

# PAK ARAB SPIRO PIPE

PAKARAB - Pakistan's Largest Manufacturer Of Plastic Pipes And Fittings

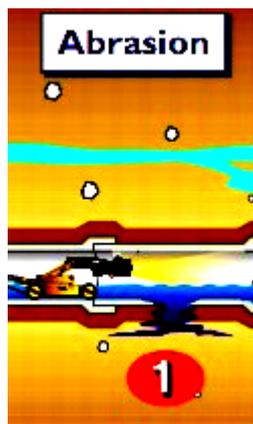


**ABSOLUTELY COMPLETE SYSTEM**

# Important Factors Considered For Selecting Material For Sewer

- Resistance To corrosion
- Resistance to abrasion
- Strength and durability
- Weight of the material
- Imperviousness
- Economy and Cost
- Weathering resistance
- Less connecting Parts
- Low specific weight
- High resistance to uv radiation
- No defects cause by rodents (animals)
- Flexibility and elasticity
- High Impact Strength
- Most efficient Hydraulic Properties

## Problem in existing sewage system



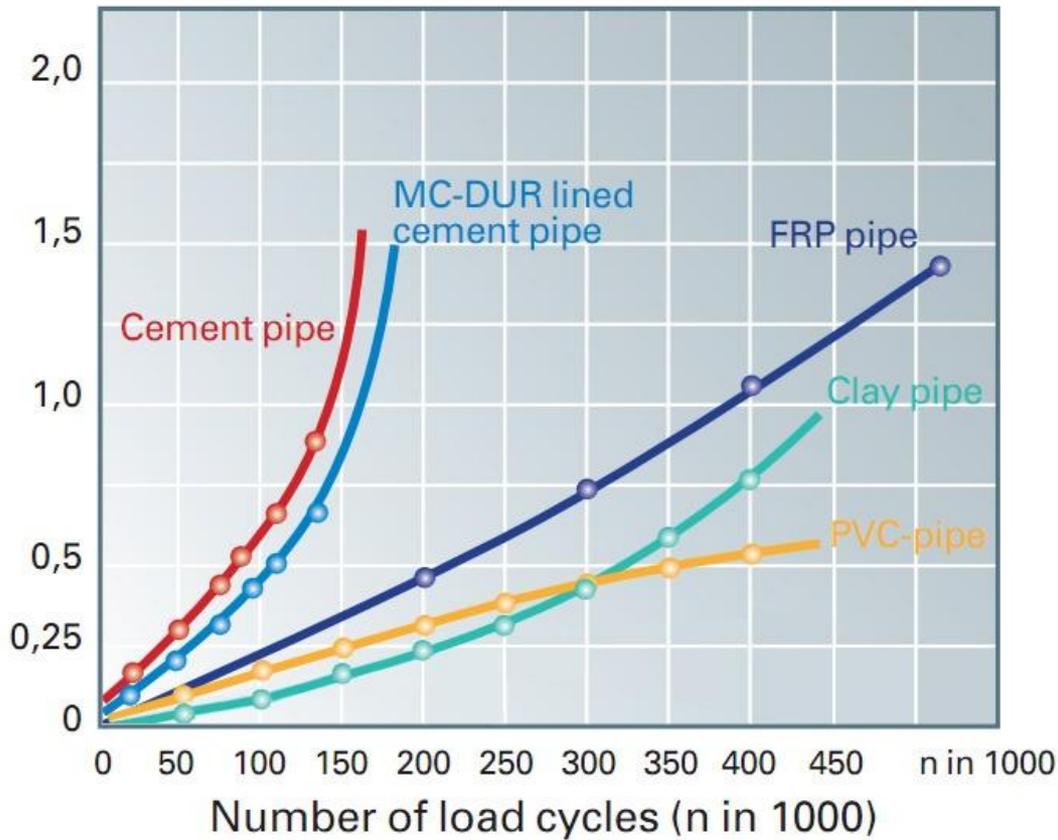
Sewage contain considerable amount of suspended solid, parts which are inorganic solids such as sand or grit. These particles moving high speed can cause wear and tear of sewer pipe internally. this abrasion can reduce thickness of pipe and reduces hydraulic efficiency of the sewer by making the interior surface rough.

Pipe material	Specific abrasion ( $\mu\text{m}$ )	Relative increase in stress for same abrasive effect (%)
PVC	0.754	0.6
Steel	1.72	6
Cast iron	2.09	2
Stoneware (clay)	4.31	2
Concrete	15.90	5
Asbestos cement	17.28	9

This table can be used to compare the values of predicted wall thickness lost due to abrasion between piping material assuming a time factor of 15, the concrete pipe would lose 75 % (15 x 5%) of its available wall thickness to abrasion. While pvc pipe 5%(15 x 5%).

## Darmstadt Test (Abrasion Resistance Test)

Average abrasion ( $a_m$  in mm)

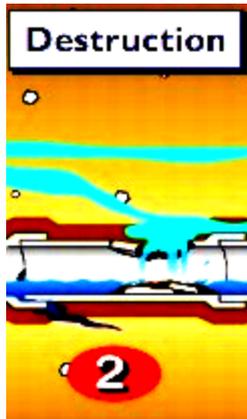


Test machine

## Abrasion Test

- A number of tests have been devised to measure the abrasion resistance of different pipe materials. One of the most important test was developed by Dr. Kirschmer which is known as the Darmstadt Test.
- The test specimen is a one meter length of pipe which is tilted back and forth with a frequency of 21.6 cycles/minute while containing an abrasive mixture of 46% by volume quartz sand (with a particle size of 0-30 mm) in water.
- The resultant flow rate over the surface of the pipe is 0.36 m/s. As shown in Figure , abrasion can then be plotted for different materials as a function of the number of cycles. On this basis of these results Pvc pipe perform better than clay or GRP and much better that concrete pipes

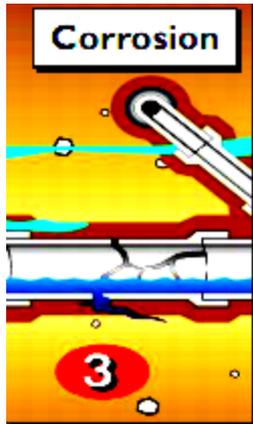
## Problem in existing sewage system



- The sewer pipe should have sufficient strength to withstand all the forces that are likely to come on them.
- Sewers are subjected to considerable external loads of backfill material and traffic load, if any.
- They are not subjected to internal pressure of water.
- To withstand external load safely without failure, sufficient wall thickness of pipe or reinforcement is essential.
- In addition, the material selected should be durable and should have sufficient resistance against natural weathering action to provide longer life to the pipe.



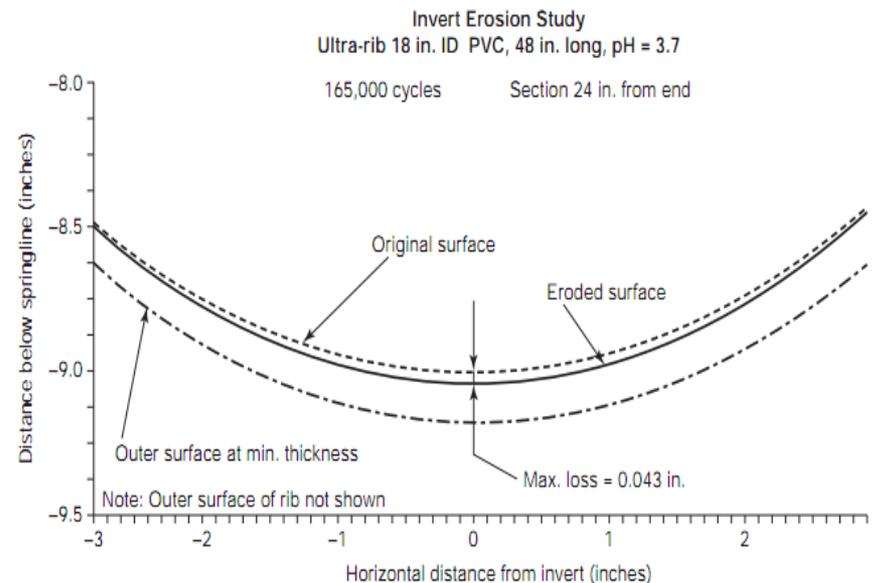
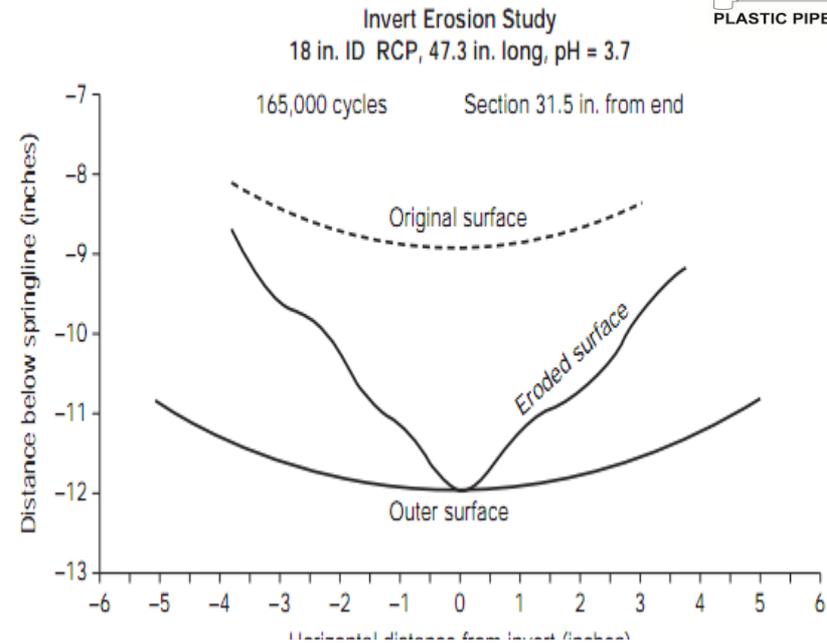
## Problem in existing sewage system



