PRODUCTS AND SERVICES GUIDE
CONCRETE PRESSURE PIPE

Rinker MATERIALS™
A QUIKRETE® COMPANY

STRONG • RELIABLE • LOCAL

Canadian Made

V.1-Eng 2026

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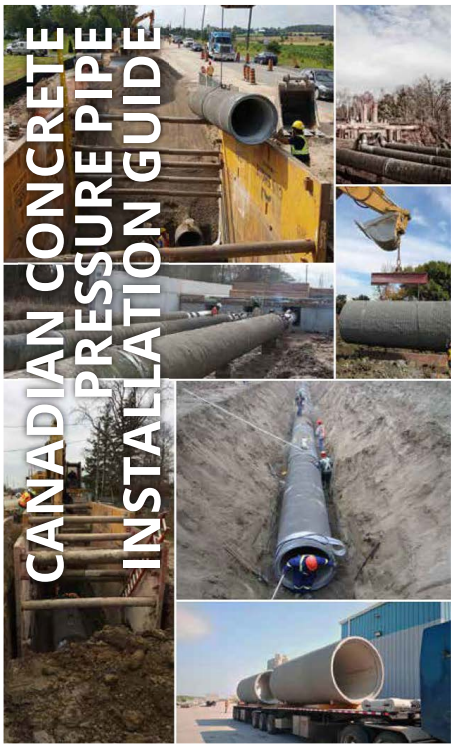
About This Guide



This guide contains information applicable to the layout and design of concrete pressure pipelines (CPP). Additional information on various topics including thrust restraint, tapping, closures, other applicaitons and installation is included for general reference. Rinker Materials Concrete Pressure Pipe Installation Guide should be used in conjunction with this engineering guide.

Custom made fittings or designs not shown herein as well as additional information on products such as valve chamber design and their use in a specific project can easily be obtained by contacting our CPP sales team.

We trust that this guide will assist you in making the most cost-effective life-cycle decisions. Rinker Materials CPP engineers have a strong belief in sustainable infrastructure and do not shy away from tough questions. We understand your responsibilities when choosing a pipeline and greatly encourage you to ask us any questions that you may have as part of your analysis, in order to make decisions that are truly comparable. Please do not hesitate to contact us at: 1-888-497-7371.

Note : This manual is furnished for information purposes only to our customers, potential customers, and their consultants. It is intended to serve as a description of Rinker Materials CPP product line. A conscientious effort has been made to include the most current information known to Rinker Materials CPP at the time of printing.

None of the information contained herein should be considered as a representation that any of the products are fit for use in a specific application. Any information appearing herein regarding the design of and/or specification for a pipeline system or a part thereof are taken at the reader's risk. Rinker Materials CPP shall not be liable for any damages resulting from the use of this guide. There are no warranties, either expressed or implied, which extend to the information contained or the products described herein.

For additional information on the products and their use in a specific project, please contact our sales representatives or members of our engineering department.

From the most famous 90 km engineered Roman aqueduct in service for over 1800 years, natural cement and aggregates have played an important role in infrastructure. Cement mortar and concrete have been recognized in their ability to prevent ferrous metal corrosion and to provide high structural strength and proved to be superior to other products.

As early as 1919, CPP was produced using high load carrying capacity and corrosion inhibiting properties of concrete with a welded steel liner as a watertight membrane. This combination created a pipe material demonstrating a high external load carrying capacity, which is a characteristic of concrete pipe, combined with high internal pressure capacity with-out leakage.

CPP is a pipe material that has been successful through time. Many proud owners call it their workhorse. In fact it has been used extensively throughout North America since 1930. This extensive use, and in many cases exclusive use in cities today, has been the result of CPP engineer's constant perseverance to achieve the highest design and manufacturing quality standards that ensure an excellent service life with a proven track record of low life-cycle costs.

Manufacturing technology and structural design innovations lead to the development of prestressed pipes with even higher internal pressure ratings. Today, product innovations continue to meet every pipeline owner's customized needs. Quality, adaptability, security, ease of installation, reliability, price vs durability, high manufacturing standards, and low life-cycle costs are the drivers to product innovation in CPP.

Company Profile

Rinker Materials CPP is the leader in the design and manufacturing of CPP systems in Canada, with more than 24.5 million meters of pipe in service today. Backed by strategically located operations in Quebec and Ontario, Rinker Materials CPP offers comprehensive products and engineering support to serve population centers nationwide.

In 2022, Quikrete Holdings added Forterra to the Quikrete family of companies. Forterra itself acquired its division CPP in Canada in March of 2015 following the sale of this from Heidelberg Cement Group (Hanson).

In 2007, Hanson was born through the acquisition of Hyprescon, the largest manufacturer of CPP in Canada since 1931.

Formerly known as Hypreson, Rinker Materials CPP is now among the best manufacturers of CPP and fittings. Through all of these changes, Rinker remains committed to manufacturing quality construction materials to meet the highest standards - yours!

SAINT-EUSTACHE (Québec) Facility

Common Applications

- Municipal Waterworks
- Transmission Mains
- Distribution Pipelines
- Water Intake Lines
- Sewer Outfall Lines
- Sewage Force-Mains
- Cooling Systems
- Gravity Sewer Lines
- Power Plant (Cooling Waterlines)
- Industrial Plants (Process/Yard Piping)
- Irrigation Networks
- Penstocks & Pressure Siphons
- Chlorine Contact Tanks
- Many other diverse applications

General Information

Pipe and fittings can be designed to different end uses and for this reason, we offer the following types of pipes, all manufactured to the appropriate AWWA standards.

Type of Pipe	Diameter Range mm (in)	Working Pressure Range kPa (psi)	Manufactured Length** (mm)	Standard
Bar-Wrapped Concrete Cylinder Pipe	350-500 (14-20)	up to 2760 (400)*	7315	AWWA C303
Prestressed Concrete Lined Cylinder Pipe	600-1500 (24-60)	up to 1720 (250)*	7315/6096	AWWA C301 (L)
Prestressed Concrete Embedded Cylinder Pipe	1650-3600 (66-144)	up to 2410 (350)*	6096/4877	AWWA C301 (E)

Note: * Higher pressure classes are available upon request
** Depending on diameter, contact Rinker Materials

Low Life-Cycle Costs

CPP has one of the longest histories of pipe materials and yet has one of the lowest (if not the lowest) rates of breakage even when compared to other products that are much younger in terms of history and predominate use. It is corrosion-resistant, has superior strength and does not require special backfill procedures or expensive bedding specification as some other pipe materials. Finally, it is competitively priced in terms of initial cost (which is a small part of total life-cycle cost), all of which leads to a pipe of unsurpassed value with a low life-cycle cost that will serve our customers well, now and in the future. A good and real business case, based on an excellent and real track record!

Performance

Rinker Materials CPP is designed to meet any combination of working pressure, surge pressure, earth (dead) loads and live loads.

External Load Carrying Capacity

Rinker Materials CPP is designed to accommodate high external loads.

Corrosion Resistance

Rinker CPP has a proven long life span thanks to the properties of concrete which improves over time. Cement mortar protects ferrous elements by providing an alkaline environment, which passivates the steel in most natural soils and aquatic environments. For special conditions, contact Rinker Materials CPP.

Restrained Joints

Rinker Materials CPP offers reliable restrained joint systems that are easy to install and completely resistant to corrosion. We supply all components and guarantee that the complete system will work perfectly.

Custom Design

Rinker Materials CPP can design and manufacture its pressure pipes in such a way as to adapt to the needs of any project. We can also design and make fittings in almost any possible configuration.

High Hydraulic Capacity

The smooth surface of the interior wall of the Rinker CPP conduits ensures excellent hydraulic load capacity with a Hazen-Williams roughness coeffcient in the range from C=140 to 150. Since concrete does not corrode, the carrying capacity is not decreased by age.

Certification

An assurance of Rinker Materials CPP commitment to quality and customer satisfaction, the following independent certification programsare in effect.

ACPPA

American Concrete Pressure Pipe Association compliance audit and certification program. Under the program instituted by the ACPPA, compliance with AWWA standards C301 and C303 is audited independently by Lloyd's Register Quality Assurance (LRQA)..

CSA W47.1

Certification of companies relating to welding by fusion of steel structures, verified by the Canadian Welding Bureau (CWB).

BNQ

"Quebec Standard"
A third party compliance program to AWWA C301 and C303 standards.

NSF-61

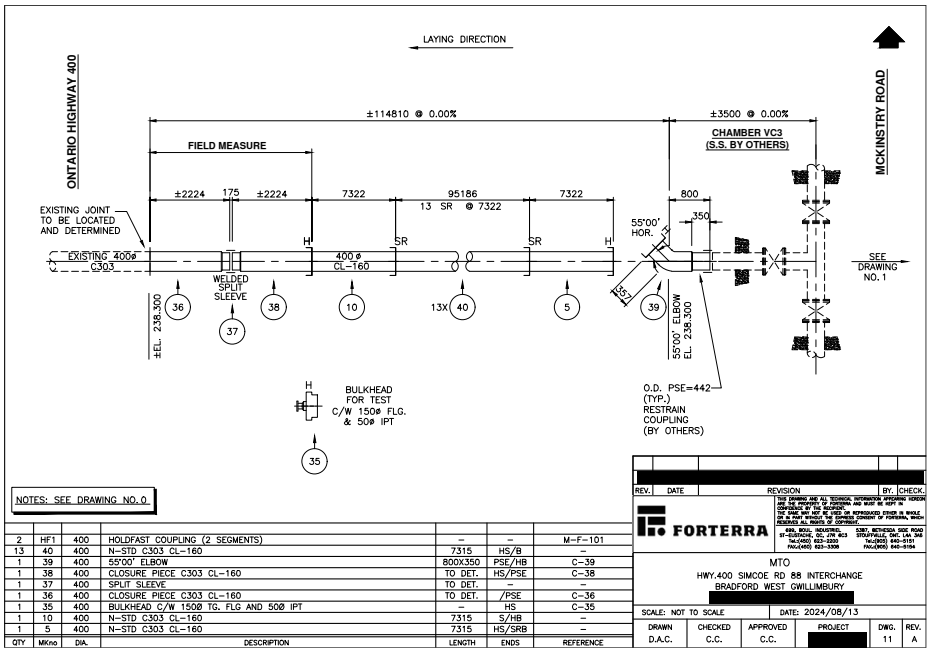
Directory of components of certified drinking water and distribution systems.

Layouts

Layout drawings are prepared by the engineering department for each project supplied and/or designed. These drawings provide all relevant information required by the contractor or engineer, including the stations and elevations of all significant points of intersection, fittings, and specials.

This layout drawing illustrates a sequential list of the pipe and fittings essential to meet the installation requirements shown on the contract drawings, which provide the installer with an easy method to schedule pipe and fittings deliveries on site.

To further support our customers, Rinker Materials CPP has created a computerized database that tracks drawings for most projects, providing engineers and owners with useful data and inforamtion when planning to modify, connect, or extend an existing transmission pipeline.



QTY	MKno	DIA.	DESCRIPTION	LENGTH	ENDS	REFERENCE
2	HF1	400	HOLDFAST COUPLING (2 SEGMENTS)	–	–	M-F-101
13	40	400	N-STD C303 CL-160	7315	HS/B	–
1	39	400	55°00' ELBOW	800X350	PSE/HB	C-39
1	38	400	CLOSURE PIECE C303 CL-160	TO DET.	HS/PSE	C-38
1	37	400	SPLIT SLEEVE	TO DET.	–	–
1	36	400	CLOSURE PIECE C303 CL-160	TO DET.	/PSE	C-36
1	35	400	BULKHEAD C/W 150Ø TG. FLG AND 50Ø IPT	–	HS	C-35
1	10	400	N-STD C303 CL-160	7315	S/HB	–
1	5	400	N-STD C303 CL-160	7315	HS/SRB	–

C303 standard pipe refers to straight sections of CPP in nominal lengths of 7.315 m (24 ft). Bar-wrapped pipe consists of steel cylinder, steel joint rings, a concrete lining, reinforcing bar and a cement mortar coating.

Bar-Wrapped Concrete Pipe (CPP) in Accordance with AWWA C303 (350mm to 500mm)

The manufacturing of this pipe complies with AWWA C303, *"CPP, Bar-Wrapped, Steel Cylinder Type*.

Initially, the steel cylinder is fabricated and serves as a water-tight membrane. Precisely sized steel joint rings are welded to each steel cylinder. The fabricated cylinder is hydro-statically tested to an internal unit stress of at least 75% of the yield strength of the steel.

The tested cylinder is then lined with a centrifugally cast concrete lining. The core lining is steam cured to assure its high strength.

The cylinder is wrapped with an evenly spaced helix of hot-rolled steel bar wire. The steel bar wire is wrapped directly on the steel cylinder under a moderate tension between 55 and 69 MPa.

The size and spacing of the hot rolled steel bar wire, and the thickness of the steel cylinder are proportioned to provide the required pipe strength as per the AWWA M-9 manual design method.

As the process continues, a dense cement-rich mortar coating with a minimum thickness of 19mm, is applied over the core, then steam cured. This provides additional structural strength and protection for the steel bar wire and cylinder.

This product utilizes the best characteristics of concrete and steel. For dimensions and classes, see table on Page 9.

Design

The pipe is designed in accordance with the latest AWWA C303 standards and the AWWA M-9 manual.

The design takes into account internal pressure and external loads.

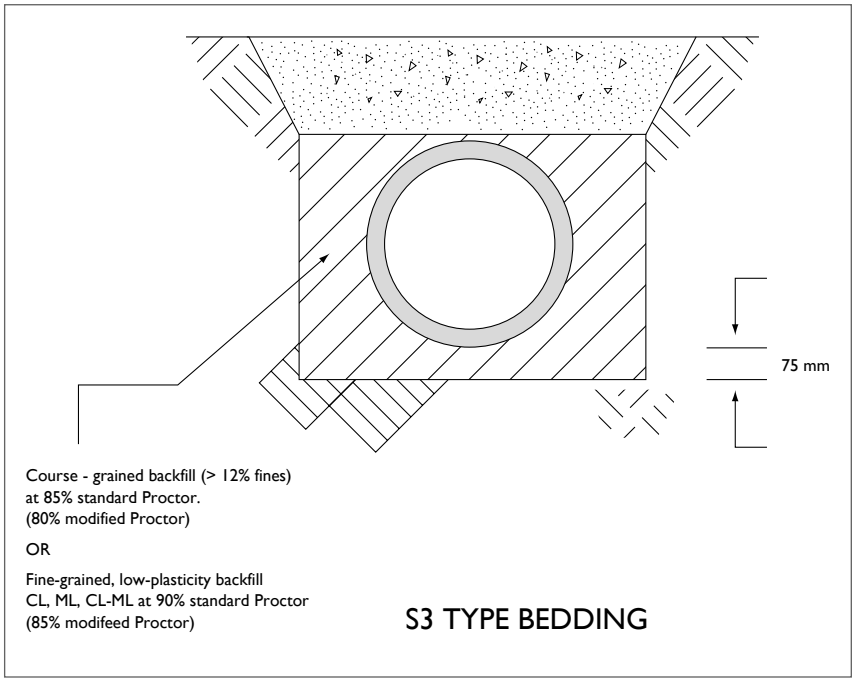
CPP conforming to AWWA C303 is considered as a semi-rigid pipe and develop their ability to support external loads both from the support of the surrounding soil as well as its inherent strength.

Internal Pressure Design

The total steel area required, including steel bar wire and cylinder, is determined by the classic hoop tension formula, limiting the average steel stress to 124 MPa or 50% of the specified minimum yield strength. The design also provides an additional capacity for transient surge pressure of at least 50% of the working pressure. For example, a class 200 (1379 kPa) pipe has a total capacity (working pressure + surge pressure) of 300 psi (2068 kPa).

Hydrostatic Testing

For pipe conforming to AWWA C303, Rinker Materials CPP recommends a field test pressure of 125% of operating pressure. Excessive testing pressure increases project costs unneccessarily!



