

Precon Sewerage System



CONCRETE SEWER PIPES ■

MANHOLE COMPONENT ■

JACKING PIPES ■

PIPE FITTINGS ■

INLET SYTEM ■

SEPTIC TANK ■

PRECON SEWERAGE SYSTEM

Introduction

Due to rapid growth in urban area, most of the metropolitan city in Indonesia urgently required integrated waste water management system. The systems can cover limited area i.e. residential estate, industrial estate, commercial area or large area of city.

The system includes sewer pipelines to convey waste water collecting from the source to The Treatment Installation Plant.

The sewerage system is designed to withstand aggressive effluents condition and no leakage along the system.

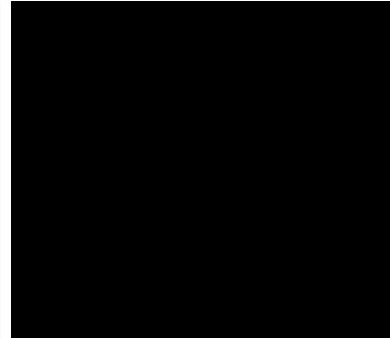
Precon has been developing concrete sewer pipes, manholes, and other products to match these conditions. It is more efficient to use concrete pipes other than PVC or HDPE pipe for size larger than 300mm diameter, beside the concrete material is stronger and can be protected by wide range method depend on the condition of effluent.



Precast Sewerage Products

Concrete Sewer Pipes

All precon pipes are produced from hard dense impermeable concrete and supplied with a flexible rubber ring joint. Standard pipes will accept hydrostatic test head of 120kPa, but higher head are available on request. All pipes has concrete cover minimum of 25mm thickness. Available in various type of protection that is Type-S (Sulfate Resisting Cement + FA Protection), Type-C (Calcareous Aggregate Protection), Type-SC (Combination A & B Protections)



Jacking Pipes

When the pipes are installed beneath the existing surface facilities which must not be disrupted, jacking method will be applied. The pipes are designed to have high axial load and collar joint with rubber ring to adopt deflection at joint during applying jacking force.



Pipe Fitting

Pipe Bend is allowed the designer to make curvature pipeline. Pipe Bend have maximum angle of 45° and 30° for small and large diameter respectively. Tee Junction and Y-Junction are designed to make joint between two pipes which have different alignment and size.

Manholes System (Access Chamber)

Precon's Manhole System is designed in standard components allows you to complete manhole construction in any depth required. The construction will be very easy, simple, without formwork, fewer operation skills and less supervision.

The system consists of:

- **Top Components**
Circular/rectangular cover & frame, Cast Iron Concrete Cover. It is designed to withstand fast moving vehicle load
- **Middle Component**
Make-up Ring, Straight Back Taper, Conversion slab. Make-up Ring is available in any height to adjust the elevation while for adjusting the upper and lower opening Straight Back Taper or Conversion Slab is introduced.
- **Bottom Component**
Manhole Shaft and Manhole Base, completed with step ladder, Bitumen Sealant Strips is apply between joint of the component to ensure water tightness.



Sewerage Associated Products

Precon also develop products and accessories related to sewerage system. The products include inlet system, interceptor, Oil/Grease Separator, Filter Tank and Septic Tank



Concrete Sewer Pipes

STANDARD REFERENCE

- Australian Standard AS 4058-1992
- Japanese Industrial Standard JIS.A.5303-1990

PIPE DESIGN

- Coef. of Manning 'n' = 0.011-0.013
- Flexible Joint System Socket-Spigot Joint with Rubber Ring.
- Test Pressure 120 kPa
- Concrete Absorption < 6.5%
- Concrete Strength 600 kg/cm²
- Concrete cover of 25mm (minimum Requirement)
- Cementitious Content 450kg/m³