- Sewer carries wastewater that releases gases such as  $H_2S$ . This gas in contact with moisture can be converted into sulfuric acid.
- The formation of acids can lead to the corrosion of sewer pipe.
- Hence, selection of corrosion resistance material is must for long life of pipe.

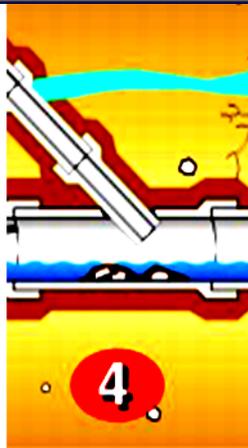
## Problem in existing sewage system

- Abrasion testing has also been conducted at California State University, Sacramento, where the performance of PVC profile wall pipe versus reinforced concrete pipe was evaluated, using velocities and aggregate materials to simulate very aggressive conditions. Additionally, acidity (pH) ranges were varied to simulate common in-service conditions.
- In this study, PVC profile pipe exhibited no measurable sensitivity or patterns of invert wear with increasing acidity of the water. Conversely, the reinforced concrete pipes (Studied in parallel with the PVC pipes) were influenced by the acidity of the flowing water, with increasingly severe invert wear in response to increasing acidity. In extremely abrasive exposures, wear must be considered. When compared with most other pipe materials, the use of PVC pipe can significantly reduce maintenance costs incurred due to abrasion and provide longer service life.

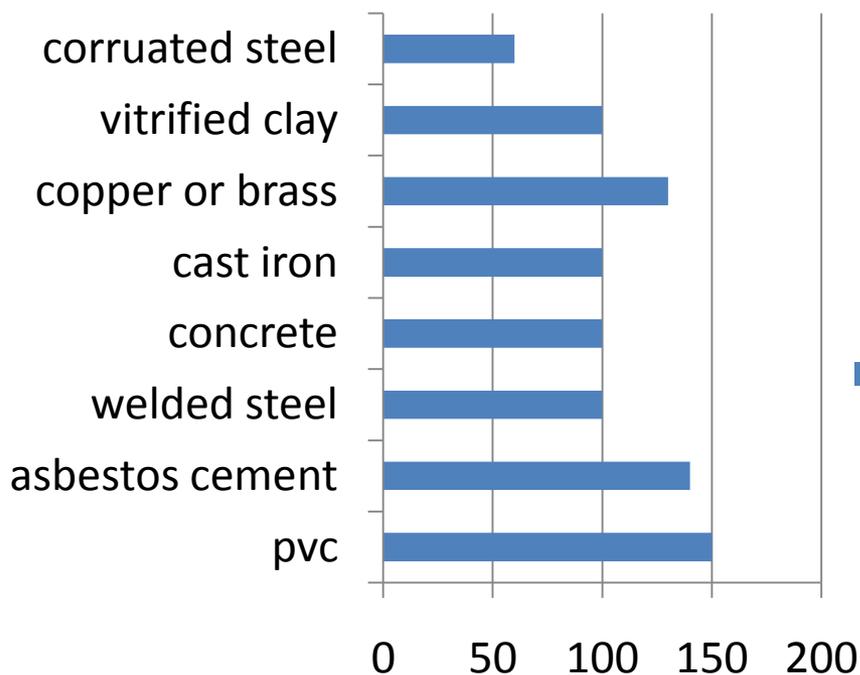


## Problem in existing sewage system

### Obstacles in the drain off

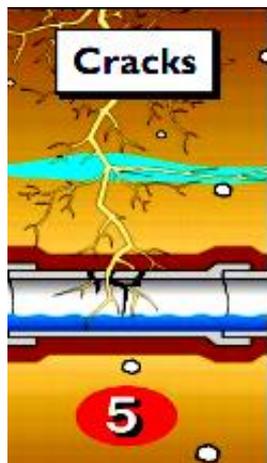


- With a low Hazen and Williams internal bore “c” factor, results pipe More turbulence and higher friction loss, to cope with that one need High sizing piping and high horse power pumps.
- In PVC this feature may allow piping downsizing and lower horsepower pumps. In other words, less energy is used over time.



■ Hazen williams Values

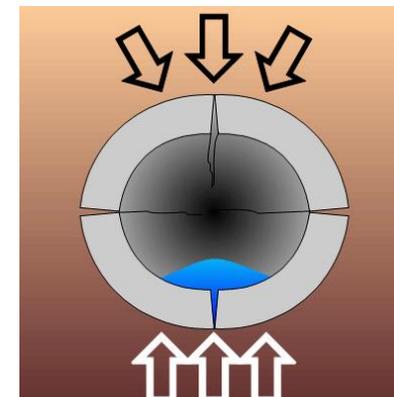
## Problem in existing sewage system



A failure that occurs when tensile stresses combined with prolonged exposure to certain fluids generate localized surface cracks

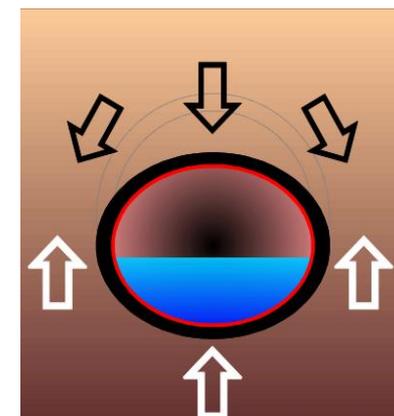
### Crack

The pipe is stiffer than the surrounded soil so it has to take over all the existing load.....until it breaks!



### Flexibility

The pipe avoids the load by deflection, the surrounded soil takes over all the load. The stiffness of the soil is about 10-200 higher than the stiffness of the pipe. Therefore soil determines the stiffness of the whole system. Therefore deformation is safe.



## Problem in existing sewage system



Exposed rebar and cracked bell



Cracked bell and hole in pipe



Severe longitudinal crack with differential movement and spalling

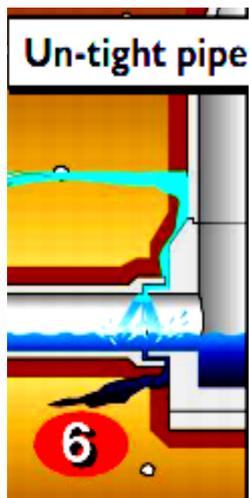


Cracking



"D" Crack

## Problem in existing sewage system



- Cement & sand has to mixed and making cement joint for connect RCC pipes and usually it is observed that from the labor error un tide connection perform, because curing time is required for creates permanent joint & hence if occasional dismantling is required, otherwise joint has to be break opened.



Example of severe infiltration of backfill material through separated joints



Misaligned pipe - offset joints



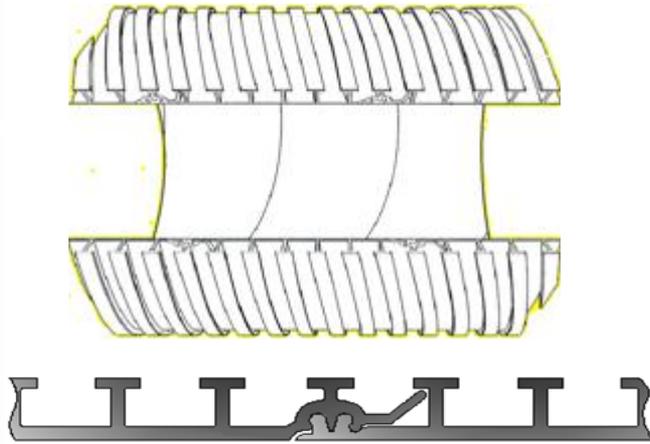
Open joint



Hole in pipe at joint

# Structural Analysis of Sewage Pipe

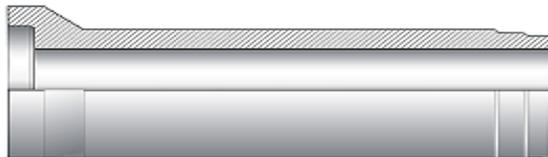
## Strength and durability



- The objective is forming a pipe to produce a uniform PVC inner wall using a mechanical lock and a continuous seal and an also add sealant with in the lock.