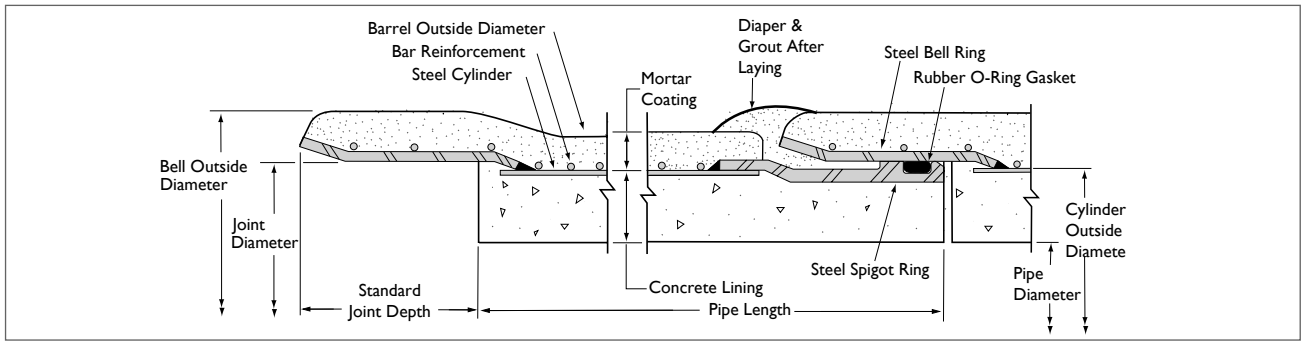
External Load Design

The maximum allowable external load, W, for a semi-rigid pipe design, is the load producing the limiting pipe deflection to $D^2/4000$, where D is the inside diameter of the pipe in inches.

Spangler's Iowa deflection equation may be applied to semi-rigid design. The AWWA M-9 manual describes the design procedure. For the diameters of C303 pipe shown in page 9 the deflection is small, generally 2.5 mm (0.5% of D) or less.

Bedding and Backfill

The "Marston Theory of Loads on Underground Conduits" concludes that the load experienced by a buried pipe is affected by trench width, type of soil, and the density of backfill material. The smaller diameter of C303 pipe (500mm and smaller), as illustrated on page 9, are designed as semi-rigid when selecting bedding requirements. Since they have sufficient strength to support large external loads, without significant deflection or dependence on support from surrounding soil, a lesser bedding requirement than for a flexible pipe can be used.



Bar-Wrapped Concrete Cylinder Pipe - AWWA C303

Nominal Pipe Diameter (mm)	Pipe I.D. (mm)	Class	Pw Pressure (kPa)	STD Joint Depth (mm)	Joint Diameter (mm)	O.D. Cylinder (mm)	Bell O.D. (mm)	Barrel O.D. (mm)	Approx. Weight (kg/m)	Max. Depth of Cover (m)*
350	356	185	1275	79	400	387	465	438	145	6.4
		200	1380							6.4
		225	1550							6.4
		250	1725							6.5
400	406	160	1103	114	454	441	515	492	169	5.7
		175	1205							5.7
		200	1380							5.7
		225	1550							5.8
		250	1725							5.8
450	457	140	965	114	514	502	575	553	209	6.1
		150	1035							6.1
		175	1205							6.1
		200	1380							6.2
		225	1550							6.2
		250	1725							6.2
500	508	130	896	114	565	552	625	604	236	5.3
		150	1035							5.4
		175	1205							5.4
		200	1380							5.4
		225	1550							5.4
		250	1725							5.4

Note : Larger diameter C303 pipe available upon request

*The above table is based on the following conditions:

- ■ Working Pressure = Pw
- ■ Surge Pressure Pt = 50 % de Pw (max)
- ■ Test Pressure Pft = 125 % of Pw (max)
- ■ Bedding: Type S3 as per AWWA M-9 (K = 0,090)
- ■ Trench Width : Transition Width (rsdp = 0,5)
- ■ Backfill Materials: Ordinary Clay - weight: 1 922 kg/m³ (120 lbs/ft³)
- ■ Modulus of Soil Reaction (E') : 4 820 kPa (700 psi)
- ■ Transient Loading = AASHTO HS20 Truck Loading

C301 standard pipe refers to straight sections of PCCP which are manufactured in nominal lengths of 7.315 m (24 ft), 6.096 m (20 ft) or 4.877 m (16 ft). depending on diameter and type of pipe (LCP or ECP).

Prestressed Concrete Cylinder Pressure Pipe (PCCP) in Accordance with AWWA C301(L) [LCP] (600 mm to 1500 mm incl.)

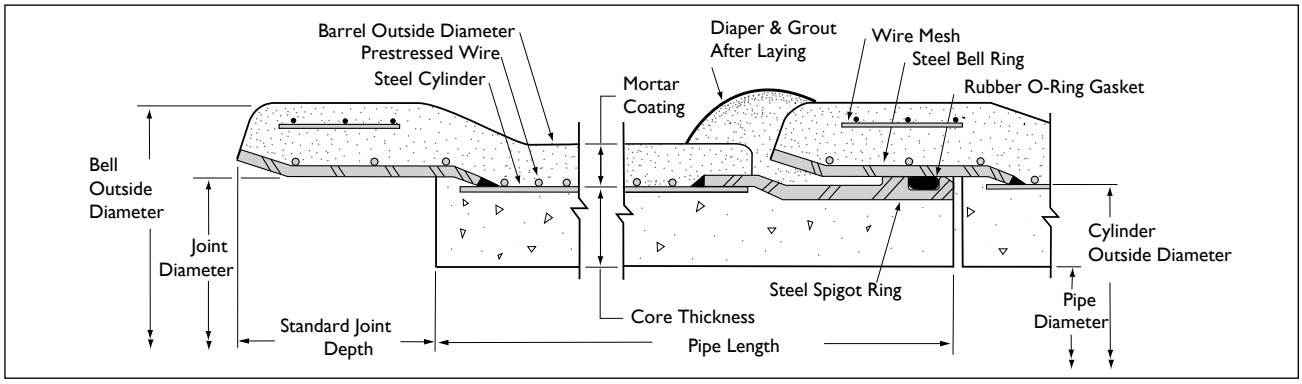
The steel cylinder is fabricated to serve as a water-tight membrane. Precisely sized steel joint rings are attached and welded to each steel cylinder. The fabricated cylinder is hydro-statically tested to a stress of at least 137.9 MPa.

The tested cylinder is then lined with a centrifugally cast concrete to constitute the core. The core is steam cured to ensure that a minimum specified comprehensive strength is obtained prior to the pre-stress operation.

Next, the core is wrapped with an evenly spaced helix of high tensile strength prestressed wire directly on the steel cylinder. For a selected pressure class, the tension and spacing of the wire are controlled to induce compression in the concrete.

A dense cement-rich mortar coating is next placed by high velocity impaction over the prestressed wire, and then steam cured.

Prestressed Concrete Cylinder Pipe Lined - AWWA C301(L)



Nominal Pipe Dia.	Pipe Diameter (mm)	Core Thickness (mm)	Standard Joint Depth (mm)	Joint Dia (mm)	Cylinder O.D. (mm)	Approx. Weight (kg/m)	Bell O.D. (mm)	Barrel O.D. (mm)	Pipe Length (m)
600	610	38	114	699	686	375	800	737	7.315
750	762	48	114	870	857	560	972	908	7.315
900	914	57	114	1041	1029	710	1143	1080	7.315
1050	1067	67	114	1200	1200	970	1302	1251	7.315
1200	1219	76	114	1372	1372	1225	1473	1422	7.315
1350	1372	86	114	1543	1543	1450	1645	1594	7.315
1500	1524	95	108	1738	1715	1640	1838	1765	6.096

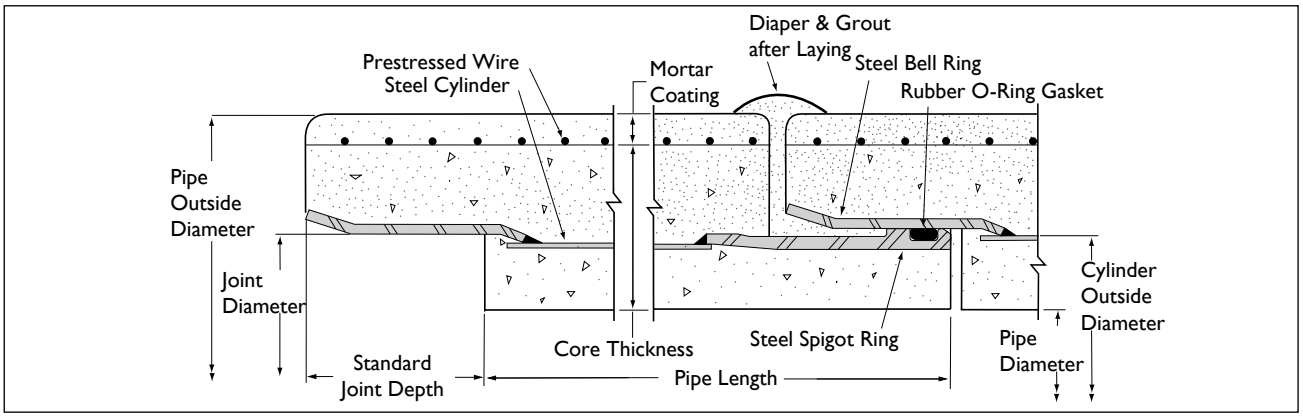
Pipe in Accordance with the AWWA C301(E) (ECP) (1650mm to 3600mm)

The steel cylinder is fabricated from gauge steel sheets. The accurately sized steel bell and spigot joint rings are welded to the ends of the steel cylinder, which is then hydrostatically tested to ensure a water tight membrane.

The tested cylinder is positioned within a vertical form and high quality concrete is cast both inside and outside, encasing the cylinder. Mechanical vibration is applied to provide a dense envelope of concrete around the cylinder. The core is steam cured to ensure that a minimum specified compressive strength is obtained prior to the prestressing operation.

The following steps resemble those described for the C301L, i.e. direct placement on the core of a uniformly spaced helix under controlled tension of prestressing wires ensuring a predetermined compression in the concrete core, followed by the application of a coating of dense cement-rich mortar.

Prestressed Concrete Cylinder Pipe Embedded - AWWA C301(E)



Nominal Pipe Dia. (mm)	Pipe Diameter (mm)	Core Thickness (mm)	Standard Joint (mm)	Joint Diameter (mm)	Cylinder O.D. (mm)	Approx. Weight (kg/m)	Bell/Barrel O.D. (mm)	Pipe Length (m)
1650	1676	127	111	1781	1759	2225	1981	6.096
1800	1829	140	114	1940	1918	2650	2159	6.096
1950	1981	152	117	2095	2073	3075	2337	6.096
2100	2134	165	124	2254	2232	3550	2518	6.096
2250	2286	165	124	2410	2388	3775	2670	6.096
2400	2438	165	124	2569	2546	4025	2822	6.096
2550	2591	165	152	2715	2699	4325	2975	6.096
2700	2743	171	152	2873	2857	4700	3140	6.096
2850	2896	181	152	3064	3048	5125	3311	6.096
3000	3048	190	152	3216	3200	6025	3483	4.877
3150	3200	216	152	3369	3353	6785	3686	4.877
3300	3353	210	152	3521	3505	6775	3826	4.877
3450	3505	219	152	3673	3658	7375	3997	4.877
3600	3658	229	152	3826	3810	7950	4169	4.877

Design

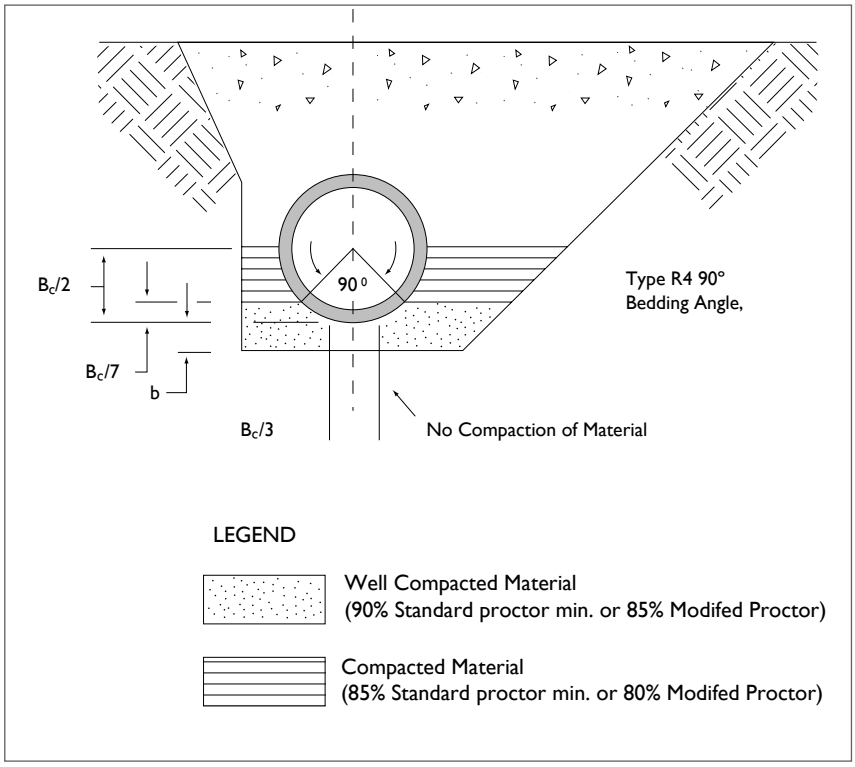
AWWA C304 Standard defines the method for the structural design of steel cylinder prestressed concrete pipe (manufactured in accordance with AWWA C301) under internal pressure and external loads.

Limit-States Design Criteria

The method adopted to determine the allowable combinations of internal pressures and external loads is based on the satisfaction of certain limit-states design criteria. This method is similar to that used to calculate other types of concrete structures. Limit states design criteria ensures reliable performance of the pipe subjected to factored loads and provides assurance that the specified prestress state and safety margins will be maintained throughout the life of the pipe.

Calculation of Stresses and Strains

The calculation of stresses and strains in the pipe wall are calculated using moments and thrusts occuring at critical locations (invert, crown, springline) and resulting from internal pressures, external loads, as well as the weight of the pipe and the fluid. These moments and thrusts induced by external loads can be evaluated on the basis of the recognized “Olander” theory. We then check the section of the pipe wall by considering it as equivalent to a beam in bending.



B_c = Exterior Diameter

Bedding and Backfill

The "Marston Theory of Loads on Underground Conduits” concludes that the trench width, type of soil and the density of the material of backfill influences the load experienced by a buried pipe. Chapter 6 of the AWWA M-9 Handbook for CPP illustrates the types of bedding conditions.

Rinker Materials CPP considers a conservative type R4 bedding for design, however, in most situations this design proves more restrictive than actually required.

Unified Design Procedures (UDP)

Rinker Materials CPP uses a design software application (UDP) developed by the American Concrete Pressure Pipe Association (ACPPA) for the design of prestressed concrete pressure pipe. This software is designed to comply with the AWWA C304.

This section contains class tables for specific working pressure combinations and backfill material in typical conditions. If you have a pipe design not shown in this manual, please contact Rinker Materials CPP.

Final State of Stress in a Prestressed Pipe

The final state of stress in a prestressed pipe is equivalent to the sum of several forces:

Prestressed Thrust

Application of prestressed wire under tension results in a uniform compressive stress in the pipe wall over the full circumference.