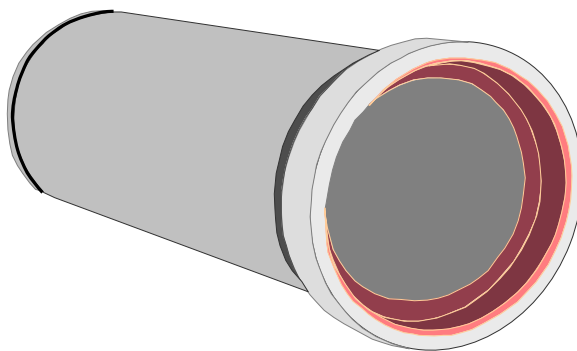
DESIGN LOAD

- Live Load SNI -02-2005 (Axle Load of 225 kN)
- Depth of Back Fill 0.3 ~ 6.0 m

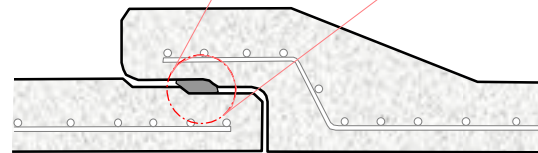
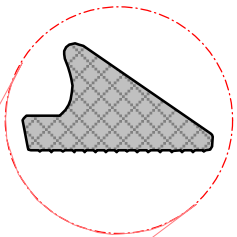
PRODUCTION SYSTEM

- Roller Compaction – Bidirectional Radial Press, fully conform to the requirement of JIS 5303-1990.

Inside Dia.	Thickness	Socket Dia.	Effective Length	Class-4 : AS-4058 (kN/m)		Weight
				Crack Load	Ult. Load	
300	55, ^{-/+3}	510	2500, ^{-/+10}	30 kN/m	45 kN/m	382 kg
400	60, ^{-/+3}	630	2500, ^{-/+10}	36 kN/m	54 kN/m	543 kg
500	80, ^{-/+5}	800	2500, ^{-/+10}	44 kN/m	66 kN/m	859 kg
600	90, ^{-/+5}	925	2500, ^{-/+10}	52 kN/m	78 kN/m	1195 kg
700	95, ^{-/+5}	1065	2500, ^{-/+10}	60 kN/m	90 kN/m	1476 kg
800	95, ^{-/+5}	1185	2500, ^{-/+15}	67 kN/m	101 kN/m	1752 kg
900	105, ^{-/+7}	1291	2500, ^{-/+15}	74 kN/m	111 kN/m	2206 kg
1000	112, ^{-/+7}	1410	2500, ^{-/+15}	81 kN/m	121 kN/m	2588 kg
1100	115, ^{-/+7}	1560	2500, ^{-/+15}	87 kN/m	130 kN/m	2924 kg
1200	130, ^{-/+7}	1685	2500, ^{-/+15}	92 kN/m	138 kN/m	3557 kg
1300	135, ^{-/+7}	1800	2500, ^{-/+15}	96 kN/m	144 kN/m	4008 kg
1400	145, ^{-/+7}	1920	2500, ^{-/+15}	104 kN/m	156 kN/m	4613 kg



Rubber Ring Profile



Joint Details

TYPE OF PROTECTION RELATED TO THE AGGRESSIVE CONDITION OF EFFLUENT

TYPE	DESCRIPTION	RECOMMENDATION
Type S	Sulfate Resisting Cement (T-V) Cement + Fly Ash	Slightly aggressive conditions, where calculated corrosion factor 'c' < 0.3mm/year
Type C	Using Calcareous Aggregate in Concrete	Mildly aggressive condition, where calculated corrosion factor 'c' < 1.0mm/year
Type SC	Calcareous Aggregate + Sulfate Resisting Cement + Fly Ash	Aggressive condition, Corrosion factor 'c' > 0.5mm/year

Notes :

- All Concrete Sewer Pipes are to have internal cover to reinforcement of 25mm and Pipe Wall Thickness of 50mm.
- All Concrete Sewer Pipes have minimum concrete strength of 600 kg/cm²
- Corrosion Factor s affected by the following data :
 - Biological Oxygen Demand
 - Hydraulic gradient of pipeline
 - pH and Temperature of sewage
 - Wetted Perimeter of pipe, Acid Reaction Efficiency, and etc.