- it works by reacting with the surfaces of male and female together with the uPVC filler forms and integral matrix across the interface.

- The profile lock holds pressure by means of compression on the seal.



- Reinforce concrete** can corrode easily because of presence of steel.

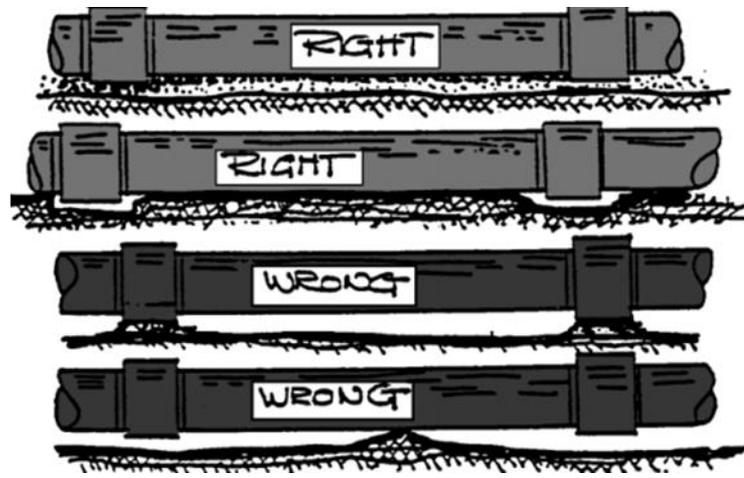
- Steel is the heterogeneous material while The concrete is homogenous material.

- therefore if both material will be used in combination than quality controlled will be very difficult.

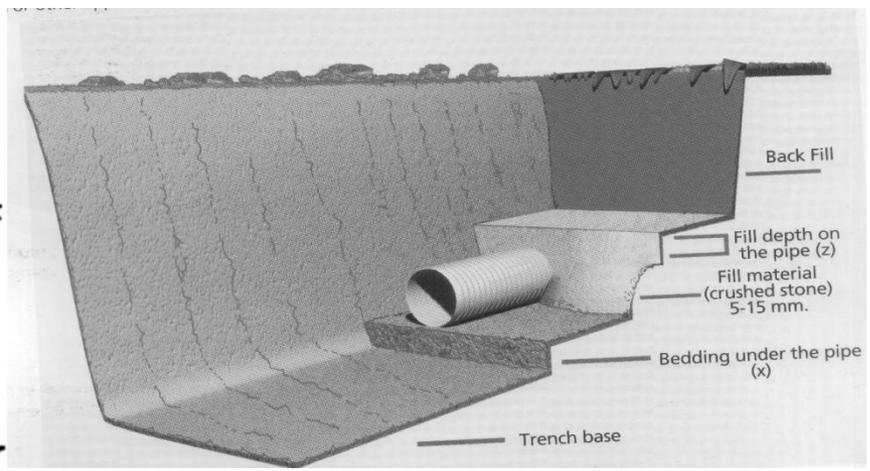
- If spacing in aggregates will not be proper ,then weak links increases in between steel and concrete if either steel or concrete fail the whole structure will be failed.

# Bedding and Back Filling are same in Spiro & RCC

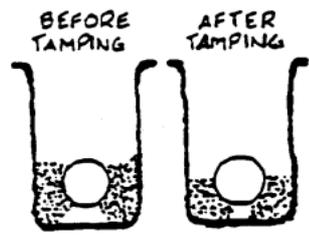
## RCC



## SPIRO

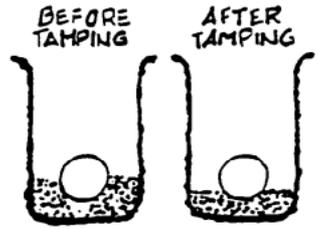


### WRONG

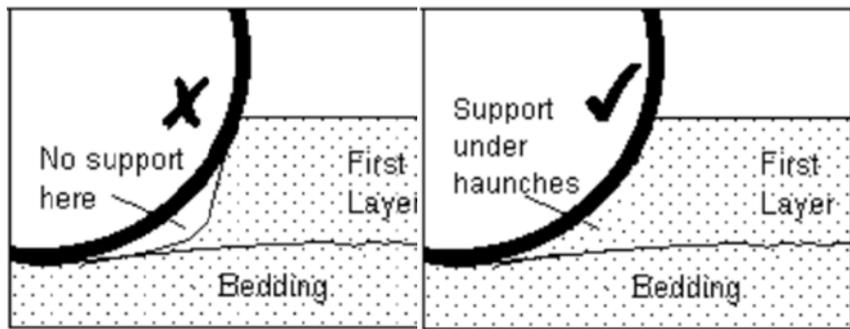


TOO MUCH DIRT BEFORE TAMPING - TAMPING BAR CANNOT COMPACT BACKFILL PROPERLY UNDER PIPE.

### RIGHT



PROPER AMOUNT OF BACKFILL WHICH CAN BE TAMPED FIRMLY UNDER PIPE.



# Hydraulic Comparison (Friction Losses)

**Spiro pipes allow to use smaller diameters than other rigid pipes to flow the same flow rate due to its manning roughness co-efficient (0.0085- 0.010), which is lower than concrete pipes(0.014- 0.016).**

**Following below chart is obtained by using manning flow velocity formula**

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$

Inner Dia	Wall thickness	Velocity	Flow	Slope
610 mm (24")	72.6 mm (3")	1.203 m/s (3.94 Ft/s)	350 l/s	0.3 m/km

Reinforced Concrete Cement  
 ASTM Specification C-76-79, Class II. Wall B

Inner Dia	Wall thickness	Velocity	Flow	Slope
532 mm (22")	9mm	1.701 m/s (5.57ft/s)	378.15 l/s	0.3 m/km
582 mm (24")	9mm	1.78 m/s (5.83) ft/s	473 l/s	0.3 m/km