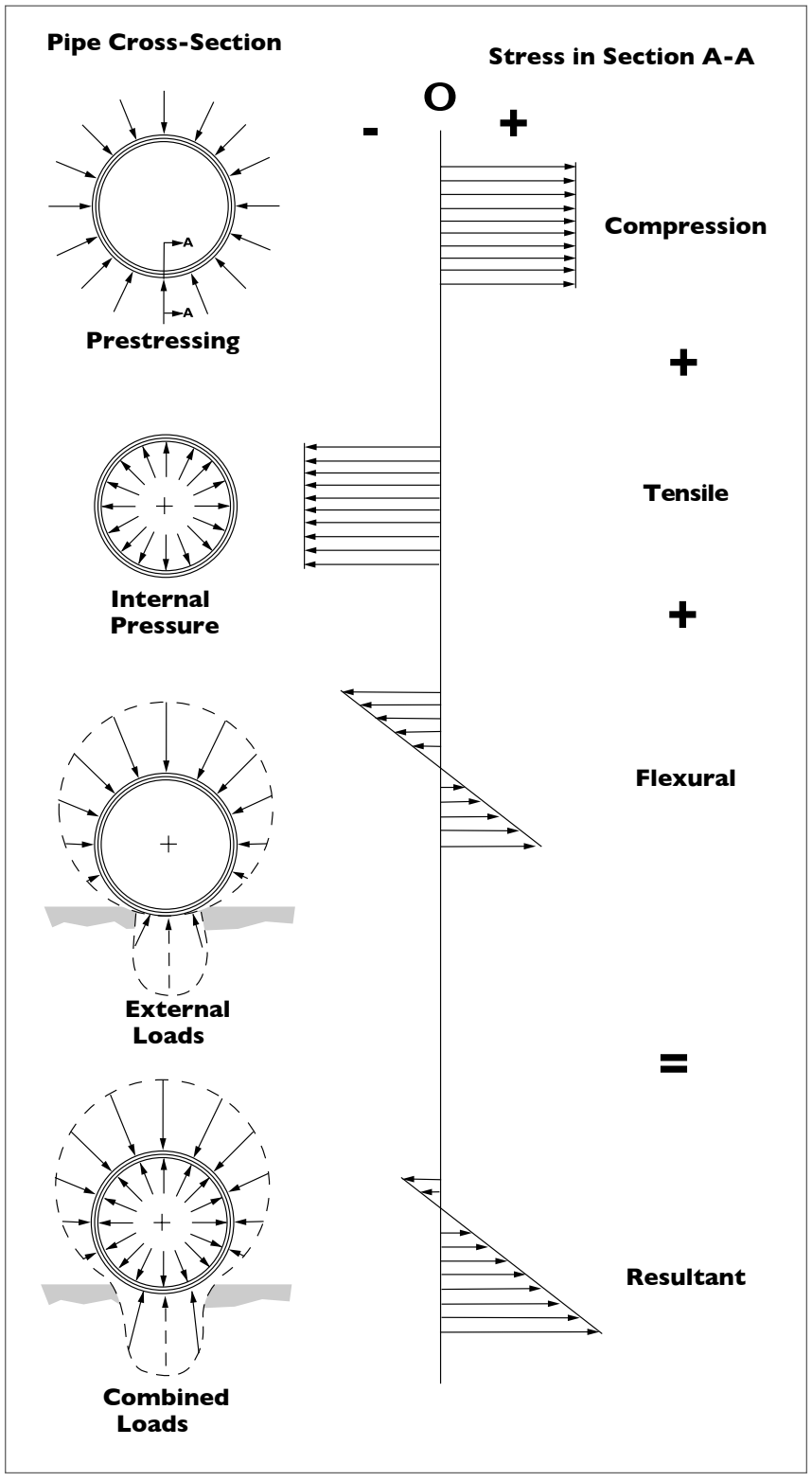
Hydrostatic Thrust

Internal pressure results in a uniform tensile stress in the pipe wall over the full circumference.

External Loads, Moments and Thrust

External loads create moments and thrusts that reduce or add stress, depending on their location along the circumference.

Superimposed Stresses in Pipe Wall



Design Charts

The following charts list classes of pipe required for commonly used working pressure and earth cover (dead load). These graphic tables are based on the criteria contained in the AWWA standard C304 and design parameters indicated.

We can also design pipes of higher classes (higher internal pressure and/or exterial loads) or with different parameters upon request (Please contact Rinker Materials CPP).

Design Procedure

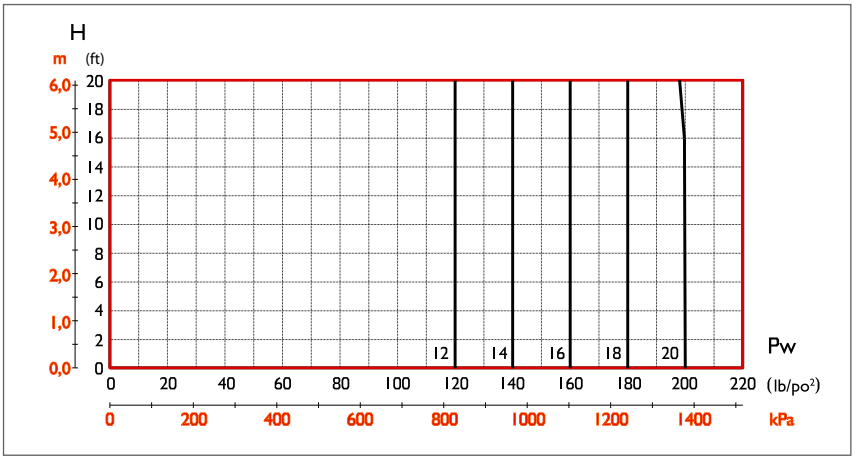
The design procedure utilized for embedded cylinder pipe (ECP) is essentially the same as above for lined cylinder pipe, with some parameter alterations (see AWWA C-304 standards).

Design Example

Determine the class of pipe, assuming a 900mm diameter LCP pipeline subject to the following conditions:		
Working or Design Pressure (P_w)	=	690 kPa (100 lb/po^2)
Transient Pressure (P_t)	=	40% P_w
Field Test Pressure (P_{ft})	=	120% P_w
Cover - Backfill above Top of Pipe (H)	=	5.5 m (18$_{ft}$)
Bedding Condition	=	type R4 (trench) (Refer to AWWA M-9)
Backfill Density	=	1920 kg/m^3 (120 lb/ft^3)
Trench Width	=	Pipe O.D.+0.610M (2ft) = 1.690M (5.5ft)

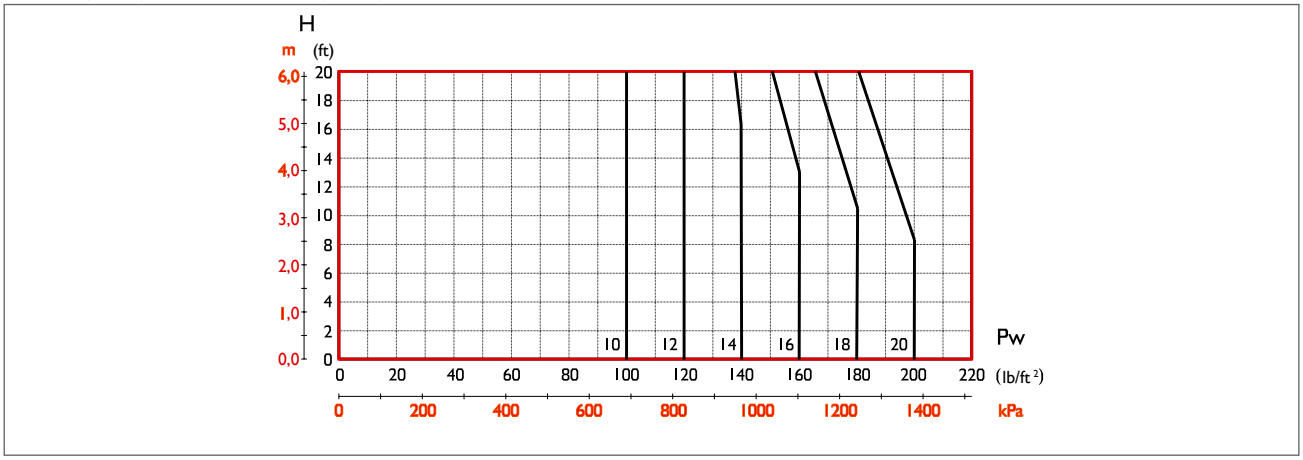
- Refer to the 900mm LCP chart and locate the working pressure along the horizontal axis (page 15).
- Locate the depth of backfill (cover) along the vertical axis.
- Produce a vertical line from the pressure axis to intersect with a horizontal line produced from the depth of cover axis. This intersection point represents the operating conditions of the pipeline.
- Select class 12, since the point of intersection is below the line representing class 12 and above the class 10 line.
- This AWWA C-301(L) Class 12 has a working pressure limit of 827 kPa (120 psi) up to a maximum cover (P_w) of 4.3m. A total capacity (P_w + P_t) of 1158 kPa (168 psi) and a transient pressure (Pt) limit of 331 kPa (48 psi). Class 12 pipe maximum field test pressure (P_{ft}) is equal to 1034 kPa (150 psi).

600mm (24”) Diameter – (LCP)

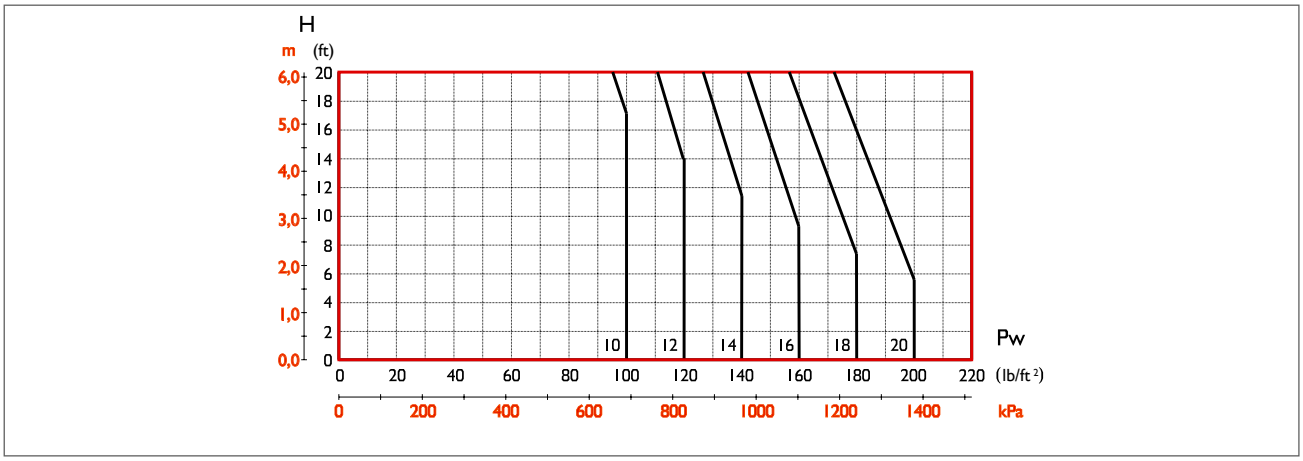


Note : PCCP Designs for higher pressure and/or cover are available upon request

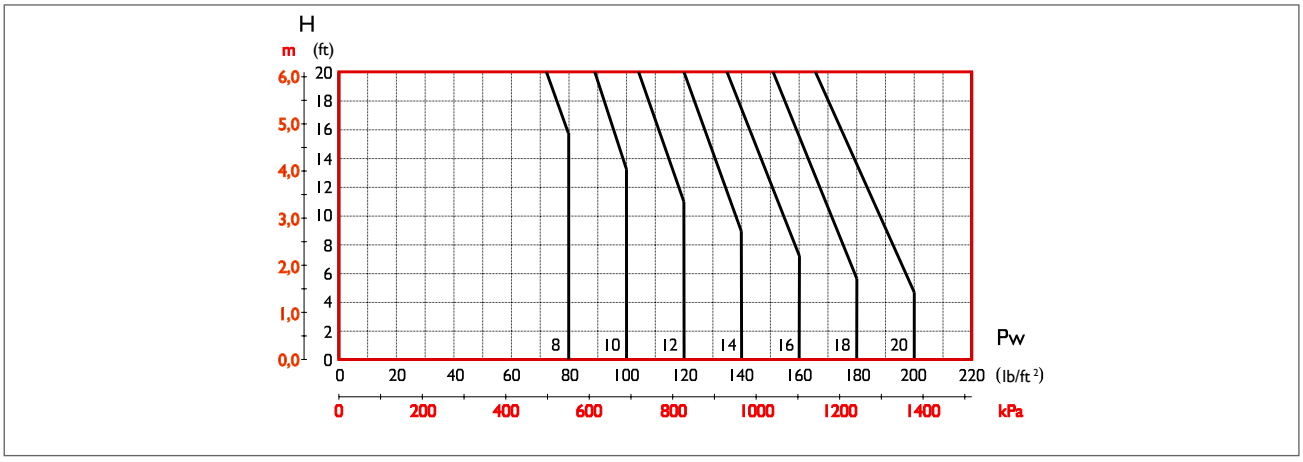
750mm (30”) Diameters – (LCP)



900mm (36”) Diameter – (LCP)

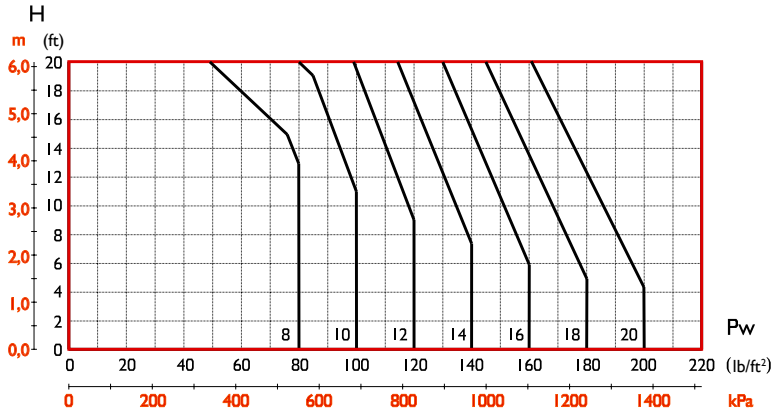


1050mm (42”) Diameter – (LCP)

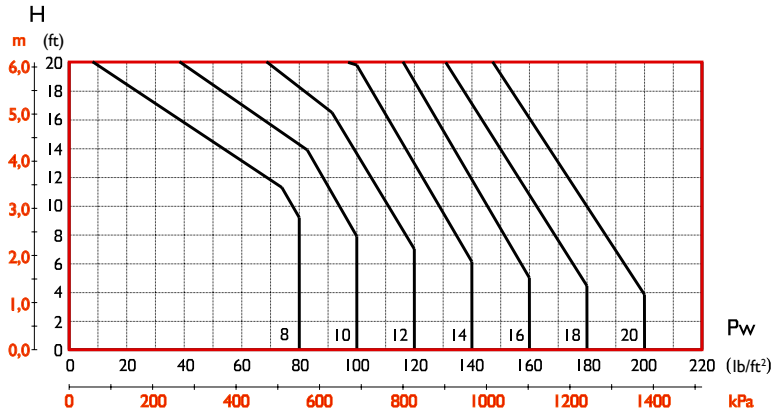


Note: PCCP Designs for higher pressure and/or cover are available upon request

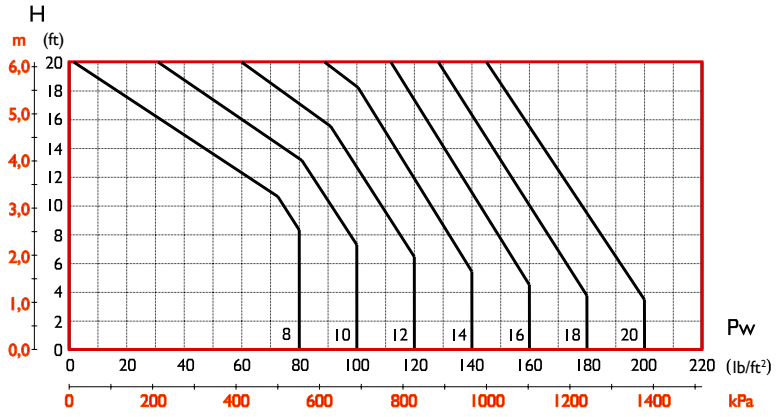
1200mm (48”) Diameter – (LCP)



1350 (54”) Diameter – (LCP)



1500mm (60”) Diameter – (LCP)



Note : PCCP Designs for higher pressure and/or cover are available upon request

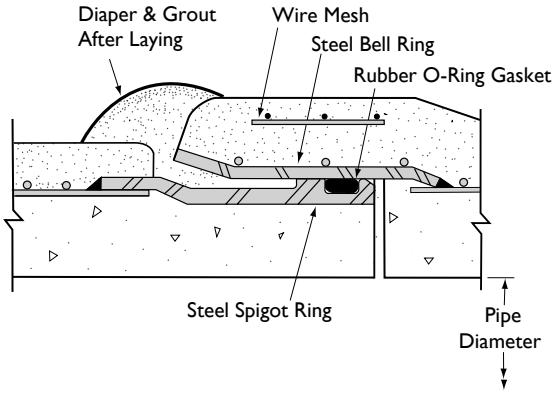
RINKER MATERIALS PRESSURE PIPE steel and rubber gasket joints are watertight, flexible, easy to assemble, self-centering, economical and versatile. Each type is detailed through this section.

