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#### **PVC pipes for street sewerage**

# **STIGMA UK**





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Unplasticized polyvinyl chloride (PVC-U) pipes and fittings for street sewerage are the basic building blocks of pipe systems laid in the ground and operating mostly in gravity conditions (with a free surface). These pipe systems have been used successfully for many years, and fully meet the requirements for reliable collection and discharge of meteoric water, domestic and fecal effluents and industrial (aggressive) effluents.

# **Properties**



PVC pipe systems have a number of advantages over pipelines made of traditional materials (such as concrete, reinforced concrete, polyester, ductile cast iron), among which the most important are:

- extraordinary corrosion resistance
- ideally smooth inner surface, which allows excellent hydraulic properties, very good sewage removal and a significant reduction in sediment formation
- low weight, which allows easier transport and easier installation
- extremely wide range of various connecting, distributing and reducing pieces, which enable the fulfillment of practically all requirements in the implementation of sewer pipe systems, which are laid in the ground
- quick and easy installation of pipe systems
- achieving complete tightness of the pipeline, which is absolutely necessary in times of serious environmental protection
- high durability of pipelines and minimal maintenance costs
- easy possibility of using PVC pipes and elements for the rehabilitation of existing sewage pipelines.

#### PVC pipes are manufactured according to two different standards:

#### A: SIST EN 1401-1

**FULL WALL PIPES** 

**STIGMA PVC UK-COMPACT PIPES** are manufactured according to the EN 1401-1 standard, which means that they have a full or compact wall. Which means that they have a full or compact wall.

#### B: SIST EN 13476-1

FOAM CORE PIPES

# **STIGMA PVC UK-EXPANDED PIPES** are made according to the EN 13476-1 standard, which means that the core is made of foamed PVC-U material and has additional advantages:

- they put less strain on the environment
- lower pipe mass
- higher material efficiency

## **Material**



Pipes and fittings are made of unplasticized polyvinyl chloride (PVC-U), which is one of themost widely used polymeric materials and also extremely tested, as it has been used for pipelines for more than 80 years.

Various additives such as ointments, fillers, pigments, UV and other stabilizers are added to the carrier material - polyvinyl chloride in order to achieve physical and chemical properties that will best meet the requirements.

| Pipes are made of raw material with the following characteristics: |                       |                 |  |  |  |  |  |  |
|--|-----------------------|-----------------|--|--|--|--|--|--|
| Density  | 1,38 - 1,45           | g/cm³           |  |  |  |  |  |  |
| Tensile strength   | ≥45                   | N/mm²           |  |  |  |  |  |  |
| Softening point temperature (Vicat)                                | ≥79                   | °C              |  |  |  |  |  |  |
| Modulus of elasticity $(E_{_{bc}})$                                | ≥3600                 | N/mm²           |  |  |  |  |  |  |
| Coefficient of linear thermal expansion                            | ~0,8x10 <sup>-4</sup> | K <sup>-1</sup> |  |  |  |  |  |  |
| Thermal conductivity coefficient (at 23°C)                         | ~0,16                 | W/mK            |  |  |  |  |  |  |
| Surface electrical resistance                                      | 1012                  | Ω               |  |  |  |  |  |  |





#### **Dimensions**

Pipe dimensions comply with **SIST EN 1401-1** and **SIST EN 13476-1** standards. PVC pipes for street sewerage are manufactured in stiffness classes SN8 and SN4.

Circumferential stiffness of the pipe: SN≥4 kN/m² EN (ISO 9969) or S<sub>R24</sub>≥31,5 kN/m² (DIN 16961)