PAK ARAB U-PVC Spiro Pipe

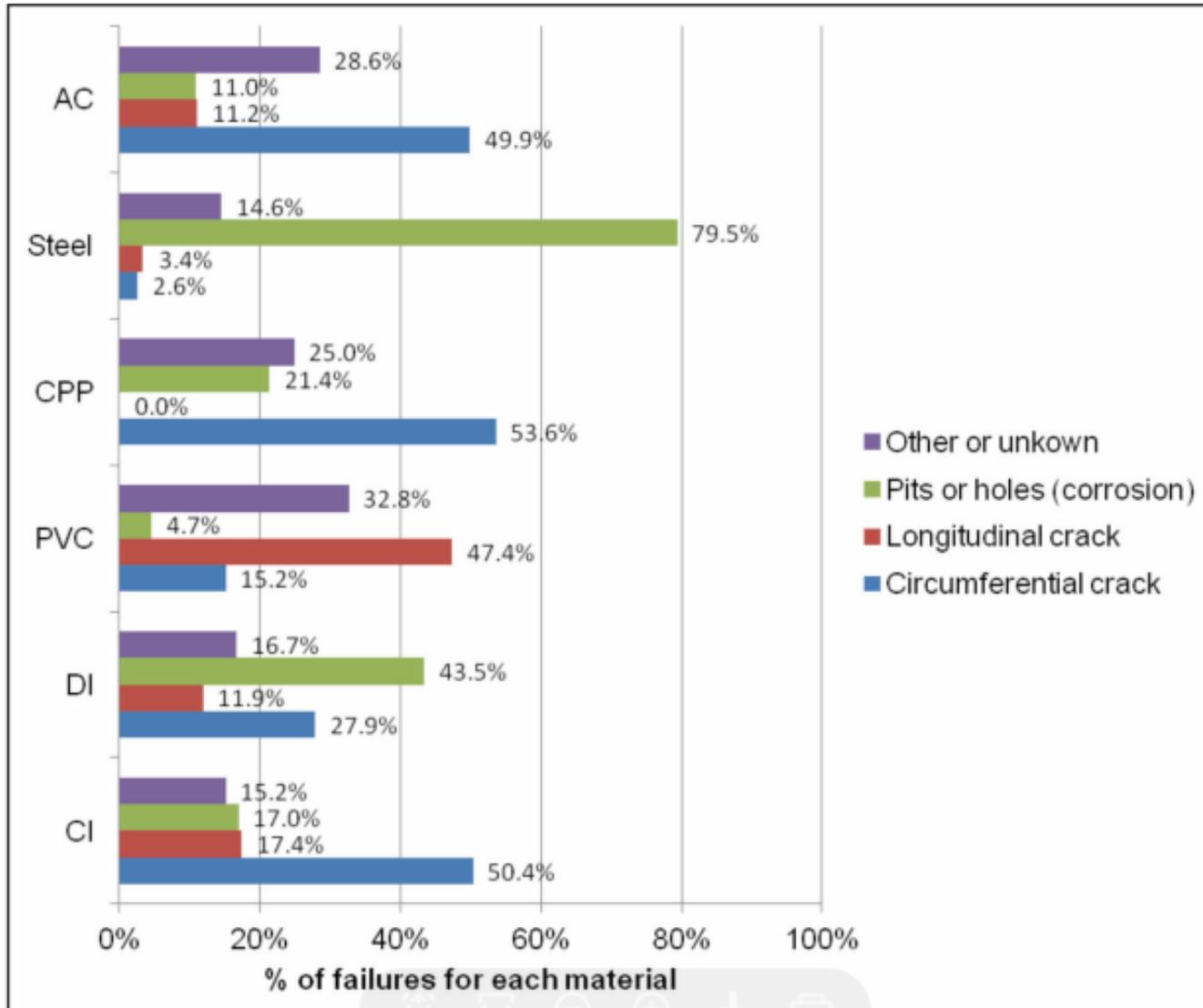
# No. of Joints

- Total Number of Joints in 500 Rft sewage pipe.

Pipe	No. of Joints	Description
Rcc	63 (More number of joints due to pipe length up to maximum 8ft long)	Cement, sand has to be available at site & mixed. Further curing time is required for creates permanent joint & hence if occasional dismantling is required, otherwise joint has to be break opened
Spiro	7 (Less number of joints, as pipe is available as per desired length)	Snap-on-type joints method used, and pipe length has been manufactured from manhole to manhole, therefore less joint required

**Low to no risk of leakage due to the possibility of production in higher lengths.  
*customized length from manhole to manhole in any diameters***

# Description of failure for each pipe material



Source :Water Main Break Rates in the USA and Canada: A Comprehensive Study 15 April 2012 Utah State University Buried Structures Laboratory | Steven Folkman, Ph.D., P.E.

## Advantages of SPIRO PIPE over other Pipes

- o Spiro Pipe offers excellent value for money.
- o Spiro pipe has a special raw material formulation to resist UV rays, temperature changes and most of chemicals.
- o The installed cost makes it more feasible than RCC or AC pipes.
- o It has 50 years of service expectancy whereas RCC design life is 15 years.
- o The ribbed surface of the pipe provide exceptional load bearing capacity.
- o For larger diameters of Spiro pipe, the pipe is reinforced with steel strips as per load functional.
- o Spiro Pipe offers smooth internal surface with a Manning coefficient of 0.0085, this allows 40% higher flow rates than RCC pipes for same diameter.
- o Spiro Pipes & Spiro Fabricated fittings i.e (Tee, Elbow, Wye, Reducer Fittings) can be connected to each other through coupling strip, all of these are guaranteed leak-proof connection method.
- o Spiro pipes have perfectly smooth inner surface which enables 15% reduction in diameter in the project enabling a considerable economy in the pipe cost.
- o It is the material of choice for sewerage lines giving protection against attacks of Hydrogen Sulfide & other chemicals
- o The production facilities of Spiro Pipes are moveable easily to another place which gives a big economy in the transportation cost of the pipes in a big pipe line projects

## Advantages of SPIRO PIPE over Other Pipes



- **Tested to rigorous standards.**
- **Resistant to chemical attack.**
- **No rust, scale or pitting.**
- **Joint integrity.**
- **Abrasion resistant.**
- **Optimum flow.**
- **Flexibility.**

## Advantages of SPIRO PIPE over Other Pipes

**High flow performance** → **Higher Hydraulic capacity due to low surface friction.**

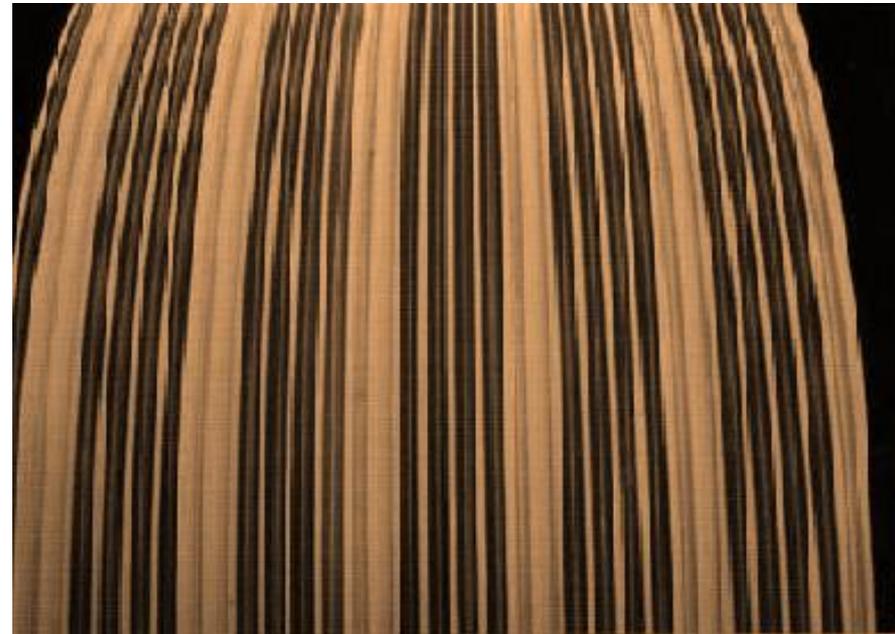
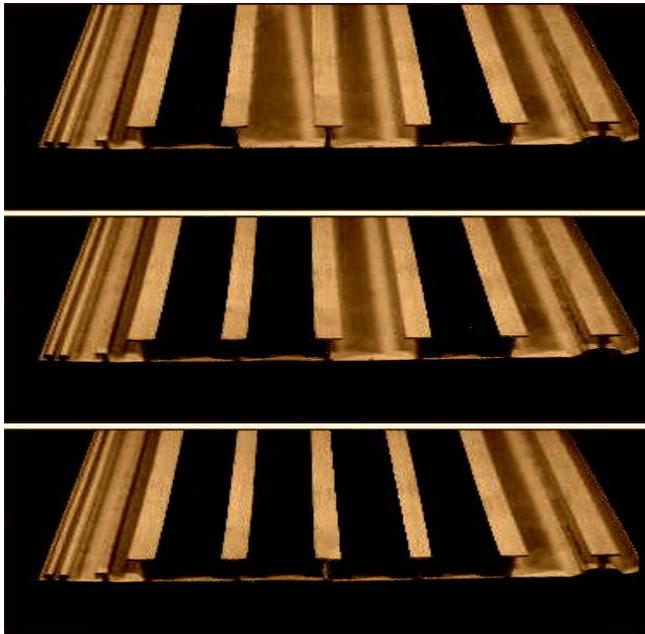
**Spiro pipes allow to use smaller diameters than other rigid pipes to flow the same flow rate due to its manning roughness co-efficient (0,009), which is lower than concrete pipes(0,014-0,016). For example 800mm Pak Arab Spiro Pipe gives the same flow rate 1000mm concrete pipe.**



## Advantages of SPIRO PIPE over Other Pipes

### **In larger diameters higher strength achieved by specially formed galvanized bands**

In diameters equal or bigger than 600 mm spiro pipe may be surrounded with band galvanise in order to increase the strength of the pipe against the fill loads and dynamic (traffic) loads. Band galvanise may be surrounded to spiro pipe after calculating the strength against external loads in two,three or four rows if required.



