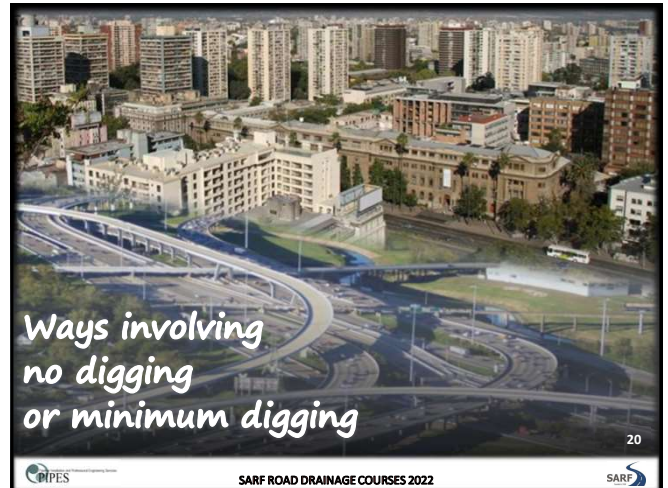


CONDITION ASSESSMENT BEFORE REHABILITATION



CONDITION ASSESSMENT BEFORE REHABILITATION

CONDITION ASSESSMENT BEFORE REHABILITATION

The asset's health needs to be checked so that any ailments are identified.

How is this done?




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Need to take some lids off

Report to those involved

Get Inside and look




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Need to take some lids off

Report to those involved

Get Inside and look



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Most engineers and officials have a hard time getting to the site and looking at the problems. You have to get in the pipe to see the problem. At least take pictures. They say a picture is worth a thousand words and can be the one thing that gets someone's attention. If necessary, hire a company to video the line and make a tape of the project. This can be used over again to educate and illustrate the problems found on installations.

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SEWER INSPECTION BY CCTV

We can't get into most pipelines

What can't camera do?

