

Input Data for structural analysis

of application buried pipes in open trench condition,
calculation acc. AWWA Fiberglass Pipe Design M45 (Third edition)

Please send to:

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Text input.	
project	
Text input.	Text input.
company	contact person
Text input.	Text input.
street	phone/Fax:
Text input.	Text input.
postcode	signature:
Text input.	Text input.
city	date/stamp

Pipe Details:

nominal diameter DN	Text input.	sewer pipe	<input type="checkbox"/>
pressure class PN	Text input.	sewer pressure pipe	<input type="checkbox"/>
nominal stiffness SN	Text input.	pressure pipe	<input type="checkbox"/>
pipe material	GRP	potable water pipe	<input type="checkbox"/>
		installation in protective water area	<input type="checkbox"/>
		air pipe	<input type="checkbox"/>
		storage sewer	<input type="checkbox"/>
		others	Text input.
		Int. vacuum	Text input.

Native soil stiffness groups. Values of constrained Modulus, M_{sn} : acc. Fiberglass Pipe Design M45; ¹ASTM D1586

Soil class	Granular		Cohesive		Modulus M_{sn} (MPa)	Pipe zone <input type="checkbox"/>
	Blow count ¹	Description	q_u kPa	Description		
-	>50	Very Dense	> 600	Very hard	138	<input type="checkbox"/>
-	30 - 50	Dense	400 - 600	Hard	69	<input type="checkbox"/>
1	15 - 30	Compact	200 - 400	Very stiff	34.5	<input type="checkbox"/>
2	8 - 15	Slightly compact	100 - 200	Stiff	20.7	<input type="checkbox"/>
3	4 - 8	Loose	50 - 100	Medium	10.3	<input type="checkbox"/>
4	2 - 4	Loose	25 - 50	Soft	4.8	<input type="checkbox"/>
5	1 - 2	Very loose	13 - 25	Very soft	1.4	<input type="checkbox"/>
6	0 - 1	Very, very loose	0 - 13	Very, very soft	0.34	<input type="checkbox"/>

Backfill soil class classification: acc. Fiberglass Pipe Design M45; ASTM D2487

Class	Description	Backfilling
Class I	Crushed rock with < 15% sand, maximum 25% passing the 9.5 mm sieve and maximum 5 % fines ²⁾	<input type="checkbox"/>
Class II	Clean, coarse-grained soils: SW, SP ¹⁾ , GW, GP or any soil beginning with one of these symbols with 12% or less fines ²⁾	<input type="checkbox"/>
Class III	Clean, coarse-grained soils with fines: GM, GC, SM, SC or any soil beginning with one of these symbols with 12% or more fines ²⁾ . Sandy or gravely fine-grained soils: CL, ML, (or CL-ML, CL/ML, ML/CL) with 30% or more retained on a n° 200 sieve.	<input type="checkbox"/>
Class IV	Fine grained soils: CL, ML, (or CL-ML, CL/ML, ML/CL) with 30% or less retained on a n° 200 sieve	<input type="checkbox"/>

Proctor density for backfill %
(Proctor density 85 – 100 %)

¹⁾ Uniform fine sand, SP, with more than 50% passing n° 100 sieve (0.15 mm) is very sensitive to moisture and is not recommended as backfill.

²⁾ % fines is the weight percentage of soil particles that pass n° 200 sieve with 0.076 mm opening.

Foundation of pipeline On native soil
 very hard and rocky
 Weak soil, not stable for foundation
Soil replacement: thickness m
 material
 Proctor density D_{Pr} %

Loads specification :

	Min. cover depth	Max. cover depth
Soil cover depth h	<input type="text" value="Text input."/> m	<input type="text" value="Text input."/> m
min. Ground water h_w above pipe invert	<input type="text" value="Text input."/> m	<input type="text" value="Text input."/> m
max. Ground water h_w above pipe invert	<input type="text" value="Text input."/> m	<input type="text" value="Text input."/> m

Other surface loads kN/m²

For pressure pipes

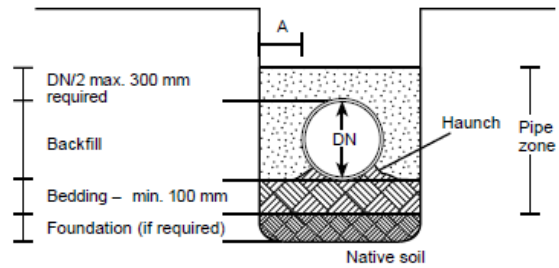
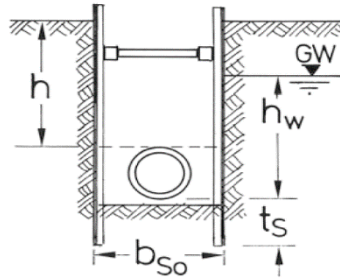
Short term	<input type="text" value="Text input."/> bar, e.g. system test pressure; hydrostatic pressure, water hammer
Long term	<input type="text" value="Text input."/> bar, e.g. operating pressure (OP), system pressure (PN, DP)

Traffic load no traffic

Load Type	Traffic (Wheel) Load	Recommended minimum cover Depth (metres)	
ATV LKW 12	40	0.6	<input type="checkbox"/>
ATV SLW 30	50	0.6	<input type="checkbox"/>
AASHTO HS20	72	0.8	<input type="checkbox"/>
AASHTO HS25	90	1.0	<input type="checkbox"/>
BS153 HA	90	1.0	<input type="checkbox"/>
ATV SLW 60	100	1.0	<input type="checkbox"/>
MOC	160	1.5	<input type="checkbox"/>
Cooper E80 Railroad		3.0	<input type="checkbox"/>

Other loads, e.g. special vehicle (please add load scheme with axle, wheels and wheel loads):

Building construction:



Type of trench embankment single trench double trench ¹⁾ stepped trench ¹⁾
¹⁾ For special shapes add a sketch

Width of trench b = m at pipe springline (2xA + DN)

 b_{so} = m at pipe trench bottom inclusive planks

Typical values for A

Nominal size DN	A (mm)
DN ≤ 400	200
400 < DN ≤ 900	400
900 < DN ≤ 1600	500
1600 < DN ≤ 2400	600
2400 < DN ≤ 4000	900

Trench planking

- no planks
- Horizontal planks, also applies to plank walls (Berlin lining)
- Planking with plates
- Vertical plank with light weight
- Vertical plank with boards *
- Vertical plank with light weight *
- Vertical plank with sheet piling *

* Depth of sheeting below pipe invert

- bedding**
- on native soil (acc. EN 1610)
 - on gravel, sand
 - on concrete ²⁾

²⁾ only as special construction in agreement with the pipe producer

ts = m

*thickness of plank (one-side)

b_s = m

Cover condition for backfilling:

Type 1 Backfilling the pipe zone (to 300 mm) over the pipe crown with the specified backfill material compacted to the required compaction level.

Type 2 Backfill to a level of 60% of pipe diameter with the specified backfill material compacted to the required compaction level.

Backfill from 60% of diameter to 300 mm over the pipe crown with specified backfill material compacted to the required compaction level.

Not practical for small pipe diameter

Not suitable for heavy traffic loading situation