Jacking Pipes

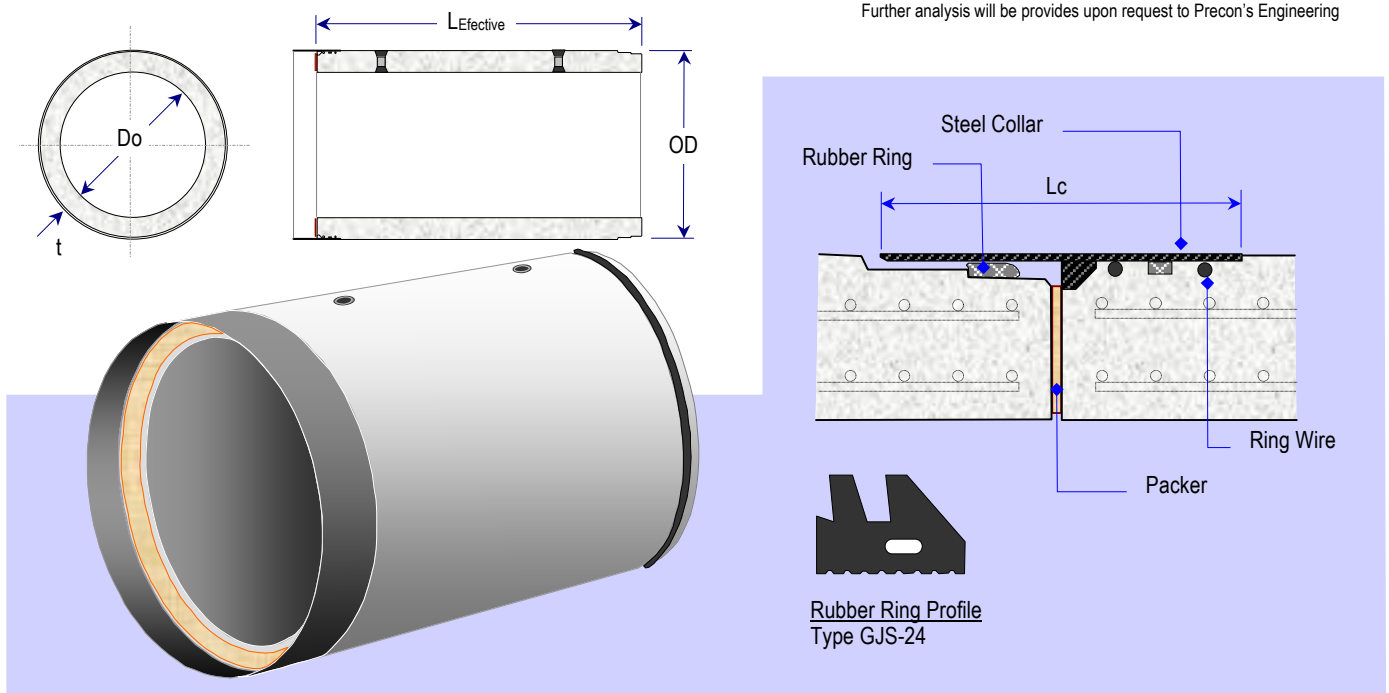
DIMENSION :

Inside Dia.	Thickness	Outside Diameter	Effective Length	Collar Thickness	Collar Length	Collar Diameter
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
450	67, ^{-/+3}	584	2430, ^{-/+10}	4.5mm	260mm	575
600	65, ^{-/+3}	730	2430, ^{-/+10}			721
700	75, ^{-/+3}	850	2430, ^{-/+10}			841
800	80, ^{-/+5}	960	2430, ^{-/+10}			951
900	90, ^{-/+5}	1080	2430, ^{-/+10}			1071
1000	100, ^{-/+5}	1200	2430, ^{-/+10}			1191
1100	105, ^{-/+5}	1310	2430, ^{-/+15}			1301
1200	115, ^{-/+7}	1430	2430, ^{-/+15}			1421
1500	140, ^{-/+7}	1780	2430, ^{-/+15}	6.0mm	260mm	1768
1650	150, ^{-/+7}	1950	2430, ^{-/+15}			1938
1800	160, ^{-/+7}	2120	2430, ^{-/+15}			2108
2000	175, ^{-/+7}	2350	2430, ^{-/+15}			2338
2400	205, ^{-/+7}	2810	2430, ^{-/+15}	9.0mm	300mm	2792