# Advantages of SPIRO PIPE over Other Pipes

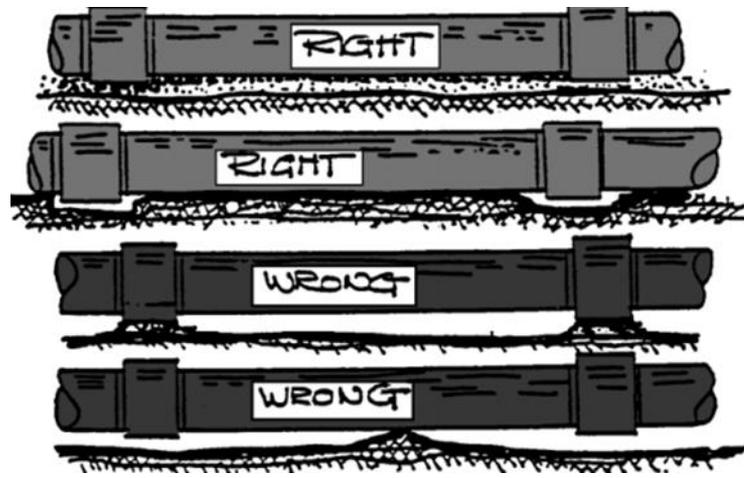
## Spiro Fabricated Fittings

Fitting of different sizes, angles, shapes and forms are available to go with Pak Arab Spiro pipes. The usual required fittings includes elbow 90°, Elbow 45°, Tee, Wye Tee etc. Besides these usual demanded fittings, special fittings on request of the customer are also available, like double Wye, reducer Tee, Reducer Wye Tee, Reducers etc.

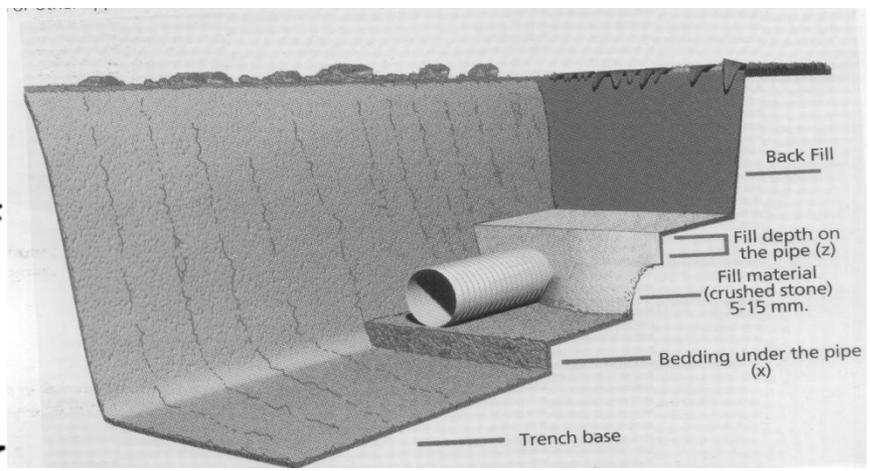


# Bedding and Back Filling are same in Spiro & RCC

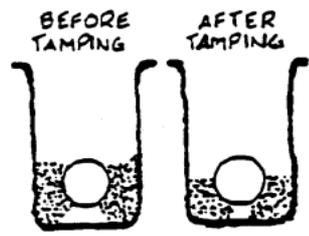
## RCC



## SPIRO

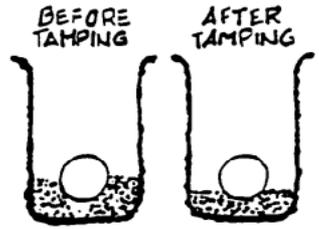


### WRONG

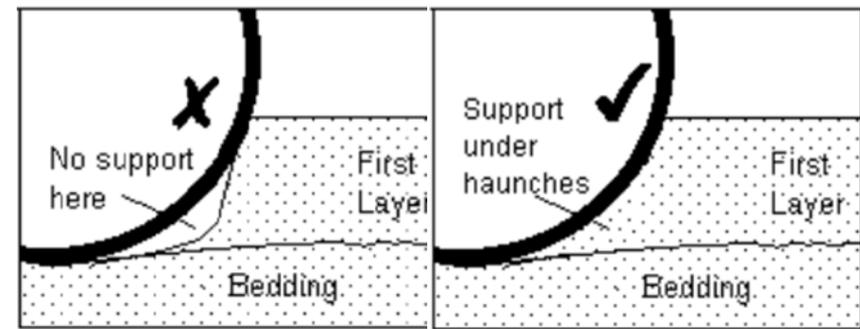


TOO MUCH DIRT BEFORE TAMPING - TAMPING BAR CANNOT COMPACT BACKFILL PROPERLY UNDER PIPE.

### RIGHT



PROPER AMOUNT OF BACKFILL WHICH CAN BE TAMPED FIRMLY UNDER PIPE.



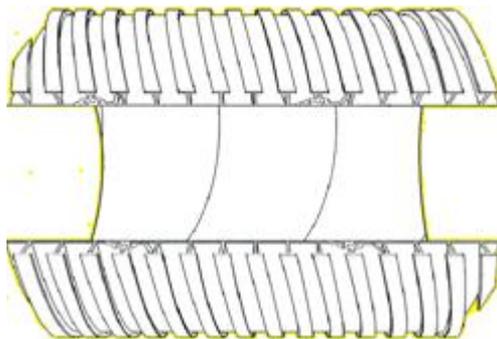
## Application Areas for SPIRO PIPE

**Pak Arab Spiro Pipe offers a unique solution for non-pressure, gravitational substructure applications:**

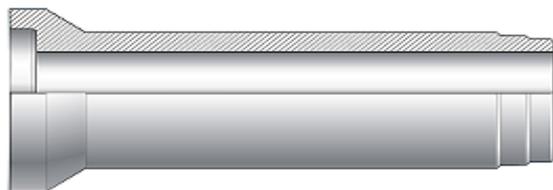
- Sewage and Drainage.
- Storm water.
- Gravitational Conduits.
- Replacement for boxed culverts in highway and motorway construction .
- Collector medians along highways.
- Conduits for power plants & industries.
- Irrigation Canals.
- Used instead of box culverts in highway Construction and in motorway construction for drainage lines.

# Structural Analysis

## Strength and durability



The objective is forming a pipe to produce a uniform PVC inner wall using a mechanical lock and a continuous seal and an also add sealant with in the lock. it works by reacting with the surfaces of male and female together with the uPVC filler forms and integral matrix across the interface. The profile lock holds pressure by means of compression on the seal.



Reinforce concrete can corrode easily because of presence of steel. Steel is the heterogenous material while The concrete is homogenous material. therefore if both material will be used in combination than quality controlled will be very difficult. If spacing in aggregates will not be proper ,then weak links increases in between steel and concrete if either steel or concrete fail the whole structure will be failed.

## Comparison Chart of RCC Pipe And UPVC SPIRO Pipe

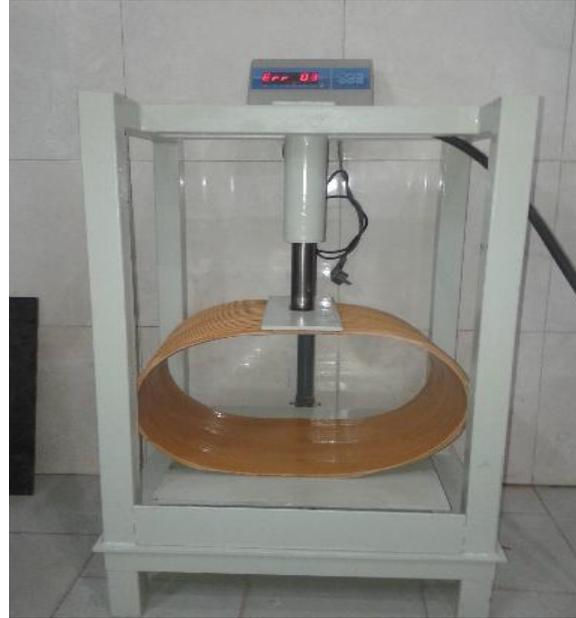
S#	Parameter	Precast Concrete Pipes	Pak Arab PVC Spiro Pipe
1	Flexibility	The trenching path is seldom straight, it is required to have lateral curvatures to ups & downs with RCC pipes, this has to be tackled with acute corners at joints.	Spiro pipe tackle the trench path by aligning it with smooth curves (horizontal & vertical).
2	Soil Settlements	Leads to cracking of pipes or joints, in the already laid duct because the pipe is unable to align to new contours.	No cracking and no adversely affect the already laid duct.
3	Co-efficient of Friction	Very high, may lead damage to cable cover of sub-ducts at time of insertion.	Low friction, plain internal surface, no difficulty in cable insertion
4	Number of Joints	More number of joints due to pipe length up 2.5 meter	Less number of joints, as pipe is available as per desired length
5	Joining Method	Cement, sand has to be available at site & mixed. Further curing time is required for creates permanent joint & hence if occasional dismantling is required, otherwise joint has to be break opened	Snap-on-type joints method used, and pipe length has been manufactured from manhole to manhole, therefore less joint required
6	Transport	Transport charges are very high due to loading & unloading difficulties. Further, like hood of breakage exists in loading operations. Material handling equipment like chain blokes and tripod is required at site.	The pipe manufactured at site and easily two person carried pipe from one place to another by walk.
7	Labour At Site	As mentioned above the full strength of labour required at the time of laying, lowering and in jointing operations.	Less labour required
8	Speed of Work	Due to lots of hurdle which mentioned in above, the speed of work is very slow.	The speed of work is very fast as mentioned in above properties.
9	Chemical, Anti Corrosive and biological Properties	Has limited suitability in acidic and alkaline climates. May support biological growth.	High degree of chemical interns & high anti-corrosive properties. Facilitates use in aggressive climates & soil conditions, including saline lands. Does not support biological growth.
10	Laying Cost	Due to heavy weight the cost of the laid duct works out to be very high.	Due to light weight the cost of the laid duct work will be very cheap.

