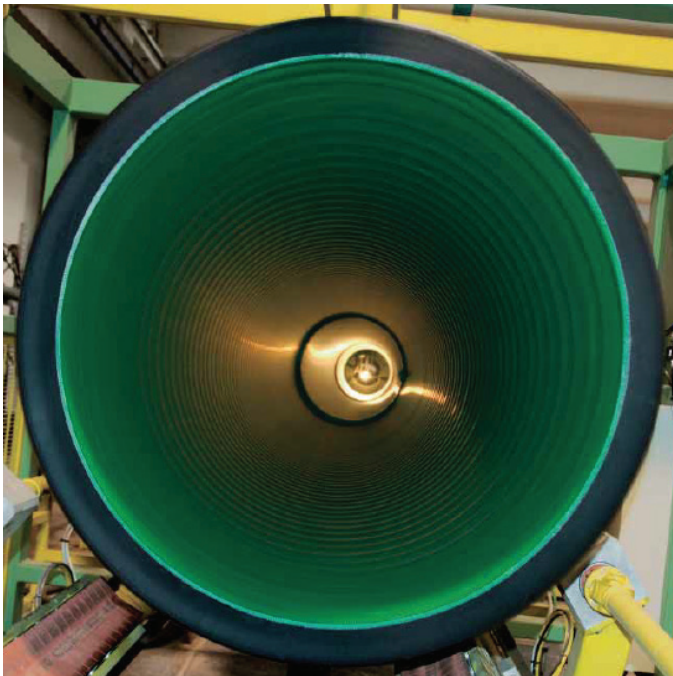


# EUROFLO<sup>®</sup> TECHNICAL BROCHURE 160MM – 1200MM SN4



## THE ADVANTAGES OF EUROFLO<sup>®</sup>

- **HIGH STRUCTURAL RESISTANCE** – to external loads under various use conditions
- **BEST HYDRAULIC PERFORMANCE** – at short and long-term
- **LIGHTWEIGHT AND IMPACT RESISTANT** – outstanding operational advantages in working site
- **INHERENT RESISTANCE** – to chemical, electrochemical and mechanical aggressiveness
- **OVERALL COST EFFECTIVENESS** – of the installation
- **WATER TIGHTNESS** – of the joint system in both directions
- **100% TECHNOLOGY & INNOVATION**

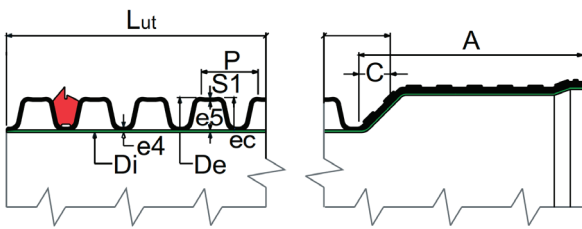
## THE PRODUCT: GEOMETRY & DIMENSIONS

- **MATERIAL** – high density polyethylene (HD-PE)
- **STRUCTURED WALL TYPE** – B (corrugated pipe) gasket positioned between the first and second corrugation
- **COLOUR** – black corrugated outer wall, green smooth inner layer
- **DIMENSIONS & STIFFNESS** – DN/OD 160 to 1200, SN4

DN/OD (mm)	Diameters (mm)		Length (mm)		Geometry of the structured wall (mm)			
	Outer (De) Min - Max	Inner (Di) Real-Norm	Socket	Total	Rib Height (ec)	Outer wall width (S1)	Inner wall width (e5)	Joint Width (e4)
					SN4	SN4	SN4	SN4
160	159,1 - 160,5	136>134,0	80	5800	11,8	0,7	1,2	2,2
200	198,8 - 200,6	174>167,0	90	5800	13,1	0,7	1,3	2,3
250	248,5 - 250,8	214>209,0	100	5800	18,0	1,4	1,6	3,4
315	313,2 - 316,0	273>263,0	150	5800	20,8	1,5	2,2	3,9
400	397,6 - 401,2	343>335,0	175	5800	28,2	2,0	2,5	4,7
500	497,0 - 501,5	427>418,0	190	5800	36,1	2,1	3,4	5,2
630	626,3 - 631,9	533>527,0	200	5800	48,2	2,4	4,0	6,8
800	795,2 - 802,4	673>669,0	280	5800	62,9	2,7	4,9	8,6
1000	994,0 - 1003,0	849>837,0	290	5800	74,9	3,5	5,9	10,9
1200	1203,6 - 1192,8	1040>1015	220	5800	50	4,5	6,0	12,0