PROPERTIES :

Crack Load	Ultimate Load	Jacking Force (*)	Pipe Weight	Collar Weight
(kg/m)	(kg/m)	(Ton)	(kg)	(kg)
4300	6500	107	642	19
4700	7100	133	819	24
4900	7400	187	1096	28
7200	10800	230	1331	31
7800	11700	299	1681	35
8400	12600	377	2068	39
8700	13000	438	2428	42
9000	13500	531	2843	46
9600	14400	794	4357	74
10800	16200	945	5125	81
11400	17100	1109	5918	91
12000	18900	1364	7180	101
13200	19800	1897	10038	186

(*) Maximum Jacking Force at NO-deflection along pipeline, while for 2nd deflection at any point in the whole pipeline Jacking force is limited to 30%. Further analysis will be provided upon request to Precon's Engineering



STANDARD REFERENCE

- Japanese Sewerage Water Work Association Standard JS WAS A-2 1991 and JS WAS A-6 1989.

DESIGN LOAD

- Live Load SNI -02-2005 (Axle Load of 225 kN)
- High Axial Force During Jacking Installation
- Excavation Depth 2.0m ~ 20.0m

PRODUCTION SYSTEM

- Automatic Roller Compaction – Bidirectional Radial Press,

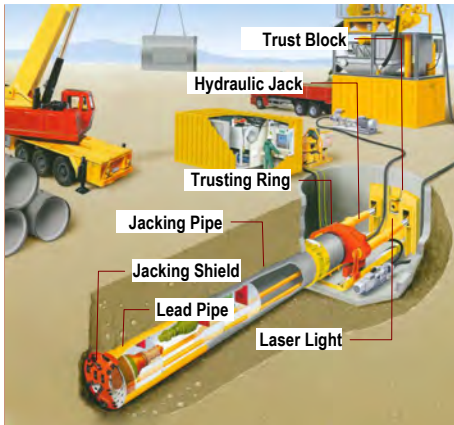
PIPE DESIGN

- Flexible Joint for Heavy Duty Application. The System includes Pre-Embedded Steel Collar with Rubber Ring.
- Test Pressure > 120kPa, With Low permeability < 6.5% Absorption Test.
- Concrete Strength K-600, High Cementitious Content > 450kg/m³. W/C Content < 0.35
- Rubber Ring : Vulcanized Rubber Ethyl Propyl Diene Monomer, Tensile Strength > 8.5MPa, Hardness 45-55, Sulfate Resistance Rubber.
- Steel Collar : ST-37 , SS-41 Steel, Protected by Hot Dip Galvanized or Zincromate Coating.
- Packer thickness is defined based on load analysis during jacking installation which is affected by Soil Condition, Section Length, deflection, jacking force, and etc

Jacking Pipes

INSTALLATION METHOD:

Concrete Pipe Jacking is method of installing Pipelines without disruption existing surface facilities or activities. Concrete pipes is installed by apply jacking force to push the concrete pipes into the cavity excavated ahead of the progressing pipelines.

