PEŠTAN
we build trust

TECHNICAL CATALOGUE

PVC

PIPES AND FITTINGS

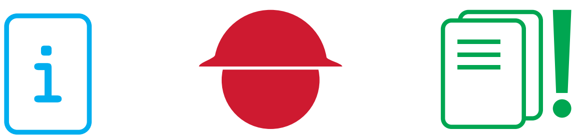
July 2018
EDITION I

CONTENT

GENERAL NOTES

The technical catalog is subject to change in certain time intervals as a consequence of the adoption of new ones products and modifications thereof. For this reason, it is necessary to check if you have the latest version of the technical catalog. The technical catalog date is located on the cover page of the catalog and the latest version you can download from www.pestan.net or request it via mail office@pestan.net.
Quick access to chapters is provided with the help pictograms.

Important information | **Safe recomendation** | **Legal note**



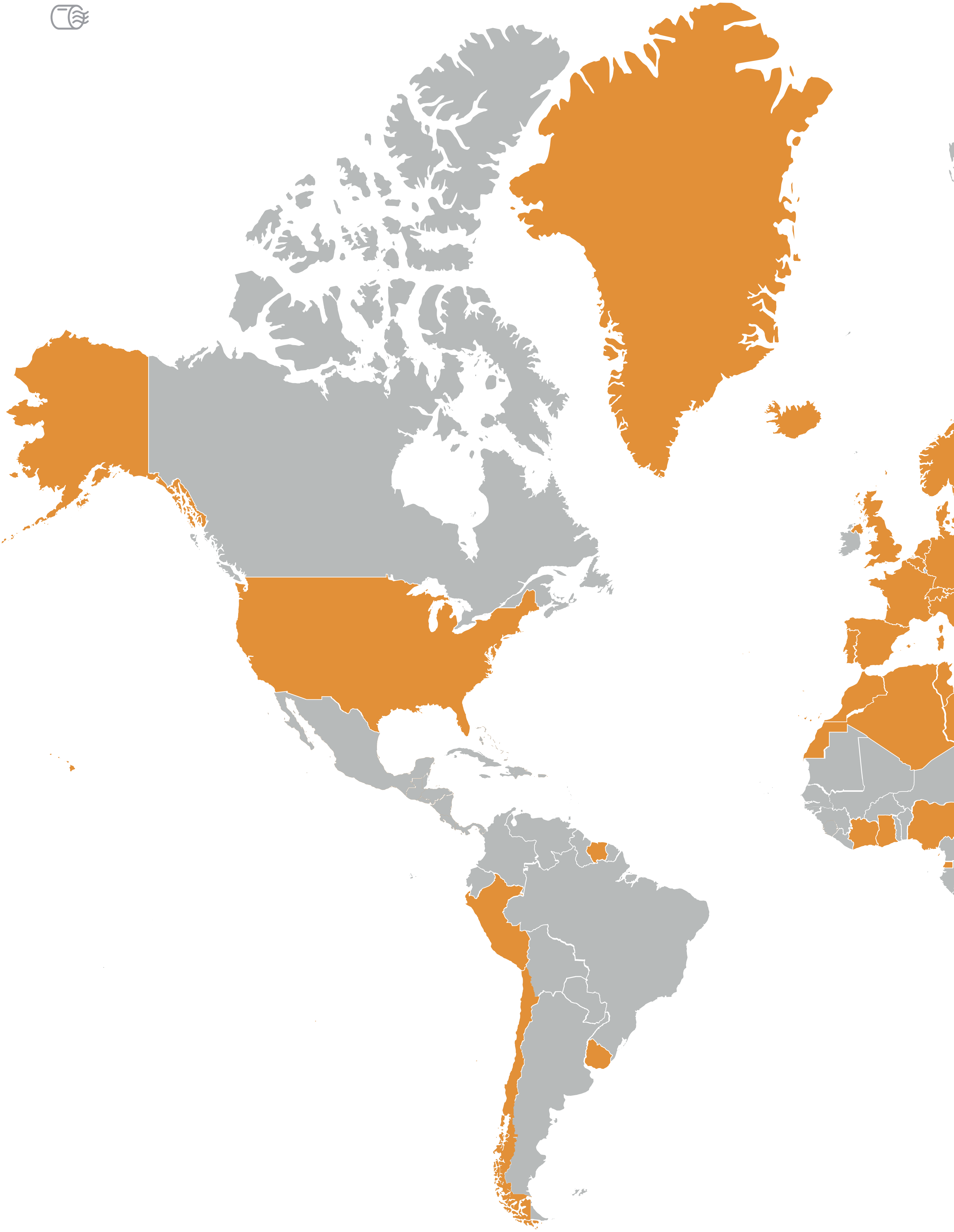
Before you start installing Pestan PVC pipes and fittings for underground drainage and sewerage, be sure to read all references related to safety at work, all for your own security and safety of people around you. During the whole system installation the system keep this instruction with you. If some details from this technical catalog are not clear contact us at mail office@pestan.net

General safety recommendations:

- Consider the general safety rules for prevention of accidents when placing pipes and fittings
- Ensure sufficient light when installing pipes and fittings
- Keep your work area clean
- Keep away children, pets and unauthorized personnel from tools and places for placing pipes and fittings (this is specially important in case of renovation)

Measures during system installation:

- If you have jewelry or other items that is hanging, be sure to remove them before installing
- Cutting tools should be properly disposed of and to use with great care because they have sharp edges
- When cutting pipes, a safe distance should be maintained between the hand holding the tube and cutting tools, and never put your hands near the part where the tool cuts
- When you are servicing, maintaining, or changing the place assembly, always turn off the power on the tool.



ABOUT US

Private company Peštan is the leader in the Balkans in production of plastic pipes and fittings for water, sewage and gas. The company was founded in 1989 and produces water pipes made of polyethylene. Over time, she introduced new ones materials (polypropylene and PVC) and expanded the production program. Today more than 5000 products can be found from the pipe and fittings and PVC profiles, through luxurious and modern drains, to the tape for irrigation.

Production plants are located in Arandjelovac 70 kilometers south from Belgrade, and foreign representations in countries in the region are:

Bosnia and Herzegovina, Romania, Croatia as well as in Ukraine and UAE.

The company is present on the market of Europe, Russia, the Middle East, North Africa, Latin America and the United States Country. Export is oriented and sales are realized in over 70 countries of the world!

PEŠTAN established the organization and business of the Company and certified according to the requirements of the Integrated System management,

- quality management of ISO 9001 (since 2004)

- environmental management, ISO 14001 (since 2010)

- management of health and safety at work of OHSAS 18001 (since 2010)

PEŠTAN has certified its products according to the appropriate one normative regulations in the most eminent certification bodies: DVGW, MPA, SABS, BULGARKONTROLE, EBETAM, IGH, VUPS, VUSAPL, ICC, SKZ, EMI...

We are doing our best to satisfy the needs of our customers, the company continuously introduces innovations and improves cadres and equipment. Since 2009, SAP ERP has been introduced to the company with modules MM, SD, PP, Fi and CO, and since 2012 are functionality expanded and WMS. Introduction of WCM and WMS system increased efficiency, contributed to deployment cost and professional maintenance. Since 2015 in Sap is implemented and quality management module (QM).

Employees of the company Pestan, which has over 1000, are joint Efforts justify the slogan of the company: WE BUILD THRUST!

1 STANDARDS

STANDARDS APPLYING ON PEŠTAN PVC PIPES AND FITTINGS

EN 1401-1:2009- Plastics piping systems for non-pressure underground drainage and sewerage - Unplasticized poly(vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system.

EN 13476-1:2007 Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) - Part 1: General requirements and performance characteristics.

EN 13476-2:2007 Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) - Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A.

ISO 3126:2005 Plastics piping systems - Plastics components - Determination of dimensions

EN 744:1995 Plastics piping and ducting systems - Thermoplastics pipes - Test method for resistance to external blows by the round-the-clock method

EN 1411:1996 Plastics piping and ducting systems - Thermoplastics pipes - Determination of resistance to external blows by the staircase method

EN 12061:1999 Plastics piping systems - Thermoplastics fittings - Test method for impact resistance

EN 12256:1998 Plastics piping systems - Thermoplastics fittings - Test method for mechanical strength or flexibility of fabricated fittings

EN 727:1994 Plastics piping and ducting systems - Thermoplastics pipes and fittings - Determination of Vicat softening temperature (VST)

EN ISO 2505:2005 Thermoplastics pipes - Longitudinal reversion - Test method and parameters

EN 580:2003 Plastics piping systems - Unplasticized poly(vinyl chloride) (PVC-U) pipes - Test method for the resistance to dichloromethane at a specified temperature (DCMT)

ISO 580:2005 Plastics piping and ducting systems - Injection-moulded thermoplastics fittings - Methods for visually assessing the effects of heating

EN 1053:1995 Plastics piping systems - Thermoplastics piping systems for non-pressure applications - Test method for watertightness

EN 681-1:1996/A3:2005 Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber

EN ISO 9969:2007 Thermoplastics pipes - Determination of ring stiffness (ISO 9969:2007)

EN ISO 13968:2008 Plastics piping and ducting systems - Thermoplastics pipes - Determination of ring flexibility (ISO 13968:2008)

EN ISO 1183-1:2012 Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pyknometer method and titration method (ISO 1183-1:2012)

EN ISO 1167-1:2006 Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 1: General method (ISO 1167-1:2006)

EN 1610:2015 Construction and testing of drains and sewers

2 INFORMATION

BASIC INFORMATION ABOUT PEŠTAN PVC PIPES AND FITTINGS

The Pestan PVC pipes and fittings program are made of PVC material (polyvinyl chloride) according to the latest extrusion and injection molding technology of pipes and fittings. Pestan PVC pipes for street sewer systems are made as three-layer (EN 13476) and compact (EN 1401) pipes. State-of-the-art pipe extrusion technology has elevated the underground drainage system outside buildings to a higher level. The possibility of recycling without loss of physical and mechanical properties make PVC material environmentally friendly.

Pipes and fittings within the PVC Pestan product range are intended for street sewer systems. The PVC pipe and fitting system is universal and can be used to remove all types of wastewater and stormwater in civil engineering systems.

Installation and manipulation of piping elements is very simple and is described in the following sections of this technical manual. Pipe fittings are connected via fittings, while the watertightness of the joint is ensured by rubber rings made of EPDM rubber. The inner layer of PVC sewage pipes has very low roughness, resulting in good hydraulic performance, high abrasion resistance as well as sediment retention and bacterial culture capture for the inner wall of the pipe.

PVC pipes are resistant to corrosion and have an estimated life of 50 years if used properly.

Pipes and fittings have excellent thermal stability and are resistant to:

- Short thermal loads up to 60 °C
- Continuous thermal load up to 40 °C

In terms of chemical resistance PVC pipes are resistant to: salt water, alcohol, acids, bases, sulfates, aggressive gases and all kinds of detergents. They are suitable for drainage of chemically aggressive waste, pH values from 2 (for very acidic wastewater) to 12 (for very basic wastewater).

The PVC program is sensitive to wastewater containing a high percentage of gasoline (petroleum), benzene or acetone. For detailed chemical resistance of the pipeline, see the chemical resistance table that is an integral part of this technical catalog.

Pipe and fitting joints are 100% leak-proof to a pressure of 0.5 bar (5m water column).

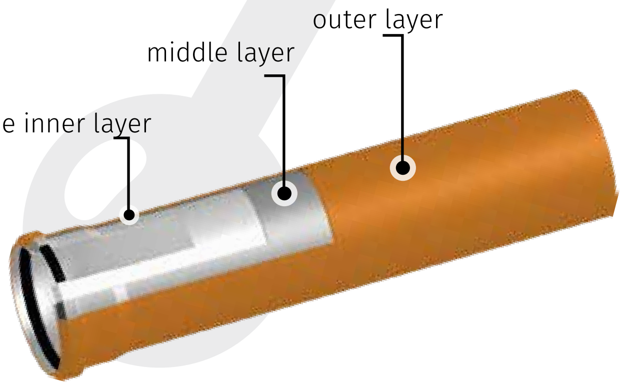
The pipes are intended for external use for a limited period of time due to their long-term UV stability. Also the pipes are intended for installation underground. Does not install at temperatures below 5 °C.

The PVC pipe program belongs to the flammability class B2 of DIN 4102, or to the group of normally flammable materials.

Pestan PVC pipes can be compact or three-layer, each contributing to the desired product characteristics. Within Peštan PVC production program are:

- Three-way PVC pipes with diameters from DN 110 to DN 630
- Compact PVC pipes with diameters from DN 110 to DN 630
- Injected fittings with diameters from DN 110 to DN 400
- Welded fittings of larger diameter and not standard shape

When it comes to three-layered tubes, the center layer differs from the inside and the outside in structure and chemical composition.



Inner layer: Made of polyvinyl chloride, the smooth orange inner surface prevents the buildup of sediment and reduces abrasion on the tubes.

Middle layer: Made of expanded polyvinyl chloride and reinforced with mineral fillers, it gives the pipes strength and flexibility.

Outer layer: Made of polyvinyl chloride, orange, gives the tubes better impact resistance and greater safety when handling and installing the product.

Three-layer pipes are manufactured to EN 13476 while compact pipes are manufactured to EN 1401.