Standard Joints

The standard joint assembly consists of a steel bell and spigot ring combined with a rubber O-ring gasket. This volumetrically sized rubber gasket is enclosed by steel rings in a completed joint with sufficient compression to form a pressure tight seal. The joint rings are tested for dimensional accuracy and are self-centering when installed.

Grouting of the exterior joint provides the steel joint components with corrosion protection. Experience has shown that zinc metalizing of rings as supplied, is an adequate protection of internal joints used in portable water systems. For sewage applications, polyamide epoxy coatings are available.

For a full discussion on how to assemble a joint in the field, please see the Rinker Materials CPP installation guide. For joint deflection, see pages 23 & 24.



Note: The gasket lubricant, supplied with the pipe is NSF-61 approved with friction-reducing qualities, to allow smooth joint assembly under winter and summer field conditions.

Holdfast Joints (350 to 1350 mm)

Corrosion protected Holdfast couplings provide a trustworthy restrained joint system for Rinker Materials CPP and fittings.

Their construction in segments facilitates the assembly of pipes and fittings, as well as their dismantling when necessary. The simple design of Holdfast Couplings allow rapid installation, giving them the flexibility necessary to follow the usual movements of settlement, subsidence, contraction and expansion, and eliminates the need for thrust blocks.

The number of pipe joints to be restrained is determined by the frictional resistance of the pipe against the soil. The calculation method is described in the AWWA M-9 manual

Technical Specifications

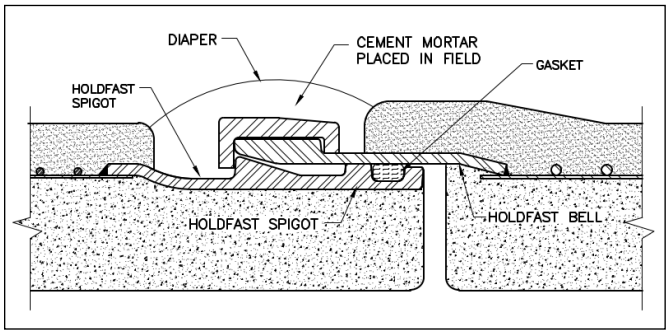
Holdfast couplings are precision ducile iron castings, conforming to ASTM A536, having a tensile strength in excess of 65,000 psi (413.7 Mpa).

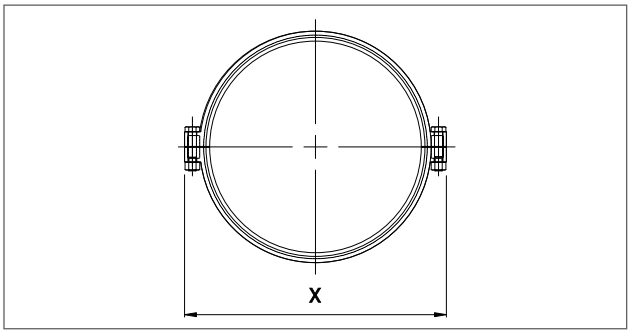
Nominal Pipe Diameter (mm)	Weight of Holdfast Coupling (kg)	Number of segments	Allowable Maximum Working Pressure kPa (Psi)	X (mm)
350	13.6	2	3241 (470)	557
400	14.5	2	2827 (410)	610
450	15.4	2	2482 (360)	670
500	17.2	2	2275 (330)	720
600	20.9	2	1793 (260)	852
750	27.2	4	1448 (210)	1023
900	32.7	4	1379 (200)	1198
1050	36.3	4	1172 (170)	1355
1200	41.7	4	1034 (150)	1523
1350	45.4	4	896 (130)	1698

Notes

1. The coupling can take an additional test pressure of 1.5 times the allowable maximum working pressure.
2. Holdfast couplings have built-in flexibility to accommodate normal ground settlement, expansion, and contraction. This flexibility should not be used to correct misalignment and turn long radius curves, as these procedures will use up joint flexibility.
3. The use of the Holdfast joints induces longitudinal thrust in the pipe that must be considered in the pipe design. The steel cylinder thickness may have to be increased to allow for these additional stresses.

Holdfast Coupling Restrained Joint

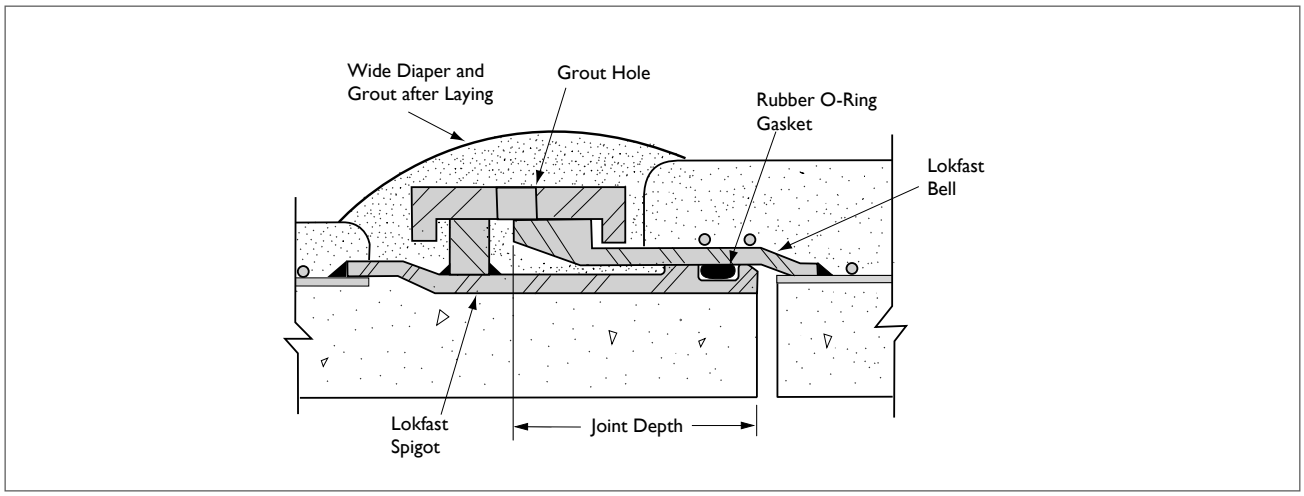




Lokfast Joint (1500mm and Larger)

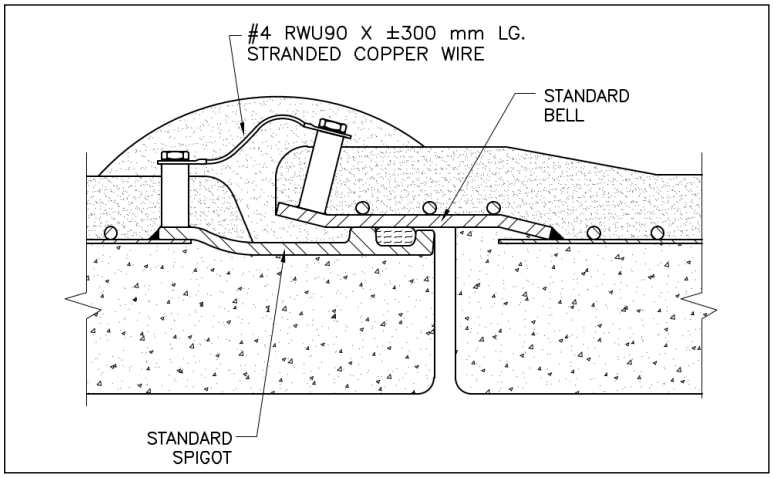
Usually known as a harness, clamp-type joint, this retained joint mechanism is used for pipes of more larger diameter. You can choose from different models depending on the diameter and nominal pressure. This joint is composed of two segments made from C-shaped steel profiles. This joint is restrained by a two-part steel clamp, secured by a two bolt and lug system on either side. The joint is completed by pouring a grout of protective mortar around the joint. This mortar distributes the thrust loads around the joint and provides the components with protection against corrosion. Contact Rinker Materials CPP for further details.

End View of Lokfast Harness Joint



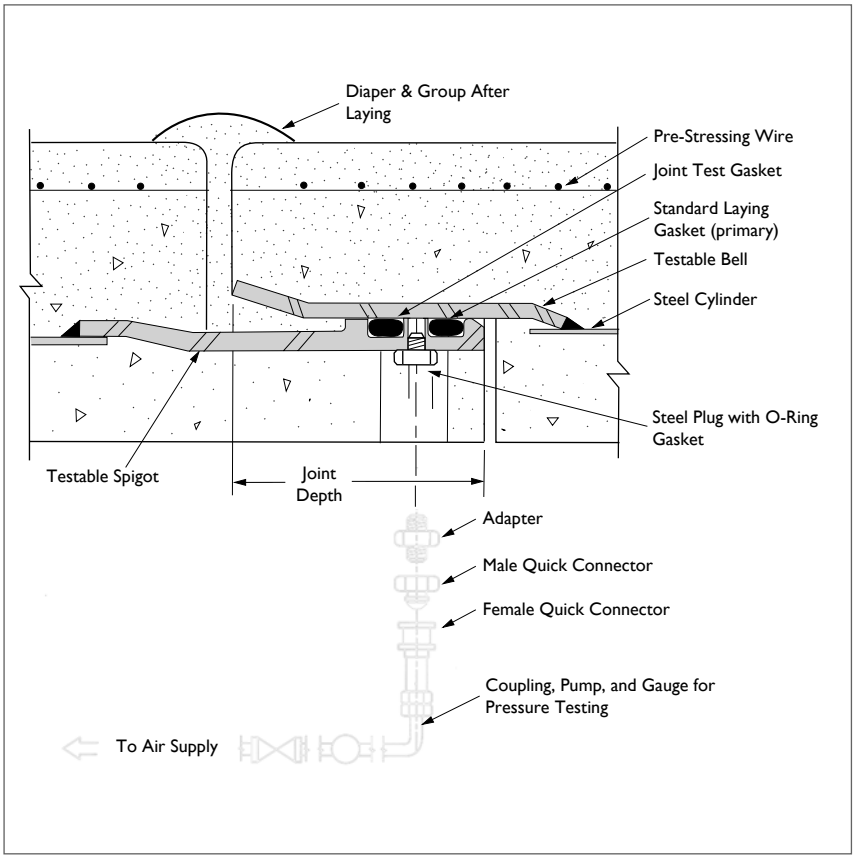
Conductivity / Bonded joints

The primary application for conductivity is to enable monitoring for environmental conditions. It is rarely necessary to bond concrete pressure pipe joints for the purpose of establishing electrical continuity, unless stray currents exist. Most environments do not require any conductivity. If the situation requires conductivity, Rinker Materials CPP can supply terminals or steel plates at each end of the pipe and fittings, and thus allow the connection of an electrical cable to each adjacent section. On LCPs, a U-shaped attachment can be welded on site at each joint instead of using an electrical connection cable with terminals or steel plates. Contact Rinker Materials CPP for further details.



Testable Joints

Testable joints, also known as double gasket joints are available for pipelines 750mm (30 inch)* and larger in diameter. Its primary function is to allow individual testing of assembled joint seals at time of installation. This eliminates the need to conduct a field pressure test on the completed pipeline, therefore eliminating the need for a large volume of water. The testing method, as illustrated below, is conducted internally using a compressed air supply and gauge to verify the gasket seal. For more information, contact Rinker Materials CPP.



Testing Procedures

1. Remove and save the steel plug with the “O” ring seal.
2. Insert the adapter and plug assembly into the spigot ring using the “O” ring gasket.
3. Connect the coupling to the plug. Pressurize to 55 psi max (380 kPa). Loss in pressure should not exceed 5 psi (35 kPa).
4. After the test, remove the adapter and replace the steel plug with the “O” ring seal.
5. Fill recess with cement mortar.

** 24" (600) and less available on request*

Welded Joints

Welded joints are another method used to transmit thrust as well as provide joint restraint, however they are generally less economical than a mechanically restrained joint due to field welding costs and increased installation time. The rigidity of a welded joint coupled with extreme soil settlement will cause adjacent pipe lengths to transform into one long rigid beam, subject to bending and shear stresses. To this end, welded type joints are used in special applications to resist thrust and to increase the lay length of a standard pipe (from 7.315m (24 ft) to 14.630m (48 ft) long).

Two types of welded joints are possible, either internal or external welded joints. Internal welded joints are used on transmission pipelines with a diameter of 1200mm (48in) or more, where it is possible to weld within the pipeline. This method requires a water tight weld due to the absence of the gasket. For pipelines 1050mm (42 in.) and smaller in diameter, an external welded joint is recommended. This method requires a field-weld bar or wedge (rolled in joint circumference), which is wedged tightly against the assembled joint rings. For pipes 1050mm (42 in) and less, external welding is recommended.

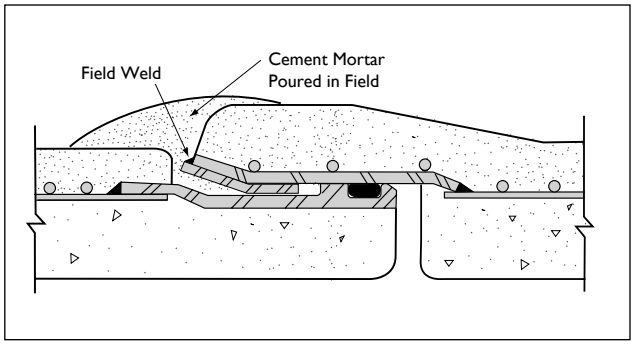
Flexible Welded Joint

This joint may be used for restraining while maintaining joint flexiblity. It is available up to 500mm diameter and applicable to C303 pipes. The gasket is left in the groove to provide water-tightness.

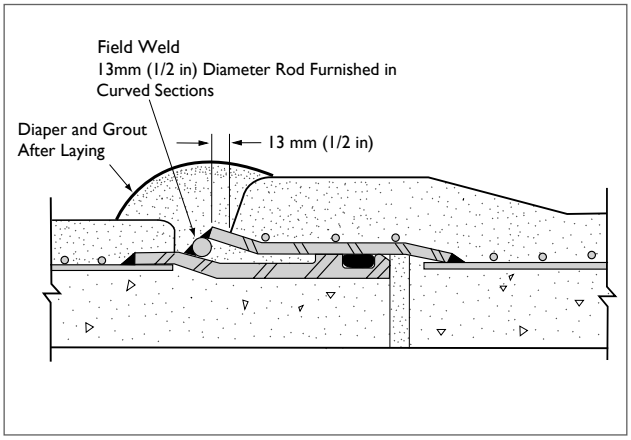
A wedge ring is welded to the bell of the pipe after completion of the joint. Skip stitch welding procedure is typically done to avoid heat damage to the rubber gasket.

Note : If joint welding is required for a long length of adjacent pipes, more attention should be given to the pipe bedding with the use of either lean concrete or un-shrinkable fill material should be utilized in this area. Differential bedding settlement may cause bending and shear over and above normal conditions which may cause excessive stresses to the pipeline.