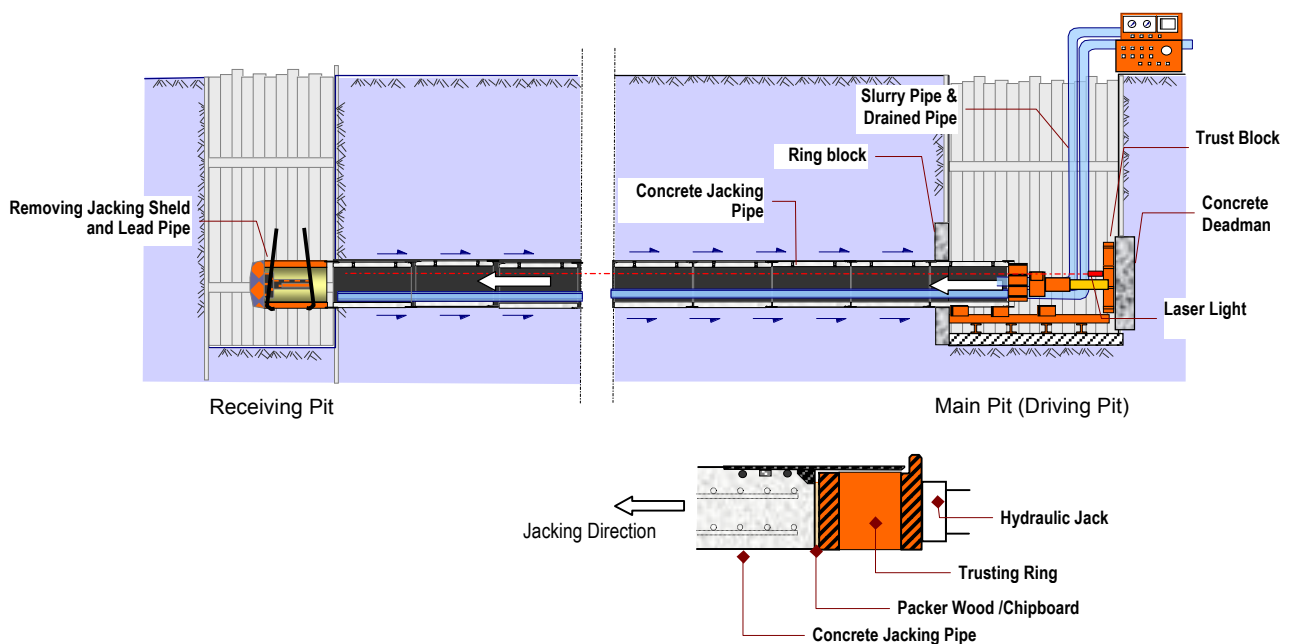


Horizontal excavation is usually carried out by using Tunnel Boring Machine. In case the size of pipes is larger than 1200mm, the excavation may be carried out by manually digging.

The Hydraulic Jack's capacity is depend on the pipe size, section length and the soil condition. Typically two or four hydraulic jacks are used for pushing and steering the pipe, and stroke up to 1.2m. Trust block is installed in the main pit to resist jacking force which is applied to the pipes through Steel Trusting Ring.

The Steel Cutting Shield fitted to the Lead Pipe gives protection to the workers and allows steering and alignment adjustment. The shield and lead pipe are pushed into receiving pit and removed for reuse.

Intermediate jacking stations may be required in the long section line (> 120m) and stiff ground conditions. Alternatively Bentonite injection may be applied to reduce friction between pipe and soil. Generally, the work method is consisting of repetitive sequence works of excavation at the face, pushing the pipe in to the excavated cavity and removing the soils by using muck cart on rails or slurry pipes wither the machine capable to break excavated soil to the slurry material.