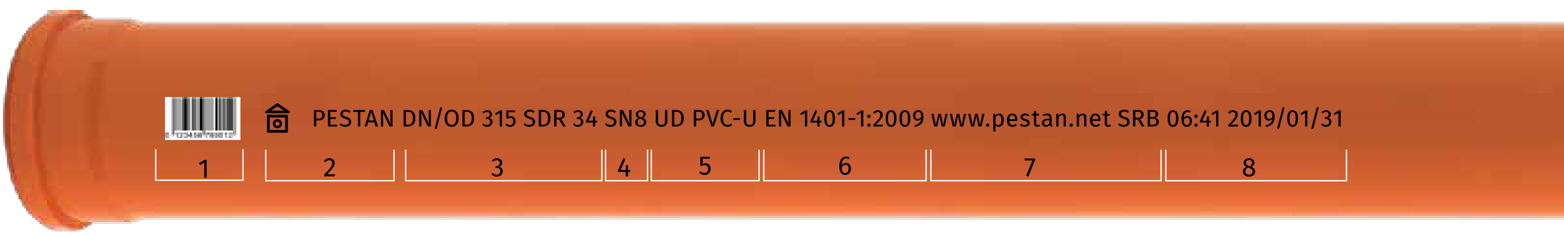
Material	PVC (polyvinyl chloride)	PVC (polyvinyl chloride)
Tube structure	Three-layer tube (outer smooth layer, inner smooth layer and foam layer of polyvinyl chloride)	One-layer PVC pipe
Density	Smooth layer = 1.42-1.48 g / cm^3; Foam layer = 0.8-1 g / cm^3	1,42-1,48 g/cm^3
Temperature resistance	short-term up to 60 °C, long-term up to 40 °C	short-term up to 60 °C, long-term up to 40 °C
Linear elongation coefficient	5x10-5 mm/mm °C	5x10-5 mm/mm °C
Chemical resistance	pH 2-pH 12	pH 2-pH 12
Modulus of elasticity	2,7-3,3 GPa	2,7-3,3 GPa
Connection mode	Socket and rubber ring - leak-proof up to 0.5bar pressure	Socket and rubber ring - leak-proof up to 0.5bar pressure
Field of application	UD - buried inside the structure of the building and outside the structure of the building	UD - buried inside the structure of the building and outside the structure of the building
Fire classification	B2 normal flammability	B2 normal flammability

Table 1: Basic properties of PVC materials

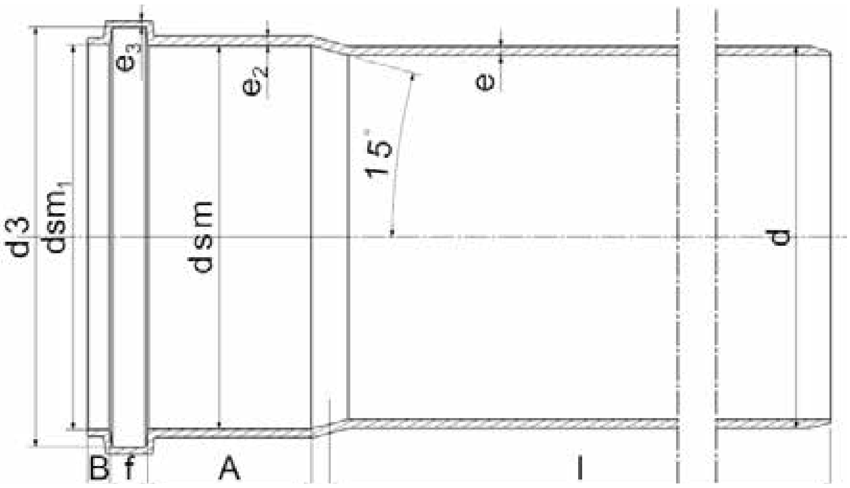
The main characteristics of PVC pipes are:

- Made of very light material with excellent mechanical properties,
- Simple and easy way of transport and handling,
- Fast and inexpensive mounting, by connecting couplings to pipe ends
- Resistant to corrosion in alkaline, acidic or aggressive environments,
- They are a good electrical insulator,
- Resistant to mechanical stress,
- Life span of 50 years,
- Without pipeline maintenance,
- EPDM rubber sealing rings according to (EN 681)

2.1 Marking of pipes



1. Barcode
2. Pestan logo
3. Diameter and SDR
4. Ring strength
5. Material
6. Production standard
7. Peštan logo
8. Time and date of production



EN 1451 (SDR 41) - SN4									
(mm)	DN 110	DN 125	DN 160	DN 200	DN 250	DN 315	DN 400	DN 500	DN 630
Dem (mm)	110	125	160	200	250	315	400	500	630
e (mm) min	3,2	3.2	4.0	4.9	6.2	7.7	9.8	12.3	15.4
d3 (mm) min	120.3	137.1	173.8	215.6	272.9	338.9	427.1	533.2	427.1
B (mm) min	6	7	9	12	18	20	24	28	24
A (mm) min	32	35	42	50	55	62	70	80	70
L (mm)	250, 500, 1000, 2000, 3000, 4000 i 6000								

EN 1451 (SDR 34) - SN8									
(mm)	DN 110	DN 125	DN 160	DN 200	DN 250	DN 315	DN 400	DN 500	DN 630
Dem (mm)	110	125	160	200	250	315	400	500	630
e (mm) min	3,2	3.7	4.7	5.9	7.3	9.2	11.7	14.6	18.4
d3 (mm) min	120.3	137.1	173.8	215.6	272.9	338.9	427.1	533.2	427.1
B (mm) min	6	7	9	12	18	20	24	28	24
A (mm) min	32	35	42	50	55	62	70	80	70
L (mm)	250, 500, 1000, 2000, 3000, 4000 i 6000								

Table 2: Strength classes tube in relation to the SDR

2.2 Marking of fittings:

Each fitting has a barcode label.

See the detailed PVC product list for more details.

1. Logo
2. Nominal diameter and degree of obliquity
3. Fitting class
4. Material designation
5. Date

Each fitting has a barcode label. Depend on For details see a detailed list of PVC products.

- Made of very lightweight material with excellent mechanical properties
- Simple and easy way to transport and handle.
- Fast and inexpensive mounting, by connecting the couplings to the pipe end
- Resistant to corrosion in alkaline, acidic or aggressive environments,
- They are a good electrical insulator,
- Resistant to mechanical stress,
- Lifetime longer than 50 years
- Practically no costs of pipeline maintenance,
- Sealing rings are made of EPDM rubber according to (EN 681)

2.3 Production program

Within the Peštan PVC production program there is a complete program of fittings (both injection molded and welded - hand made) made in all diameters and all strengths:

- elbows at 15 °, 30 °, 45 °, 67.5 ° and 87.5 ° from diameters ø110 to ø630
- Single branch at 45 ° from diameter ø110 to ø630
- PVC FF double socket fitting ø110
- Double couplings, sliding couplings, reducers, revisions, etc.

HTB ELBOW 15°

HTB ELBOW 35°

HTB ELBOW 45°

HTB ELBOW 67.5°

HTB ELBOW 87.5°

HTAE BRANCH 45°

HTAE BRANCH 67.5°

HTAE BRANCH 87.5°

HTAE BRANCH 45°

HTDA DOUBLE BRANCH 67,5°

HTDA DOUBLE BRANCH 87,5°

HTRE REVISION

HTU DOUBLE SOCKET

HTR EXCENTRIC REDUCER

HTSW SIFONSKI LUK

PVC Non-returnable valve

3 PACKAGING

PACKAGING, TRANSPORT AND STORAGE

3.1 Packing of pipes and fittings

Peštan PVC pipes and fittings are packaged in transport packages (unit and pallet) in a way favorable to customers. The way packaging provides the customer with safety when storing as well as easy handling with the same.

3.1.1 Pipe packing

Standard PVC pipe packages are on pallets and in packages. Pipes of all diameters in lengths of 0.25 and 0.50 meters are packed in cardboard packaging, which in a certain number, thus packed and packed on a pallet, represent a transport packaging. A EURO pallet measuring 800 x 1200 mm is used as the basis for transport packaging.

Figure 1: *Layout of the box (box)*

Figure 2: *Layout of the transport packaging (pallet)*

Pipes in lengths of 1m inclusive with tubes of 6 meters are packed in packages which, depending on the diameters and lengths, contain a certain number of pieces in the unit package as well as in the whole packages. Each package contains a certain number of unit packs, which are packed on a certain number of wooden beams, represent the ultimate transport packaging ready for further distribution to the final customer.

Figure No.3: *Layout of a packaged two-frame package*

Figure No.4: Layout of a packaged three-frame package

3.1.2 Fittings packaging

Standard packs of fittings are in cartons of certain dimensions, which represent unit packs, and which in a number form the transport packaging. Transport packages are formed on EURO pallets in dimensions 800 x 1200 mm and maximum height 1400 mm.

NOTE: For accurate information about packaging dimensions, number of pieces on unit and transport Packages contact Peštan on mail office@pestan.net

3.2 Transport and manipulation

Peštan PVC pipes and all fittings should be transported with appropriate transport vehicles. The loading area of the transport vehicle must be clean, flat, without sharp jaws and without any waste, (both on the floor of the vehicle and on all sides of the inner part of the transport vehicle).

SIzes of pallets are such that they fill int the loading space to the maximum. When it comes to the loading of the pallets, the packaging is defined so that two pallets can be placed on each other int he height of 2.9 m..

Picture No.5: *Loading transport packaging*

When loading transport packages of tubes, which are packed in packages, depending on the diameter of the pipes, the packages are packed in height in two or more levels. The number of levels depends on the height of the packaged package, so pipes with diameters: ø110, ø125, ø160 are packed in three levels, pipes with ø200, ø250, ø315 and ø500 in two levels, ø400 in six levels and pipes with ø630

in four levels. The PVC tubes that are packed on pallets, where the unit pack is a box, are packed in two levels in height. The height of the loading area must be at least 2.9 meters.

Picture 6: *Transport packaging (bulk)*

When it comes to loading pipes outside the transport package (bulk), pipes must by all their length rely on a flat surface so as not to come to deformation of the same. This is what primarily needs to be taken care of because incorrect handling can lead to damaging the pipe. Take care of it, because it can handle incorrect handling get bending at their ends.

During loading and unloading, the pipes must be handled carefully. They should not be thrown, hit, dragged, push, especially for concrete and other rough ones surfaces.

Picture 7: *Layout of properly and irregularly assembled pipes during transport*

3.3 Storage

Peštan PVC pipes and fittings that are packed in cardboard boxes are stored exclusively indoors (preferably shelf, one pallet-one pallet place).

Picture no. 17: *The appearance of shelf storage*

If there is no regal warehouse it is recommended that this packages be stored in closed space on flat surface in one level. When there is no transport packaging, and the goods arrived to final buyer as units then units should be placed on a single sturdy and dry pallet. Boxes (units) should be placed on one another aligned by the edges. Boxes must not be outside the pallet.

For storage of transport packages of pipes and joints elements, the warehouse needs to meet certain conditions.

3.3.1 Recommended storage conditions

Transport packaging stored dry, clean and closed space, with temperatures should be stored between 10 and 30 °C, and relative humidity between 50 and 60%. Packages should be protected from direct the influence of sunlight, moisture and heat, and especially They should be protected from high temperature oscillations as this can lead to the occurrence of condensation and loss of functional properties of transport packaging (cardboard boxes).

Pestan PVC pipes from 1 meter to 6 meters in length can be stored indoors and outdoors. When stored outdoors, the pipes must be protected from direct sunlight by a UV stable foil or canopy. It is recommended that these transport packages also be stored indoors or in a shaded area.

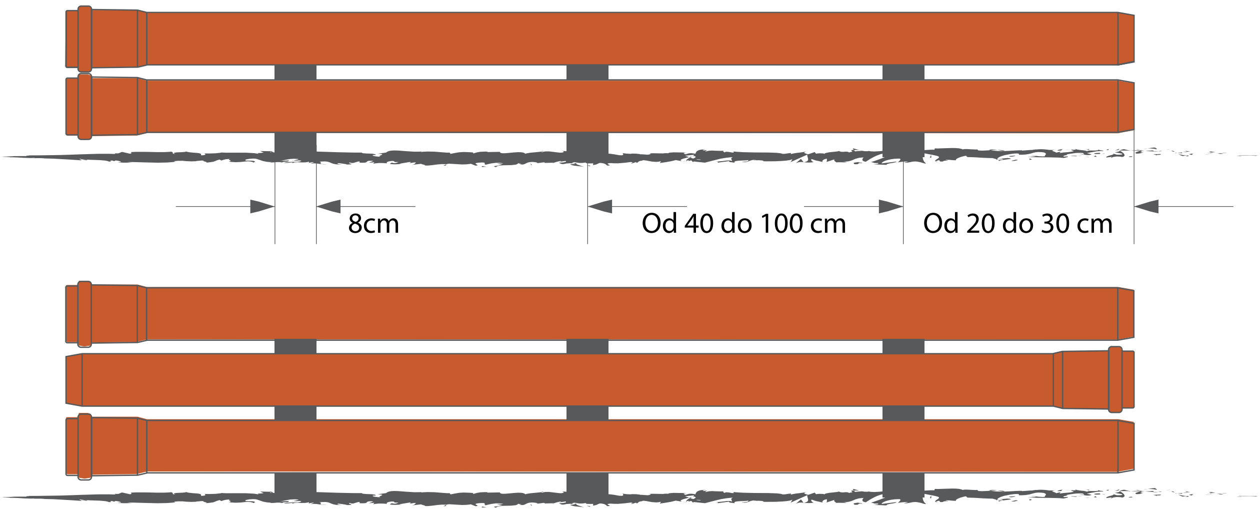
No matter where it is stored, whether indoors or outdoors, PVC pipe packages should not be stacked at more than the prescribed level:

- Pipes of all diameters 0.25 in length - one level
- Pipes with diameter ø110, ø125, ø160 length 0.5 meters - two levels
- Pipes with diameter ø110, ø125, ø160 length 1, 2, 3, 4, 5, 6 meters - four levels
- Pipes with a diameter of ø200 1 meter long - four levels
- Pipes with diameter ø200 of length 2, 3, 4, 5, 6 meters - three levels
- Pipes with diameter ø250, ø315, ø500, ø630 lengths 1, 2, 3, 4,
- 5, 6 meters - three levels
- Pipes ø400 in diameter 1, 2, 3, 4, 5, 6 meters - six level

Picture No.9: *PVC pipes*

Also, when storing pipes, they must not be stored near heated surfaces and care should be taken not to come into contact with fuels, solvents, etc. In the case of loose tubes (pieces or unit packs), the following should be observed:

- Pipes should be stored on a flat surface
- Place wooden beams under the pipe so that the joints (sockets) at the ends of the pipe do not rest on the substrate and thus deform
- Do not drop, pull or push pipes on uneven surfaces when stacking
- Pay attention to the way the pipes are stacked (rotate the pipes alternately so that the joints at the ends are free and therefore do not deform)
- Ensure that a packed pile of pipes does not scatter to the sides
- The height of the crimped pipes must not exceed 1.5 meters
- Store the tubes indoors and, if no storage conditions exist, the tubes should be stored in a shaded area or covered with a UV stable protective film.