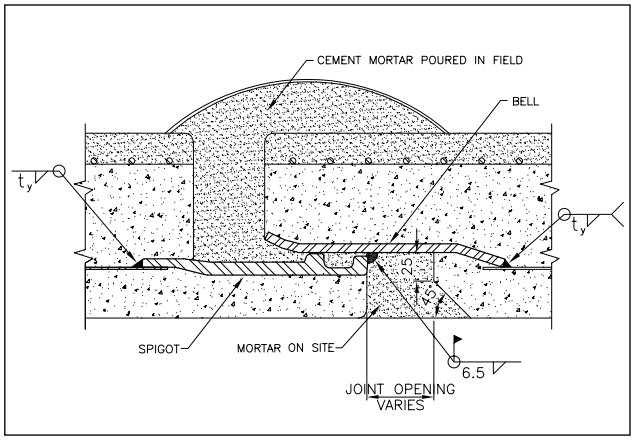
Flexible Welded Joint



LCP External Welded



ECP Internal Welded

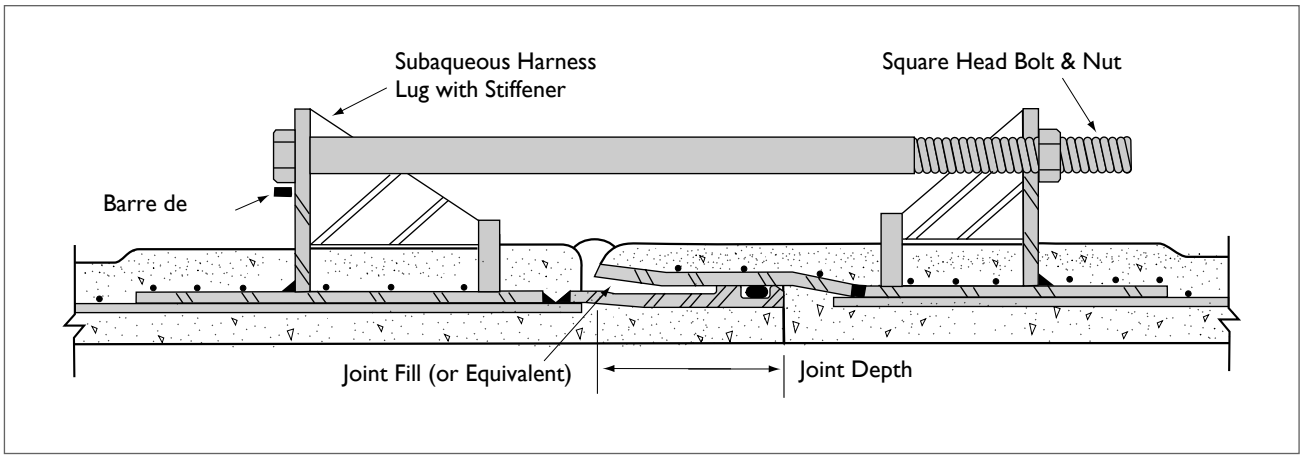


Subaqueous Joints

Underwater joints are available for all pipe sizes manufactured by Rinker Materials CPP as well as all fittings. This bolt clamp/fixing harness, is generally used in conjunction with Bell and Spigot joint ring. Its main application is to facilitate the installation of pipe underwater. Typical projects include water supply intakes, sewer outfalls, river crossings and power plant coiling systems commonly installed in an underwater trench at the bottom of a river, lake or ocean. A team of divers uses this underwater assembly to assemble the joint under water.

To allow flexiblility of the pipe once the joint is complete, loosen the nuts of the underwater assembly by two turns. These components are usually designed solely based on the force required to assemble the joint and not to resist a longitudinal thrust.

To reduce underwater installation costs, Rinker Materials CPP recommends pre-assembly of two sections of pipe (see section on welded joints) which provides double the normal installation length.



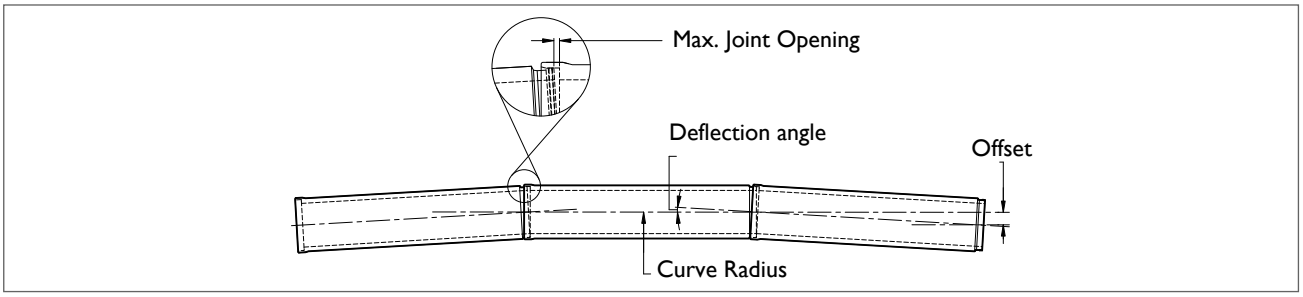
BEVELS AND JOINT DEFLECTIONS are typically utilized for pipelines requiring a change in direction (either horizontally or vertically) of up to 5 degrees.

Joint Deflections - Standard Pipes

			Standard Joints		Restrained Holdfast Joints*	
Nominal Pipe Diameter (mm)	Max. Joint Opening (mm)	Max. Deflection Angel (deg)	Offset Std. Length 7.315 (mm)	Curve Radius 7.315 (m)	Offset Std. Length 7.315 (mm)	Curve Radius Std. Lengths (m)
350	13	1 deg 52 mm	238	225	145	369
400	44	5 deg 32 mm	708	76	128	418
450	44	4 deg 54 mm	626	86	113	474
500	44	4 deg 27 mm	570	94	103	521
600	44	3 deg 38 mm	461	117	83	644
750	44	2 deg 55 mm	371	145	67	802
900	44	2 deg 26 mm	310	174	56	959
1050	44	2 deg 7 mm	269	200	48	1106
1200	44	1 deg 51 mm	235	229	42	1264
1350	44	1 deg 38 mm	209	257	38	1422
1500	25	1 deg 27 mm				
1650	27	0 deg 55 mm				
1800	28	0 deg 50 mm				
1950	27	0 deg 44 mm				
2100	30	0 deg 48 mm				
2250	30	0 deg 43 mm				
2400	30	0 deg 40 mm				
2550	44	0 deg 56 mm				
2700	45	0 deg 54 mm				
2850	45	0 deg 50 mm				
3000	45	0 deg 48 mm				
3150	45	0 deg 46 mm				
3300	45	0 deg 44 mm				
3450	45	0 deg 42 mm				
3600	45	0 deg 40 mm				

See Rinker Materials for details

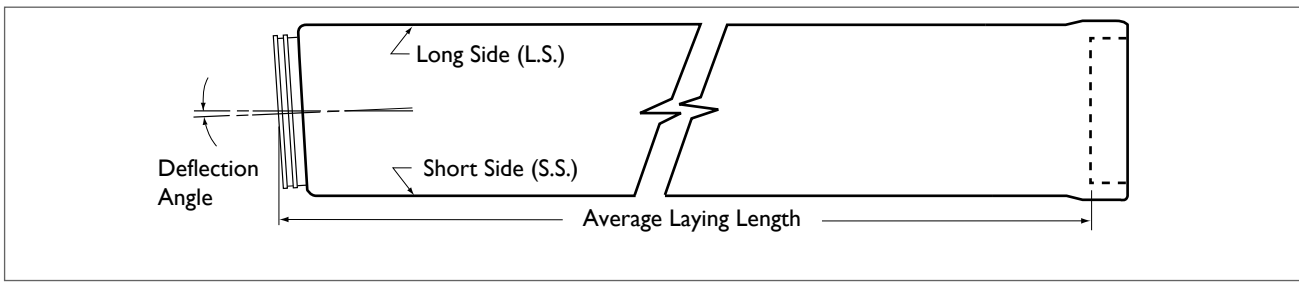
** Max Deflection angel for hold fast, consult engineering see dept.*



A bevel pipe is manufactured by angling the spigot ring on a standard length of pipe. Bevel pipe is used in applications where the required degree of deflection exceeds that of the allowable standard joint.

Deflection of Half and Full Bevel Pipes

Nominal Pipe Diameter (mm)	HALF BEVEL				FULL BEVEL			
	Deflection Angel (deg)	Pipe Laying Length (mm)	Offset Standard Length (mm)	Curve Radius Standard Length (m)	Deflection Angle (deg)	Pipe Laying Length (mm)	Offset Standard Length (mm)	Curve Radius Standard Length (m)
350	2 deg 7 min	7315	271	198	4 deg 14 min	7307	540	99
400	2 deg 8 min	7314	273	196	4 deg 16 min	7305	543	98
450	2 deg 7 min	7312	271	197	4 deg 14 min	7303	540	99
500	2 deg 9 min	7311	274	195	4 deg 17 min	7301	546	98
600	2 deg 5 min	7309	265	201	4 deg 9 min	7292	529	101
750	2 deg 5 min	7306	266	200	4 deg 10 min	7290	531	100
900	2 deg 6 min	7303	267	200	4 deg 11 min	7284	532	100
1050	2 deg 7 min	7303	270	197	4 deg 14 min	7281	538	98
1200	2 deg 7 min	7300	270	197	4 deg 14 min	7274	537	98
1350	2 deg 5 min	6077	222	166	4 deg 11 min	6049	441	83
1500	2 deg 6 min	6074	222	166	4 deg 11 min	6042	440	83
1650	2 deg 0 min	6075	212	174	4 deg 0 min	6044	422	87
1800	2 deg 0 min	6072	212	174	4 deg 0 min	6038	421	87
1950	2 deg 0 min	6072	212	174	4 deg 0 min	6036	421	86
2100	2 deg 0 min	6070	212	174	4 deg 0 min	6030	421	86
2250	2 deg 0 min	6067	212	174	4 deg 0 min	6025	420	86
2400	2 deg 0 min	6064	212	174	4 deg 0 min	6019	420	86
2550	2 deg 0 min	6062	212	174	4 deg 0 min	6014	420	86
2700	2 deg 0 min	6059	211	174	4 deg 0 min	6009	419	86
2850	2 deg 0 min	6056	211	174	4 deg 0 min	6002	419	86
3000	2 deg 0 min	4834	169	138	4 deg 0 min	4778	333	68
3150	2 deg 0 min	4831	169	138	4 deg 0 min	4772	333	68
3300	2 deg 0 min	4829	169	138	4 deg 0 min	4767	333	68
3450	2 deg 0 min	4826	168	138	4 deg 0 min	4762	332	68
3600	2 deg 0 min	4823	168	138	4 deg 0 min	4757	332	70



UNLIKE OTHER PIPE MATERIALS, outlets such as hydrant connections can be built directly into the wall of CPP. Tees and/or crosses are utilized when the ratio of the outlet diameter to the pipeline becomes too large (see page 31).

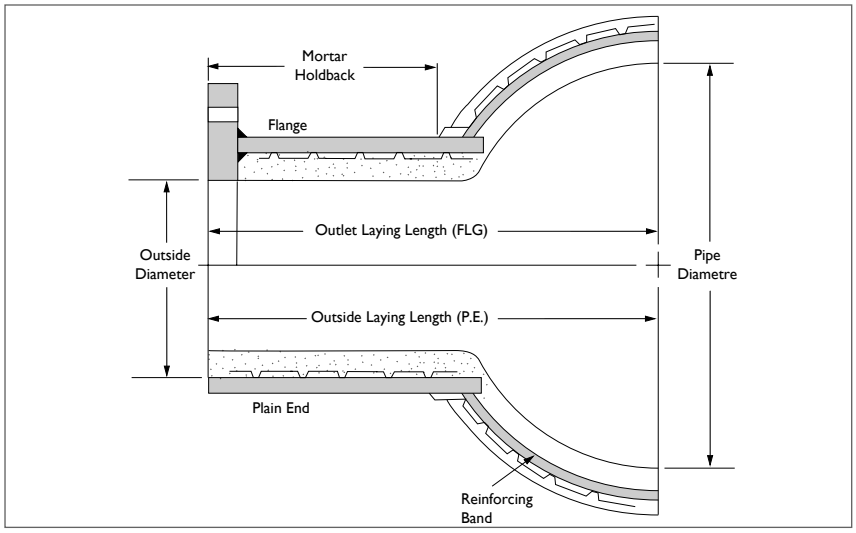
Large Outlets

Both fittings and pipe sections can be fabricated to accommodate various types and sizes of outlets, such as branch lines, hydrants, blow-offs, and air relief valves. To preserve the strength of the pipe wall in the outlet area, additional reinforcement may be required such as reinforcing bands and collars. Outlet diameters larger than illustrated on the table are manufactured as tees.

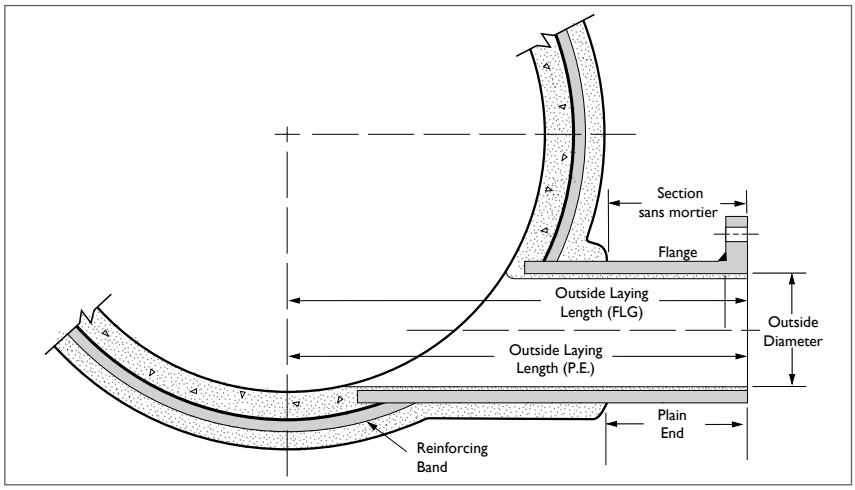
Outlets are available as:

- Bell
- Spigot
- Plain End
- Flange

Centreline Outlet Cross-Section



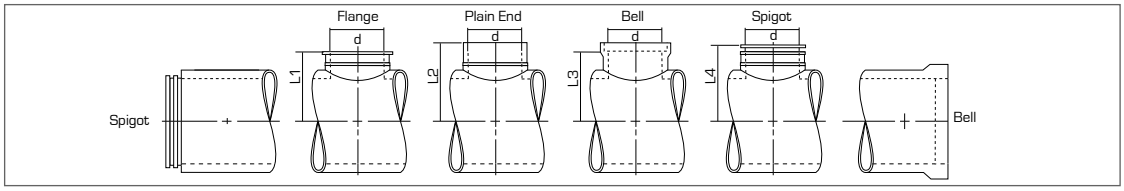
Tangent Outlet Cross-Section



Tangent outlets, outlets with branch angled to the main (wye), as well as longer branch laying lengths are available upon request.