## Cost Comparison Chart Between RCC versus UPVC SPIRO

S#	Parameters	RCC PIPE		UPVC SPIRO PIPE	
		Comment	Cost / Ft	Comment	Cost / Ft
1	Cost of Pipe Per Ft	Excluding cost of loading, unloading & transportation of pipes from one place to another place	100	Pipe will be produced at trench site therefore no need of transportation	150
2	Cost of trenching	Same in all cases	-	Same in all cases	-
3	Cost of unloading pipe at site	Atleast 2 to 4 labor and crane for safe unloading without damaging pipe. despite after full curing some pipes must be damaged	30	No need of labor and cranes	-
4	Laying cost in trench	Atleast 2 labor and crane required for laying up to maximum length of 8ft	30	It can be laid down with out any machinery and few labors handle this work up to maximum length from manhole to manhole	10
5	Jointing of pipe	Cement & sand required along with mason	10	Joint free pipe & whenever the joints required than coupling strip will be used after customized length	5
6	Curing at joints	Joints are not intact easily, therefore curing required at every point which consume time and efficiency of work	5	No curing required	-
Total			175		165

Note: The above quoted cost has been assumed from various sources, to provide the overview for the above facts

# SPIRO PIPE / TESTING PARAMETERS



# SPIRO PIPE / PRESSURE TESTING (ASTM—F1697-09)



# Rupture / Breaking strength at 18 psi



# Testing of Spiro Pipe by using ASTM Standards



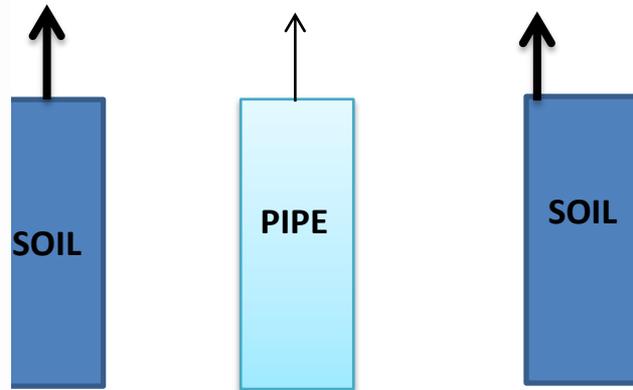
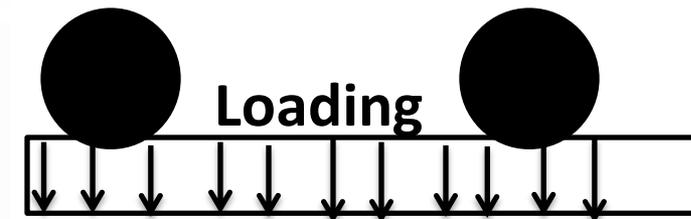
← Internal Pressure Test

Deformation Test →



# LOADING BEHAVIOUR ON FLEXIBLE PIPE

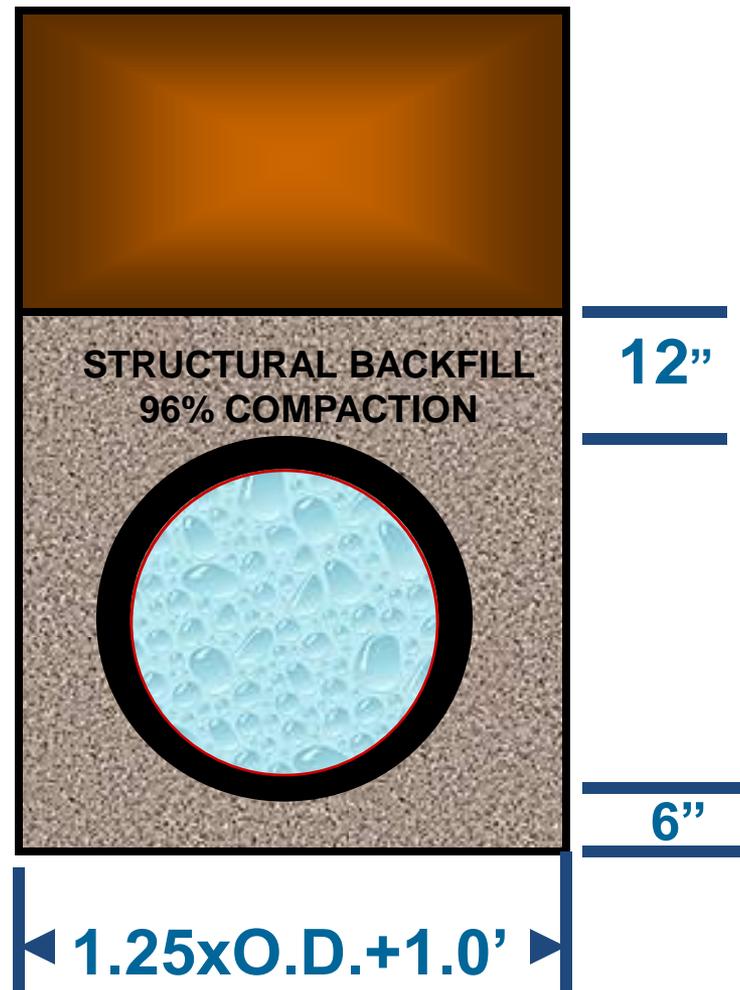
## Flexible pipe



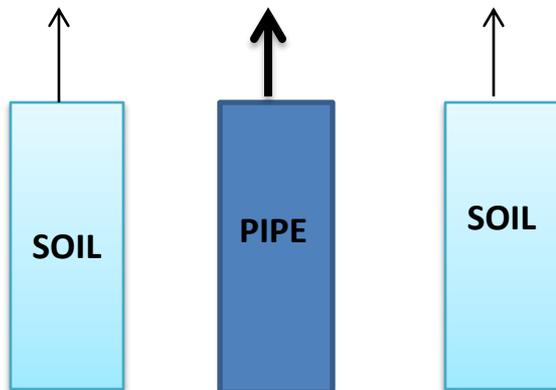
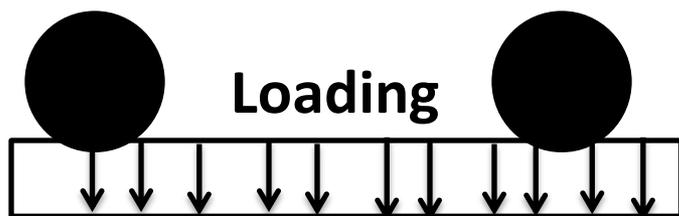
Strong Spring

Weak Spring

Strong Spring



# LOADING BEHAVIOUR ON RIGID PIPE

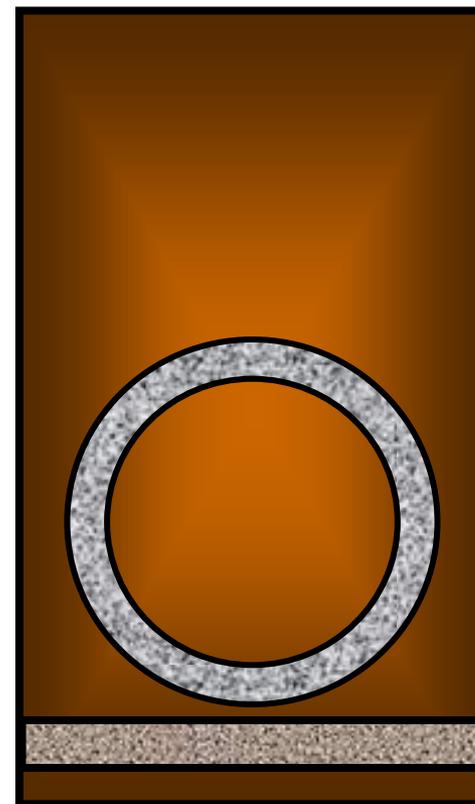


Weak  
Spring

Strong  
Spring

Weak  
Spring

## Rigid pipe



# MODIFIED IOWA EQUATION

( % of Deflection of Flexible Pipe under Soil Burial)