Picture No. 10: *Properly placed PVC pipes on wooden beams*

The wooden base for the underlay of the pipe must not be less than 8 cm thick and not less than 5 cm thick. The axial distance between the billets depending on the diameter and length of the pipe varies from 400 to 1000 mm, while the pipe clearance also depends on the diameter and length of the pipe also from 200 to 500 mm.

Picture No.11: *PVC STRONG pipes properly secured to the wooden beams*

4 INSTALLING

INSTALLING AND CONNECTING

Peštan PVC pipes and fittings are installed in accordance with EN 1601 Street gravity drainage system sewage system.

If there is a specific regulation within certain countries that deviates from the mentioned standard, it is obligatory to consult Pestan technical support before installing the system itself.

4.1 Pipeline types

The main task of sewage is to discharge (transport) contaminated wastewater from settlements, that is, industry to wastewater treatment plants. This requirement is the basis of the sanitary-hygiene principles and is fulfilled by the hydraulic transport of wastewater. It can be realized in a number of ways, ie sewer systems. Under the sewage system we mean ways of evacuation of different types of wastewater (faecal or sanitary, industrial and atmospheric wastewater). The appropriate sewage system for an inhabited place is selected depending on the local conditions, sanitary requirements and technical and economic indicators. Depending on the method of sewage collection and evacuation, the following sewage systems are distinguished: general (common), separation (separate) and mixed (combined) sewage systems.

4.1.1 General system

The general system is one in which all three types of used water (faecal, industrial and atmospheric) are drained by a single sewer network. Basic quantitative load of general

sewage systems cause atmospheric water, therefore, for general sewage systems, the functional dimensions of the ducts result from the required uptake of atmospheric water. A very important feature of such a sewage system is the large fluctuation of the flow (during rain, atmospheric and used water flow through the channels, while only used water flows through the channels).

4.1.2 Separation system

A sewage separation system is called such a sewage system, where atmospheric and clean industrial waters are drained by a single sewer network, and sewage and used industrial water drained by another duct system. The sewage separation system may be complete and incomplete.

A complete separation system is called the system where both networks of channels are constructed (in the form of buried closed channels).

The incomplete separation system is applied in smaller settlements, where atmospheric water is drained by rigs (open channels), while complete sewage with closed channels is built for the used water.

4.1.3 Mixed system or combined system

A mixed system or combined sewer system is called a sewerage system where in one settlement there are both general and separation sewerage systems (eg separation in newly built parts of settlements and general in existing parts of settlements).

4.2 Substrate characteristics

The first step in designing sewer systems is geotechnical exploration work along the entire pipeline route. Preliminary field and laboratory tests are required to obtain the necessary soil parameters such as soil type and its structure, granulometric composition, volume and groundwater level.

The most important condition for achieving satisfactory installation of pipe systems is the interaction of the pipe and the surrounding soil. The highest support for the installed pipe is given by the soil around the lower half of the pipe in both directions. That's why it's extraordinary important on what type of soil is laid and how the soil is compacted in the area around the pipe.

In general, there are two ways of laying pipes:

1. Laying on natural - unprepared soil;
2. Laying on a base layer (bedding) of special material that is compacted to the required level;
3. In view of the above, in any installation of pipe systems the designer is obliged to determine the conditions for laying the pipes, such as:
4. Soil properties and suitability of local soil application for bedding;
5. Geotechnical properties of soil for the bedding, side and overhead embankment, as well as the way of their installation;
6. Proper pipe strength class.

4.3 Trench Excavation

Regarding the minimum required trench width (according to measurements and depth of laying), the regulations for laying waste water pipes (EN 1610) must be observed. It should take into consideration that too narrow channel adversely affects the required installation (settlement / compression area water), a too wide channel increases the cost of both result in an increase in system load.

4.3.1 The width of the trench

The width of the trench should allow for the proper laying and compaction of the fill material. The minimum width between the pipe and the slope of the trench is bmin = 30 cm. The minimum width of the trench (B) in the crown of the pipe is:

B=D+(2×b_min)

The width of the trench should allow for the proper laying and compaction of the fill material. The minimum width between the pipe and the slope of the trench is bmin = 30 cm. The minimum width of the trench (B) in the crown of the pipe is:

B=1≥4×DN

In general, these conditions apply to pipes with a diameter of DN> 250, since for pipes of a smaller diameter, the trench width (B) satisfies these conditions.

You can see the minimum recommended trench widths in the table below.

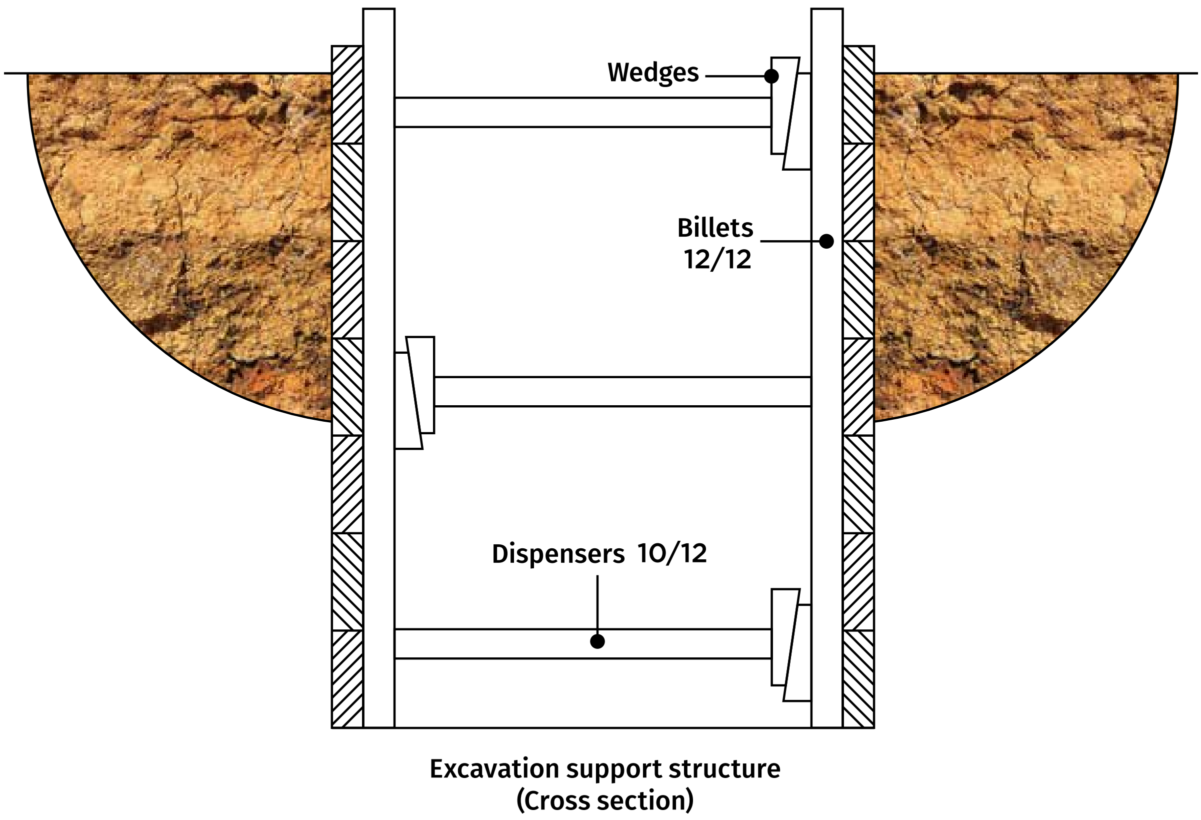
DN	d≤1.00m	1.00m≤d≥4.00m	d≥4.00m
160	0.60	0.80	1.00
200	0.70	0.80	1.00
250	0.75	0.85	1.00
315	0.80	0.90	1.00
400	0.90	1.00	1.10
500	1.00	1.10	1.20
630	1.15	1.25	1.35

Table 3: Recommended trench widths

4.3.2 Excavation Protection and Support

Excavation of the earth up to 100 cm deep can be carried out without excavation of the trench, if the strength of the earth itself allows. Excavation of soil in depths greater than 100 cm may only be carried out with gradual securing of the sides of the excavation. Shoring of the excavation sides is not necessary if the sides are done by angle (natural slope of the terrain), or when digging up to a depth of more than 200 cm.

The trenches and ducts must be constructed to a width that permits the undisturbed work of breaking the sides and the work of the workers in them. The minimum width of trenches and the depth of the channel is determined to 100 cm freely. At a depth of more than 100 cm, the width of the trench or channel must be such that the clear width of the trench, after completion, is at least 60 cm. Example pictures below:



Picture 12: *Example of excavation subgrade*

If more pipes are placed in the trench or channel then the distance between the pipes should be 15 cm. Wood and other materials used to break up the sides of trenches and ducts must, by their strength and dimensions, fit the purpose for which they are intended, in accordance with the applicable technical regulations. that is, standards. The excavation of trenches and canals must be appropriate to the geophysical characteristics, distraction and pressure of the soil in which the excavation is carried out, as well as to the appropriate static calculation. The excavated material from the trenches and canals must be discarded at such a distance from the edge of the excavation that there is no possibility of plunging that material into the excavation. The spacing between the individual formwork elements (excavation side) must be determined in such a way as to prevent the soil from falling apart, in accordance with soil characteristics.

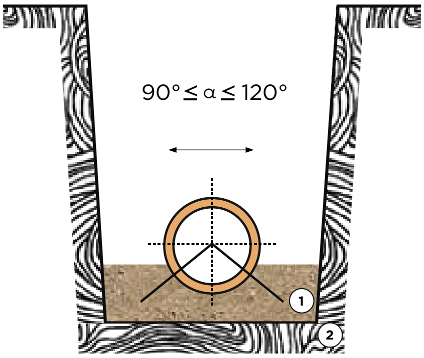
The formwork for supporting the sides of the excavation (trench, canal, pit) must extend at least 20 cm above the edge of the excavation to prevent material from falling off the ground into the excavation.

When ejecting the earth from the excavation, gutters laid on special supports must be used from a depth of more than 200 cm. The entrances shall not be burdened with an amount of excavated material larger than the specified one, which the worker must be familiar with before starting work, and must have an edge protection of at least 20 cm high.

4.4 Placing (laying) pipes in the trench

4.4.1 Laying on natural soil

In some cases it is possible to lay pipes on the bottom of the trench, but only in incoherent dry soils that do not contain larger rocks (> 20 mm), such as gravel, coarse sand, fine sand and sandy clay. In such soil, the pipe is laid directly on a thin (10-15 cm) unbound leveling layer. The purpose of the leveling layer is to raise the bottom of the trench to the required angle and to provide the required fall, and to ensure a stable, uniform bearing of the pipe at an angle of 90º (Picture 1).



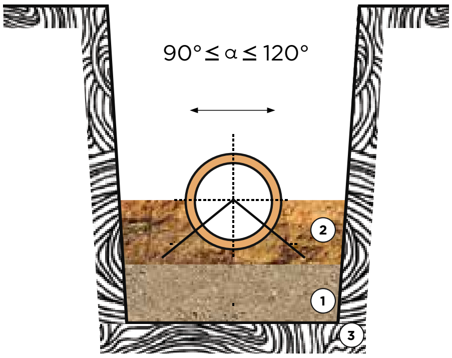
Picture 13: *Laying pipes on natural soil*

1. The bottom of the trench
2. Unbroken leveling layer

4.4.2 Installation with sand beddnig

Installation with sand bedding need to be use in case of:

1. When in favorable natural conditions the trench is mistakenly deeper than the depth of the designed for the installation of tubes;
2. For rocky, cohesive (clay) and muddy soils
3. Poorly bearing soils, such as organic mud and peat; and in all other cases where provided for by the project. Examples of cases from points 1 and 2 are shown in Picture 2.



Picture 14: *Example of installation in a well-supporting soil*

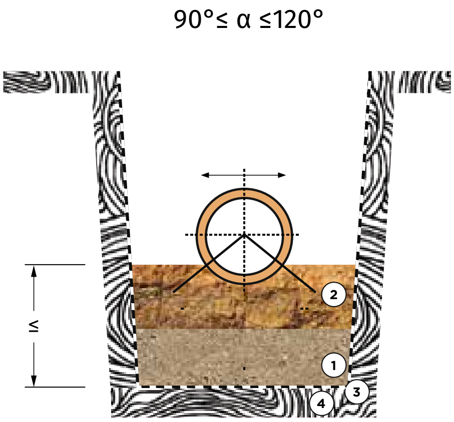
1. The base layer
2. Flattening layer
3. The bottom of the trench

When laying the pipeline on two layers of sand and gravel material with a maximum grain size of 20 mm, it should:

- The base layer is made of well compacted material 25 cm thick (minimum 15 cm).
- and a leveling layer 10 to 15 cm thick, unbroken.