### THE PROFILE

The EUROFLO® profile is particular, it falls within the B type of the PREN 13476-1 resulting from the most recent growth in the production technology field. This has permitted to modify the traditional structure of the rib from a flat or semi circular top to a double arch one



Profile type for DN/OD up to 1000 (mm)

### SYMBOLS OF THE EUROFLO® PROFILE

<b>Lut</b>	Useful length (mm)
<b>P</b>	Corrugation pitch (mm)
<b>C</b>	Area of the socket conical shaft
<b>A</b>	Socket length (or insertion) (mm)
<b>S1</b>	Outer layer width (mm)
<b>e5</b>	Minimum normal width (mm)
<b>e4</b>	Joint area width (mm)
<b>ec</b>	Height of the structured wall (mm)
<b>Di</b>	Inner diameter, chosen with greater value compared to the minimum by norm (mm)
<b>De</b>	Normal outer diameter according to PREN 13476-1 (mm)

## REFERENCE NORMS: PREN 13476-1

PLASTIC PIPING SYSTEM FOR UNDERGROUND AND NON-PRESSURISED SEWAGE AND DRAINAGE

1- STRUCTURED WALL PIPING SYSTEM IN PVC-U, PP AND PE.

### CONFORMITY REQUIREMENTS

SPECIFICATIONS	INSTRUCTIONS	TESTING PARAMETERS		TESTING METHODS
Circumference thickness	≥ of the classification ones	In keeping with EN ISO 9969		EN ISO 9969
Creep ratio	≤ 4 with a 2 year extrapolation	In keeping with EN ISO 9967		EN ISO 9967
Impact resistance	TIR ≤ 10%	CHARACTERISTICS	READINGS	EN 744
		Percussion type Percussion mass Falling height Testing temperature Conditioning	See PREN 13476-1 See PREN 13476-1 See PREN 13476-1 (0 1)°C Water/Air	
Ring flexibility	See PREN 13476-1	Deformation	30% of the outer diameter	EN 1446
Oven test	≤ 3% without any cracks or delamination	Temperature Immersion time ≤8mm >8mm	(110+2)°C 30 min 60 min	ISO 12091
Joint tightness		Temperature Pipe deflection Socket deflection	(23+2)°C 10% DN 5% DN	EN 1277 Cond. B
	No leakage for 15 min	Water pressure	0,05 bar	
	No leakage for 15 min	Water pressure	0,5 bar	
	maxΔP ≤10% for 15 min	Air pressure	- 0,3 bar	
		Temperature Angular deflection	(23+2)°C Dext ≤3152° 315<Dext ≤6301,5° Dext>630 1°	EN 1277 Cond. C
	No loss for 15 min	Water pressure	0,05 bar	
	No loss for 15 min	Water pressure	0,5 bar	
	maxΔP ≤10% for 15 min	Air pressure	- 0,3 bar	

## QUALITY OF THE EUROFLO® PIPES

The voluntary compliance with the institute and the acquisition of the P-IIP/A quality certification involves:

- **PROCESS CONTROL** through monitoring, recording and checking process and product parameters (temperature, pressures, extrusion speed, processing anomalies)
- **PRODUCT CONTROL**, all the tests made according to PREN 13476-1 are carried out on the product at a steady cadence. These tests are the minimum requirements that must be withstood and maintained by the product. The tests results are summarized in a "test report" that is at the customer's disposal and it certifies the tests that have been carried out successfully.
- **PERIODICAL CONTROL AUDITS:** the IIP carries out, through its network of inspectors, control visits and sample tests on the finished product and on the operating documents.

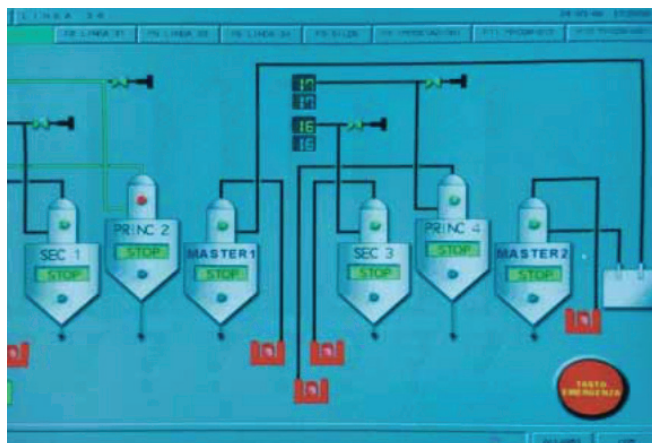
As a complete guarantee of this, the manufacturer has implemented a Company Quality Management System, in keeping with the **UNI EN ISO 9001:2000** norm.