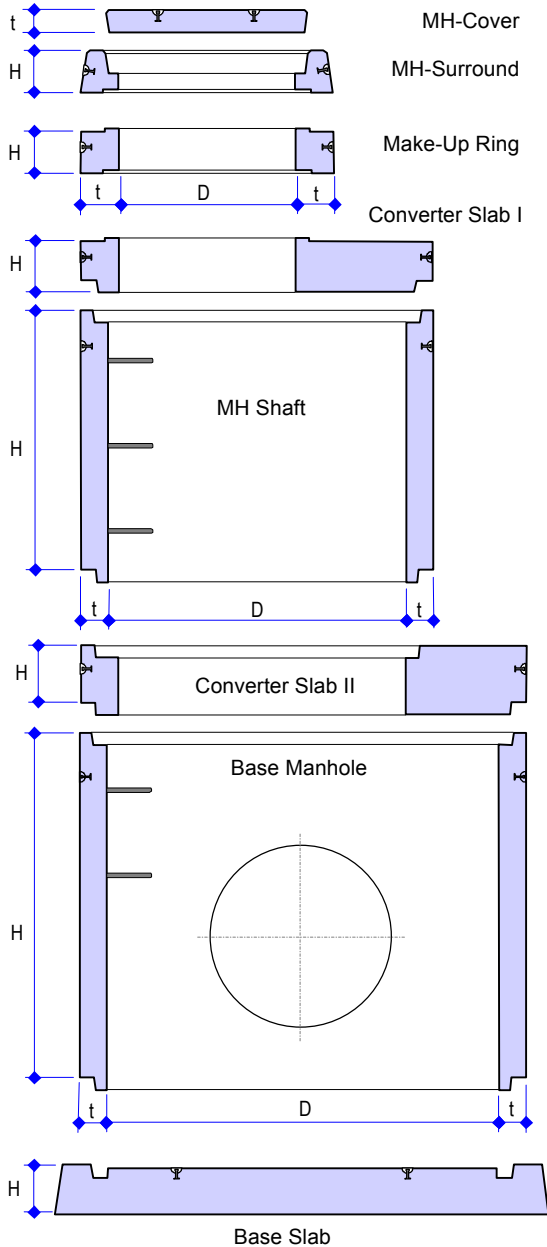
Pipeline alignment is continually monitored and adjusted during jacking by laser light from the jacking pit to the target fixed to the inside crown of the lead pipe or shield. Gradual adjustments are continuously made to avoid over-stressing to the concrete pipe. In the alignment adjustment process, deflection between concrete pipes is limited up to 2°, otherwise concrete may be cracks.

Generally, pipe jacking is carried during two daily shifts of 8-10 hours per shift and progress, dependent on pipe size and ground conditions, can vary from 1-6 pipes per shift.

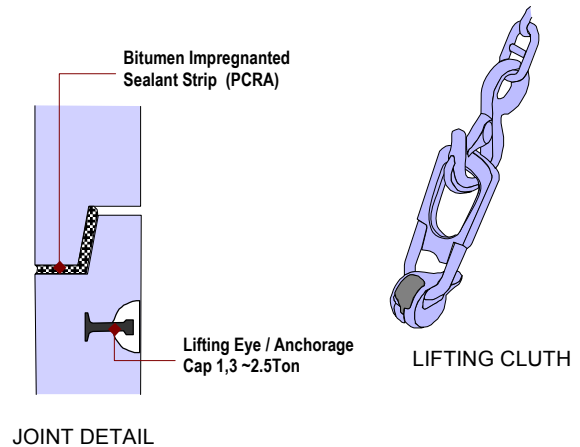
Manhole Access Chamber

Precon's Access Chambers are designed as integral components which can be assembled to variety depth to suit the project requirements. The Construction will be very simple and ease. Manhole can be finished not more than 30 minutes.

THE COMPONENTS:



COMPONENT	DIMENSION			WEIGHT (kg)
	t	D	H	
MH-Cover Light Duty (LD)	80	715	-	76
MH-Cover Heavy Duty (HD)	125		111	
MH-Surround Light Duty (LD)	150	625	150	82
MH-Surround Heavy Duty (HD)			200	95
Make-Up Ring	150	625	100	155
			150	232
			225	349
Converter Slab-I (625/1000)	-	1000	180	366
MH-Shaft	100	1000	300	255
			600	510
			900	765
			1200	1020
Converter Slab-II (1000/1500)	-	1500	180	801
Base Manhole	140	1500	1200	2258
			1500	2822
			1800	3387
Base Slab 1000		1000	120	342
Base Slab 1500		1500	150	924



MANHOLE DESIGN:

- Designed in conformance with Australian Standard AS 4198-1994.
- Water tights Joint and Impermeable Wall, Test Pressure > 120kPa, With Low permeability < 6.5% Absorption Test.
- High Sulfate Resistance with Sulfate Resisting Cement + Fly Ash and High Cementitious Content > 450kg/m³.
- Manhole can be installed up to 25.0m depth, since lateral forces act equally around the periphery, which places the section pure compression
- Lifting anchorage system, to provide safe and ease handling.
- Two alternative design loads, Heavy Duty to withstand Heavy Vehicle Load and Light Duty for Light Vehicle or Pedestrian usage.