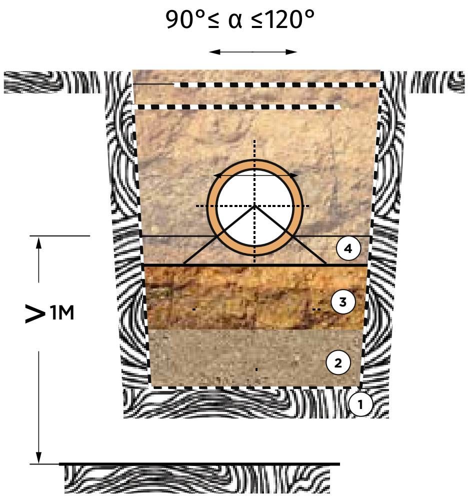
In poorly bearing soils, depending on the thickness of the poorly bearing layer, below the projected pipeline level, two solutions are possible:

1. Where the thickness of the weakly bearing layer is <10m (Figure 3). In this case, the poor bearing soil is excavated and the trench is filled with a well-compacted mixture of broken rock and sand (10: 3 ratio), and the base layer is laid on geotextile.
2. Where the thickness of the weakly bearing layer is> 10 m (Figure 4). In this case, a base layer of 25 cm well compacted mixture of crushed stone and sand is made (1: 3 ratio). Geotextile placement is preferred.



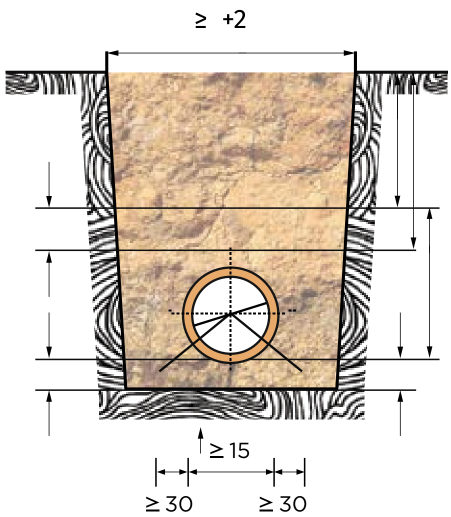
Picture 15: *Example of laying on bad bearing soil thickness ≤ 10 m*

1. Leveling layer
2. Geotextiles
3. A well-compacted base layer
4. The bottom of the trench



Picture 16: *Example of laying on poorly bearing soil with thickness > 10m*

1. The bottom of the trench
2. Broken stone
3. Gravel
4. Sand



Picture 17: *Cross section of the trench*

With proper foundation and leveling, the class and installation density of the material for lateral and over-backfill are equally important for achieving proper pipe fitting. The criterion according to which the selected material suitable for lateral and over-ground backfill is based on achieving the required soil strength after compaction. Suitable materials include broad-graded, naturally-grained materials, with a maximum grain size not exceeding 10% of the nominal pipe diameter or 60 mm, where the smaller value is applicable (table). Backfill material must not contain snow, ice or icy clumps of soil.

Material	Particle diameter [mm]	Note
Gravel, breaking stone	8 - 22, 4 - 16 8 - 12, 4 - 8	the most suitable material, maximum 5 to 20% of 2 mm particles
Gravel	2 - 20	suitable material, not more than 5 to 20% of particles of 0.2 mm
Sand, tiny gravel	0.2 - 20	partially suitable material, not more than 5% of particles of 0.02 mm

Tabela br 4: Svojstva materijala zatrpavanja

4.5 Connection of PVC

Connection of PVC sewage elements is interconnected via couplings with rubber gaskets, which provide waterproof element connection. All pipes and fittings have a socket on at least one end. Pipes that do not have sockets can be connected via double sockets or sliding couplings. Pipes can be cut either with a special pipe cutter or with a hand saw with fine teeth and using a guide as shown in the picture below.

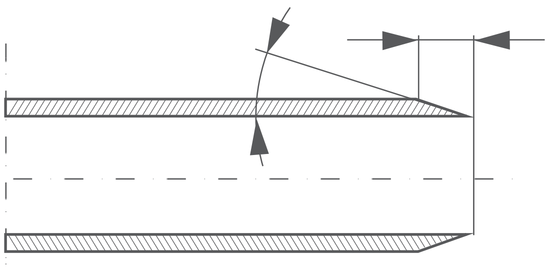
Bonding of pipes with conventional adhesives it is not possible and should not be applied.

The fitting must not be shortened.

Use all protective measures when cutting

Pipe cutting must be done directly on the pipe axis and the cut end of the pipe must be cleaned and trimmed. Make the bevel of the cut end of the pipe fine sandpaper or fine file. There are special cutting tools, which during the cutting form the end of the pipe and make an inclination at the very end of the pipe. The table below shows the required bevel dimensions of the pipe ends.

Picture 18: *Cutting pipes*



Processing the end of the tube at an angle of 15°

Picture 19: *Depiction of required slanting*

DN	110	125	160	200	250	315	400	500	630
S (mm)	3,2	3,2	4	4,9	6,2	7,7	9,8	12,3	15,4
b (mm)	12	12	15	18,5	23	29	36,5	46	57,5

Table No 5: Table of required slanting

After preparing the cut pipe or joining the factory pieces without cutting, the following should be done:

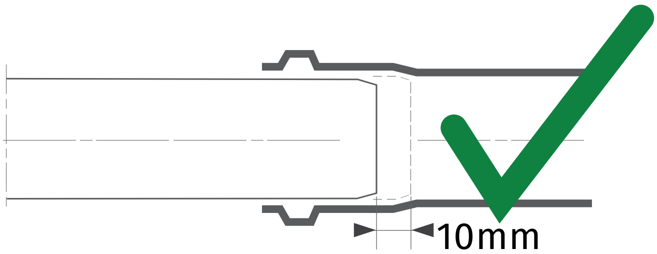
1. Clean the socket and the straight end of the pipe. Clean with a dry cloth or cloth dampened with water

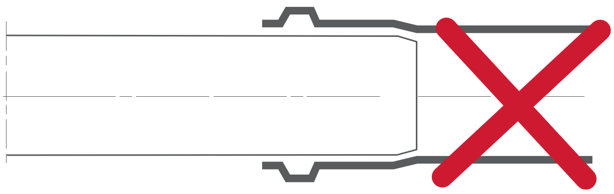
2. After cleaning the pipe, check the condition of the sealing elements.

3. After cleaning and checking the condition of the sealing element, it is necessary to lubricate the flat end of the tube. It is recommended to use Peštan lubricants for this purpose. Petroleum based lubricants should not be used. The sleeve and the sealing rubber band must be dry and clean. They should also be lubricated

4. After the lubricant has been applied to the straight end of the pipe, insert it completely into the socket. It is recommended that the insertion depth of the pipe into the sleeve be marked so that the straight end of the pipe (10-15 mm) can be drawn more accurately. In this way, the pipes are left to elongate or to collect during thermal expansion

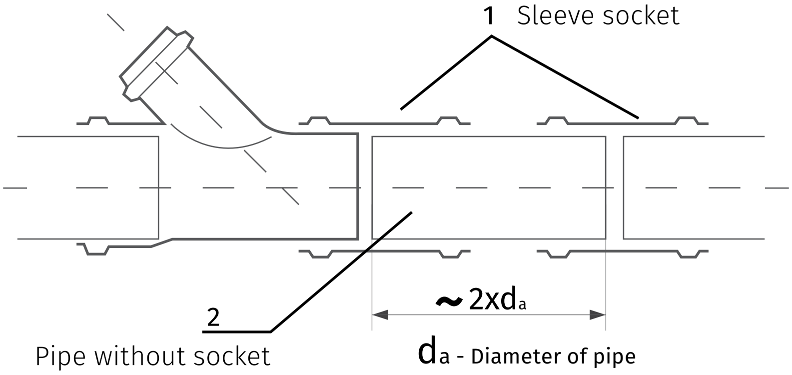
display of properly inserted pipe in the socket:





4.6 Connection of pipes and fittings

When installing the pipeline, pipe cutting occurs, resulting in the appearance of debris from the pipes that do not have a socket on them (pipe smooth on both sides). The picture below shows the method of joining the pipeline with sliding couplings and pipes without sockets. In this case, the pipe without sockets installed between the two couplings must have a length of at least twice the nominal diameter. For example, if the diameter is 160 mm, the minimum length of pipe without sleeve must be 320 mm.



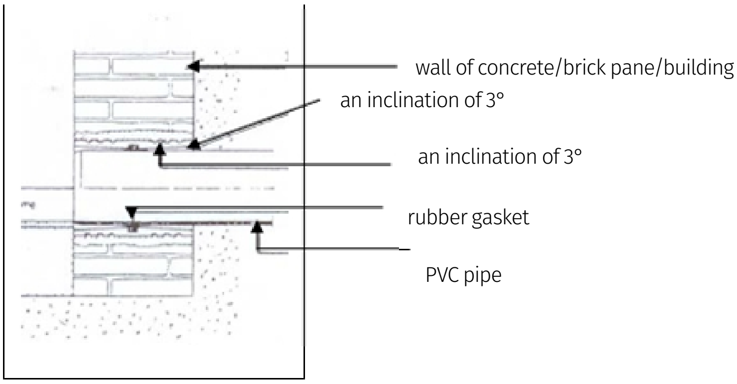
Picture 20: *Coupling of pipes without sleeve with sliding coupling*

When connecting pipes and fittings, follow all the steps as well as for connecting pipes:

1. Clean fitting sleeve and straight end of pipe. Clean with a dry cloth or cloth dampened with water.
2. After cleaning the pipes and fittings, check the condition of the sealing elements
3. After cleaning and checking the condition of the sealing elements, it is necessary to lubricate the straight end of the pipe and the fittings themselves. It is recommended to use Peštan lubricants for this purpose. Petroleum based lubricants should not be used. The sleeve and the sealing rubber band must be dry and clean. They must also be lubricated.

4.6.1 Connecting with shafts and buildings

A special KGF conductor made of PVC, of various dimensions, is used to connect pipes to shafts windows or buildings. The sealing between KGF and the pipe is done with a rubber gasket, which comes with a conductor.



Picture 21: *Connecting pipes to the building shaft*

NOTE: In certain cases, ie larger diameters than DN 125, a lever is necessary for connection. When using a lever, the wooden insert should be placed horizontally in the middle of the sleeve or the pipe itself so that it does not become damaged. When using a hammer to connect the pipe, take care not to damage the pipe and sleeve when winding the chain around the pipe and attaching the hammer to the pipe sleeve itself.

4.6.2 Installing KGF Coupler

1. When concreting an element on the site through which the KGF piece is to be placed, a sufficiently large opening in the formwork must be left at the penetration through the element when sliding through which the KGF piece can be placed and could be co-concreted element concretes.
2. In the case of a prefabricated element, leave a sufficiently large opening through which the KGF piece can be fitted.
3. When installing the KGF piece, make sure that the KGF piece is positioned in the correct direction so that there is no counter-positioned eraser and the inability to connect the pipe to the shaft.
4. After that, concreting KGF pieces in the shaft, taking care that the eraser and the inside of KGF pieces do not become soiled with concrete.
5. After the concreting process, remove the formwork of the concrete element and seamlessly connect the pipes to the concrete element through the mounted KGF piece.

Picture 22: *KGF coupling*

4.6.3 Steep bottom sections

When laying pipes and fittings on steep sections, due to the action of longitudinal force, precautions should be taken bedding, pipe shear, and joint spacing, which is usually achieved in practice by making concrete support blocks. In doing so, the socket must be turned upstream (ie in the counter) in order for the pipes to naturally fill. The number and construction of the supporting blocks depends on the longitudinal fall of the pipeline as well as in the nominal diameter of the pipe. In case of more pronounced falls, support blocks should be placed behind each socket (about every 5m). Any water retained on the slope behind the abutment block should be drained to eliminate flushing.

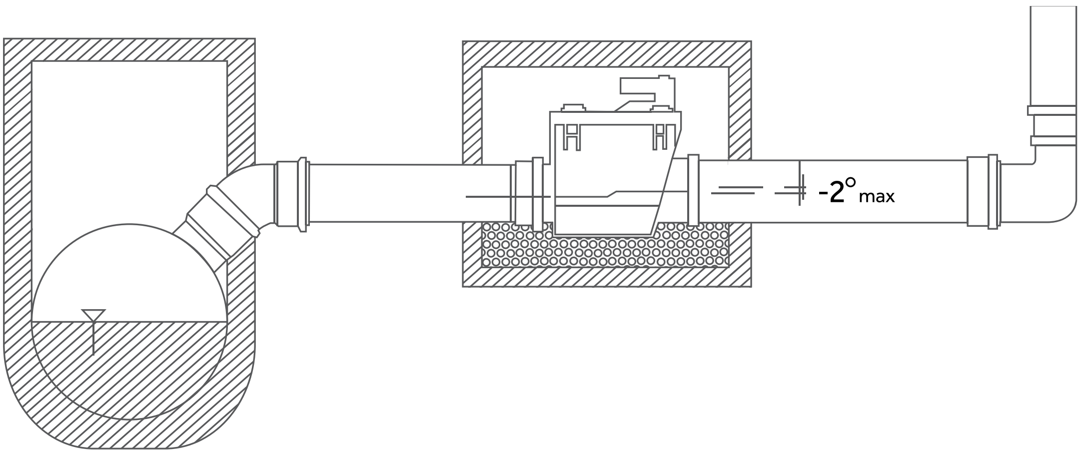
4.7 Installation of a flood prevention device - non-returnable valve

Non-returnable valves are installed in pipelines where there is a possibility of return of water from the street sewer to the facilities due to elevation of water in the sewer system as well as preventing the entry of rodents and other animals through the sewer pipes. Non-return valves are equipped with automatic valves to close the water flow and are in the opposite direction to the intended water flow, and are manufactured in dimensions from ø110 to ø315.