Large Outlets Laying Lengths (on standard pipe)

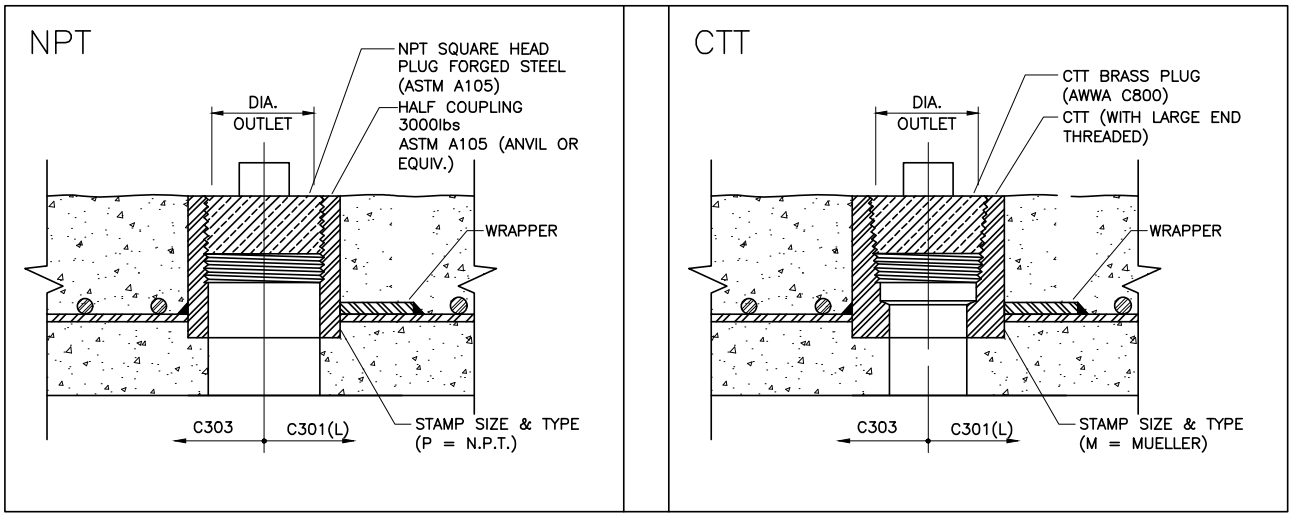
Nominal Diameter (mm)	Type of Outlet Length	d (Outlet Diameter in mm)										
		100	150	200	250	300	350	400	450	500	600	750
350	L1	450	450	450								
	L2	475	475	475								
400	L1	475	475	475	475							
	L2	500	500	500	500							
450	L1	525	525	525	525	525						
	L2	550	550	550	550	550						
500	L1	550	550	550	550	550						
	L2	575	575	575	575	575						
600	L1	600	600	600	600	600	600	600				
	L2	625	625	625	625	625	625	625				
	L3						450	450				
	L4						575	575				
750	L1	700	700	700	700	700	700	700	700			
	L2	725	725	725	725	725	725	725	725			
	L3						550	550	550			
	L4						650	650	650			
900	L1	775	775	775	775	775	775	775	775	775		
	L2	800	800	800	800	800	800	800	800	800		
	L3						625	625	625	625		
	L4						725	725	725	725		
1050	L1	850	850	850	850	850	850	850	850	850		
	L2	875	875	875	875	875	875	875	875	875		
	L3						700	700	700	700		
	L4						825	825	825	825		
1200	L1	950	950	950	950	950	950	950	950	950	1075	
	L2	975	975	975	975	975	975	975	975	975	975	
	L3						800	800	800	800	800	
	L4						900	900	900	900	900	
1350	L1	1025	1025	1025	1025	1025	1025	1025	1025	1025	1175	
	L2	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	
	L3						875	875	875	875	875	
	L4						975	975	975	975	975	
1500	L1	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1275
	L2	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
	L3						975	975	975	975	975	975
	L4						1075	1075	1075	1075	1075	1075



For outlets smaller than 100mm refer to page 27. For larger outlets, tees are used. Refer to page 31.

Small Threaded (Service) Outlets

Threaded outlets up to 75mm (3in.) in diameter are available for the full range of pipe manufactured by Rinker Materials CPP. Both N.P.T (IPT) and C.T.T are available in a variety of diameters (see chart below). More than one outlet can be manufactured on one section of pipe or at the same location.



Small Threaded Outlets Type

Metric	9 mm	13 mm	19 mm	25 mm	32 mm	38 mm	51 mm	76 mm
Imperial	3/8”	1/2”	3/4”	1”	1 - 1/4”	1 - 1/2”	2”	3”
NPT (IPT)	X	X	X	X	X	X	X	X
CTT			X	X	X	X	X	

Rinker Materials CPP manufactures its FITTINGS to AWWA standards so that they provide the same high hydraulic capacity, structural strength, anti-corrosion properties and durability as the pipe itself. Our fittings are designed to withstand a pressure rating equivalent to the adjacent pipe.

Commonly Used Fittings

- Elbow
- Tee
- Cross
- Wye
- Reducer
- Bulkhead
- Night Plug/Cap
- Custom Fittings

The following pages present the dimensions of the most common fittings.

We can also manufacture specially shaped or designed fittings.

Elbows (Bends)

Elbows are used where the deflection required is not obtainable by either pipe deflection, bevel pipe, or a combination of both. Elbows are available in all diameters manufactured by Rinker Materials CPP. A degree of deflection between 5 and 90 degrees, can be achieved in increments of 1 degree. Joint deflection may be used in conjunction with the elbows to adjust to the specified angle.

Other special elbows, such as long radius elbows, or elbows greater than 90 degrees are available upon request.

Standard Wyes

The dimensions for wyes are not tabulated here due to the large number of combinations of joint types, deflection angles, and laying lengths of the branch and main. Please contact Rinker Materials CPP to determine the proper configuration for your needs.

Tees and Crosses

Rinker Materials CPP can manufacture standard sized tees and crosses as shown in the tables or to your individual requirements. Combinations of joint styles along the main pipe and branch pipe are also offered.

We can also manufacture custom tees, crosses and wyes upon request.

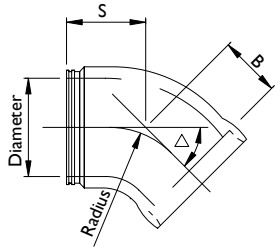
Reducers

Reducers are manufactured of steel plate rolled into cones. The thickness of the plate is a function of the operating pressure and the diameter of the pipeline. The inside and outside surfaces are lined and coated with reinforced mortar to provide a smooth, even transition from the larger to smaller diameter.

Special attention should be taken of the potential thrust developed towards the small end of the reducer.

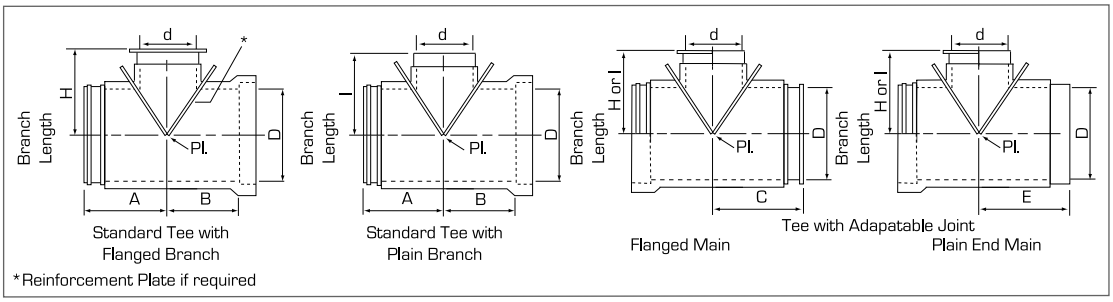
Elbow Laying Lengths

Degree	Bell/ Spigot	350	400	450	500	600	750	900	1050	1200	1350	1500	1650	1800	1950	2100	2250	2400
5	S	150	150	150	150	150	150	150	150	150	200	200	200	250	250	250	250	250
	B	150	150	150	150	150	150	150	150	150	200	200	200	250	250	250	250	250
7.5	S	150	150	150	150	150	150	150	150	150	200	250	250	250	250	250	250	250
	B	150	150	150	150	150	150	150	150	150	200	250	250	250	250	250	250	250
10	S	150	150	150	150	150	150	150	150	200	250	250	250	250	250	300	300	300
	B	150	150	150	150	150	150	150	150	200	250	250	250	250	250	300	300	300
12.5	S	150	150	150	150	150	150	200	200	200	250	250	300	300	300	300	300	350
	B	150	150	150	150	150	150	200	200	200	250	250	300	300	300	300	300	350
15	S	150	150	150	150	150	200	200	200	200	250	300	300	300	300	350	350	350
	B	150	150	150	150	150	200	200	200	200	250	300	300	300	300	350	350	350
22.5	S	200	200	200	225	225	250	250	300	325	400	425	450	475	475	500	525	525
	B	125	125	125	150	150	175	175	200	225	275	275	275	300	300	325	350	350
30	S	225	250	250	275	275	325	350	400	450	525	575	625	650	675	725	750	775
	B	150	175	175	200	200	250	275	300	350	400	425	450	475	500	550	575	600
45	S	275	300	300	325	350	400	450	525	575	700	750	800	850	900	950	1000	1050
	B	200	225	225	250	275	325	375	425	475	550	600	650	675	725	775	825	875
60	S	325	350	375	400	450	525	600	700	775	925	1000	1100	1175	1250	1325	1400	1475
	B	250	275	300	325	375	450	525	600	675	800	850	925	1000	1075	1150	1225	1300
75	S	400	425	475	500	575	675	775	925	1025	1200	1300	1425	1525	1625	1725	1850	1950
	B	325	350	400	425	500	600	700	825	925	1050	1150	1250	1350	1450	1550	1675	1775
90	S	475	525	575	625	700	850	975	1150	1275	1475	1625	1775	1900	2050	2200	2325	2475
	B	400	450	500	550	625	775	900	1050	1175	1350	1475	1600	1750	1875	2025	2150	2300



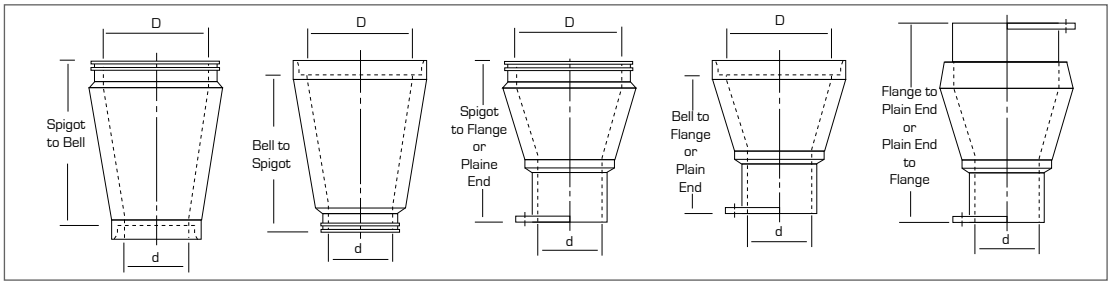
Standard Tees (all dimensions in mm)

D Main (mm)	d Branch (mm)	Principal				Branch			
		A Pl to Spigot	B Pl to Bell	C Pl to Flange	E Pl to Plain End	F Pl to Spigot	G Pl to Bell	H Pl to Flange	I Pl to Plain End
350	250	400	400	500	550			450	475
	300	450	450	550	600			450	475
	350	500	500	600	650	400	300	450	475
400	300	450	450	550	600			475	500
	350	500	500	600	650	425	325	475	500
	400	550	550	650	700	425	325	475	500
450	350	500	500	600	650	475	375	525	550
	400	550	550	650	700	475	375	525	550
	450	600	600	700	750	475	375	525	550
500	350	500	500	600	650	500	400	550	575
	400	550	550	650	700	500	400	550	575
	450	600	600	700	750	500	400	550	575
	500	650	650	750	800	500	400	550	575
600	450	600	600	700	750	575	450	600	625
	500	650	650	750	800	575	450	600	625
	600	750	750	850	900	575	450	750	625
750	500	650	650	800	800	650	550	700	725
	600	750	750	900	900	650	550	825	725
	750	900	900	1050	1050	675	550	825	725
900	600	750	750	900	900	725	625	925	800
	750	900	900	1050	1050	725	625	925	800
	900	1050	1050	1200	1200	850	725	1025	900
1050	600	750	750	975	975	825	700	1000	875
	750	900	900	1125	1125	825	700	1000	875
	900	1050	1050	1275	1275	825	700	1000	875
	1050	1200	1200	1425	1425	1025	900	1200	1075
1200	750	900	900	1175	1125	900	800	1075	975
	900	1050	1050	1325	1275	900	800	1075	975
	1050	1200	1200	1475	1425	900	800	1075	975
	1200	1300	1300	1575	1525	1100	1000	1275	1175
1350	750	900	900	1175	1125	975	875	1175	1050
	900	1050	1050	1325	1275	975	875	1175	1050
	1050	1200	1200	1475	1425	975	875	1175	1050
	1200	1350	1350	1575	1525	975	875	1175	1050
	1350	1350	1350	1575	1525	1175	1075	1375	1250



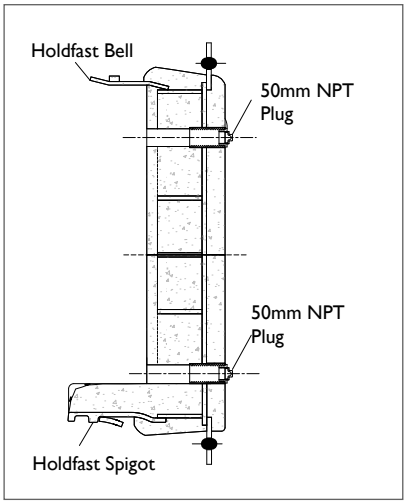
Reducers (all dimensions in mm)

D mm		d mm	Spigot/ Bell	Bell/ Spigot	Spigot/ PSE	Bell/ PSE	PSE/ PSE	FLG/ FLG
350	X	200	—	—	750	650	875	975
		250	—	—	625	525	750	850
		300	—	—	500	400	625	725
400	X	200	—	—	875	775	1000	1100
		300	—	—	625	525	750	850
		350	275	275	500	400	625	725
450	X	250	—	—	875	775	1000	1100
		300	—	—	750	650	875	975
		350	400	400	625	525	750	850
		400	275	275	500	400	625	725
500	X	300	—	—	875	775	1000	1100
		350	525	525	750	650	875	975
		400	400	400	625	525	750	850
		450	275	275	500	400	625	725
600	X	350	775	775	1000	900	1125	1225
		400	650	650	875	775	1000	1100
		450	525	525	750	650	875	975
		500	400	400	625	525	750	850
750	X	400	1050	1061	1275	1186	1385	1485
		450	925	936	1150	1061	1260	1360
		500	800	811	1025	936	1135	1235
		600	550	561	775	686	885	985
900	X	450	1300	1311	1525	1436	1635	1735
		500	1175	1186	1400	1311	1510	1610
		600	925	936	1150	1061	1260	1360
		750	586	586	785	696	895	995
1050	X	500	1550	1561	1775	1686	1885	2035
		600	1300	1311	1525	1436	1635	1785
		750	961	961	1160	1071	1270	1420
		900	586	586	785	696	895	1045
1200	X	600	1675	1686	1900	1811	2010	2160
		750	1336	1336	1535	1446	1645	1795
		900	961	961	1160	1071	1270	1420
		1050	586	586	785	696	895	1095
1350	X	750	1714	1714	1913	1824	2023	2173
		900	1339	1339	1538	1449	1648	1798
		1050	964	964	1163	1074	1273	1473
		1200	589	589	788	699	898	1098



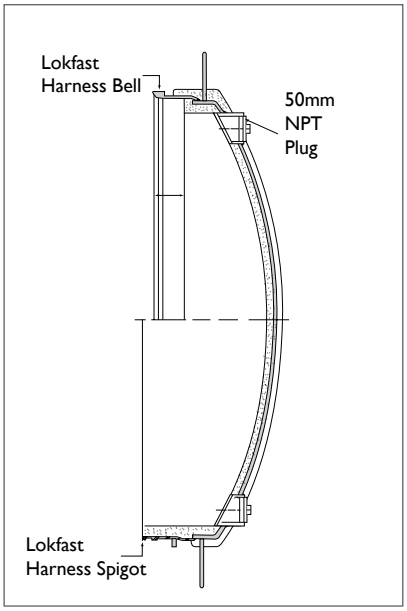
Regular Concrete Bulkhead (350mm to 1350mm)

Regular Rinker Materials CPP bulkheads are manufactured with standard bell or spigot joint rings and must be braced with a thrust block or with other means to keep them in position. The bulkheads are also manufactured with a restrained bell or spigot joint ring, and do not need external bracing. To resist the thrust on the bulkhead, enough frictional drag force developed between the pipe and the backfill material must be achieved. For this purpose, the required restrained pipe length must be designed, and several restrained pipe joints are generally required to withstand the force on the bulkhead (see AWWA M-9 manual, chapter 9).



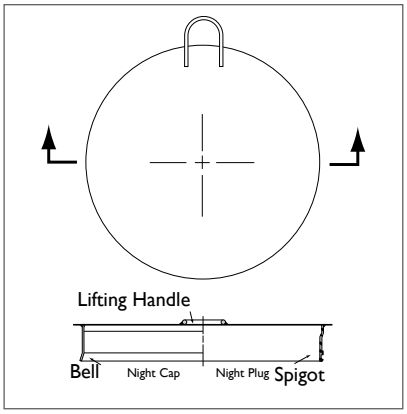
Dished Bulkhead (1500mm and larger)

The dished bulkhead is generally used for large diameter pipe (1500mm and larger) and with a restrained joint (Lokfast), which do not require an external stop. When a restrained system is used on a bulkhead, the required length of the restrained pipe section must be assessed and, in general, several restrained joints must be provided to counter the force exerted on the bulkhead (see AWWA M-9 Manual, chapter 9).