An element of quality of the EUROFLO® product is the ability to fully comply with the strict specifications defined by the relevant norm PREN 13476-1.

This quality must be guaranteed to the client and maintained steadily in all the phases of the production process in order to assure use suitability and resistance throughout the life of the product.

For this reason the manufacturer has decided to refer to a third body for what concerns the guarantee of the EUROFLO® product quality by means of conformity to the PREN 13476-1.

The third body, IIP s.r.l. (Italian Institute of Plastic) is a certifying inspection and testing organization, confirmed by the Sincert, that carries out promotional Quality activities and inspections in the manufacturing industrial and services field with particular reference to the area of plastic materials.





## TECHNICAL SPECIFICATIONS FOR EUROFLO®

**NOMINAL DIAMETER** – outer DN/OD., inner min.Di., (equal or above the minimum defined in the norm). Made using first quality granule, requirements such as those given by the norm. Supplied in 5.8M – double extruded in-line to increase the reliability of the system pipe-joint.

**HYDRAULIC WATER/AIR TIGHTNESS** of the joint system certified at 0,5 bar in pressure and 0,3 bar in depression carried out in accordance with the EN 1277 norm (conditions B and C).

**RING STIFFNESS CLASS** SN4 KN/m<sup>2</sup> taken from samples of the product according to EN ISO 9969.

**COLOUR:** inner green (other colours on demand); outer black for more resistance to ultraviolet rays.

**MARKING** according to the norm including: [normative reference] [producer or making] [nominal diameter] [nominal ring stiffness SN] [material] [month/year of production] [control number and/or Italian plastic Institute seal]

**JOINT** type by ribbed double-wall integrated socket obtained directly during the extrusion of the pipe

**CERTIFICATION** on display and reference norms:

- P-IIP/A seal of the pipe and joint system
- European committee of standardization (DOC. PREN 13476-1)
- EN ISO 9969
- EN 1277
- UNI EN ISO 9001:2000 third party certification of Quality Management System
- Other norms in connection with the testing parameters as indicated in the above mentioned norms.

Structured-wall HD-PE pipe for underground sewage and drainage not under pressure, in keeping with the european document PREN 13476-1:2002.

Pipes shall be certified by IIP – Istituto Italiano dei Plastici, which will issue the Piip certification seal. The pipes shall be produced in a factory provided with a Quality Management System (QMS) in keeping with the european norm UNI EN ISO 9001:2000, certified by authorized third party institute. The structured wall of the pipe shall be formed by a corrugated outer wall (type B of PREN 13476-1) and a smooth inner surface.

Outer surface shall be black colored for best protection against UV rays, inner layer shall be green to help visual inspections.

The joint between pipes shall be made by elastomeric gasket (in keeping with EN 681-1 norm) and double-wall ribbed socket, obtained by in-line extrusion during pipe production. The joint system shall be certified by a third party institute such as IIP.



## GUIDELINE FOR INSTALLATION & USE

### TRANSPORT

- Suitable vehicles shall be used, with flat platforms and no sharp edges which may damage the pipes.
- Carefully load the pipes and secure them by suitable load restraints to the truck.
- Load by alternating the pipes so that the sockets of the pipes don't squash during transport.
- In the loading lay-out, put the bigger sizes at the bottom and the smaller sizes at the top of the load.

### RECEPTION

While unloading always check the conformity of the goods to the purchase specifications and/or the reference norms, in particular:

- check indications given by marking;
- check macro defects of geometry or any other visible defect (e.g. abrasion, surface conditions);
- check the integrity of the joining components.

### UNLOADING & HANDLING

- Use suitable devices for unloading and handling the pipes.
- Avoid fork damage, injuries, abrasions, rough handling and any other damage. The safety of the operator shall be ensured any case.
- While unloading do not make use of hooks at the ends of the pipes.
- Use ropes or straps instead.

### STORING

- Store the pipes by laying them on a flat surface, with wood gluts put at a suitable distance, without sharp edges, stable, protected and sheltered.
- The height of the stack will be according to the size of the pipes.
- Stack the pipes alternating the pipes, in order to put the socket in one side and the plain end in the opposite side.
- Store fittings and sealing gaskets in special places protected by sun rays, heat, oil and grease.
- Do not install gaskets during storage.

FIG. 1

Check the conformity of the goods



Particular of the sealing gasket joint system and marking

FIG. 2

Transport in pallets

Transport of spare pipes with ropes



FIG. 3

Stocking gaskets and fittings



Do not use oils or chemicals.

Do not expose to sunrays.

