

# Plastic pipe laying instructions

---

## Scope

The SIA 190 (2000) standard, which defines the permissible installation depths according to the criteria taken into account in this technical data sheet, has been applied. This sheet is for guidance only and is to be used according to the actual parameters of the project.

## Loads

The loads supported by the plastic pipes are specific to each project. The engineering planning office must define the possible load cases. According to SIA 160, two load cases are first defined according to the following models in order to verify structural safety and serviceability :

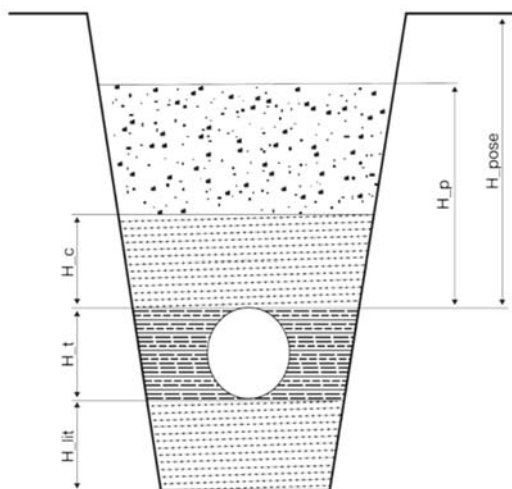
- Loads due to off-road traffic (load model 1)
- Charges due to traffic on the roadway (load model 1 + 2 + 3)

## Encasement profile

The EN 1610 standard describes the execution and encasement of plastic pipe excavation in different profiles. The acceptable depth range is described in the depth of laying section.

- **U1/V1 profile** : Give priority to this type of profile for plastic pipes.
- **U4/V4 profile** : This type of profile is used for domestic drainage networks according to the SIA 190 and SN 592 000 standards.

## Backfill#



**Figure 1** : V1 profile

1. **Bedding** with a minimum height ( $H_{lit}$ ) of 10 cm of sand or gravel (grain size: 0 -16 mm).
2. The length of the **pipe** must rest completely on the bedding.
3. **Compact** in several layers with uncrushed gravel 0-16 mm in size, up to the top edge of the pipe ( $H_t$ ) in order to ensure good compaction quality (guarantee lateral support).
4. Make a minimum height ( $H_c$ ) **coverage** of 10 cm with uncrushed gravel (0-16 mm grain size).
5. Put in place a **protective layer** ( $H_p$ ) with a minimum thickness of 30cm depending on the compaction.

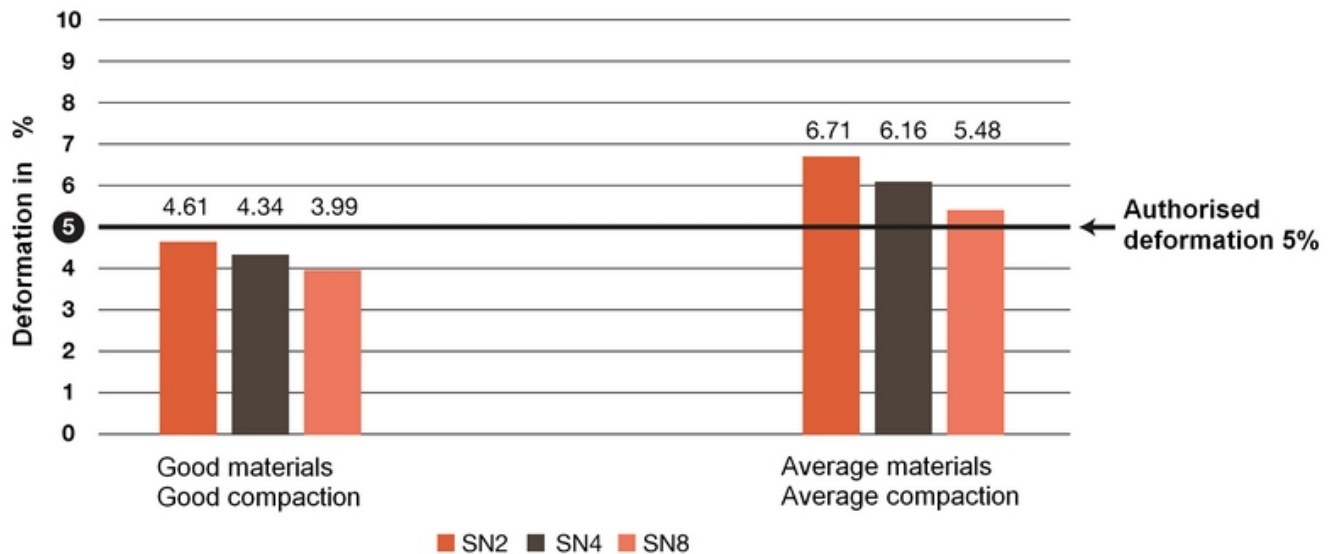
## Static calculation

The static calculation, carried out according to the SIA 190 standard, checks the structural safety as well as the serviceability and takes into account the rigidity of the system, the characteristics of the construction materials, the encasement profile and the loads exerted.

- Terrain deformation module : 3 N/mm<sup>2</sup>
- Volumetric mass density of the ground : 20 kN/m<sup>3</sup>
- Support factor for flexible hose : 1.2
- Dynamic coefficient : 1.3
- Plastic pipe diameter : Ø 250 mm

## The importance of compaction (exemples)

The influence of terrain quality and compaction is shown below. The calculation of the deformations was carried out according to the SIA 190 standard.