MATERIAL SPECIFICATION

- Concrete Strength : K-400
- Steel Wire : Hard Drawn Deformed Wire, fy 500MPa.
- Joint Material : Bitumen Impregnated Sealant Strip.
- Step Ladder : Hot Dip Galvanized Ladder of 16mm diameter rebar.

LOAD CAPACITY :

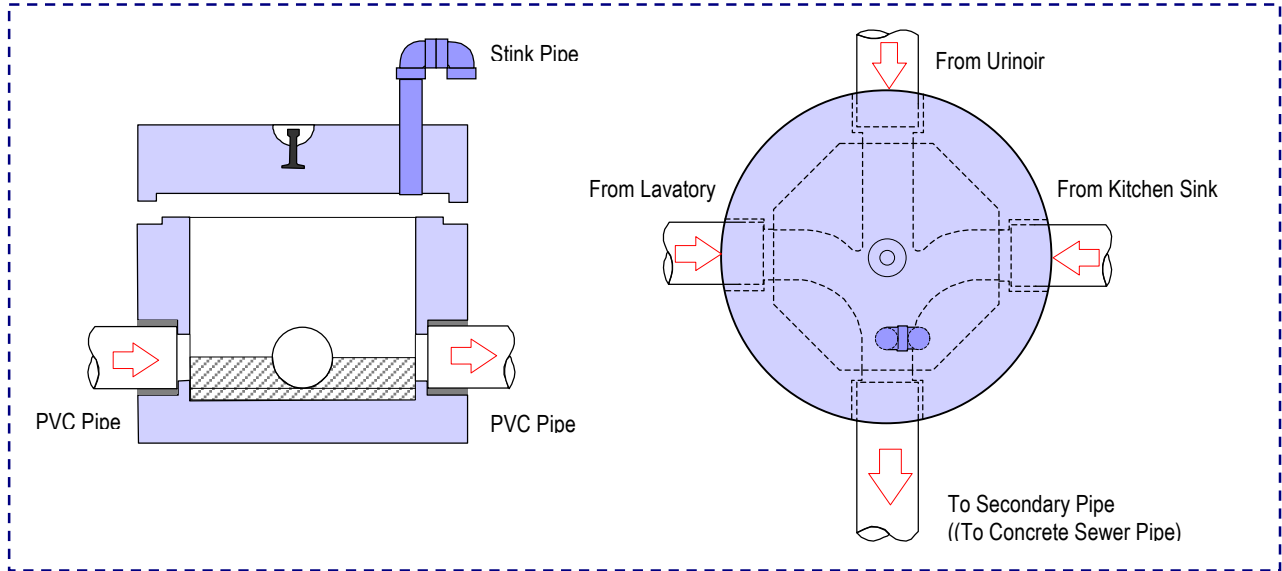
Load Class	Crack Load	Ultimate Load
Light Duty	40kN	80 kN
Heavy Duty	105kN	210kN

Sewerage Associated Products

Interceptor / Inlet System

Interceptor / inlet system is to collect wastewater directly from kitchen sink, toilets, lavatory and waste full and carrying to the Manhole System.