Picture 23: *Non-return valves with one and two valves*

Basic principle of installation:

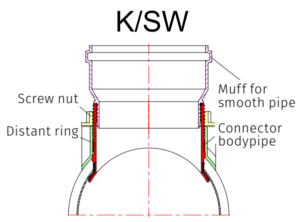
- Non-return valves are easily integrated into smaller manholes available to clean the device itself.
- Do not use sharp objects when cleaning edges.
- The maximum allowable drop when installing a non-return valve is 2%. The following diagram shows the installation diagram of a non-return valve.



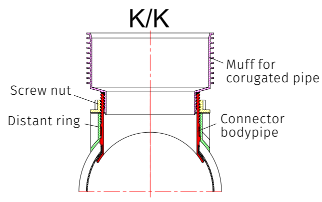
Picture 24: *Non-return valve installation diagram*

4.8 SAG – Saddle after grip

SAG saddle after grip is intended for subsequent connection to the existing pipeline, and in combination with PP STRONG pipes gives quick and easy solution. The joint is safe and watertight, enabled by a specially tapered EPDM eraser on the inside of the SAG.



Technical Drawing No.1:
K / SW - Smooth tube extension



Technical Drawing No.1:
K / K - Corrugated tube extension

Picture 25: *SAG - Saddle after grip*

4.9 Pipeline testing

Testing of piping connections for leakage using measuring tubes or similar test fixtures. Testing is carried out on sections of the pipeline that is not yet covered. To prevent position reversal, the piping may be partially buried, pipe joints should remain uncovered. All piping sections of the pipe under test, including all divisions, are sealed tight and relieved of any pressure. Pipes and fittings are tightened so that the position of the piping does not change during the test, which will ensure the tightness of the joints.

External sewerage testing can be divided into three sections:

- technical inspection,
- Watertight test
- Gas tightness test

The pipeline is tested after assembly and connection of the feed elements and is tested in segments. The segments are isolated through the inspection openings. It should be borne in mind that the highest pressure occurs at the lowest point of the pipeline segment being tested and that there is a maximum permissible pressure of 0.5 bar. It is the obligation of each contractor to make a record of the pipeline test and under these conditions the guarantee given by the Pestan company applies.

Pipeline testing can be tested in two ways:

- Water and
- By air

1. WATER TESTING

Filling with water is carried out in such a way that no air is retained inside the pipe. The pipe is usually filled slowly from the lowest point of the section, so that the air from the pipe exits at the end of the section, through a sufficiently large opening left for this purpose. The test is performed only one hour after filling, so that the remaining air has time to gradually exit the pipeline.
Pressure reading is performed at the lowest point of the measuring section. Gravity tubes are tested by a pressure of 0.5 bar overpressure, measured above the lowest wet point of the section of tube being tested.
The test duration is 30 minutes, in accordance with SRPS EN 1610. If necessary, more water can be added continuously, and then again measured.

2. AIR TESTING

Pipeline testing by the method of pumping air inside the pipeline is significantly faster and more efficient than water testing. The pipeline is filled so that both ends of the pipeline are closed by test balloons, one of which is a passing balloon with a manometer through which air is pumped inside the pipeline.
Pumping is performed up to a pressure of 0.2 bar, followed by a change in pressure. The test takes 5 minutes, in accordance with SRPS EN 1610. If necessary, the air inside the pipeline can be pumped up and then stabilized and re-measured again. When testing pipelines with this method, special attention must be payed to the pipeline getting heavier difficult (securing) before testing begins.

4.10 Backfilling and Compaction

Filling (30 cm above the top of the tube) follows in layers. Up to 1 m of cover can be used lighter and medium compaction devices. Heavy machinery can be used only afterwards.

4.10.1 Compaction level

4.10.1 Compaction level
The required degree of compaction depends on load conditions.

- For traffic areas min. compactness of the the soil in the pipe zone is 90% as modified according to Proctor's density experiment.
- Outside traffic areas, required level of compaction fullness is:
  - 85% according to Proctor's test if thickness if the top layer is > 4.0 m;
  - 90% according to Proctor's test if it's thickness of top layer is <4.0 m.

If compaction is required by modified Proctor of 85%, then:

- Compaction in layers of 0.2 m thickness using vibrating machines (weighing 50-100 kg) with compaction with both tube sides;
- Further made in layers of 0.15 m thickness using vibrating machines (weighing 50-100 kg), it is recommended that the minimum height in this way of the compacted layer be 0.30 m Wheelbase;
- Then it is further made in layers 0.20m thickness using a vibrating machine (weighing 100-200 kg), it is recommended that the minimum height of this tight layer 0.40 m;
- The final layer of 0.10 m thick should be pressed by feet.

The fill of material must be compacted in layers thickness from 10 to 30 cm. Required thickness of overtop backfill is:

- Minimum 15 cm for pipes with diameter Dn> 400;
- • Minimum 30 cm for pipes with diameter Dn <400.

4.10.2 Material compacting

Compacting degree materials depending on conditions loads and exploits need to be presented in the project documentation. Compaction is possible execute in different ways. It is possible to achieve varying degrees of compaction depending on the equipment, thickness of the layers and compressibility of the material. In Table 2. Compaction values for gravel and sand materials are given.

COMPACTING METHODS

Equipment	Weight (kg)	Max thickness (m)		Minimum thickness overhead backfill (m)	Number of passes for getting tightness	
		Gravel, Sand	Clay, sludge		85% Proctors experiment	90% Proctors experiment
Tread	-	0.1	-	-	1	3
Manually ramming	min. 15	0.15	0.10	0.30	1	3
Vibrating rammer	50 - 100	0.30	0.20 - 0.25	0.50	1	3
Vibrating board**	50 - 100	0.20	-	0.50	1	4
Vibrating board	50 - 100 100 - 200 400 - 600		- - 0.20	0.50 0.40 0.80	1 1 1	4 4 4

* before compaction
** in case of bilateral compression relative to the tube

Table No.6: Compaction Methods

4.10.3 Main backfill

Material can be used for the main backfill from the excavation if it is fit to achieve the required compaction and if its maximum grain is less than 300 mm. For pipes with diameters DN <400 and with overburden 15 cm thick, material the main backfill must not contain size grains larger than 60 mm. For traffic areas required is a minimum backbone compaction of 90% according to a modified Proctor density test.

4.11 Pipe Installation in Concrete

Pestans PVC pipes are made of unmixed PVC and can be laid directly in concrete if longitudinal dilation is considered. While watering in concrete tubes should be well secured so to avoid pipeline displacement during installation as not to pipeline displacement occurred during installation concrete. Pipe connections should also be provided protective tape to prevent cement from penetrating to the sealing elements.

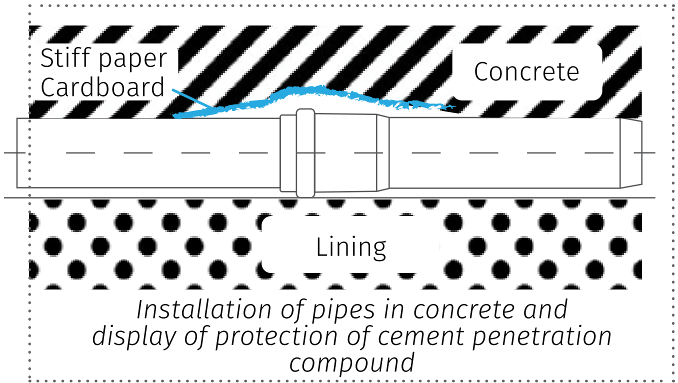


Figure 26: *Installation of pipes in concrete*

If the height of the groundwater relative to the pipe is such that with low filling of the pipe with waste water buoyancy may impair its stability, or it is a considerable amount of external loads, mostly then pipe cladding need to be carried out with concrete. In the first case because of weight gain, and in the other for weight increase resistance to external load. Thickness above the crown of the concrete arose from the static calculation for active load (rarely below 30 cm). When crossing from pipes with concrete lining the pipe laid in the ground should be installed short tube 0.5 m to form a joint connection.

5 USING THE PIPELINE

5.1. Hydraulic calculation of PVC (polyvinyl chloride) pipes for street sewage system

Pestans PVC program is designed for street systems sewers, and is primarily intended for removal all types of wastewater in civil engineering systems. Because of the scope of these systems, as part of this chapters will explain ways of sizing for drainage of used water.

The drainage channel calculation consists of two parts:

- Empirical
- Hydraulic

The empirical part is about pipe sizing horizontal pipeline branches and collection of used water from sewage sites, ie connecting lines.

This part of the calculation is done empirically because of frequency of a large number of factors that on capacity the connection line is affected by: flow variability wastewater, flow rate variability, naturalness, diversity (filling points), variability in the number of persons, various lengths of time system usage and the presence of air and gases in the network. The hydraulic part is related to the calculation gravity sewer system and selection gravity flow parameters in pipelines, at their partial fulfillment. The goal of hydraulic calculation of a sewer system is a choice the most economical pipe diameter for the appropriate flow. There are several reasons for this: plugging in households street sewer connections, speed changes streams in channels...

5.1.1. Introduction

For evacuation of excess water from the territory of the settlement sewer or sewer systems are being built. Every modern and tidy settlement owns its own sewer network which the water used is carried to the plant for purification before discharge into the recipients (water receivers). Surplus waters in the territory settlements are considered used water from households, institutions and industry, then water which fall in the form of an atmospheric precipitate settlements, and in some cases so-called “other people’s” water which reach the sewers via poor quality pipe joints or through inspection shafts. Wastewater means a mixture different waters, where each component has its own composition, that is, changed the original chemical composition and physical properties. Depending on the origin and characteristics, waste waters are divided into four categories:

- Household water used (fecal or sanitary wastewater)
- Industrial water used
- Atmospheric waters
- Municipal wastewater

The objects and appliances they collect used water from the place where they are created and taken to the place for purification or discharge into a recipient called sewage system or sewage system. The sewage system consists of the following group of objects:

- Sewer or sewer network, respectively secondary (secondary) and main (primary) a collector network used to water collected and discharged to the treatment plant
- Sewage network buildings (pumping stations, audit shafts, home connections, etc.) to which enables proper functioning, management and network maintenance
- Wastewater treatment plant, by which the water used is purified to degree that is in accordance with the prescribed standards
- Discharges that are purified (or unpurified) used water is discharged into the water receiver (recipient)

5.1.2. Variant solutions for wastewater drainage from settlements

Modern construction practice in construction takes several basic variants of sewage solutions and methods of wastewater drainage settlements. There are basically three variants of the code sewage disposal from a particular populated place, as follows:

1. Free-flow wastewater treatment in sewage collectors, as well as pumping applications gravity station sewer system
2. Sewage disposal with periodic by flowing under pressure (the pressure in the pipeline is higher of atmospheric), with a large number of pumping stations and long thrust conduits-sewage under by pressing
3. Sewage disposal with periodic flow, creating a vacuum (pressure in the pipeline is smaller than atmospheric), using vacuum pumping cell-vacuum sewer Gravity sewer system with flow with Free water mirror is the most common a way to evacuate used water from inhabited environment in contemporary construction practice and has widespread use in our midst, due to a number of advantages in in relation to the vacuum system and the pressure system.

The main feature of this method of evacuation of waste water is that the flow is the free flow in the pipelines with water mirror, allowing it to flow freely in the pipeline and odor removal. In the pipeline is required provide such flow that it is not enabled precipitation of suspended solids in the water used, and this is achieved by selection of such slope (fall) of the pipeline it provides the occurrence of self-cleaning speed in sewers pipelines. With gravity sewers easy and simple control is provided and collector maintenance and are set up for this purpose inspection shafts or shafts, approximately every 50 m (in dependencies on pipeline diameter). In the event of a crash on the gravity sewer, fast is enabled detection and response to the elimination of the observed accident, and gravity sewer also allows direct connection of each home connection after building a basic sewer network in the street.

5.1.3. Hydraulic calculation of free flow sewage network - gravity the system

When hydraulic calculation is being done “PEŠTAN” sewage pipes were adopted to be used water flows through the sewer network with a free water mirror and at the same time channels only partially filled with used water. There are several reasons for this: it is the simplest resolved connection of home connections to the street sewage; changes in flow velocity in channels caused by flow changes are much smaller than would be the case with pressure flow; by flowing fresh air over the waste water a variety of gases are provided which can be extracted from the wastewater while at the same time water aeration is done. On the benefits of the gravity system sewage system and its use and functioning there were words in Chapter 3. Hydraulic calculation gravity sewer system implies selection of gravity flow parameters in pipelines, at their partial fulfillment. Aim for hydraulic calculation of a sewer of the system is to choose the most economical pipe diameter for proper flow, to which it is dimensioned pipeline (sewer system is dimensioned to the maximum hourly flow of water used which was discussed in Chapter 4). It is in nature wastewater flow with free water the mirror takes place in the sewer network in conditions turbulent-transient and non-stationary modes. The unsteady or unstable regime is a consequence character of the functioning of the sewer network in the observed cross-section of a channel or collector, where over time the water depth and velocity varies, respectively flow. However, the practical calculation of hydraulic parameters (flow and flow rates used water) partially filled sewage networks in Free-flow flow conditions are enforced assuming turbulent-transient, stationary and uniform flow regime by individual sections of the network. These assumptions on the basis for the sewer network budget in free flow conditions are as follows:

1. Depth of water used (h), flow surface cross sections (F) and flow velocity (v) are constant in all cross sections observed sewage sections over a period of time moment
2. Drop in energy line (IE), drop in waterline mirrors (IOs) and tube bottom drop (ID) are equal — Figure 2.

These simplifications that are inroduced don't create great errors as consequences by the opportunity sewage network hydraulic calculation. You can say that designing a sewer system is not just a result of a theoretical knowledge, already far more experience. The calculation applies a whole series of guidelines, which were created as a result of practical long-standing experiences as well as simplifications of theoretical knowledge. The guidelines are just a good starting point for designing, or making project decisions and solutions, which should always be tailored to local ones characteristics and experiences.