Night Cap or Plug

The night plugs and night caps are used to cover the end of a pipeline during work interruptions. They prevent dirt, water and foreign bodies from entering the pipe. The rigidity of these night caps/plugs are enough to resist wear and tear from repetitive use, but not to resist internal water pressure.

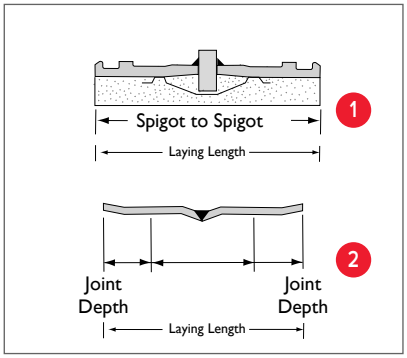


THE PRIMARY APPLICATION for an adapter is to connect CPP to a valve or to a pipeline made of another material, either old or new.

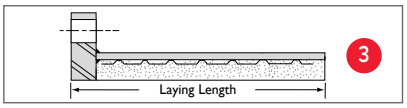
Adapters

We manufacture custom adapters according to requirements. Bell to bell or male to male type joint adapters can be used in the event of a change in installation direction. The layout lengths of these most common adapters for various diameters are tabulated below.

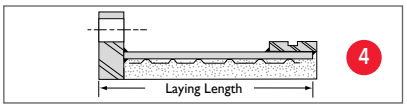
Typical Adapters



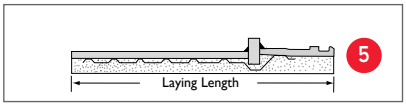
Flange to Plain End



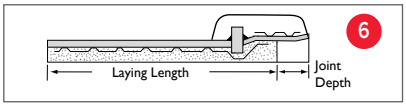
Flange to VIC 44



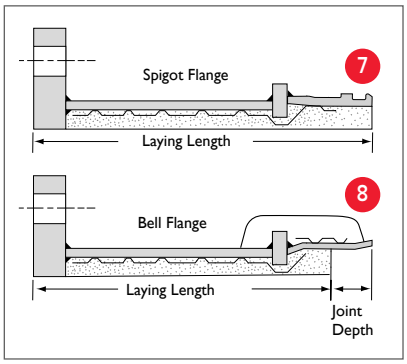
Plain End Spigot Ring



Plain End Bell Ring



Typical Flange Adapters



Nominal Pipe Diameter	1 Spigot/ Spigot (mm)	2 Bell/ Bell (mm)	3 Flange/ PE (mm)	4 Flange/ Vic 31 or 44	5 Spigot/ PE (mm)	6 Bell/PE (mm)	7 Flange/ Spigot (mm)	8 Flange/ Bell (mm)
350	280	70	300	300	525	420	425	320
400	280	52	300	300	525	420	425	320
450	280	52	300	300	525	416	425	316
500	280	52	300	300	525	416	425	316
600	280	52	300	300	552	438	452	338
750	280	52	300	300	552	438	452	338
900	280	104	300	300	552	464	452	364
1050	280	90	350	350	552	502	452	452
1200	280	84	350	350	552	502	452	452
1350	292	82	350	350	552	447	502	397
1350	380	158	350	350	596	485	546	435
1500	380	152	350	350	596	482	546	432
1650	387	101	350	350	603	460	553	410
1800	387	95	350	350	603	457	553	407
1950	387	87	350	350	603	453	553	403
2100	393	107	350	350	609	466	559	416
2250	393	107	400	400	609	466	609	466
2400	393	107	400	400	609	466	609	466

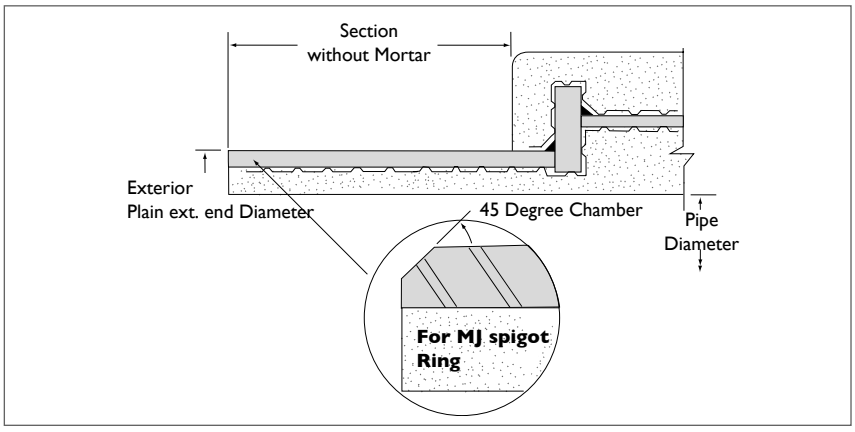
Plain Steel Ends (PSE)

We manufacture steel ends on pipes and/or fittings to allow connection with any type of pipe, valve, faucet or measuring device and closures. The table on page 36 lists the lengths for the following steel ends.

Plain Steel Ends

The plain steel end allows insertion into bell of a cast iron pipe joint or connection with a mechanical joint or flexible coupling (Mechanical seal, Robar, or Smith Blair), or a split sleeve welded joint.

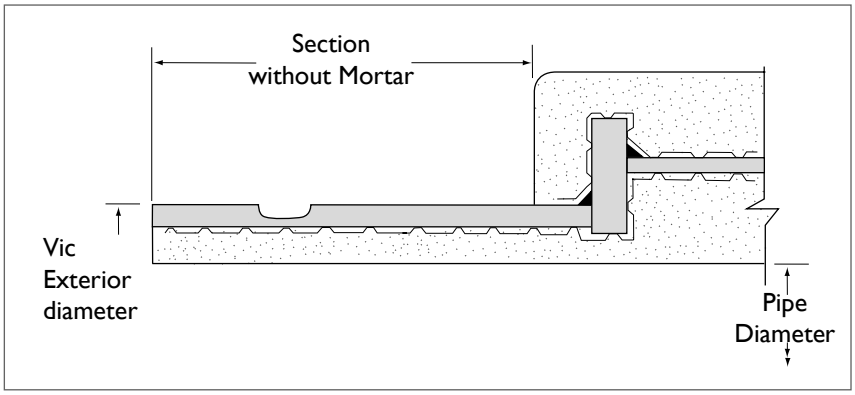
Plain End (mechanical joint spigot)



Grooved End

The grooved end is used in conjunction with the Victaulic type coupling. This type of mounting is required in restraint configuration where unbalanced forces can cause a standard coupling to pullapart.

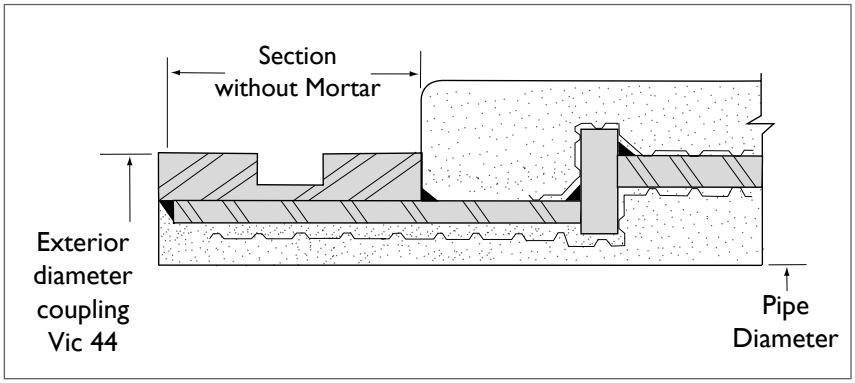
Grooved End



Shouldered end

The shouldered end uses the Victaulic type #44 coupling and is applicable to adapters and wall pieces in valve chambers. This assembly is equivalent to the grooved end.

Shouldered End



Flanged ends

Flange Specifications:

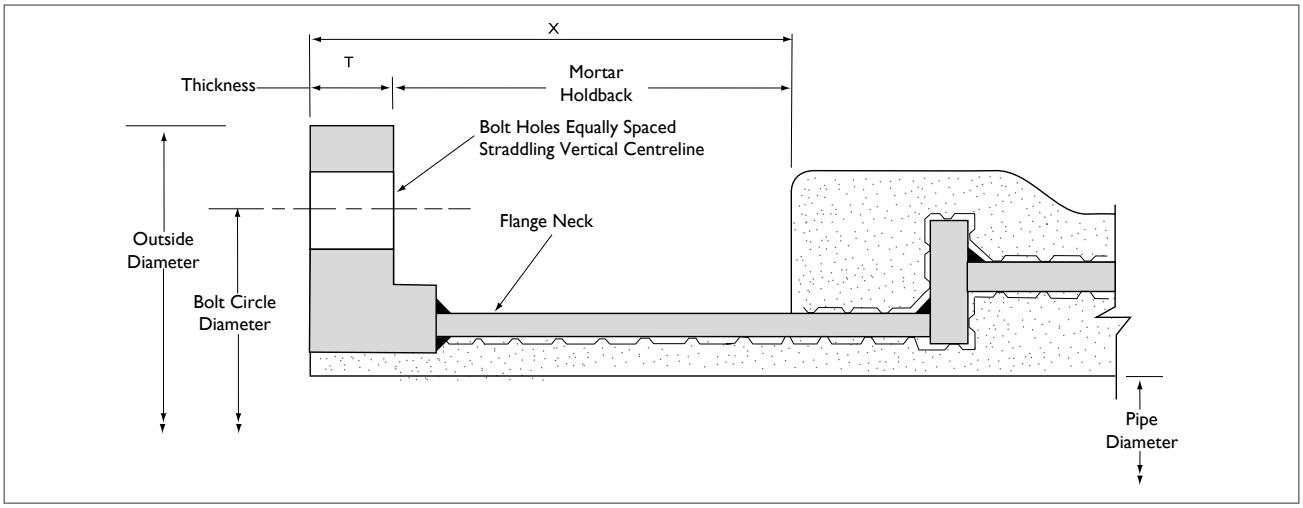
Flanges installed on Rinker Materials Pressure Pipe and Fittings are fabricated to AWWA C207 standard for “Steel Pipe flanges for Waterworks Service - Sizes 4 in. through 144 in. (100mm through 3600mm)”.

Types of Flanges:

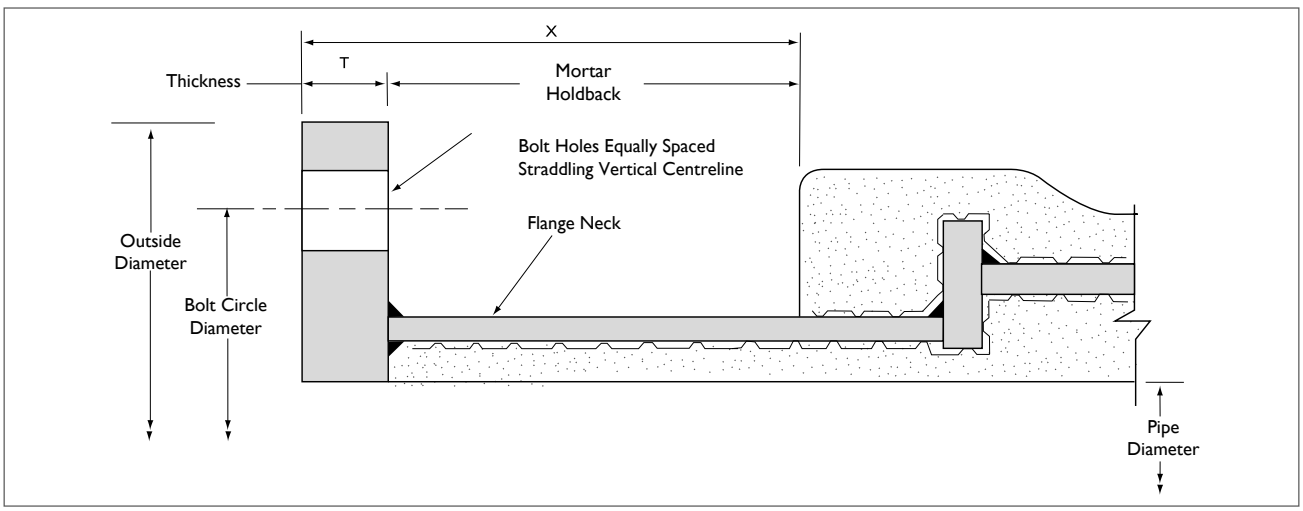
100mm to 300mm Diameter Flanges:
The standard flanges supplied are Class E stepped and conform to AWWA standards. Pressure rating: 1895 kPa (275 psi). For pipe diameters less than 100mm, contact Rinker Materials.

350mm and Larger Diameter:
For pressure ratings of 150 psi (1035 kPa) and less, AWWA standard steel-ring flanges Class D are supplied. If required, for higher pressure ratings, AWWA standard steel-ring flanges Class E are supplied. Pressure rating for Class E flanges is 275 psi (1895 kPa).

Steel-Hub Flange (diameter of 100mm to 300 mm)



Steel-Ring Flange (350mm and larger)



Flanged Ends

Nominal Pipe Diameter		Outside Diameter of Flange (In.)	Bolt Circle Diameter (In.)	Diameter of Bolts (In.)	Diameter of Bolts (In.)	Flange Thickness (T)			X	
						Class D 1 035 kPa (150 psi) Ring (in)	Class E 1 895 kPa (275 lb/ft2)		Class D (mm)	Class E (mm)
mm	in						Hub (In.)	Ring (In.)		
100	4	9.00	7.50	0.625	8		0.938			125
150	6	11.00	9.50	0.750	8		1.000			125
200	8	13.50	11.75	0.750	8		1.125			125
250	10	16.00	14.25	0.875	12		1.188			125
300	12	19.00	17.00	0.875	12		1.250			125
350	14	21.00	18.75	1.000	12	0.938		1.875	175	225
400	16	23.50	21.25	1.000	16	1.000		2.000	175	250
450	18	25.00	22.75	1.125	16	1.062		2.125	200	250
500	20	27.50	25.00	1.125	20	1.125		2.375	200	275
600	24	32.00	29.50	1.250	20	1.250		2.625	225	300
750	30	38.75	36.00	1.250	28	1.375		2.875	250	325
900	36	46.00	42.75	1.500	32	1.625		3.125	275	325
1050	42	53.00	49.50	1.500	36	1.750		3.375	300	375
1200	48	59.50	56.00	1.500	44	1.875		3.500	300	375
1350	54	66.25	62.75	1.750	44	2.125		3.750	300	425
1500	60	73.00	69.25	1.750	52	2.250		3.875	300	450
1650	66	80.00	76.00	1.750	52	2.500		4.250	300	450
1800	72	86.50	82.50	1.750	60	2.625		4.375	325	450
1950	78	93.00	89.00	2.000	64	2.750		4.750	350	475
2100	84	99.75	95.50	2.000	64	2.875		4.750	350	475
2250	90	106.50	102.00	2.250	68	3.000		5.125	375	525
2400	96	113.25	108.50	2.250	68	3.250		5.125	400	525

1. All of the above flanges have the same diameter and pattern as ANSI/ASME B16.1 class 125 cast-iron flanges.

In sizes 24 inches and smaller, they also match ANSI/ASME B16.5 150 psi.

2. All flanges are flat faced to receive a full face gasket. (red rubber is standard for most applications).

3. Bolt and nuts (when supplied) conform to:

- ASTM A307 grade B for 150 psi pressure rating.

- ASTM A193 grade B7 for higher pressure rating.