Combining camera with laser & sonar

Multi sensor inspections



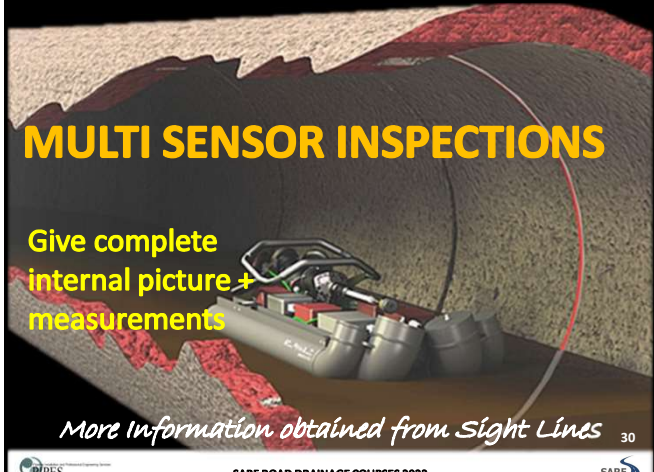

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MULTI SENSOR INSPECTIONS

Give complete internal picture + measurements

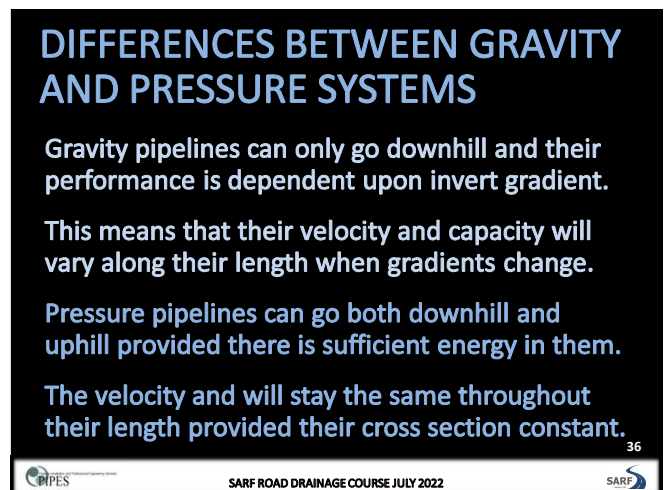
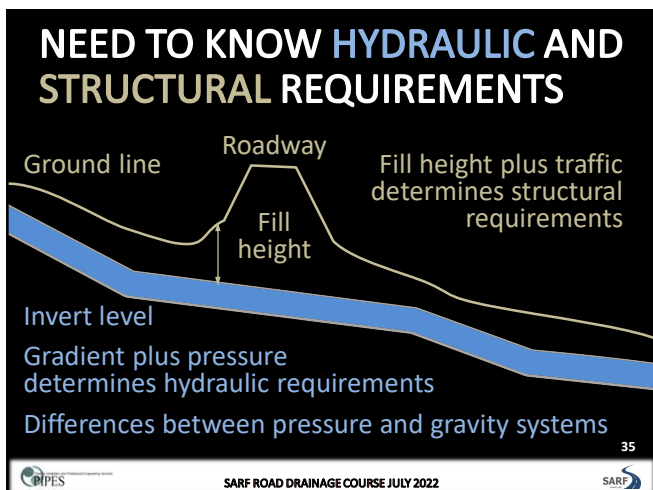
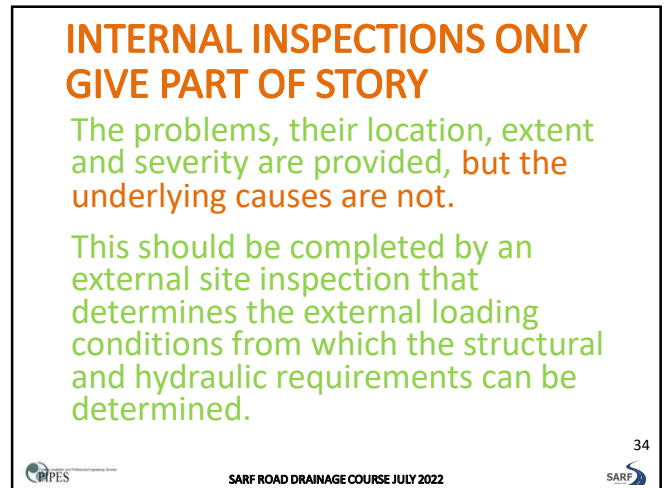
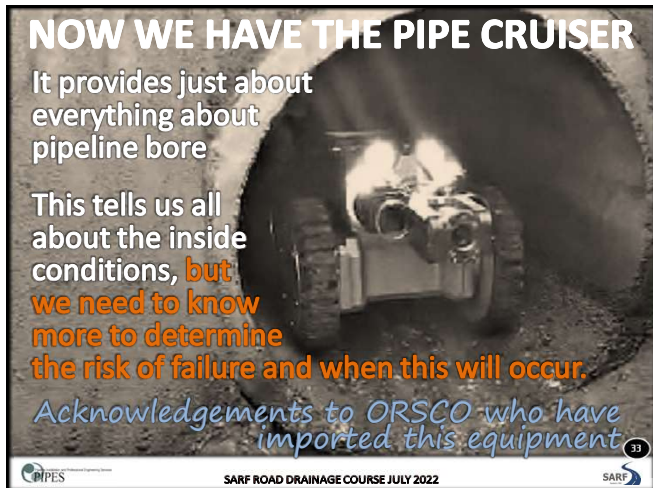
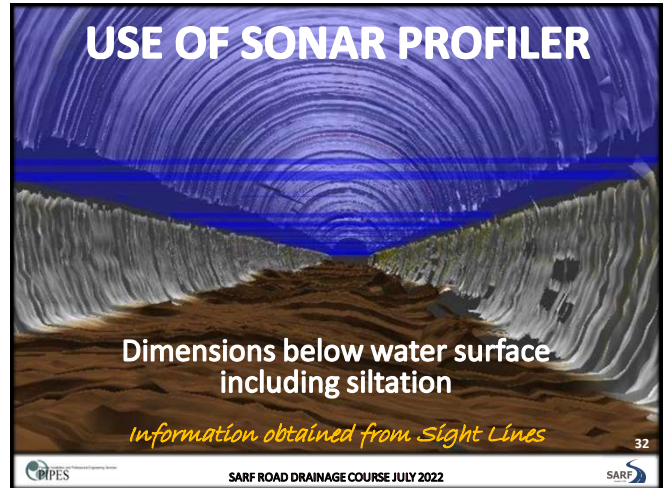
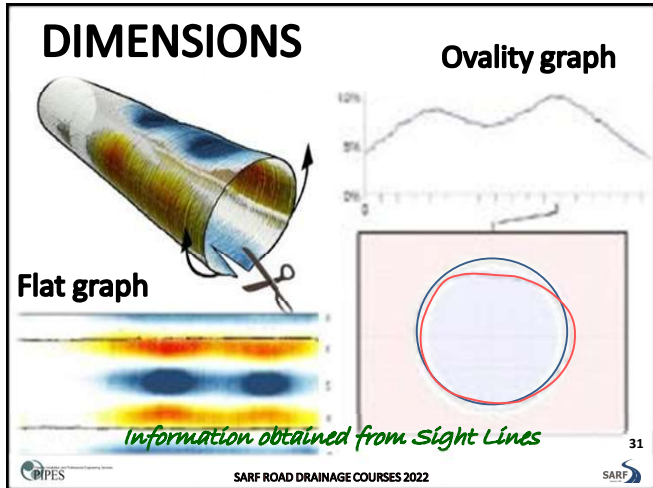
More information obtained from Sight Lines