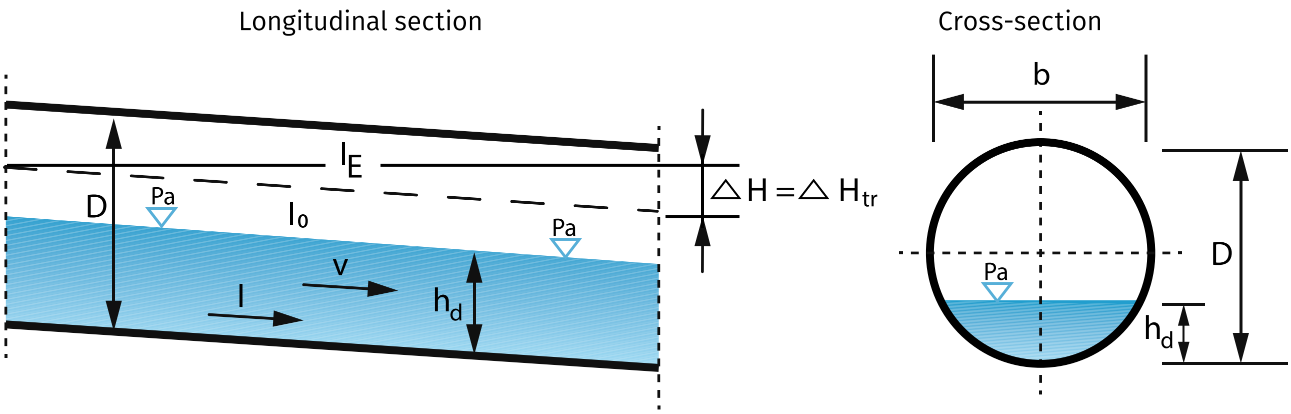


Figure 26: *Uniform flow pattern in a partially filled round sewer*

For hydraulic calculation of PVC sewage systems pipes of the PEŠTAN Aranđelovac factory with free water mirror flow (gravity flow) and for a water with temperature of 10 ˚C, tables are presented in which they are shown results of hydraulic calculation (waste flows full profile water and flow rates waste water for full profile). Also, a table with water flow rates and velocities flow in PVC sewage pipes at partial profile completions, because this table serves to the designer executed the actual fulfillment budget waste water profiles (in cm or mm) as well as calculation of actual effluent flow rate in pipelines. Values of wastewater flow rates in PVC sewer pipes (for a fully filled profile and uniform flow) are obtained on the basis of Prandtl-Colebrook's formulas, because they turned out to be the results obtained by applying this equation are closer of reality, since it flows in a sewer network enters turbulent-transition mode:

- $$v=-2\log\left(\frac{2.51\cdot\gamma}{d\cdot\sqrt{2g\cdot I\cdot d}}+\frac{k}{3.71d}\right)\cdot\sqrt{2g\cdot I\cdot d} \qquad (1)$$

wherein:
v - mean velocity of wastewater flow in the pipeline (m/s)
Pipeline Bottom I-Drop (Power Line Drop) (‰)
γ - kinematic viscosity coefficient (m^2/s)
k - absolute (drive) pipe wall roughness (mm)
g - acceleration of Earth's gravity; g = 9.81 m/s^2
d - pipe inner diameter (m)

The preceding term for the rate of effluent flow at full profile (Form No. 1) was obtained at based on the Darcy-Weisbach equation for calculation falling energy lines due to friction along the length of the pipe (ie to calculate friction energy losses along the pipe):

(2)
- $$I = I\_0 = I\_E = \Delta H/L = 〖\Delta H〗\_tr/L = \lambda/D \; v\^2/2g$$
(2)

- $$\Delta H_{tr} = \lambda\frac{L}{d}\cdot\frac{v^2}{2g}$$

where are they:
v - mean velocity of wastewater flow in the pipeline (m/s)
L - length of pipe (m)
ΔHtr - hydraulic friction losses (m)
d-pipe inner diameter (m)
g-acceleration of Earth's gravity; g = 9.81 m/s^2
λ-coefficient of friction resistance

The coefficient of friction resistance λ, over which from the form No.2 we get a drop in the energy line due to friction in the pipe, it is calculated via Prandtl-Colebrook's formula, which encompasses a turbulent transition regime and asymptotically satisfies the turbulent rough and turbulent smooth mode:

- $$\frac{1}{\sqrt{\lambda}} = -2\cdot\log\cdot\left(\frac{k}{3.71\cdot d}+\frac{2.51}{\mathrm{Re}\cdot\sqrt{\lambda}}\right) \qquad (3)$$

As noted above, the flow is waste water in the sewer network is getting turbulent transient flow regime, so the friction coefficient is λ function of both the Reynolds number and the inside diameter pipe and the absolute (drive) roughness of the pipe wall, which can also be observed from Form No.3.

In form number 3 we can notice that the coefficient friction resistance, among other things, depends on value Reynolds number:

- $$Re=\frac{v \cdot d}{\gamma} \quad (4)$$

where they are:
v - mean velocity of wastewater flow in the pipeline (m/s)
d - pipe inner diameter (m)
γ - kinematic viscosity coefficient for water (m^2/s).

So by combining Form No.3 for computation coefficient of friction resistance, Form No.4 for computation values of Reynolds number and form no.2 for calculating the fall of the energy line (by uniform flow that occurs in sewage collectors the drop in the energy line equals the drop in the water level mirrors and fall of the bottom of the pipeline) a form is obtained No.1 for calculating the flow rate of wastewater at fully filled sewer pipe. Flow rate of wastewater in PVC sewage pipes (at full profile) are obtained using the continuity equation:

Q = v F (5)

F = d2π/4 (6)

wherein:
v - mean velocity of water flow in pipes (m / s)
F - pipe cross-sectional area or flow-through area (m^2)
Q - flow rate of water (l/s)
d - pipe inner diameter (m)

The final expression form for the flow rate is waste water in sewage pipes at full profile, is obtained when in Form No.5, the flow velocity waste water replaced by Form No.1 and surface the cross-section of the pipe F is replaced by the form No.6:

- $$Q=-\log\cdot\left(\frac{2.51\cdot\gamma}{d\cdot\sqrt{2\cdot g\cdot I\cdot d}}+\frac{k}{3.71\cdot d}\right)\frac{d^2\cdot\pi}{2}\sqrt{2\cdot g\cdot I\cdot d}$$

(7)

In the above forms we see that the value of the coefficient of friction resistance, and therefore team and value of wastewater flow rate i value of wastewater flow at full profile depend on the driving roughness of the pipe wall. Namely, in practice, the initial roughness was shown to be pipe wall, made by a sewer pipe manufacturer analyzes and determines laboratory on new ones tubes completely inadequate for hydraulic budget, because it ignores the assembly character sewage networks and all its power plants properties. The assembly character of the sewer network covers all local energy losses that are occur on a single pipeline (forks, knees, arches) etc.) and it also covers the existence of auditing shafts (manholes) on the sewer network and pipe joints. Under drive characteristics one sewer system goes without saying altered wastewater quality relative to potable, containing suspended in its composition matter, coarse particles, sand, various others inorganic and organic matter, which are deposited in tubes and alter its factory roughness. Of course, to this deposition of suspended matter in sewage collectors come after a certain exploitation period and use of sewage system networks, but this exploitation period must to consider, because to the designer the essential behavior is and proper functioning of the network in working conditions. To meet the designers, to be covered a specific exploitation period of use sewer networks and to get it right functioning of the sewage network in the workrooms in the circumstances, the term propulsion (real roughness). Because of all this, real (drive, absolute) roughness of sewer pipes is much higher than the factory declared value, established by laboratory tests. However, how the required profile dimensions and functioning designed sewage networks are directly dependent from the magnitude of the assumed roughness of the pipe wall (less roughness causes higher throughput channels), there is an aspiration for designers to chooses as little roughness as possible. Therefore, it is recommended to the designers, since the actual roughness is very difficult to determine, for the size of the driving roughness select the middle values obtained on the basis of tests, measurements and tests carried out experiences so far. For the size of the drive wall roughness of PVC sewer pipes (k) ‘PESTAN’ recommends selection in accordance with ATV-A-110E, 10 Standards for the Hydraulic Dimensioning and the Performance Verification of Sewers and Drains (Table 2):

Scope	Drive roughness k (mm)
Channels with connectors and special panes; complex profile channels and channels complex profile built on site (masonry, concrete); channels from non-standard pipes	1,50
Channels with shafts, turns and connections (up to DN 1000); channels special panes (for all DNs).	0.75
Straight sections of canals with windows	0.50
Flat sections of canals without shafts; pressure sections; siphons	0.25

Table 6: Roughness values according to ATV-A-110E, 10.

Except for these values of the coefficients absolute of the roughness of the pipe wall given in the table above, hydraulic calculation of the factory PVC pipelines 'PESTAN' was executed for three other selected values absolute roughness coefficient: k = 0,125 mm; k = 1.0 mm and k = 1.25 mm, which are often represented in domestic and foreign literature and which are often used for hydraulic sewer calculation PVC piping. So for each of these seven values of the coefficient of absolute wall roughness pipes individually, 'PEŠTAN' was created by a spreadsheet hydraulic calculation of PVC sewer pipes (wastewater flows for full profile are calculated and effluent flow rates for full profile). So, designers were given the opportunity to select the most favorable absolute value pipe wall roughness, using standard ATV-A-110E, 10, and also using personal experience and data from literature, and were also given the opportunity to perform a hydraulic calculation for multiple values absolute roughness of the pipe wall and yes afterwards make a comparison of the results obtained and those adopted diameter and choose a more affordable and cost-effective variant. The value of the kinematic viscosity coefficient is $\gamma = 1.31 * 10\text{-}6\ m^2/s$, for a water temperature of 10 ˚C. As for the selected values of the bottom drop pipelines, they range from 0.1 ‰ to 50 ‰ and for these selected values the bottom of the pipeline falls wastewater flow rate in full sewer profiles as well as flow rate in full profiles were calculated. It is also important to emphasize that local losses in sewage collectors do not enter in calculation because they are included in the drive roughness. This recommendation does not apply to individual supporting facilities on the sewer network (siphons, drains, etc.) and suppresses pipelines at pumping stations when all local losses must be taken individually.

5.1.4. Minimum falls of the pipeline bottom

When laying "PEŠTAN" sewer pipes special attention should be paid to longitudinal decline pipes especially to the minimum. Since it is flowing in sewage collectors gravitationally and that in the used (waste) water is certain amount of sediment drawn (suspended particles), the minimum longitudinal fall represents that slope of the pipe which, in the gravitational flow of the water used, provides the energy needed to pull the coating that is, preventing the precipitation of suspended ones particles in pipelines. Minimum longitudinal fall represents the technical-economic category. By applying larger longitudinal falls it is secured greater traction or greater certainty that it will not settle to suspended matter but at the same time, in lowland settlements in particular, significantly increase the cost of sewer construction. There are very extensive theoretical considerations from which resulted in various sizes recommended minimum longitudinal falls. Since it is done on the techno-economic category, each of these recommendation can be attacked or defended. Minimal longitudinal falls can be obtained by using certain empirical patterns, and the pattern that most commonly used in domestic and foreign engineering practice is:

• $I_{min} = 1/d$

In this pattern, size d represents the intrinsic diameter of sewer pipe in (mm), and I_{min} represents the minimum longitudinal slope of the pipe. If apply this form to 'PESTAN' sewer PVC pipes will be given the following values of minimum longitudinal pipeline falls (which are date tabulated):

DN	Class of pipes	d (mm)	Imin (‰)
110	SN4,SN8	103,6	9.65
125	SN4	118,6	8.43
125	SN8	117,6	8.50
160	SN2	153,6	6.51
160	SN4	152	6.58
160	SN8	150,6	6.64
200	SN2	192,2	5.20
200	SN4	190,2	5.26
200	SN8	188,2	5.31
250	SN2	240,2	4.16
250	SN4	237,6	4.21
250	SN8	235,4	4.25
315	SN2	302,6	3.30
315	SN4	299,6	3.34
315	SN8	296,6	3.37
400	SN2	384,2	2.60
400	SN4	380,4	2.63
400	SN8	376,6	2.66
500	SN2	480,4	2.08
500	SN4	475,4	2.10
500	SN8	470,8	2.12

Table No.7: Table of required min falls depending on the diameter and class of pipe

It should be emphasized that the values of the nominal and inside diameter of PVC sewer pipes as well a class of pipes are taken from Tables No.1-7, and on the basis thereof the inner diameter of the PVC pipes it produces 'PESTAN' calculated minimum longitudinal falls pipeline according to the above form. Long falls and velocities of wastewater flow in the pipeline are linearly dependent magnitudes. Therefore, when talks about minimum and maximum speeds, can are talking about both minimum and maximum drops. The velocity in the pipeline is due to the longitudinal slope pipes, so design is simplified with knowledge of the limitations of longitudinal falls. The downs are in function of the shape and size of the profile, as in function of the roughness of the pipe material. Apply the budget form above of minimum longitudinal falls represents very a sharp criterion for the calculation of minimum longitudinal pipeline crashes and thus makes it difficult to achieve values of minimum longitudinal falls they need to satisfy sewer collectors. Thus, for determining minimum pipe crashes of PVC, the following diagram may be applied, on which it is depicted dependence of minimum longitudinal fall pipes as a function of transverse profile-internal diameter PVC pipes (in the case of round profiles):