To determine the suitability of a particular burial depth, pipe deflection to be estimated through;

$$\% \text{ Deflection} = 0.1 (W+P) 100 / 0.149 (PS)+0.061 E$$

Where:

- % DEFLECTION=predicted percentage of diametric deflection
- W=Live Load (psi): pressure transmitted to the pipe from traffic on the ground surface
- P=Prism Load or Dead load(psi); pressure acting on the pipe from the weight of the soil column above the pipe
- E=Modulus of Soil Reaction (psi); Stiffness of the embankment soil

## External Loading Characteristics (ASTM D 2412-02)

Loading	1 ft / Burial	5 ft / Burial	10 ft / Burial	15 ft / Burial	20 ft / Burial	45 ft / Burial
Soil	120 lb / ft <sup>3</sup>	120 lb / ft <sup>3</sup>	120 lb / ft <sup>3</sup>	120 lb / ft <sup>3</sup>	120 lb / ft <sup>3</sup>	120 lb / ft <sup>3</sup>
Live Load; H2O Highway Traffic	12.5 psi	1.74 psi	Live Load are negligible	Live Load are negligible	Live Load are negligible	Live Load are negligible
Sand Embankme nt Material / Modulus of Soil Reaction	2000 psi	2000 psi	2000 psi	2000 psi	2000 psi	2000 psi
<b>Resulted Deflection</b>	<b>1.03 %</b>	<b>0.46 %</b>	<b>0.65 %</b>	<b>0.97 %</b>	<b>1.30 %</b>	<b>3.01 %</b>

**Maximum Recommended Deflection for Sewer pipe is 7.5% as per ASTM**

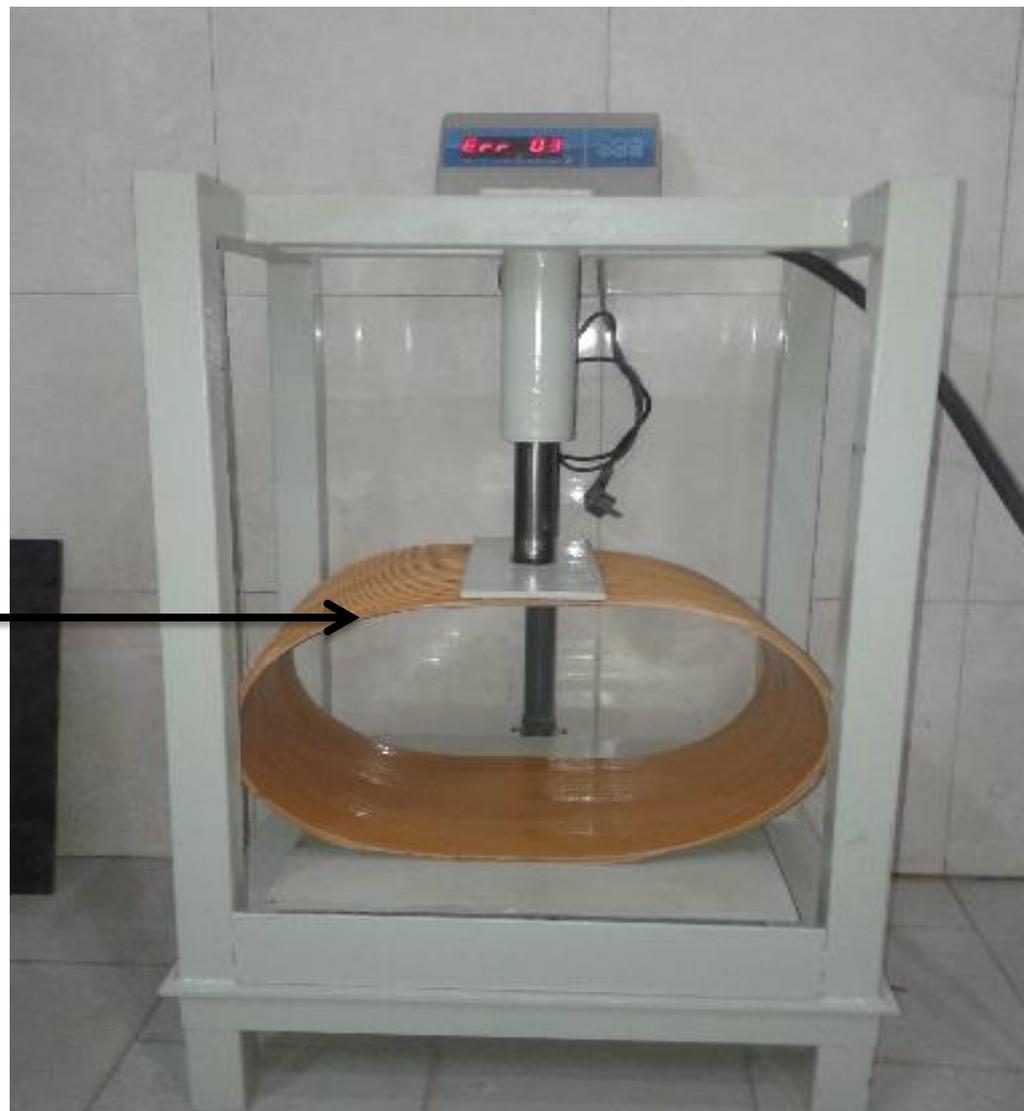
# ASTM D 2412-02 (2008) (Pipe Stiffness Test of Spiro Pipe)

**External Loading Characteristics  
(ASTM D 2412-02)**

**30 % Deflection**

**Original Dia. 18 inches**

**Dia after max. Deflection; 12 inches**



S#	Pipe	Pak Arab	PakArab Spiro	Government	Government	According to the manning coefficient, the Spiro Pipe has 40% higher flow rate than RCC Pipes & easily enales 15% reduction in diameter					Comparasion of Flow Coefficient (Slope S= 0.3 m/Km)	
	RCC SIZE	Spiro Size	TR-84, 98, 168	of Sindh SCH RCC Rates	of Punjab SCH RCC Rates	RCC Size	Spiro Size	RCC Rates (Punjab)	Spiro Rates	% Difference	V = Flow Velocity m/sec & Q = Flow rate ltr/sec	
	Inch	mm	Rs/Ft	Rs/Ft	Rs/Ft						RCC FLOW COEFFICIENT	SPIRO FLOW COEFFICIENT
1	6"	150mm	260	-	71.30	8"	150	71.3	260	72.57%	V = 0.54 Q = 17.7	V = 0.7376 Q = 13.08
2	8"	200	314	229	96.45	9"	200	115.5	314	63.21%	V = 0.59 Q = 24.27	V = 0.89 Q = 28.12
3	9"	250	380	-	115.5	12"	250	399.4	380	-4.85%	V = 0.715 Q = 52.18	V = 1.033 Q = 50.92
4	12"	300	462	412	399.4	15"	300	490.2	462	-5.75%	V = 0.82 Q = 94.4	V = 1.16 Q = 82.7
5	15"	400	945	515	490.2	18"	400	535.15	945	43.37%	V = 0.93344 Q = 153.4	V = 1.409 Q = 177.7
6	18"	450	1052	618	535.15	21"	450	684.1	1052	38.39%	V = 1.03 Q = 231.2	V = 1.523 Q = 243.195
7	21"	500	1189	744	684.1	24"	500 (20")	817.25	1189	31.26%	V = 1.129 Q = 329.8	V = 1.6327 Q = 321.8
8	24"	600	1417	869	817.25	27"	600	1129.8	1417	25.40%	V = 1.22 Q = 451.1	V = 1.841 Q = 522.7
9	27"	700	1661	-	1129.8	30"	700	1211.55	1661	27.08%	V = 1.30915 Q = 597.1	V = 2.038 Q = 787.7
10	30"	750	1769	1147	1211.55	33"	750	1414.75	1769	20.02%	V = 1.39 Q = 769.3	V = 2.13 Q = 946.3
11	33"	800	1875	1386	1414.75	36"	800	1893.15	1875	-0.95%	V = 1.47 Q = 969.7	V = 2.22 Q = 1123.6
12	36"	900	2088	1568	1893.15	42"	900	2455.2	2088	-14.95%	V = 1.63 Q = 1461.3	V = 2.40 Q = 1537.1
13	42"	1000	2306	1997	2455.2	48"	1000	3269.7	2306	-29.47%	V = 1.785 Q = 2084.5	V = 2.57 Q = 2034.2
14	48"	1200	2774	2476	3269.7	54"	1200	4094.95	2774	-32.25%	V = 1.929 Q = 2851.4	V = 2.90 Q = 3303.94
15	54"	1300	3048	4475	4094.95	60"	1300	4682.8	3048	-34.91%	V = 2.06 Q = 3773.8	V = 3.06 Q = 4087.8
16	60"	1500	3475	5597	4682.8						V = Q =	V = Q =
17	66"				5635.7						V = Q =	V = Q =
18	72"				6391.9						V = Q =	V = Q =