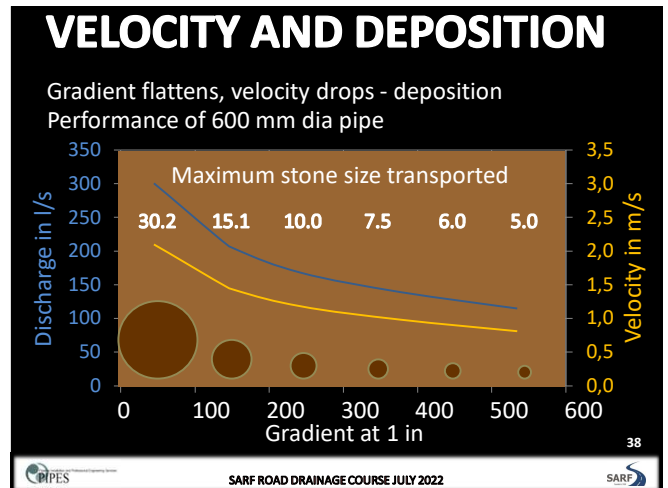
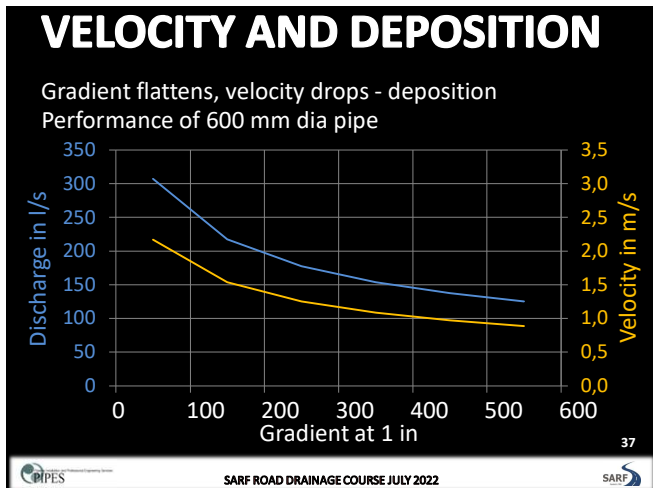
30

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CONDITION ASSESSMENT BEFORE REHABILITATION



CONDITION ASSESSMENT BEFORE REHABILITATION



STRUCTURAL REQUIREMENTS

The load carrying capacity of a pipeline depends upon the pipe/soil system.

With rigid pipes the pipes only carry 40 – 70% of the load; the soil carries the rest.

With flexible pipes the pipes only carry 5 – 20% of the load; the soil carries the rest.

When rehabilitating pipelines it is usually rigid pipes being lined with flexible pipes. **Interaction between existing pipeline and soil, and between lining and host pipeline need to be understood.**

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WHY DO COLLAPSES OCCUR ?

Is this due to lack of knowledge, or due to knowledge not being applied ?

Or not checking that specifications met ?

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WHY DO COLLAPSES OCCUR ?

Is this due to lack of knowledge, or due to knowledge not being applied ?

- NOT UNDERSTANDING PIPE/SOIL SYSTEM
- NOT ESTABLISHING SITE CONDITIONS AND DESIGNING ACCORDINGLY
- NOT PROVIDING ADEQUATE BEDDING FOUNDATIONS
- NOT PROVIDING FOR MOVEMENT
- NOT USING CORRECT JOINTING PROCEDURES

Or not checking that specifications met ?

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VARIABLE FOUNDING CONDITIONS

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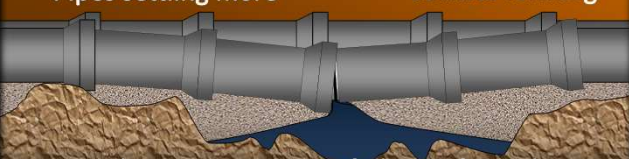
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CONDITION ASSESSMENT BEFORE REHABILITATION

VARIABLE FOUNDING CONDITIONS

With time this results in:

- Bedding settling
- Joints opening
- Leaks developing
- Bedding softening more
- Pipes settling more
- Capacity deteriorating
- Siltation at dips
- Leaks getting worse
- Cycle repeating
- Cavities forming



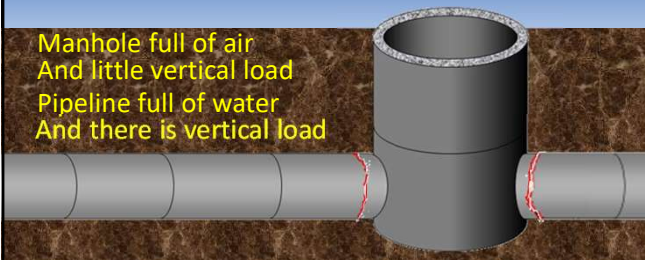
Results in progressive failure of pipeline