| Nominal<br>diameter DN<br>(mm) | Outer<br>diameter<br>d <sub>1</sub> (mm) | Wall<br>thickness<br>s <sub>1</sub> (mm) | Inner<br>diameter of<br>the sleeve<br>d <sub>2</sub> (mm) | Outer<br>diameter of<br>the sleeve<br>d <sub>3</sub> (mm)` | Sealing ring<br>depth c max<br>(mm) | Plug-in<br>depth of the<br>end t <sub>e</sub> (min)<br>(mm) | Recording<br>width<br>b (mm) | Pipe length<br>l (m) |
|--------------------------------|--|--|---|--|-------------------------------------|---|------------------------------|----------------------|
| 110                            | 110                                      | 3,2                                      | 110,4   | 125,5  | 22                                  | 76  | 6                            |                      |
| 125                            | 125                                      | 3,2                                      | 125,4   | 142,1  | 26                                  | 82  | 6                            |                      |
| 160                            | 160                                      | 4,0                                      | 160,5   | 179,7  | 32                                  | 100   | 7                            |                      |
| 200                            | 200                                      | 4,9                                      | 200,6   | 223,0  | 40                                  | 120   | 9                            | 1. 2. 5              |
| 250                            | 250                                      | 6,2                                      | 250,6   | 282,1  | 70                                  | 140   | 9                            | 1, 5, 5              |
| 315                            | 315                                      | 7,7                                      | 315,7   | 350,5  | 70                                  | 160   | 12                           |                      |
| 400                            | 400                                      | 9,8                                      | 400,8   | 441,9  | 70                                  | 190   | 15                           |                      |
| 500                            | 500                                      | 12,2                                     | 501,0   | 551,6  | 80                                  | 220   | 18                           |                      |
| 630*                           | 630                                      | 15,4                                     | 631,2   | 692,8  | 95                                  | 260   | 23                           | 1.3.6                |
| 800*                           | 800                                      | 19,6                                     | 802,4   |  | 110                                 | 280   | 32                           | 1, 3, 0              |

\* Pipes are not in our own production programme.

### Circumferential stiffness of the pipe: SN≥8 kN/m<sup>2</sup> EN (ISO 9969) or $S_{R24} \ge 63 \text{ kN/m}^2$ (DIN 16961)

| Nominal<br>diameter DN<br>(mm) | Outer<br>diameter<br>d <sub>1</sub> (mm) | Debelina<br>stene<br>s <sub>1</sub> (mm) | Inner<br>diameter of<br>the sleeve<br>d <sub>2</sub> (mm) | Outer<br>diameter of<br>the sleeve<br>d <sub>3</sub> (mm)` | Sealing ring<br>depth c max<br>(mm) | Plug-in<br>depth of the<br>end t <sub>e</sub> (min)<br>(mm) | Recording<br>width<br>b (mm) | Pipe length<br>l (m) |
|--------------------------------|--|--|---|--|-------------------------------------|---|------------------------------|----------------------|
| 110                            | 110                                      | 3,2                                      | 110,4   | 125,5  | 22                                  | 76  | 6                            |                      |
| 125                            | 125                                      | 3,2                                      | 125,4   | 142,7  | 26                                  | 82  | 6                            |                      |
| 160                            | 160                                      | 4,7                                      | 160,5   | 183,2  | 32                                  | 100   | 7                            |                      |
| 200                            | 200                                      | 5,9                                      | 200,6   | 224,6  | 40                                  | 120   | 9                            | 1 • 2 • 5            |
| 250                            | 250                                      | 7,3                                      | 250,6   | 283,9  | 70                                  | 140   | 9                            | 1, 3, 5              |
| 315                            | 315                                      | 9,2                                      | 315,7   | 352,7  | 70                                  | 160   | 12                           |                      |
| 400                            | 400                                      | 11,7                                     | 400,8   | 444,7  | 70                                  | 190   | 15                           |                      |
| 500                            | 500                                      | 14,6                                     | 501,0   | 555,2  | 80                                  | 220   | 18                           |                      |
| 630*                           | 630                                      | 18,4                                     | 631,2   | 697,2  | 95                                  | 260   | 23                           | 1 • 2 • 6            |
| 800*                           | 800                                      |  | 802,4   |  | 110                                 | 280   | 32                           | т, э, ө              |

\* Pipes are not in our own production programme.



