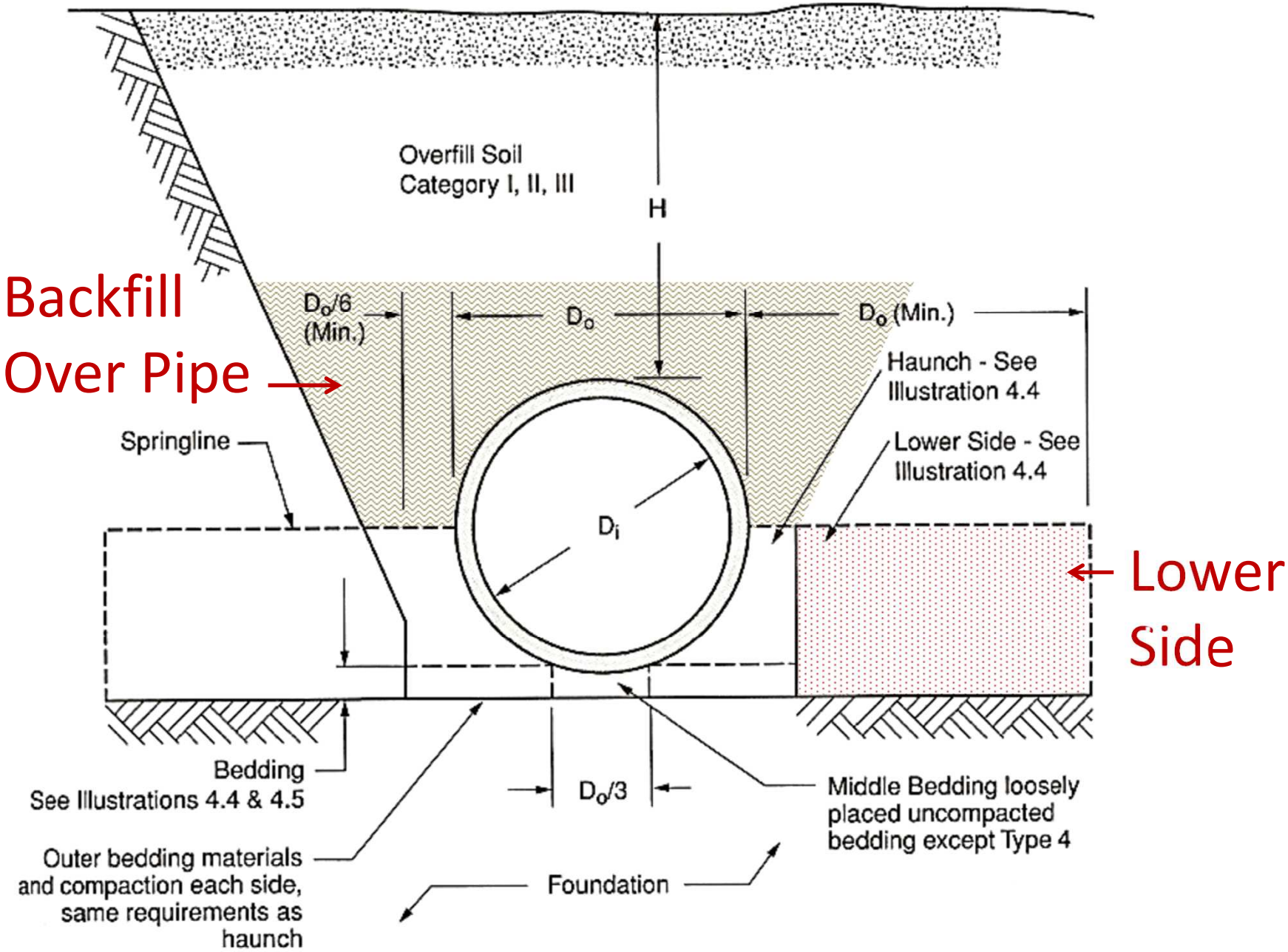




Rigid Pipe attracts load because it does not deflect

Flexible Pipe deflects to shed load to surrounding soil.

RCP Standard Installation Direct Design (SIDD)



RCP Installation Standards

(AASHTO Section 27)

Installation Type	Haunch & Outer Bedding	Lower Side
Danger Type 1	95% SW	90% SW 95% ML 100% CL
Type 2	90% SW 95% ML	85% SW 90% ML 95% CL
Type 3	85% SW 90% ML 95% CL	85% SW 90% ML 95% CL
Danger Type 4	None SW & ML * 85% CL	None SW & ML * 85% CL