## Pak Arab Spiro Pipes Projects

- Bahria Town (Pvt) Ltd Karachi
- Javedan Corporation Naya Nazimabad
- HUBCO Narowal
- Engro Polymer & Chemical Ltd, Port Qasim
- PHED Lahore (Kahna, Ferozpur Road, Lahore)

# Picture Gallery



# Advantages of SPIRO PIPE over other PIPES

Low transportation costs especially in larger diameters. Up to 6 times lower costs due to transportation of profiles instead of pipes



# Advantages of SPIRO PIPE over other PIPES

Just few vehicles carry all the stuff required to make Pak Arab Spiro Pipe at any project



## Advantages of SPIRO PIPE over Other Pipes

Spirally wound piping technology allows SPIRO PIPE to be produced on site



## Advantages of SPIRO PIPE over Other Pipes on site Production with various Lengths



# Advantages of SPIRO PIPE over other PIPES

## Less Labor Required



# Advantages of SPIRO PIPE over other PIPES

## Installation Handling

No need heavy machineries to carry & laying the pipe in the trench



## Advantages of SPIRO PIPE over Other Pipes

Low to no risk of leakage due to the possibility of production in higher lengths.

*customized length from manhole to manhole in any diameters*



# Advantages of SPIRO PIPE over other PIPES

## Ease of Coupling & Jointing



# Advantages of SPIRO PIPE over other PIPES

## Laying and Bedding



# FAQS

**Q: How can you decide the number of steel band reinforcement on the pipe ?**

**A:** Applied on the pipe the amount of reinforcing steel bands as a result of the static analysis obtained the maximum and minimum fill depth ,also depend on traffic load.

**Q: Inner diameter or external diameter of the pipe is you specify?**

**A:** External diameter

**Q: What is the standard length of spiro pipe ?**

**A:** Spiro pipe can be produced in desired length according to customer demand. There is no size restriction.

**Q: How does spiro pipe connect to each other?what kind of coupling do you use?**

**A:** The pipes connected to each other with the couplings which are produced with the same material uPVC. And are applied from the inner side of pipe by uPVC solvent.

## FAQS

**Q: What is safe maximum allowable velocity which does not erode the internal as well as overall surface of the pipe ?**

**A:** The safe maximum allowable velocity That is assume for sewage is 10f/s .after that the abrasion will occur in pipe of any material now if we assume that abrasion will occur in pvc at that velocity then according to the following data

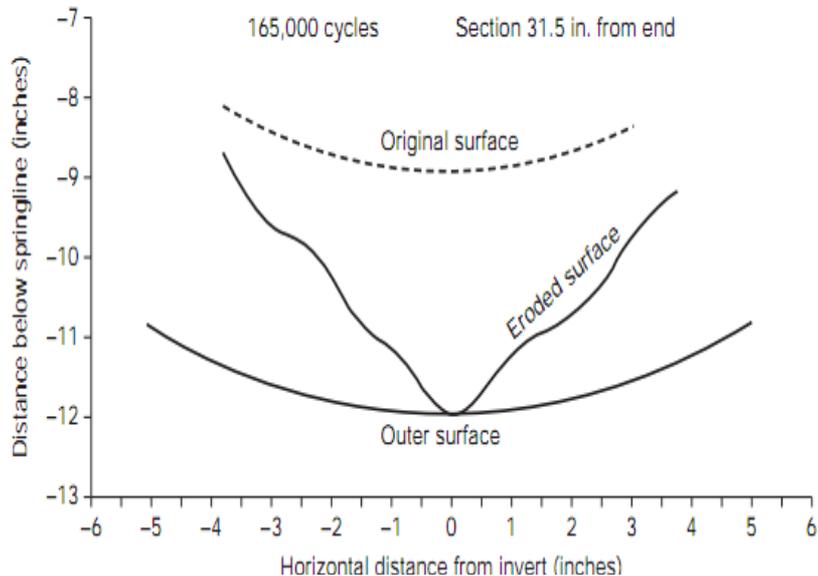
Pipe material	Specific abrasion ( $\mu\text{m}$ )	Relative increase in stress for same abrasive effect (%)
PVC	0.754	0.6
Steel	1.72	6
Cast iron	2.09	2
Stoneware (clay)	4.31	2
Concrete	15.90	5
Asbestos cement	17.28	9

Source: Handbook of PVC Pipe Design and Construction (First Industrial Press Edition)

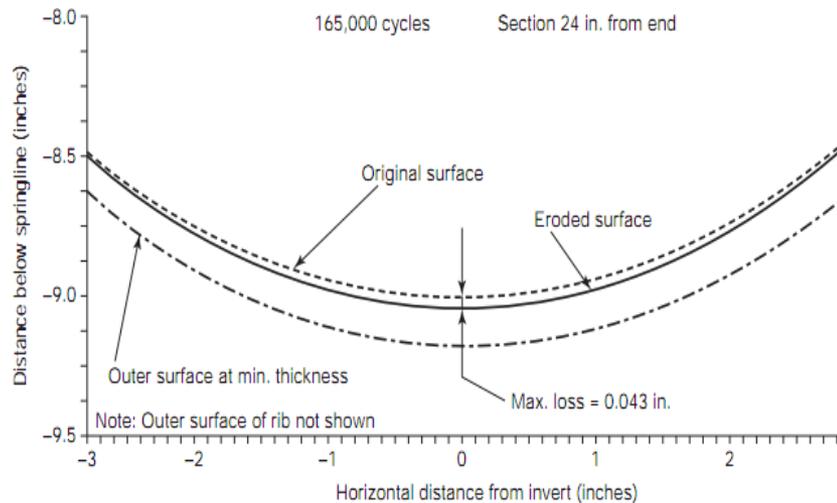
# FAQS

- This table can be used to compare the values of predicted wall thickness lost due to abrasion between piping material assuming a time factor of 15, the concrete pipe would lose 75 % ( $15 \times 5\%$ ) of its available wall thickness to abrasion. While PVC pipe 5%( $15 \times 5\%$ ).
- Furthermore Abrasion testing has also been conducted at California State University, Sacramento, where the performance of PVC profile wall pipe versus reinforced concrete pipe was evaluated, using velocities and aggregate materials to simulate very aggressive conditions. Additionally, acidity (pH) ranges were varied to simulate common in-service conditions.
- In this study, PVC profile pipe exhibited no measurable sensitivity or patterns of invert wear with increasing acidity of the water. Conversely, the reinforced concrete pipes (Studied in parallel with the PVC pipes) were influenced by the acidity of the flowing water, with increasingly severe invert wear in response to increasing acidity. In extremely abrasive exposures, wear must be considered. When compared with most other pipe materials, the use of PVC pipe can significantly reduce maintenance costs incurred due to abrasion and provide longer service life.

**Invert Erosion Study**  
 18 in. ID RCP, 47.3 in. long, pH = 3.7



**Invert Erosion Study**  
 Ultra-rib 18 in. ID PVC, 48 in. long, pH = 3.7



# Faqs

**Q: what is the design life of spiro pipe when using sewage system ?**

**A:** PVC, having the molecular structure where the chlorine atom is bound to every other carbon chain, is highly resistant to oxidative reactions, and maintains its performance for a long time (50 years). Other general purpose plastics with structures made up only of carbon and hydrogen are more susceptible to deterioration by oxidation in extended use conditions

**Q: recommendation required for use of spiro pipe for sewage application in hilly areas in extreme cold conditions**

**A:** the maximum service temperature of upvc used in these pipes are between (-15 C and 50 C)

**Q : inner diameter or external diameter of the pipe is you specify ?**

**A:** an external diameter is the diameter of the spiro pipe.

**Q: what kind of coupling do you use ?**

**A:** coupling is applied to the inner side of the pipe by means of pvc solvent, and create pvc ties between pipe and couplings.

**Q: what is the standard length of the spiro pipe ?**

**A:** spiro pipe can be produced in desired length according to customer demand. Sometimes it is possible to produce one piece from manhole to manhole without joint in small diameters. There is no size restriction.

**Q: how much the thickness of spiro pipe ?**

**A:** the list that shows the thickness of spiro pipe is in the page 10 of spiro catalogue.



**Thank You**