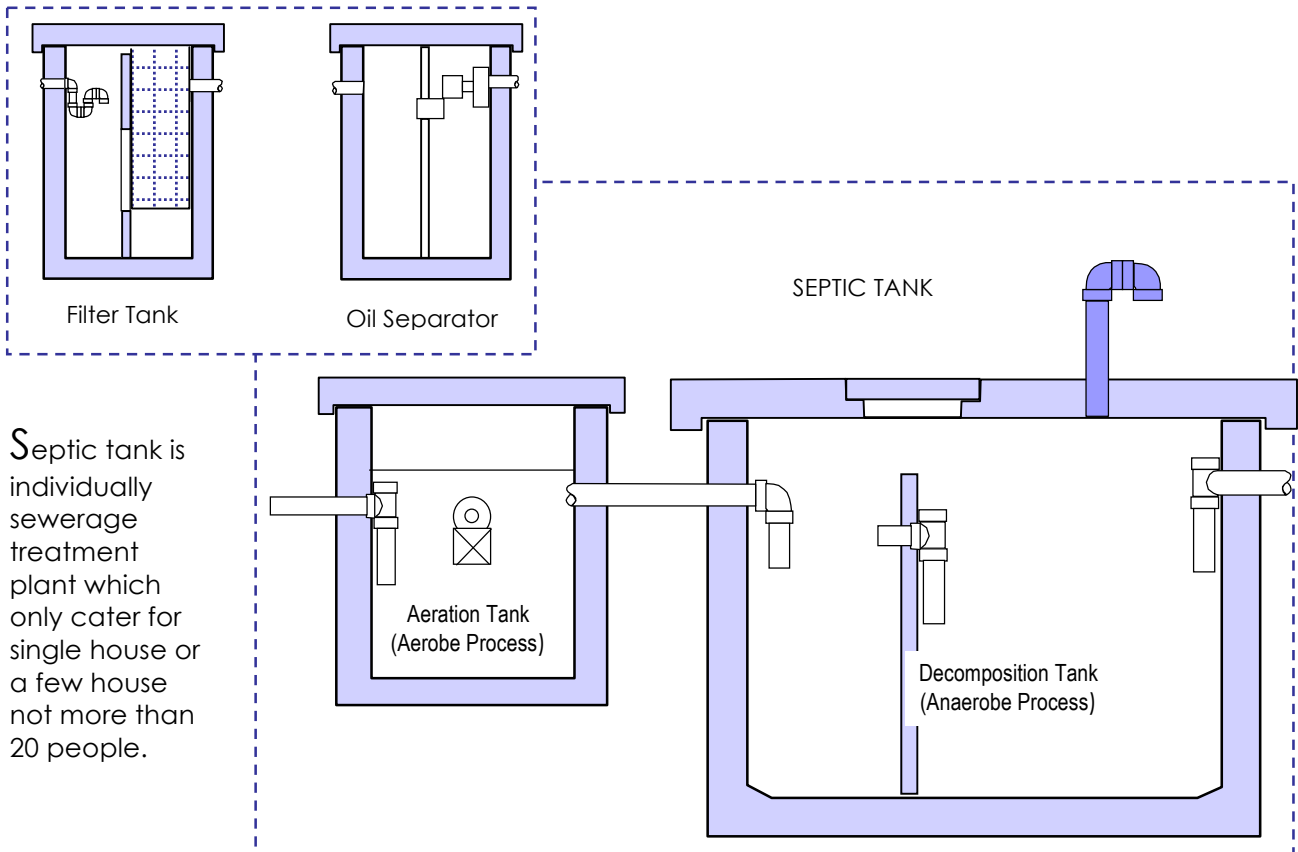
This pipe size is 4~6inchi diameter of PVC. While for main pipeline is Concrete Sewer Pipes of 300mm or greater.



Oil Separator, Filter Tank, Septic Tank

Oil separator is designed to separate oil/grease from water, which is collect from kitchen or other source containing grease/oil.

Filter tank is used to avoid blocked in the sewer pipeline due to inorganic coarse material.



Septic tank is individually sewerage treatment plant which only cater for single house or a few house not more than 20 people.

Project Reference

Sewerage Pipeline System , PLP Yogyakarta, Package 5

Project includes Constructions of Reinforced Concrete Pipes 600mm Diameter, more than 1000m length and construction of Manhole Access chamber.

Sulfate Resisting Cement and Fly Ash are used to protect the pipe from aggressive condition on sewerage pipelines.

Precon is able to quick response to meet very tight schedule which the project need be accomplished within 3 months.

BSD City – Jacking Pipe Design

Construction of Large Pipes 1650mm, 1800mm and 2000mm diameter. The Pipes are designed in conformance with Specification of Jacking Pipes - JS WAS A-2 1991, the installation method is open excavation trench which is buried more than 6m depth.

Jati Gede – Pipe Siphon

Project includes Installation of Twin Siphon Pipes of 1200mm Diameter. High Load Strength of pipe is required to withstand high load which have cover depth > 25m.

Pipe Bends are designed with angle of 120° – 170° , and working pressure of 120 kPa.