Note: *CH* not recommended

Things you need to know to Compete…

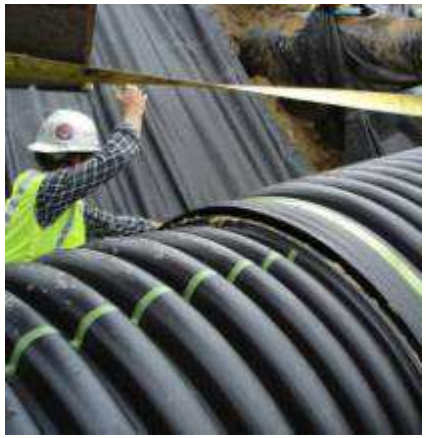
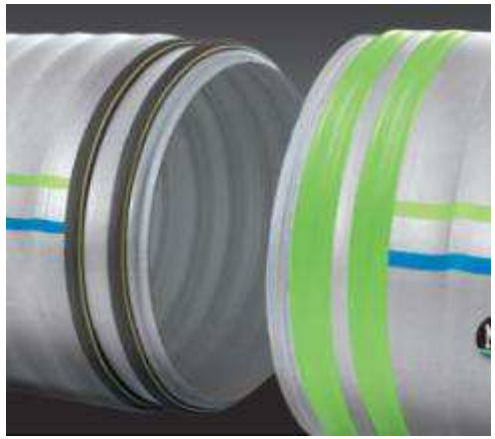
RCP - Class III (ACPA Chart)

Danger

Pipe Diam. (in)	Type 1 ACPA (ft)	Type 2 ACPA (ft)	Type 3 ACPA (ft)	Type 4 ACPA (ft)
15	22	16	12	7
18	22	16	12	7
24	22	16	12	8
30	22	16	12	8
36	22	16	12	8
42	22	16	12	8
48	[illegible]	16	12	8
60	[illegible]	16	12	8

Danger

HDPE and HP…

Group I	Group II	Group III	Group IV
			
Mega Green (PE)	***N-12 (PE)***	***N-12 HP Storm (PP)***	***SaniTite HP (PP)***
ASTM F2648	***AASHTO M294***	***AASHTO MP21-11***	***ASTM F2764***
		ASTM F2736	

Backfilling:

HP Storm
HIGH PERFORMANCE

Table 2
Maximum Cover for ADS N-12 HP Pipe Under Pavement (Storm Drainage), ft (m)

Diameter in (mm)	Class 1	Class 2			Class 3			Class 4
	Compacted	95%	90%	85%	95%	90%	85%	85%
12 (300)	40 (12.2)	28 (8.5)	21 (6.4)	16 (4.9)	21 (6.4)	17 (5.2)	15 (4.6)	14 (4.3)
15 (375)	42 (12.8)	29 (8.8)	22 (6.7)	17 (5.2)	22 (6.7)	17 (5.2)	16 (4.9)	15 (4.6)
18 (450)	37 (11.3)	26 (7.9)	19 (5.8)	14 (4.3)	20 (6.1)	15 (4.6)	14 (4.3)	13 (4.0)
24 (600)	32 (9.8)	23 (7.0)	17 (5.2)	13 (4.0)	17 (5.2)	13 (4.0)	12 (3.7)	11 (3.4)
30 (750)	32 (9.8)	23 (7.0)	17 (5.2)	13 (34.0)	18 (5.5)	14 (4.3)	12 (3.7)	12 (3.7)
36 (900)	29 (8.8)	21 (6.4)	15 (4.6)	11 (3.4)	16 (4.9)	12 (3.7)	11 (3.4)	10 (3.0)
48 (1200)	24 (7.3)	18 (5.5)	14 (4.3)	10 (3.0)	14 (4.3)	11 (3.4)	10 (3.0)	9 (2.7)
60 (1500)	30 (9.1)	22 (6.7)	16 (4.9)	12 (3.7)	17 (5.2)	13 (4.0)	11 (3.4)	8 (2.4)

ASTM D2321 Class IV Soil = Low Plasticity Clay and Loams (CL and ML)