Protect from heat, oil and chemicals

## GO-IN JOINT SYSTEM

### SPECIAL PIECES FOR POLYETHYLENE CORRUGATED SEWAGE AND DRAINAGE SYSTEMS:

#### COUPLING: GO-IN QUICK JOINT

One of the problems that may arise on the working site is the connection of a branch in an unexpected position or new end- user connections to be created onto an existing EUROFLO® pipe network. Therefore a GO-IN coupling kit has been designed. It contains gaskets and joint elements. This solution permits quickly and easily to make branches and end-user connections to corrugated or PVC pipes. All these operations can be made directly on site in very fast and user-friendly way.

#### ADVANTAGES:

##### EASY INSTALLATION:

- no trouble even with existing network;
- no limit in positioning of the joint
- no mechanical device necessary for the branch connection (only drilling tool)

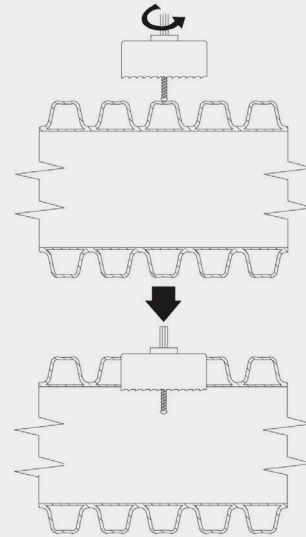
##### QUICK INSTALLATION:

- no sliding sleeve necessary
- no stopping the flow in the main pipe

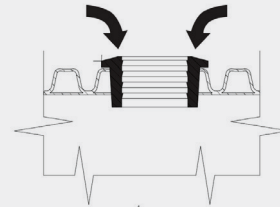
##### ECONOMICAL WITH RESPECT TO OTHER JOINT SYSTEMS

- The main pipe flow is not interrupted or reduced with sleeves or tee joints
- Cost-effective

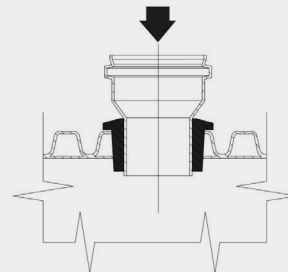
#### 1. DRILL THE MAIN PIPE BY USING SPECIAL DRILLING TOOL



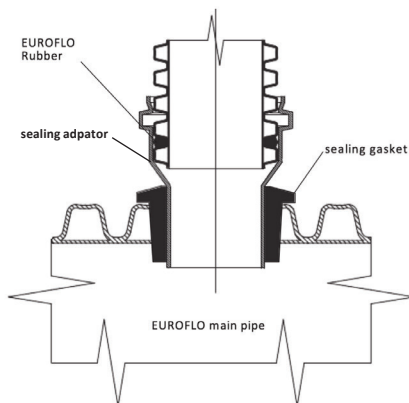
#### 2. POSITION THE SEALING GASKET



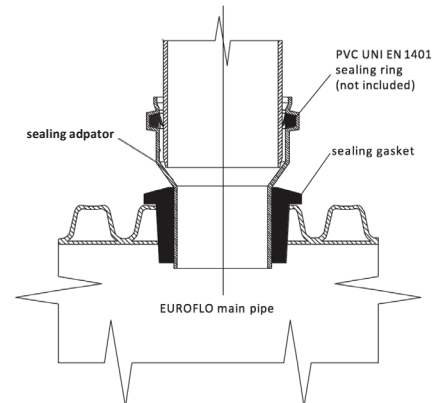
#### 3. FIT THE SEALING ADAPTOR



#### EUROFLO® CONNECTION



#### PVC/SMOOTH CONNECTION



Sealing Adaptor not needed for 110mm connections

## FLOW RATES & SPEEDS

obtained by Gauckler-Strickler formula (safety coefficient  $K_s = 80 \text{ m}^{1/3} \text{ s}^{-1}$ )

$i$  = pipe slope

Pipe filling=50%		$i = 0,5\%$		$i = 1\%$		$i = 2\%$		$i = 3\%$		$i = 5\%$	
DN (mm)	D int (mm)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)
160	136	0,593	0,004	0,839	0,006	1,187	0,009	1,454	0,011	1,877	0,014
200	174	0,699	0,008	0,989	0,012	1,399	0,017	1,713	0,020	2,212	0,026
250	214	0,803	0,014	1,135	0,020	1,606	0,029	1,967	0,035	2,539	0,046
315	273	0,944	0,028	1,335	0,039	1,889	0,055	2,313	0,068	2,986	0,087
400	343	1,100	0,051	1,555	0,072	2,199	0,102	2,693	0,124	3,477	0,161
500	427	1,272	0,091	1,799	0,129	2,545	0,182	3,117	0,223	4,024	0,288
630	533	1,475	0,164	2,086	0,233	2,950	0,329	3,613	0,403	4,665	0,520
800	673	1,723	0,306	2,437	0,433	3,447	0,613	4,221	0,750	5,450	0,969
1000	849	2,012	0,569	2,845	0,805	4,024	1,138	4,928	1,394	6,362	1,800
1200	1030	2,289	0,953	3,237	1,348	4,577	1,906	5,606	2,334	7,237	3,014