In the case of a good material and a good compaction, the pipe having the lowest rigidity (SN2 in this case) is allowed.

For average material and compaction, the pipe with the highest rigidity (SN8 in this case) will not be allowed.

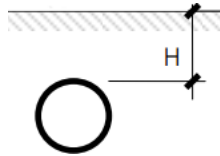
The quality of the material and the compaction strongly influence the result of deformation.

## Depth of laying

The installation depths of the PVC, PE and PP pipes meet the criteria of the SIA 190 standard, in order to guarantee the structural strength and a maximum admissible deformation of 5% of the plastic pipes.

According to standard SIA190, the minimum covering height ( $H_{\text{laying}}$ ) is 0.8 m.

The tables below define the allowable installation depths ( $H_{\text{laying}}$ ), as an indication, depending on the type and rigidity of the pipe, the load profile and the quality of the encasement.



Indicative height $H_{\text{laying}}$ in m	HARD PVC PIPES <b>COMPACT</b>			HARD PVC PIPES <b>COMPACT</b>		
	Loads <b>OUTSIDE</b> traffic areas Load model 1 SIA 160			Loads <b>INSIDE</b> traffic areas Load model 3 SIA 160		
	U1/V1 profile			U1/V1 profile		
	SDR 51 (S 25) <b>SN 2</b>	SDR 41 (S 20) <b>SN 4</b>	SDR 34 (S 16.5) <b>SN 8</b>	SDR 51 (S 25) <b>SN 2</b>	SDR 41 (S 20) <b>SN 4</b>	SDR 34 (S 16.5) <b>SN 8</b>
0.50						
0.60			<b>0.65</b>			
0.70		<b>0.75</b>			<b>0.70</b>	
0.80	<b>0.80</b>			<b>0.80</b>		
0.90				<b>0.95</b>		
1.00						
.						
.						
.						
2.80				<b>2.75</b>		
2.90						
3.00						
3.10						
3.20	<b>3.20</b>			<b>3.10</b>		
3.30						
3.40						
3.50		<b>3.50</b>			<b>3.55</b>	
3.60						
3.70						
3.80						
3.90			<b>3.90</b>			
4.00						

**Table 1** : Recommended installation depth for PVC pipes.  $E_{\text{short}}=3,600\text{N/mm}$  -  $E_{\text{long}}=1,750\text{ N/mm}$

Indicative height H <sub>laying</sub> in m	PP-HM PIPES				PP-HM PIPES			
	Loads <b>OUTSIDE</b> traffic areas Load model 1 SIA 160				Loads <b>INSIDE</b> traffic areas Load model 3 SIA 160			
	U1/V1 profile				U1/V1 profile			
	SDR 33 (S 16) <b>SN 4</b>	SDR 29 (S 14) <b>SN 8-10</b>	SDR 26 (S 12.5) <b>SN 12</b>	SDR 22 (S 10.5) <b>SN 16</b>	SDR 33 (S 16) <b>SN 4</b>	SDR 29 (S 14) <b>SN 8-10</b>	SDR 26 (S 12.5) <b>SN 12</b>	SDR 22 (S 10.5) <b>SN 16</b>
0.50				<b>0.55</b>				<b>0.58</b>
0.60		<b>0.68</b>	<b>0.62</b>			<b>0.64</b>		
0.70	<b>0.72</b>				<b>0.72</b>			
0.80					<b>0.78</b>			
0.90								
1.00								
.								
.								
.								
2.80								
2.90								
3.00								
3.10					<b>3.05</b>			
3.20								
3.30						<b>3.25</b>		
3.40	<b>3.40</b>							
3.50		<b>3.55</b>						
3.60								
3.70								
3.80			<b>3.80</b>					
3.90								<b>3.97</b>
4.00								
4.10								
4.20				<b>4.20</b>				

**Table 2:** Recommended installation depth for PP-HM pipes. Eshort=1'900N/mm - Elong=700 N/mm

Indicative height <b>H<sub>laying</sub></b> in m	PE-HD PIPES			PE-HD PIPES		
	Loads <b>OUTSIDE</b> traffic areas Load model 1 SIA 160			Loads <b>INSIDE</b> traffic areas Load model 3 SIA 160		
	U1/V1 profile			U1/V1 profile		
	SDR 33 (S 16) <b>SN 2</b>	SDR 26 (S 12.5) <b>SN 4</b>	SDR 21 (S 10) <b>SN 8</b>	SDR 33 (S 16) <b>SN 2</b>	SDR 26 (S 12.5) <b>SN 4</b>	SDR 21 (S 10) <b>SN 8</b>
0.50						
0.60			<b>0.60</b>			
0.70			<b>0.65</b>			
0.80		<b>0.78</b>				
0.90			<b>0.88</b>			
1.00						
1.10	<b>1.10</b>					
1.20						
1.30						
1.40						
1.50						
1.60			<b>1.55</b>			
1.70						
1.80						
1.90			<b>1.90</b>			
.						
.						
2.80	<b>2.75</b>					
2.90			<b>2.90</b>			
3.00						
3.10						
3.20			<b>3.20</b>			
3.30		<b>3.30</b>				
3.40						
3.50			<b>3.50</b>			
3.60						

**Table 3:** Recommended laying depth for HDPE pipes. Eshort = 1000 N / mm; Elong = 150 N / mm