Local Conditions

Know your compaction equipment

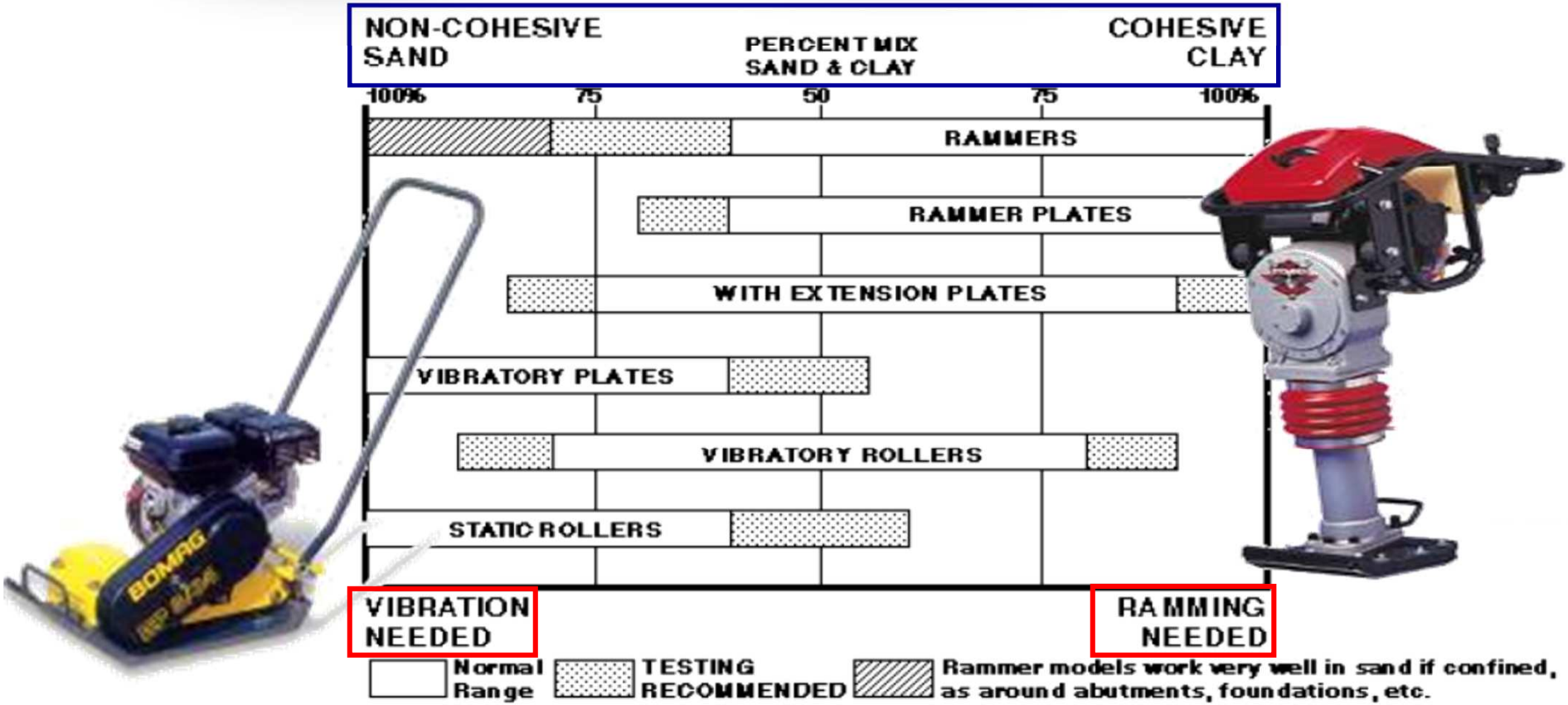
TTCI - FAST

Transportation **T**echnology **C**enter **I**nc.
Facility for **A**ccelerated **S**ervice **T**esting

	AASHTO H-25 or HS-25(1)	Cooper E-80(1)
Cover, ft. (m)	Live Load Transferred to Pipe, psi (N/mm2)	Live Load Transferred to Pipe, psi (N/mm2)
1 (0.3)	15.63 (0.108)	N/R
2 (0.6)	6.95 (0.048)	26.39 (0.1824)
3 (0.9)	5.21 (0.036)	23.61 (0.1632)
4 (1.2)	3.48 (0.024)	18.40 (0.1272)
5 (1.5)	2.18 (0.015)	16.67 (0.1152)
6 (1.8)	1.74 (0.012)	15.63 (0.1080)
7 (2.1)	1.53 (0.011)	12.15 (0.0840)
8 (2.4)	0.86 (0.006)	11.11 (0.0768)
10 (3.0)	Negligible	7.64 (0.0528)
12 (3.7)		5.56 (0.0384)
14 (4.3)		4.17 (0.0288)
16 (4.9)		3.47 (0.0240)
18 (5.5)		2.78 (0.0192)
20 (6.1)		2.08 (0.0144)
22 (6.7)		1.91 (0.0132)
24 (7.3)		1.74 (0.0120)
26 (7.9)		1.39 (0.0096)
28 (8.5)		1.04 (0.0072)
30 (9.1)		0.69 (0.0048)
35 (10.7)		Negligible

Live Load

Table 6-3
Compaction Equipment Selection Guide



PROJECT:	**Proposed Building & Pavement** For New Youth Building at Crosspoint Church 4609 Bellaire Boulevard Bellaire, Texas	BORING NO.: **B-2** PROJECT NO. 15G25662	DEPTH: **20'** DATE: May 8, 2015
CLIENT:	**Roy Harper AIA Associates, Inc.** Houston, Texas	Water was not encountered **during drilling operation**	

FIELD DATA							LABORATORY DATA							
									ATTERBERG LIMITS (%)					
DEPTH (FEET)	SOIL SYMBOL	SAMPLES	N: BLOWS/FT	T: INCHES/100 BLOWS	P: TONS/SQ FT	RQD: PERCENT	MOISTURE CONTENT (%)	DRY DENSITY POUNDS/CU. FT	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	SHEAR STRENGTH (TSF)	
			P=2.0				29							
			P=2.25				30							
5			P=1.5				31							
			P=1.75				29		77	26	51			
			P=2.0				28							
10														

DRILLING METHOD (S)

Continuous Flight Auger & Intermittent Sampling

Legend

Fat Clay		Lean Clay / Silty Clay		Silty Sand / Sandy Silt	
Fill		Clayey Sand		Silty Clayey Sand	

DESCRIPTION OF STRATUM

Stiff to very stiff, dark gray FAT CLAY (CH)

- very stiff from 2' to 4'

- stiff from 4' to 8'

Know your soils!!! Is a CH allowed?


TOYOTA
SCHOOL BUS