Pipe filling=70%		$i = 0,5\%$		$i = 1\%$		$i = 2\%$		$i = 3\%$		$i = 5\%$	
DN (mm)	D int (mm)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)
160	136	0,665	0,007	0,940	0,010	1,329	0,014	1,628	0,018	2,102	0,023
200	174	0,783	0,014	1,108	0,020	1,566	0,028	1,918	0,034	2,477	0,044
250	214	0,899	0,024	1,271	0,034	1,798	0,048	2,202	0,059	2,843	0,076
315	273	1,057	0,046	1,496	0,065	2,115	0,093	2,890	0,113	3,344	0,146
400	343	1,231	0,085	1,741	0,120	2,463	0,170	3,016	0,208	3,894	0,269
500	427	1,425	0,152	2,015	0,216	2,850	0,305	3,490	0,374	4,506	0,482
630	533	1,652	0,275	2,336	0,390	3,304	0,551	4,046	0,675	5,224	0,871
800	673	1,930	0,513	2,729	0,726	3,860	1,026	4,727	1,257	6,103	1,622
1000	849	2,253	0,953	3,186	1,348	4,506	1,907	5,519	2,335	7,125	3,014
1200	1030	2,563	1,596	3,624	2,257	5,126	3,192	6,278	3,909	8,105	5,047

Pipe filling=95%		$i = 0,5\%$		$i = 1\%$		$i = 2\%$		$i = 3\%$		$i = 5\%$	
DN (mm)	D int (mm)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)	speed (m/sec)	flow rate (m <sup>3</sup> /sec)
160	136	0,650	0,009	0,919	0,013	1,300	0,019	1,592	0,023	2,055	0,029
200	174	0,766	0,018	1,083	0,025	1,532	0,036	1,876	0,044	2,422	0,056
250	214	0,879	0,031	1,243	0,044	1,758	0,062	2,153	0,076	2,780	0,098
315	273	1,034	0,059	1,462	0,084	2,068	0,119	2,533	0,145	3,270	0,188
400	343	1,204	0,109	1,703	0,154	2,408	0,218	2,949	0,267	3,807	0,345
500	427	1,393	0,196	1,971	0,277	2,787	0,391	3,413	0,479	4,406	0,619
630	533	1,615	0,354	2,284	0,500	3,231	0,707	3,957	0,866	5,108	1,118
800	673	1,887	0,658	2,669	0,931	3,774	1,317	4,622	1,613	5,967	2,082
1000	849	2,203	1,223	3,116	1,730	4,406	2,447	5,397	2,997	6,967	3,869
1200	1030	2,506	2,048	3,544	2,897	5,012	4,096	6,139	5,017	7,925	6,477





# APPENDIX



# APPENDIX A

## TABLE 1 COMPREHENSIVE INSTALLATION INSTRUCTIONS

### EUROFLO® STIFFNESS RATING TABLES

#### RING STIFFNESS (SN) CHOICE

Recommended SN value (Kpa) depending on installation conditions

Cat. Filling Material Group (see backfill column in Soil Groups Table A1 at right)	Compaction Class (Compaction specifications in Table 6 attached)	Recommended minimum SN values (Kpa) according to EN1046											
		Installation depth = 1-3m											
		Trafficked areas						Non-trafficked areas					
		Un-disturbed native soil group (see Soil Groups Table A1 at right)						UN-disturbed native soil group (see table A1 at right)					
		1	2	3	4	5	6	1	2	3	4	5	6
1	W	4,0	4,0	6,3	6,3	10,0	*	1,25	1,25	2,0	2,0	4,0	5,0
	M							1,25	2,0	2,0	4,0	5,0	6,3
	N							2,0	2,0	2,0	4,0	8,0	10,0
2	W		6,3	8,0	10,0	*	*		2,0	2,0	4,0	5,0	5,0
	M								2,0	4,0	5,0	6,3	6,3
	N								*	6,3	8,0	8,0	*
3	W			10,0	*	*	*			4,0	6,3	8,0	8,0
	M									6,3	8,0	10,0	*
	N									*	*	*	*
4	W				*	*	*				6,3	8,0	8,0
	M										*	*	*
	N										*	*	*
Installation depth = 3-6m													
1	W	2,0	2,0	2,5	4,0	5,0	6,3	2,0	2,0	2,5	4,0	5,0	6,3
	M							2,0	4,0	4,0	5,0	5,3	8,0
	N												
2	W		4,0	4,0	5,0	8,0	8,0		4,0	4,0	5,0	8,0	8,0
	M								5,0	5,0	8,0	10,0	*
	N												
3	W			6,3	8,0	10,0	*			6,3	8,0	10,0	*
	M									*	*	*	*
	N												
4	W				*	*	*				*	*	*
	M										*	*	*
	N												