#### **Color of the pipe**

RAL 8023

The color of the Stigma PVC UK pipe is brown. (RAL 8023)

# **Quality Assurance**



Pipes are manufactured and tested in accordance with the standard **SIST EN 1401-1** and **SIST EN 13476-1**, which requires continuous inspection of pipes.

#### Regular testing / own laboratory:

- dimension control (outside diameter, wall thickness, headboard dimensions)
- pipe layout control (color, pipe inscription)
- circumferential stiffness of the pipe
- softening point temperature (according to Vicat)
- tightness of pipe joints and shaped pieces
- impact resistance
- pipe creep module

#### Periodic testing / external laboratory:

- toughness of the pipe
- dimensional stability of the pipe
- dichloromethane resistance
- sulphate ash content
- dichloromethane resistance
- resistance of the pipe to internal hydrostatic pressure

In parallel with internal testing, PVC pipes for street sewerage are regularly tested at external independent institutions (ZAG - Civil Engineering Institute of Slovenia), as evidencedby the issued test reports.

**ST - CS d.o.o.** has an established and properly maintained management system that meets the requirements of the ISO 9001 standard, which ensures high quality products and services.

# **Chemical resistance**



Non-softened polyvinyl chloride (PVC-U) is highly resistant to chemicals that occur in sewage as well as to aggressive substances found in the soil outside the pipe. The table shows the orientation of the resistance of PVC-U pipes to individual media or groups of media at certain temperatures. More detailed data for the chemical resistance of PVC-U to media are collected in the technical report ISO TR 10358 and the standard DIN 8061-B1. For the use of pipes in special cases, it is necessary to consult the manufacturer of PVC-U raw material or the manufacturer of pipes.

Chemical resistance of PVC-U pipes to individual media or groups of media at temperatures of 20  $^{\circ}$  C and 60  $^{\circ}$  C, where:

- (+) corresponds
- (0) partially corresponds
- (-) does not correspond to
- (\*) consultation required

| Media                              | 20°C | 60°C |
|------------------------------------|------|------|
| Acetone                            | -    | -    |
| Alcoholic beverages (up to 40 ° C) | +    | +    |
| Ammonia (5 x additional conc.)     | +    | +    |
| Petrol                             | +    | +    |
| Citric acid                        | +    | +    |
| Detergents                         | +    | +    |
| Nitric acid (up to 40 ° C)         | +    | 0    |
| Ethanol (96%)                      | +    | 0    |
| Formaldehyde (up to 40 ° C)        | +    | *    |
| Glycerin (technically pure)        | +    | +    |
| Chlorinated water                  | +    | +    |
| Fuel oil                           | +    | *    |
| Flaxseed oil (technically pure)    | +    | 0    |
| Lugi                               | +    | +    |
| Methanol (all concentrations)      | +    | 0    |
| Mineral oils                       | +    | +    |
| Mineral Water                      | +    | +    |
| Lactic acid                        | +    | 0    |
| Milk                               | +    | +    |
| Sea water                          | +    | +    |
| Motor oils                         | +    | 0    |
| Gasoil                             | -    | -    |
| Acetic acid                        | +    | +    |
| Kerosene (technically clean)       | +    | *    |
| Beer                               | +    | +    |
| Vegetable oils                     | +    | +    |
| Fruit (vegetable) juices           | +    | +    |
| Hydrochloric acid (5%)             | +    | 0    |
| Liquid soap                        | +    | +    |
| Urine                              | +    | 0    |
| Animal oils                        | +    | +    |
| Sulfuric acid (up to 10%)          | +    | +    |
| Sulfuric acid (up to 30%)          | +    | +    |

# **Transport and Storage**



PVC-U pipes, due to their considerable resistance to wear and impact and low weight, enable uncomplicated transport and efficient storage procedures and practically do notrequire special protective measures. Nevertheless, careful handling is required, as attentionshould be paid to sharp objects and edges that can permanently damage the pipe. Therefore, it is necessary to clean the means of transport and storage areas with sharp objects and protect the sharp edges. Greater attention should also be paid to the transport of pipes at temperatures below 5 ° C, when PVC pipes become less resistant to shocks.