4. Other types of flanges such as type B or F are available for particular applications.

5. Blind flanges are supplied according to the required pressure rating.

6. Pressure rating is based on the design of the maximum operating pressure plus the anticipated surge pressure.

7. Maximum test pressure should not exceed 125% of the pressure rating.

8. Bolt holes straddle the center-line, unless otherwise specified.

9. Tolerance on flange thickness are positive (+).

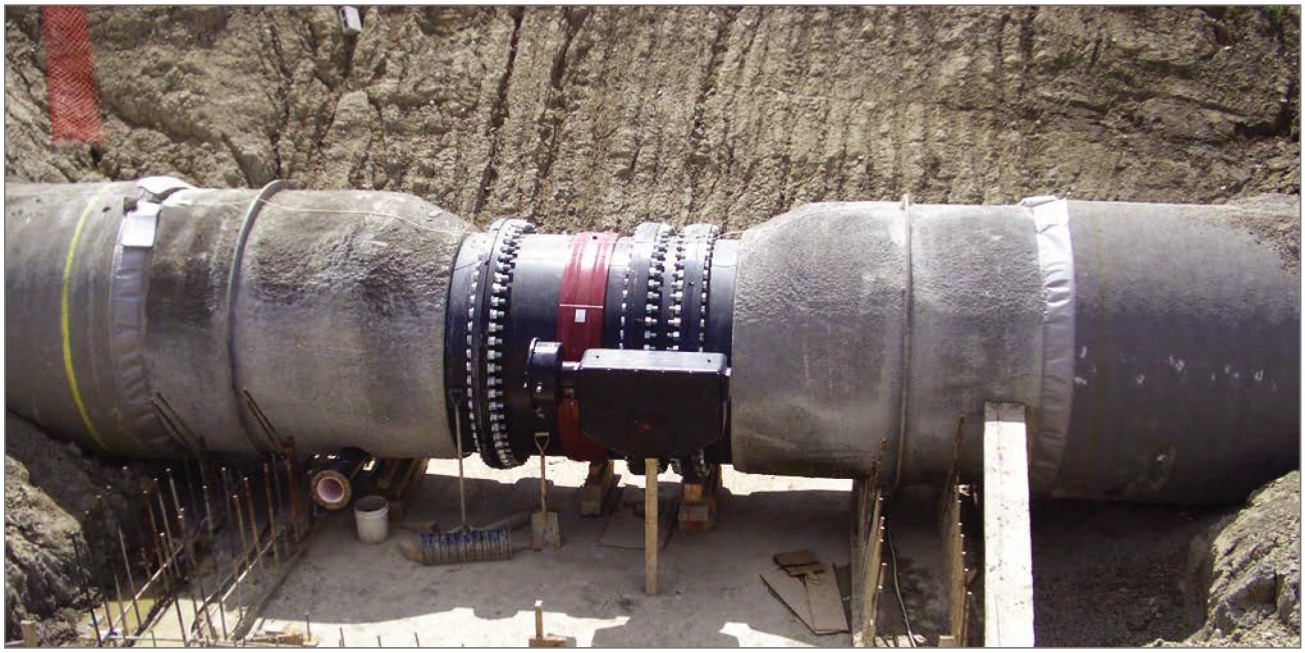
VALVE CHAMBERS are easily integrated in CPP layout arrangement to create a uniform system.

Wall Pieces

The most common wall piece consists of a bell or spigot joint on one end and a flange or plain end on the other. Other configurations and joint types are available. Please contact Rinker Materials CPP for details.

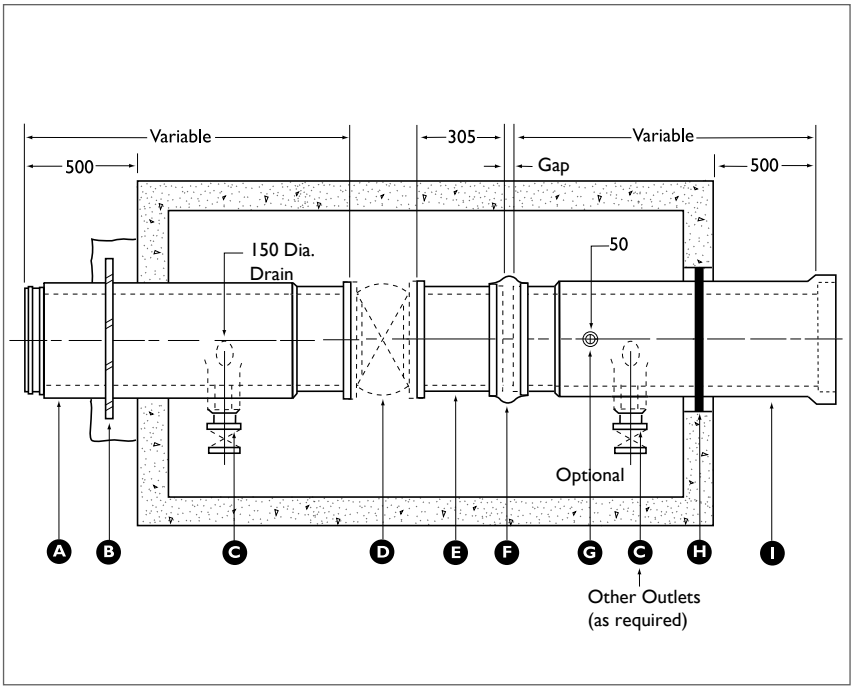
For standard chambers, either wall keys or water stops may be utilized to create a better bond between the chamber wall and the wall piece. A water stop is generally used for pipe/fitting passing through a wall of a watertight structure. Thrust flanges (anchor rings) are available to transmit the thrust into the wall of a structure and/or surrounding soil, therefore the structural integrity of the chamber wall must be analyzed.

Typical Wall Piece



**Thrust flanges may be thicker than waterstops.*

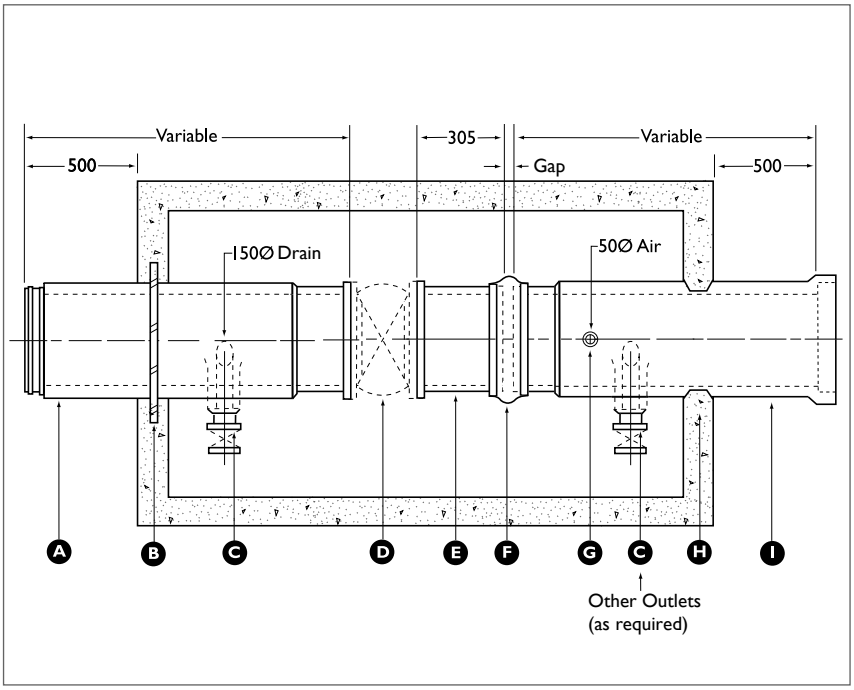
Typical Precast Chamber



- A Wall Piece(spigot to flange end)
- B External Thrust Flange (concrete encased)
- C Tangent Flanged Outlet (top or bottom)
- D Valve (Butterfly or Gate)
- E Flange to Plain End Adapter
- F Coupling* (restrained or unrestrained)
- G Threaded Outlet (NPT/IPT)
- H Flexible rubber sealing connector (with smooth pipe wall)
- I Wall Piece (plain end to bell)

* *Contact Rinker Materials CPP Division for a full range of available couplings.*

Typical Cast in Place Chamber



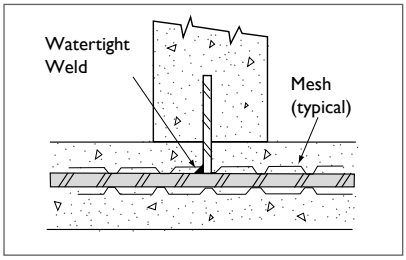
- A Wall Piece (spigot to flange end)
- B Thrust Flange (or water stop)
- C Tangent Flange Outlet (top or bottom)
- D Valve (Butterfuly or Gate)
- E Flange to Plain End Adapter
- F Coupling* (rerestrained or unrestrained)
- G Threaded Outlet (NPT/IPT)
- H Coating Keyway (or rough pipe wall)
- I Wall Piece (plain end to bell)

Wall Achorages for cast-inplace Chamber:

Water Stop

Where a pipe or fitting passes through the wall of a watertight structure, a water stop is generally provided by welding a steel ring to the pipe or fitting. A watertight weld is required.

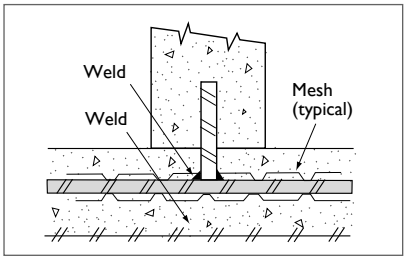
Water Stop



Thrust Flange

It is sometimes necessary for thrust or restrained purposes, to anchor the pipe or fitting to a concrete anchor block or a concrete wall. A steel ring may be welded to the wall piece in order to restrain the thrust. The size of the steel ring, and the size and lengths of weld required must be designed to fully transmit the thrust to the concrete anchor block or wall.

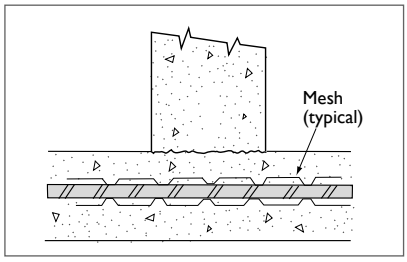
Thrust Flange



Wall Anchorage

Fitting coating is roughened to key into the wall of a concrete structure where thrust restraints is not a problem. The regular mortar coating of the standard pipe is adequate for this purpose, and no special roughening is necessary.

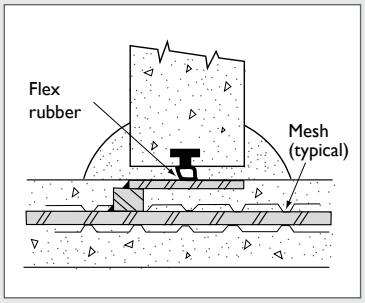
Wall Anchorage



Flexible Rubber Connector

To reduce water filtration in chambers, flexible rubber connectors are available in some areas from precast chamber manufacturers. These are also used at sewer maintenance hole connections.

For Precast Chambers:



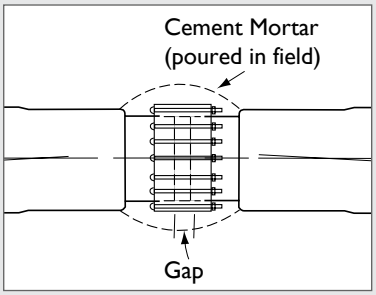
CLOSURE PIECES are available for connecting two sections of pipe in the field. These are required to connect a new pipeline to an existing pipeline or in a multiple crew installation.

Closures

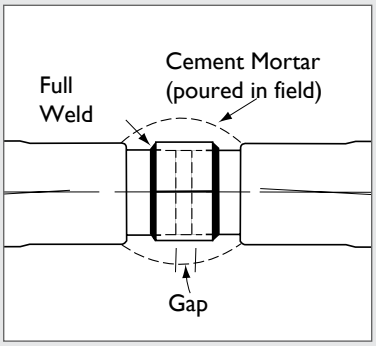
A typical closure assembly consists of two fabricated short pipes complete with one plain steel end on each, and either a bolted sleeve coupling or split sleeve. The use of a coupling requires bolting the assembly together to seal the closure. Welding is not required, however the standard couplings do not resist unbalanced forces (thrust). Couplings with restraining systems are available.

A split sleeve welded joint may be used in lieu of a coupling in a restrained area; however, it requires welding the circumference on each plain steel end. Both methods require mortar encasement of the exterior exposed steel components. Inside sleeve welded joints are generally used for large diameter pipeline where access is practical.

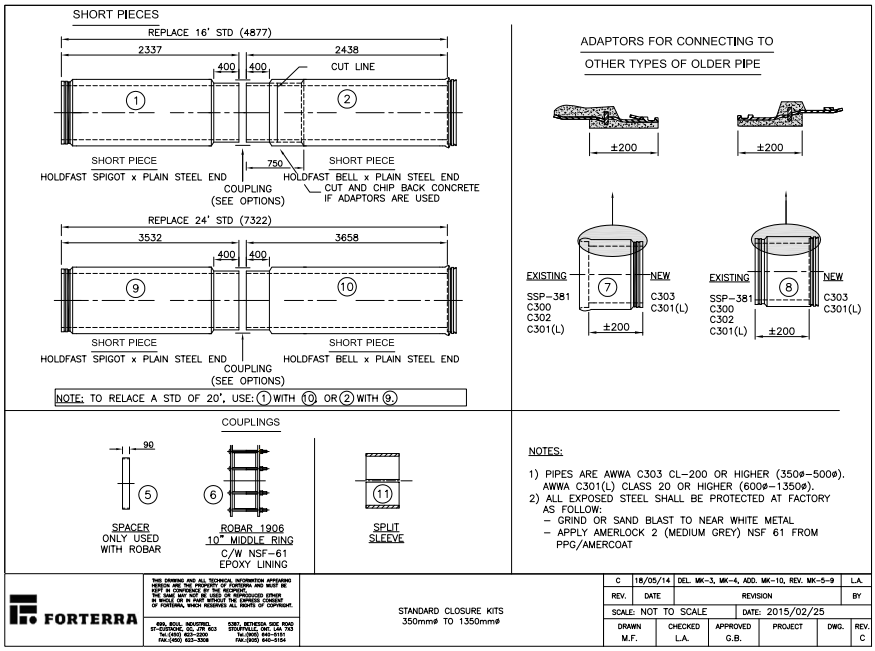
Flexible Coupling



Split Sleeve



Typical Emergency Repair Clossure



Note: For 20' std. (6.096) use combination 184 or 283.

Rinker Materials CPP can provide special pipe protection systems as required for special conditions.

Pipe Exterior

- Mortars made with sulphate resistant cement or silica fume blended cement.
  - Type HS cement is used in mortar when sulphates are present in soils in a significant amount;
  - Type GUb-SF cement is used for structures exposed to certain environments or mild chemical attack;
  - Mortars made with GUb-SF cement exhibit enhanced properties.
- Organic coatings such as polyurethane or expoxies.
  - Bonded coatings over mortar are used in the presence of severely corrosive soils (natural or man made) or for above ground piping.

Pipe Interior

- Mortars or concrete with sulfate resistant cement
  - Type HS cement is for pipe interior where sulfate attack is a concern (sulfate attack of pipe flowing full is unlikely for most conditions).
- Organic Coating
  - Bonded coating for the piping interior is generally used in the presence of aggressive industrial effuents or when corrosion by sewer gases is a possibility.

Pipe Joints

- Epoxy coatings on exposed joint surfaces are supplied for sewage or industrial applications.

OUR FIELD SERVICES DIVISION is another demonstration of our commitment to our values and mission to be the leader in underground infrastructure and to always find better ways to serve our customers.

We are dedicated to offer our customers a wide range of services to support them before, during and after the realization of their infrastructure projects. We do not limit ourselves to being just a pipe and fittings manufacturer. Field services are provided through a solid team of technologists and professional engineers as well as experienced field service crew.

In order to offer our customers cutting edge technologies and innovative infrastructure problem solutions. we have established strategic alliances with other organizations. The resulting synergy is most beneficial to our customers.

Do not hesitate to contact us for assistance with any questions or concerns that you may have. Contact Rinker Materials CPP for our recognized service providers.

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