**TABLE 2**  
(normative)

**CLASSIFICATION OF SOILS**

In this prestandard three types of soil are considered, namely granular, cohesive and organic. Each of these has subgroups, which for granular material are based on particle size and granulation and for cohesive material are based on levels of plasticity. Table

**Soil groups**

Soil type	Soil Group					To be used as backfill
	#	Typical	Symbol*	Distinguishing mark	Example(s)	
Granular	1	Single-sized gravel	[GE] [GU]	Steep granulation line, predominance of one- grain-size zone	Crushed rock, river and beach gravel, morainic gravel, scoria, volcanic ash	Yes
		well-graded gravels, gravel-sand mixtures	[GW]	Continuous granulation line, several grain-size zones		
		Poorly graded gravel-sand mixture	[GI] [GP]	Steplike granulation line, one or more absent grain size zones		
	2	Single-sized sands	[SE] [SU]	Steep granulation line, predominance of one grain size zone	Dune and drift sand, valley sand, basin sand	Yes
		Well-graded sands, and gravel mixtures	[SW]	Continuous granulation line, several grain size zones	Morainic sand, terrace sand, beach sand	
		Poorly graded sand-gravel mixtures zones	[SI] [SP]	Steplike granulation line, one or more absent grain zones		
Granular	3	Silty gravels poorly graded gravel-sand-silt mixtures	[GM] [GU]	Broad/intermittent granulation line with fine grain silt	Weathered gravel, slope debries, clayey gravel	Yes
		Clayey gravels, poorly graded gravel-sand-clay mixtures	[GC] [GT]	Broad/intermittent granulation line with fine grained clay		
		Silty sands, poorly graded sand-silt mixtures	[SM] [SU]	Broad/intermittent granulation line with fine grained silt	Liquid sand. Loam, sand loess	
		Clayey sands, poorly graded sand-clay mixtures	[SC] [ST]	Broad/ intermittent granulation line with fine grained clay	Loamy sand, alluvial clay, alluvial marl	
Cohesive	4	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	[ML] [UL]	Low stability, rapid reaction, nil to slight plasticity	Loess, loam	Yes
		Inorganic clay, distinctly plastic clay	[CL] [TA] [TAL]™	Medium to very high stability, to slow reaction, low to medium plasticity	Alluvial marl, clay	
Organic	5	Mixed grained soils with admixtures of humus or chalk	[OK]	Admixtures of plant or non-plant type, decay smell, light weight, large porosity	Top soils, chalky sand, tuff sand	No
		Organic silt and organic clay	[OL] [OU]	Medium stability, slow to very quick reaction, low to medium plasticity	sea chalk, top soil	
		Organic clay, clay with organic admixtures	[OH] [OT]	High stability, nil reaction, medium to high plasticity	Mud, loam	
	6	Peat, other highly organic soil	[Pt] [HN] [HZ]	Decomposed peats, fibrous, brown to black coloured	Peat	
		Muds	[F]	Sludges deposited under water, often interspersed with sand/ clay/ chalk, very soft	Muds	

\* The symbols used are taken from two sources. Symbol in square brackets [...] are taken from British Standard BS 5930. Symbols in the round brackets (...) are taken from German Standard DIN 18196

## RECOMMENDED COMPACTION METHOD

Table 3 gives the recommended maximum layer thickness and the number of passes required to achieve the compaction classes for the various types of equipment and pipe zone backfill materials.

Also included are recommended minimum cover thickness required above the pipe before the relevant piece of equipment can be used over the pipe.

The details given in Table 3 are a guide and where the installation is of a sufficient size it is recommended that trials using a variety of the above combinations are carried out so that the optimum practice is selected for the purpose.