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MANHOLE CONNECTIONS

Manhole full of air
And little vertical load
Pipeline full of water
And there is vertical load




Relative movement cracks pipes

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MANHOLE CONNECTIONS

Manhole full of air
And little vertical load
Pipeline full of water
And there is vertical load



Pipeline tends to settle relative to manhole
Relative movement cracks pipes
Cracked pipes break

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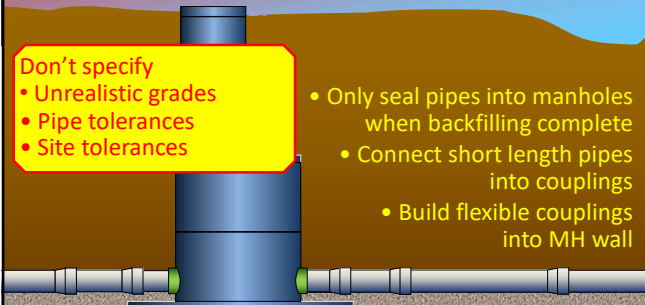
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COPING WITH SETTLEMENT

Don't specify

- Unrealistic grades
- Pipe tolerances
- Site tolerances

- Only seal pipes into manholes when backfilling complete
- Connect short length pipes into couplings
- Build flexible couplings into MH wall



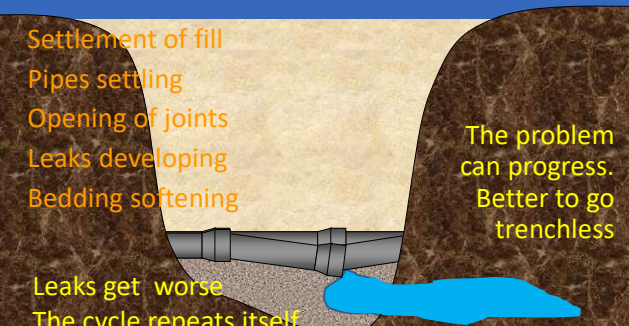
Construct oversized manhole base
Construct foundation under pipe bedding and MH base

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PROBLEM WITH LOCAL REPAIRS

Settlement of fill
Pipes settling
Opening of joints
Leaks developing
Bedding softening



The problem can progress. Better to go trenchless

Leaks get worse
The cycle repeats itself
Further breakages

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RECENT DEVELOPMENT IS CAMERA ON A POLE

Pipelines can now be inspected from manholes



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CONDITION ASSESSMENT BEFORE REHABILITATION

INSPECTIONS ALONE ONLY GIVE PART OF THE STORY

The problems, their location, extent and severity are provided, but the underlying causes are not.

These should be identified before any solutions are decided upon, to ensure that problems effectively addressed and to avoid future malfunctioning.

Underlying causes usually hydraulic or structural-they precipitate others.



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HYDRAULIC PROBLEMS

With gravity pipelines if the gradient flattens, deposition will occur, resulting in siltation.

Siltation in both sewers and stormwater drains will reduce their capacity.

Resulting in upstream flooding and roadway over-topping on stormwater systems.

Resulting in gas formation and corrosion in sewers as well as manholes surcharging and over-topping.

When downstream gradients increase gas release and serious corrosion occurs in sewers.



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STRUCTURAL PROBLEMS

The most serious problem is the development of longitudinal bending or shear cracks due to overloading or loss of bedding support.

Circumferential cracks occur due to the relative settlement pipes either due to uneven founding conditions or pipe connections into structures

Structural problems are very much dependent on the pipe material used.

Structural problems can't be rectified by simple means, such as pipeline cleaning.

If not addressed pipeline deterioration accelerates.



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CONDITION ASSESSMENT GIVES

Present condition of the pipeline.

The pipeline's history from design, through construction and maintenance to present.

The past problems.

This should provide the basis for more than just a risk analysis to prioritize rehabilitation.

It provides the details needed to investigate the underlying causes of the problems.

It provides basis for rehabilitation if needed.



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CONDITION ASSESSMENT GIVES

Present condition of the pipeline.

The pipeline's history from design, through construction and maintenance to present.

The past problems.

This should provide the basis for more than just a risk analysis to prioritize rehabilitation.

It provides the details needed to investigate the underlying causes of the problems.

It provides basis for rehabilitation if needed.



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ASSESSMENT SHOULD INCLUDE PERFORMANCE & CONDITION

Performance relates to primary function

Condition relates to secondary functions

Water tightness

Structural integrity

Long term durability



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