|                       |   | 110                                | 125 |     |     |     | 315 |    |    | 630 |    |
|-----------------------|---|------------------------------------|-----|-----|-----|-----|-----|----|----|-----|----|
| Pipe<br>length<br>(m) | 1 | Number of pipes in the pallet      | 76  | 60  | 33  | 20  | 12  | 9  | 9  | 4   | 4  |
|                       | 1 | Total length of pipe in the pallet | 76  | 60  | 33  | 20  | 12  | 9  | 9  | 4   | 4  |
|                       | 2 | Number of pipes in the pallet      | 76  | 60  | 33  | 20  | 12  | 9  | 9  | 4   | 4  |
|                       | 3 | Number of pipes in the pallet      | 228 | 180 | 99  | 60  | 36  | 27 | 27 | 12  | 12 |
|                       | _ | Number of pipes in the pallet      | 76  | 60  | 33  | 20  | 12  | 9  | 9  | 4   |    |
|                       | 5 | Total length of pipe in the pallet | 380 | 300 | 165 | 100 | 60  | 45 | 45 | 20  |    |

\* Pipes are packed in pallets with wooden frames during the production process.

\*\* Non-standard pipe lengths can be produced in agreement with the client.

The pipes should be folded along their entire length and should be protected againstslipping. The loading height should not exceed one meter. In the case of palletized pipes and multi-storey storage, it is necessary to ensure that the wooden frames of one pallet rest on the wooden frames of the pallet below it (wood on wood).

When loading or unloading pipes, do not pull over sharp edges or on the ground. Werecommend the use of suitable tools, such as lifting straps.

The material from which the pipes are made is UV stabilized and thus quite resistant to ultraviolet rays and other weather conditions. However, we recommend that you store thepipes unprotected from the weather for a maximum of one year. In case of prolonged storage, the pipes must be protected from sunbeams.

# **Pipe connection**



Pipes and various connecting pieces are connected quickly and easily by inserting the plug end into the groove advertisement and with an integrated rubber seal. Prior to joining pipes and fittings, the contact surfaces must be clean and undamaged.

If the required length of the pipe is shorter than the standard one, cut the pipe straight (with a fine-toothed saw) and grind the end edge at an angle of ~ 15 °. Lubricate the chamfered edge with a suitable antifriction agent (grease for rubber seals, silicone oil, soapy water), which must not damage the seal or pipe. Push the plug end of the pipe into the nozzle of the adjacent pipe or connecting piece with a slight rotation to the limit. The final position on the pipe is marked with a pen, and then the pipe is pulled out by about 2 mm for each running meter between the joints, but not more than 10 mm, which allows to compensate the stretches of the pipe due to temperature changes.

Deviations of the pipe in the head from the direction of the pipeline must be avoided. Pipe bends and other connecting pieces are used to change the direction of the route.

# **Pipe installation**



Pipe installation must be carried out by qualified workers under professional supervision.

When installing the pipes, it is necessary to follow the general guidelines for laying pipes that are laid in the ground and are roughly defined in the standard SIST EN 1610 and also in the standard DIN 4033.

With proper preparation of the bed (thickness 15 cm) with sand or other soil that can be

hardened and which does not contain stones (grains up to 20 mm), good and gradual hardening of the backfill (degree of compaction according to Proctor Dpr> = 95%) at pipes and 30 cm above the top of the pipes, it is achieved that pipes covered with earth from 0.8 m and up to 8 m and even under the heaviest traffic load SLW 60 (according to DIN 1072) are

not deformed above the permissible limit 6 %. If the pipe cover is less than 0.8 m, it is necessary to take care of load distribution (eg by concreting).

More detailed installation instructions can be found in the "DOWNLOADS" category, where, in addition to the catalogs, you will find guidelines for laying pipelines, which deal with ditch excavation, bed construction, overlapping and main backfilling of the pipeline. General guidelines for testing the tightness of laid pipelines in accordance with SIST EN 1610 are also available.



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