**Table 3 - Recommended layer thickness and number of passes for compaction**

Equipment	Number of passes for compaction class		Maximum layer thickness, in meters, after compaction for soil group (see Annex A)				Minimum thickness over pipe crown before compaction m
	Well	Moderate	1	2	3	4	
<b>Foot or hand tamper</b>							
min. 15kg	3	1	0,15	0,10	0,10	0,10	0,20
<b>Vibrating tamper</b>							
min. 70kg	3	1	0,30	0,25	0,20	0,15	0,30
<b>Plate vibrator</b>							
min. 50kg	4	1	0,10				0,15
min. 100kg	4	1	0,15	0,10			0,15
min. 200kg	4	1	0,20	0,15	0,10		0,20
min. 400kg	4	1	0,30	0,25	0,15	0,10	0,30
min. 600kg	4	1	0,40	0,30	0,20	0,15	0,50
<b>Vibrating roller</b>							
min. 15kN/m	6	2	0,35	0,25	0,20		0,60
min. 30kN/m	6	2	0,60	0,50	0,30		1,20
min. 45kN/m	6	2	1,00	0,75	0,40		1,80
min. 65kN/m	6	2	1,50	1,10	0,60		2,40
<b>Twin vibrating roller</b>							
min. 5 kN/m	6	2	0,15	0,10			0,20
min. 10kN/m	6	2	0,25	0,20	0,15		0,45
min. 20kN/m	6	2	0,35	0,30	0,20		0,60
min. 30kN/m	6	2	0,50	0,40	0,30		0,85
<b>Triple heavy roller (no vibration)</b>							
min. 50kN/m	6	2	0,25	0,20	0,20		1,00

## REMAINING BACKFILL

The remaining part of the backfill may be made with excavated material with a maximum particle size of up to 300mm providing there is at least 300mm cover to the pipe. If compaction is required the material shall be suitable for compaction and shall have a maximum particle size not greater than 2/3 of the compaction layer thickness.

Note: Attention is drawn to any relevant local and/or national regulations.

Under non-trafficked areas compaction class N (see Table 5) is felt to be sufficient. Under trafficked areas compaction class W (see Table 5) shall be used.

## COMPACTION QUALITY CONTROL

Conformity to the design assumptions should be confirmed by one or more of the following methods:

- close monitoring of the backfill procedures;
- verification of the initial deflection of the installed pipe;
- on-site verification of the degree of compaction.

After repair and additional connection procedures, care should be taken that when replacing sidefill and backfill the new density values are approximately equal to those immediately adjacent

## PARTICLE SIZE

- a) no particle greater than the applicable limit given in Table 4;
- b) no soil lumps greater than twice the applicable maximum particle size given in Table 4;
- c) no frozen material;
- d) no debris (e.g. asphalt, bottles, cans, trees);
- e) where compaction is specified, the material shall be compactible.

**TABLE 4 - MAXIMUM PARTICLE SIZE**

Nominal size			Maximum size
	DN	< 100	15
100 ≤	DN	< 300	20
300 ≤	DN	< 600	30
600 ≤	DN		40

Note: The values are the ones used in the descriptors of a grading, e.g. 6/14, 8/12 etc.

It is acknowledged that in such gradings individual particles larger than the descriptors can occur.

Fine-grained soils with medium to high plasticity and organic soils (with group 5 or group 6 classification; see Annex A) are generally considered unsuitable for primary pipe zone backfill material, unless the pipe and installation have been designed from this condition.

The structural properties of the pipe zone backfill material are primarily dependent upon the type of material and the degree of compaction achieved. The degree of compaction can be varied by using different types of equipment and by varying the numbers of layers.



# APPENDIX B

## EXAMPLE OF AN INSTALLATION FROM APPENDIX A - MINIMUM COVER FOR MAXIMUM LOADS

### ACCEPTABLE SOIL GROUPS

1. **Native soil group: hard clay.**  
Backfill: Good compactible gravel, well compacted.  
Minimum cover (Install Depth) 700mm
2. **Native soil group: sandy loam**  
Backfill: Good compactible gravel, well compacted.  
Minimum cover (Install Depth) 700mm
3. **Native soil group: river gravel**  
Backfill: Good compactible gravel, well compacted.  
Minimum cover (Install Depth) 700mm

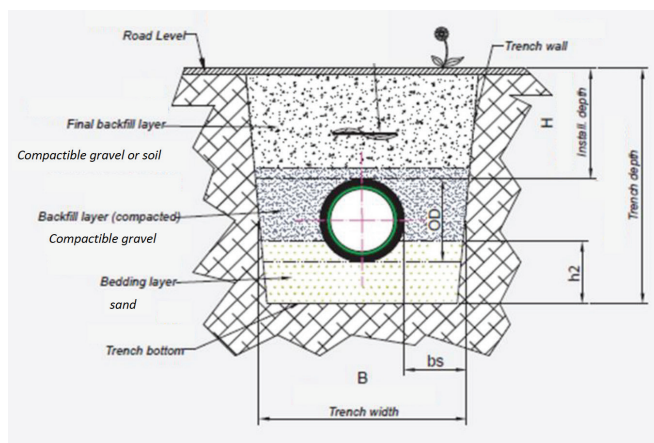
### THIS EXAMPLE ASSUMES:

- A maximum load of a 50 tonne truck and trailer unit with 9 axles (4 axle truck with towed, 5-axle trailer)
- The backfill and compaction ("good compactible gravel, well compacted") is absolutely critical to the performance.
- The culvert diameter is between 250mm and 1200mm and the Stiffness Rating is SN4

### TRENCH CONSTRUCTION: (SEE DIAGRAM BELOW).

- Avoid any hazardous condition: the safety of the operators shall be paramount.
- Avoid objects falling or wall collapsing: Slope/support the trench walls.
- The bottom of the trench shall be smooth and without sharp objects.
- Make a bedding layer with sand (layer thickness:  $h_2 = 100$  to  $200$  mm according to DN)
- Level and spread the bedding material.  
Do not compact the bedding layer.

### BACK-FILLING:



- Place good compactible gravel, laid with care near the pipe, in layers 30 cm thick. Each layer is compacted after it is laid. This procedure continues until a minimum thickness 150 mm over the pipe crown has been reached.
- Final backfilling can be done by using any compactible kind of soil suitable to the intended traffic load/type.

### TRENCH WIDTH RECOMMENDATIONS

DN (mm)	bs (mm) Minimum
$DN \leq 300$	250
$300 < DN \leq 900$	400
$900 < DN \leq 1200$	500

### Notes:

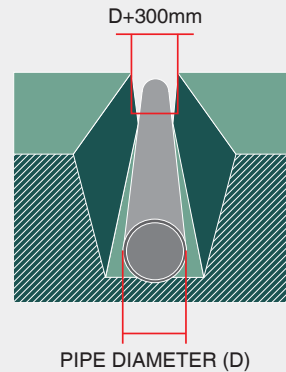
- NB. Full installation practices for buried flexible pipelines are given in AS/NZS 2566.2. These guidelines do not purport to override the standard and are a guide only.
- Any deviation from the backfill criteria could result in failure of the culvert.

# APPENDIX C

## BASIC RURAL INSTALLATION INSTRUCTIONS

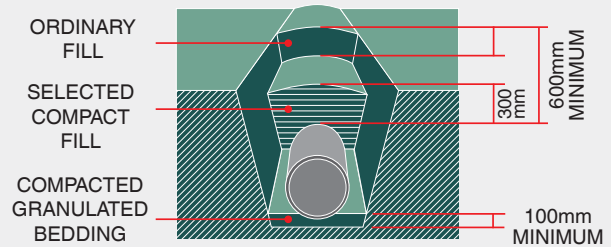
### EXCAVATION

Dig a trench 300mm wider than the pipe. Ideal depth of cover is 600mm.



### PIPE LAYING

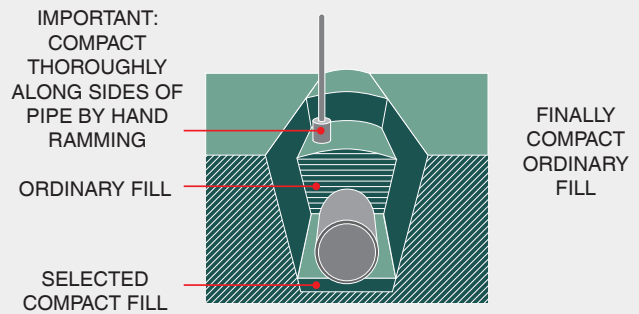
Bedding to be 5-20mm compacted granular material. Lay pipe in centre of trench. Selected compactible fill (not wet clay) added in layers around pipe to 300mm cover. Top up trench with compacted ordinary fill.



### COMPACTION OF BEDDING

EUROFLO® pipe uses its flexibility to transfer load to the surrounding bedding.

Thorough compaction of the fill along the pipe sides is important to ensure long, trouble free service. Fill should be carefully compacted by hand ramming along the sides of and around the pipe and built up to the finished ground surface.



### LIGHT DUTY INSTALLATION

Selected excavation fill may be used as bedding. It should be substantially free from rock, tree roots or rubbish. Wet or saturated clay shouldn't be used as bedding or surrounding material. The minimum depth of cover should be 500mm.