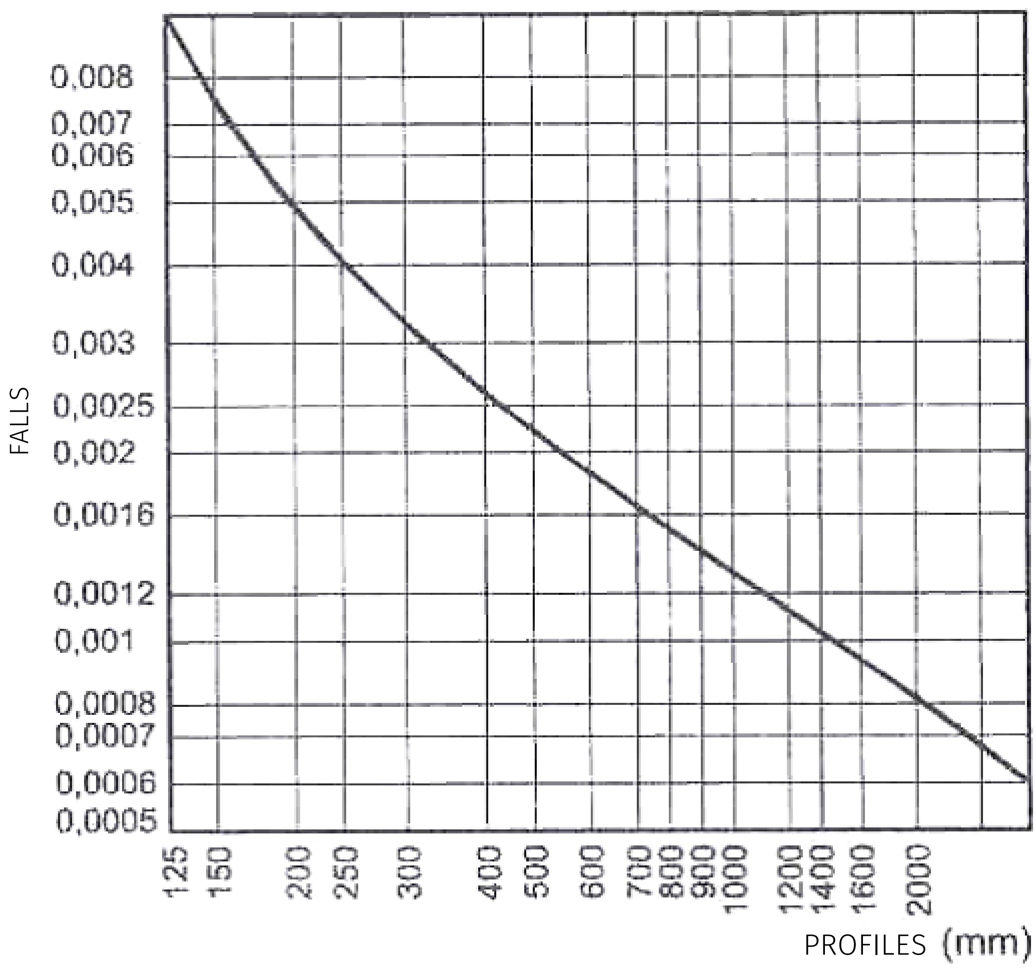


Diagram no. 1: Minimum falls when installing PVC pipes

5.1.5. Minimum pipe diameters

In the initial branches (sections) of the sewer networks, the calculation flow is very small, so it would according to hydraulic calculus got extremely small channel dimensions. For the reason that wastewater is frequent they also carry large waste materials that they can cause clogging of the duct, which sometimes gets on keep the precipitate at the bottom of the channel and substantially reduce free channel profile, which at the beginning of the channel sections considerable hydraulic loading can occur and to facilitate duct cleaning it is restricted use of the smallest channel or collector profiles. Thus, e.g. years of research in Russia and indicated to Germany that the average annual number the clogging of the profile depends directly on the dimensions profiles. These studies have shown that he is average annual number of channel clogs at profile 200 mm is twice smaller than profile 150 mm, that is, at 300 mm profiles over three times smaller than 200 mm profile. On the other hand, practice has shown that there is no need for special saving in the dimensions of the smallest profiles, future that when building sewer networks (especially for smaller profiles up to ≈ 300 mm) larger part of the investment cost (70 to 80%) is waste to supporting works (excavation, trench excavation, loosening, groundwater evacuation, drafting placenta, backfill, removal of excess material etc.), while the pipe material itself is smaller (15 to 30%), depending on profile size, depth excavation, soil categories, etc. Minimum diameter pipe also represents a technical-economic category. In practice, for a minimum pipe diameter, adopts Ø 200-300 mm diameter for sewage. For mixed sewage sewage and atmospheric waters, for a minimum pipe diameter Ø 300-400 mm diameters are adopted.

5.1.6. Degree of channel filling

The degree of filling of a sewer pipe represents reserve element in production picks of used water and the necessary space for maintaining the used water in an aerobic state. As noted above, the flow of water in sewage pipes the most common flow is with with a free mirror (if done correctly home connection, duct venting, drifting away of floating atter etc.). In case of wastewater level in sewage collectors is exceeded a certain value of pressure flow in pipes occurs pressure flow. To avoid this, it enforces the collector charge height limitation, depending from the size (inner diameter) of the collector. The following fill heights for round are recommended PVC profiles:

For d = 200-300 mm; hp = 0.60xd
For d = 350-450 mm; hp = 0.70xd
For d = 500-900 mm; hp = 0.75xd

wherein:
hp - collector charge height
d - Inner diameter of PVC sewer pipe

Accordingly, the calculated charge height (for relevant flow) must be equal to or less than the maximum allowable channel fill sizes.

***Hydraulic tables** for Peštan PVC tubes are available on the company's website Peštan in the download section of PVC KG pipes and fittings.*
Download the tables at the link:
www.pestan.net/en/pvc-kg-cevi-i-fitting
or by scanning a QR code:

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.1: roughness coefficient k = 0,125 mm (1/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,074	0,623	0,082	0,902	0,081	0,881	0,099	1,825	0,098	1,774	0,097	1,730	0,116	3,352	0,115	3,258	0,114	3,166	0,135	6,122	0,134	5,945	0,133	5,797	0,159	11,398	0,157	11,097	0,156	10,801	0,187	21,624	0,185	21,056	0,184	20,498	0,217	39,301	0,215	38,218	0,214	37,239
0,2	0,110	0,925	0,121	1,336	0,120	1,306	0,145	2,694	0,144	2,618	0,143	2,554	0,170	4,934	0,169	4,797	0,168	4,662	0,198	8,988	0,197	8,729	0,196	8,514	0,232	16,694	0,231	16,254	0,229	15,822	0,273	31,595	0,271	30,769	0,269	29,955	0,316	57,302	0,314	55,729	0,312	54,305
0,3	0,138	1,162	0,152	1,678	0,151	1,639	0,182	3,376	0,181	3,282	0,180	3,201	0,213	6,174	0,211	6,003	0,210	5,835	0,248	11,230	0,246	10,908	0,245	10,639	0,290	20,830	0,288	20,283	0,286	19,745	0,340	39,370	0,338	38,342	0,335	37,330	0,394	71,317	0,391	69,363	0,388	67,595
0,4	0,162	1,366	0,178	1,970	0,177	1,925	0,214	3,958	0,212	3,848	0,211	3,753	0,249	7,232	0,248	7,032	0,246	6,835	0,290	13,142	0,288	12,764	0,286	12,451	0,339	24,351	0,337	23,712	0,334	23,084	0,397	45,982	0,394	44,783	0,392	43,603	0,459	83,226	0,456	80,949	0,453	78,888
0,5	0,184	1,547	0,202	2,230	0,201	2,179	0,242	4,476	0,240	4,352	0,238	4,245	0,282	8,171	0,280	7,945	0,278	7,723	0,328	14,838	0,325	14,412	0,323	14,059	0,382	27,473	0,380	26,754	0,377	26,046	0,447	51,842	0,444	50,491	0,442	49,162	0,518	93,773	0,514	91,210	0,511	88,890
0,6	0,203	1,712	0,223	2,466	0,222	2,411	0,267	4,947	0,265	4,810	0,264	4,692	0,311	9,026	0,309	8,776	0,307	8,531	0,362	16,379	0,359	15,910	0,357	15,520	0,422	30,310	0,419	29,517	0,416	28,737	0,493	57,162	0,490	55,674	0,487	54,210	0,570	103,345	0,567	100,522	0,563	97,968
0,7	0,221	1,864	0,243	2,685	0,242	2,625	0,291	5,383	0,289	5,234	0,287	5,105	0,338	9,815	0,336	9,544	0,334	9,278	0,393	17,803	0,390	17,293	0,388	16,870	0,458	32,928	0,455	32,067	0,452	31,220	0,536	62,070	0,532	60,456	0,529	58,867	0,619	112,172	0,615	109,110	0,611	106,340
0,8	0,238	2,007	0,262	2,890	0,260	2,825	0,313	5,790	0,310	5,630	0,308	5,492	0,364	10,553	0,361	10,262	0,359	9,976	0,422	19,132	0,419	18,585	0,417	18,130	0,492	35,372	0,489	34,448	0,486	33,539	0,575	66,651	0,571	64,918	0,568	63,213	0,665	120,407	0,660	117,123	0,656	114,150
0,9	0,254	2,142	0,279	3,083	0,278	3,014	0,333	6,174	0,331	6,003	0,329	5,856	0,388	11,247	0,385	10,937	0,382	10,633	0,450	20,384	0,447	19,802	0,444	19,317	0,524	37,673	0,521	36,690	0,517	35,722	0,612	70,962	0,608	69,118	0,605	67,304	0,707	128,157	0,703	124,662	0,698	121,500
1	0,269	2,270	0,296	3,266	0,294	3,193	0,353	6,538	0,351	6,357	0,348	6,201	0,411	11,906	0,408	11,578	0,405	11,256	0,476	21,571	0,473	20,955	0,470	20,443	0,554	39,855	0,551	38,814	0,547	37,791	0,648	75,047	0,644	73,098	0,639	71,181	0,748	135,498	0,743	131,805	0,738	128,463
1,1	0,284	2,392	0,312	3,441	0,310	3,364	0,372	6,885	0,369	6,695	0,367	6,531	0,432	12,534	0,429	12,189	0,426	11,850	0,501	22,703	0,498	22,055	0,495	21,515	0,583	41,933	0,580	40,839	0,576	39,763	0,681	78,939	0,677	76,889	0,673	74,873	0,787	142,490	0,781	138,608	0,776	135,094
1,2	0,298	2,508	0,327	3,608	0,325	3,527	0,390	7,217	0,387	7,018	0,385	6,846	0,453	13,136	0,450	12,774	0,447	12,419	0,525	23,786	0,521	23,107	0,518	22,542	0,611	43,922	0,607	42,776	0,603	41,649	0,713	82,662	0,709	80,517	0,704	78,406	0,823	149,178	0,818	145,115	0,813	141,438
1,3	0,311	2,621	0,341	3,769	0,339	3,685	0,407	7,537	0,404	7,329	0,402	7,149	0,473	13,714	0,470	13,336	0,466	12,966	0,548	24,826	0,544	24,118	0,541	23,529	0,638	45,832	0,633	44,637	0,629	43,461	0,744	86,237	0,739	84,000	0,735	81,799	0,859	155,599	0,853	151,363	0,848	147,529
1,4	0,324	2,729	0,355	3,925	0,353	3,836	0,424	7,845	0,421	7,628	0,418	7,442	0,492	14,270	0,489	13,878	0,485	13,493	0,570	25,828	0,566	25,092	0,563	24,479	0,663	47,672	0,659	46,429	0,655	45,207	0,774	89,681	0,769	87,355	0,764	85,067	0,893	161,784	0,887	157,380	0,882	153,395
1,5	0,336	2,834	0,369	4,075	0,367	3,983	0,440	8,142	0,437	7,918	0,434	7,724	0,511	14,808	0,507	14,401	0,504	14,002	0,592	26,796	0,587	26,033	0,584	25,397	0,688	49,449	0,684	48,161	0,679	46,893	0,803	93,007	0,798	90,596	0,792	88,223	0,926	167,756	0,920	163,191	0,914	159,060
1,6	0,348	2,935	0,382	4,220	0,380	4,125	0,455	8,430	0,452	8,198	0,449	7,998	0,529	15,330	0,525	14,908	0,521	14,494	0,612	27,734	0,608	26,944	0,604	26,286	0,712	51,170	0,707	49,837	0,703	48,526	0,830	96,227	0,825	93,732	0,820	91,279	0,958	173,536	0,952	168,815	0,946	164,543
1,7	0,360	3,034	0,395	4,361	0,393	4,263	0,470	8,710	0,467	8,470	0,464	8,263	0,546	15,835	0,542	15,400	0,539	14,973	0,632	28,644	0,628	27,828	0,624	27,149	0,735	52,839	0,730	51,463	0,726	50,110	0,857	99,349	0,852	96,775	0,846	94,242	0,989	179,142	0,982	174,270	0,976	169,860
1,8	0,371	3,130	0,407	4,498	0,405	4,397	0,485	8,982	0,482	8,735	0,479	8,521	0,563	16,327	0,559	15,878	0,555	15,438	0,652	29,528	0,647	28,687	0,643	27,987	0,758	54,461	0,753	53,043	0,748	51,649	0,884	102,383	0,878	99,731	0,872	97,121	1,019	184,589	1,012	179,569	1,006	175,027
1,9	0,383	3,223	0,419	4,632	0,417	4,528	0,499	9,247	0,496	8,992	0,493	8,773	0,580	16,805	0,576	16,344	0,572	15,890	0,671	30,388	0,666	29,523	0,662	28,803	0,780	56,040	0,775	54,582	0,770	53,147	0,909	105,336	0,903	102,608	0,898	99,924	1,048	189,889	1,041	184,726	1,035	180,054
2	0,393	3,314	0,431	4,762	0,429	4,655	0,513	9,505	0,510	9,243	0,506	9,018	0,596	17,271	0,591	16,797	0,587	16,332	0,689	31,227	0,685	30,338	0,680	29,599	0,801	57,579	0,796	56,081	0,791	54,607	0,934	108,214	0,928	105,412	0,922	102,655	1,077	195,054	1,070	189,752	1,063	184,954
2,1	0,404	3,403	0,443	4,889	0,440	4,779	0,527	9,757	0,523	9,488	0,520	9,257	0,611	17,727	0,607	17,240	0,603	16,762	0,708	32,046	0,703	31,134	0,698	30,375	0,822	59,081	0,817	57,544	0,811	56,032	0,958	111,022	0,952	108,148	0,946	105,320	1,104	200,093	1,097	194,656	1,090	189,734
2,2	0,414	3,490	0,454	5,013	0,451	4,901	0,540	10,003	0,536	9,728	0,533	9,491	0,627	18,172	0,622	17,673	0,618	17,183	0,725	32,846	0,720	31,911	0,716	31,134	0,842	60,548	0,837	58,973	0,832	57,424	0,982	113,766	0,976	110,821	0,969	107,923	1,132	205,016	1,124	199,446	1,117	194,404
2,3	0,424	3,575	0,465	5,135	0,462	5,020	0,553	10,244	0,549	9,962	0,546	9,720	0,642	18,607	0,637	18,097	0,633	17,595	0,742	33,628	0,737	32,672	0,733	31,876	0,862	61,983	0,857	60,371	0,851	58,785	1,005	116,449	0,999	113,435	0,992	110,470	1,158	209,831	1,151	204,130	1,144	198,971
2,4	0,434	3,658	0,476	5,254	0,473	5,136	0,566	10,480	0,562	10,192	0,558	9,944	0,656	19,033	0,652	18,511	0,647	17,998	0,759	34,394	0,754	33,416	0,749	32,602	0,882	63,388	0,876	61,740	0,871	60,118	1,028	119,075	1,021	115,994	1,015	112,962	1,184	214,543	1,176	208,716	1,169	203,441
2,5	0,444	3,740	0,486	5,371	0,484	5,251	0,578	10,712	0,574	10,417	0,571	10,163	0,671	19,451	0,666	18,917	0,662	18,393	0,776	35,145	0,771	34,146	0,766	33,314	0,901	64,764	0,895	63,081	0,889	61,424	1,050	121,649	1,043	118,501	1,037	115,404	1,210	219,160	1,202	213,208	1,194	207,821
2,6	0,453	3,820	0,497	5,485	0,494	5,363	0,591	10,938	0,587	10,637	0,583	10,378	0,685	19,860	0,680	19,316	0,675	18,781	0,792	35,881	0,787	34,861	0,782	34,012	0,920	66,114	0,914	64,396	0,908	62,705	1,072	124,172	1,065	120,960	1,058	117,799	1,235	223,687	1,227	217,613	1,219	212,115
2,7	0,463	3,898	0,507	5,598	0,504	5,473	0,603	11,161	0,598	10,854	0,595	10,590	0,699	20,262	0,694	19,707	0,689	19,161	0,808	36,604	0,802	35,564	0,798	34,698	0,938	67,439	0,932	65,686	0,926	63,962	1,093	126,648	1,086	123,372	1,079	120,149	1,259	228,129	1,251	221,935	1,243	216,329
2,8	0,472	3,976	0,517	5,708	0,514	5,581	0,614	11,380	0,610	11,067	0,606	10,797	0,712	20,657	0,707	20,091	0,703	19,535	0,824	37,314	0,818	36,253	0,813	35,371	0,956	68,740	0,950	66,954	0,944	65,196	1,114	129,079	1,107	125,741	1,100	122,456	1,283	232,490	1,275	226,179	1,267	220,466
2,9	0,481	4,051	0,527	5,817	0,524	5,687	0,626	11,595	0,622	11,276	0,618	11,001	0,726	21,045	0,721	20,469	0,716	19,902	0,839	38,011	0,833	36,931	0,828	36,032	0,974	70,018	0,968	68,199	0,962	66,409	1,135	131,469	1,127	128,069	1,120	124,724	1,307	236,776	1,298	230,349	1,290	224,532
3	0,490	4,126	0,536	5,924	0,533	5,791	0,637	11,806	0,633	11,482	0,629	11,202	0,739	21,427	0,734	20,840	0,729	20,263	0,854	38,697	0,848	37,597	0,843	36,682	0,992	71,275	0,985	69,424	0,979	67,602	1,155	133,818	1,148	130,357	1,140	126,953	1,330	240,989	1,321	234,448	1,313	228,528
3,1	0,498	4,200	0,546	6,029	0,543	5,894	0,649	12,014	0,644	11,684	0,640	11,400	0,752	21,802	0,747	21,205	0,742	20,618	0,869	39,371	0,863	38,253	0,858	37,322	1,009	72,512	1,002	70,628	0,996	68,775	1,175	136,128	1,167	132,609	1,160	129,146	1,353	245,134	1,344	238,481	1,336	232,460
3,2	0,507	4,272	0,555	6,132	0,552	5,995	0,660	12,219	0,655	11,883	0,651	11,594	0,765	22,172	0,759	21,565	0,754	20,968	0,884	40,035	0,878	38,898	0,872	37,952	1,026	73,729	1,019	71,814	1,013	69,930	1,194	138,403	1,187	134,825	1,179	131,305	1,376	249,213	1,367	242,451	1,358	236,330
3,3	0,515	4,343	0,565	6,234	0,561	6,095	0,671	12,421	0,666	12,079	0,662	11,785	0,777	22,536	0,772	21,919	0,767	21,312	0,898	40,689	0,892	39,534	0,887	38,572	1,042	74,927	1,036	72,982	1,029	71,068	1,214	140,642	1,206	137,007	1,198	133,430	1,398	253,230	1,389	246,359	1,380	240,140
3,4	0,524	4,413	0,574	6,335	0,570	6,193	0,681	12,619	0,677	12,273	0,673	11,974	0,790	22,895	0,784	22,268	0,779	21,652	0,913	41,334	0,906	40,160	0,901	39,183	1,059	76,108	1,052	74,132	1,045	72,188	1,233	142,849	1,225	139,157	1,217	135,525	1,420	257,187	1,410	250,210	1,402	243,894
3,5	0,532	4,483	0,583	6,434	0,579	6,290	0,692	12,815	0,687	12,463	0,683	12,160	0,802	23,248	0,796	22,612	0,791	21,986	0,927	41,969	0,920	40,777	0,915	39,786	1,075	77,272	1,068	75,266	1,061	73,293	1,252	145,024	1,244	141,276	1,236	137,589	1,441	261,088	1,432	254,005	1,423	247,594
3,6	0,540	4,551	0,592	6,531	0,588	6,385	0,702	13,009	0,698	12,651	0,693	12,344	0,814	23,597	0,808	22,951	0,803	22,316	0,940	42,595	0,934	41,386	0,928	40,380	1,091	78,420	1,084	76,384	1,077	74,382	1,270	147,168	1,262	143,365	1,254	139,624	1,462	264,933	1,453	257,747	1,444	251,242
3,7	0,548	4,618	0,600	6,628	0,597	6,480	0,713	13,199	0,708	12,837	0,703	12,525	0,826	23,941	0,820	23,286	0,814	22,642	0,954	43,213	0,947	41,987	0,942	40,966	1,107	79,552	1,100	77,488	1,093	75,456	1,288	149,284	1,280	145,427	1,272	141,632	1,483	268,726	1,474	261,438	1,465	254,841
3,8	0,556	4,685	0,609	6,723	0,605	6,573	0,723	13,387	0,718	13,020	0,714	12,703	0,837	24,280	0,832	23,616	0,826	22,963	0,968	43,823	0,961	42,579	0,955	41,544	1,122	80,670	1,115	78,576	1,108	76,516	1,306	151,371	1,298	147,460	1,290	143,613	1,504	272,469	1,494	265,080	1,485	258,392
3,9	0,564	4,751	0,617	6,817	0,614	6,664	0,733	13,573	0,728	13,201	0,723	12,880	0,849	24,616	0,843	23,942	0,837	23,280	0,981	44,425	0,974	43,164	0,968	42,115	1,138	81,773	1,130	79,651	1,123	77,563	1,324	153,431	1,316	149,468	1,307	145,568	1,524	276,164	1,514	268,675	1,505	261,896
4	0,572	4,815	0,626	6,909	0,622	6,755	0,743	13,757	0,738	13,379	0,733	13,054	0,860	24,946	0,854	24,264	0,849	23,593	0,994	45,020	0,987	43,742	0,981	42,679	1,153	82,862	1,145	80,712	1,138	78,596	1,342	155,466	1,333	151,450	1,325	147,499	1,545	279,812	1,534	272,225	1,525	265,357
4,1	0,579	4,880	0,634	7,001	0,630	6,845	0,753	13,938	0,747	13,555	0,743	13,226	0,872	25,273	0,866	24,582	0,860	23,903	1,007	45,607	1,000	44,313	0,994	43,236	1,168	83,938	1,160	81,760	1,153	79,617	1,359	157,475	1,351	153,408	1,342	149,406	1,564	283,415	1,554	275,731	1,545	268,775
4,2	0,587	4,943	0,642	7,092	0,639	6,933	0,762	14,117	0,757	13,730	0,752	13,396	0,883	25,597	0,877	24,896	0,871	24,208	1,020	46,187	1,013	44,877	1,007	43,786	1,183	85,001	1,175	82,795	1,168	80,626	1,376	159,461	1,368	155,343	1,359	151,291	1,584	286,975	1,574	279,195	1,564	272,153
4,3	0,594	5,006	0,650	7,181	0,647	7,021	0,772	14,294	0,767	13,902	0,762	13,564	0,894	25,916	0,888	25,207	0,882	24,511	1,032	46,760	1,025	45,434	1,019	44,330	1,197	86,051	1,190	83,819	1,182	81,623	1,393	161,423	1,384	157,255	1,376	153,153	1,603	290,494	1,593	282,618	1,583	275,490
4,4	0,601	5,067	0,658	7,270	0,655	7,107	0,781	14,469	0,776	14,072	0,771	13,730	0,905	26,232	0,898	25,514	0,892	24,809	1,045	47,327	1,038	45,985	1,031	44,868	1,212	87,090	1,204	84,831	1,196	82,608	1,410	163,363	1,401	159,145	1,392	154,995	1,623	293,972	1,612	286,003	1,602	278,790
4,5	0,609	5,129	0,666	7,357	0,663	7,193	0,791	14,642	0,785	14,241	0,780	13,895	0,915	26,544	0,909	25,818	0,903	25,105	1,057	47,888	1,050	46,530	1,044	45,399	1,226	88,117	1,218	85,832	1,210	83,583	1,426	165,282	1,417	161,014	1,409	156,815	1,642	297,411	1,631	289,350	1,621	282,053
4,6	0,616	5,189	0,674	7,444	0,670	7,278	0,800	14,814	0,794	14,407	0,790	14,057	0,926	26,853	0,920	26,119	0,913	25,397	1,070	48,443	1,062	47,069	1,056	45,925	1,240	89,133	1,232	86,821	1,224	84,547	1,443	167,179	1,434	162,863	1,425	158,616	1,660	300,813	1,650	292,660	1,640	285,280
4,7	0,623	5,249	0,682	7,529	0,678	7,361	0,809	14,983	0,803	14,572	0,799	14,218	0,937	27,158	0,930	26,416	0,924	25,686	1,082	48,992	1,074	47,602	1,068	46,446	1,254	90,138	1,246	87,801	1,238	85,501	1,459	169,056	1,450	164,692	1,441	160,398	1,679	304,179	1,668	295,934	1,658	288,473

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.1: roughness coefficient k=0,125 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,8	0,630	5,309	0,690	7,614	0,686	7,444	0,818	15,151	0,812	14,735	0,808	14,377	0,947	27,461	0,941	26,710	0,934	25,972	1,094	49,535	1,086	48,130	1,080	46,961	1,268	91,133	1,260	88,770	1,252	86,445	1,475	170,914	1,466	166,502	1,457	162,161	1,697	307,509	1,686	299,175	1,676	291,632
4,9	0,637	5,367	0,697	7,698	0,693	7,526	0,827	15,317	0,821	14,897	0,816	14,535	0,957	27,760	0,951	27,001	0,944	26,256	1,106	50,072	1,098	48,652	1,091	47,471	1,282	92,117	1,273	89,729	1,265	87,379	1,491	172,753	1,482	168,293	1,472	163,906	1,716	310,805	1,704	302,382	1,694	294,759
5	0,644	5,426	0,705	7,781	0,701	7,608	0,836	15,481	0,830	15,056	0,825	14,691	0,968	28,057	0,961	27,290	0,954	26,536	1,117	50,604	1,110	49,170	1,103	47,975	1,295	93,092	1,287	90,678	1,279	88,304	1,507	174,573	1,497	170,067	1,488	165,633	1,734	314,068	1,722	305,557	1,712	297,854
5,1	0,651	5,483	0,712	7,864	0,708	7,688	0,845	15,644	0,839	15,215	0,834	14,845	0,978	28,350	0,971	27,575	0,964	26,814	1,129	51,131	1,121	49,682	1,114	48,475	1,309	94,057	1,300	91,619	1,292	89,219	1,522	176,375	1,513	171,823	1,503	167,344	1,751	317,298	1,740	308,701	1,729	300,919
5,2	0,658	5,540	0,720	7,945	0,716	7,768	0,853	15,805	0,848	15,372	0,842	14,999	0,988	28,641	0,981	27,858	0,974	27,089	1,140	51,653	1,133	50,189	1,126	48,970	1,322	95,013	1,313	92,550	1,305	90,126	1,538	178,160	1,528	173,562	1,518	169,038	1,769	320,498	1,758	311,814	1,747	303,954
5,3	0,664	5,597	0,727	8,026	0,723	7,847	0,862	15,965	0,856	15,527	0,851	15,150	0,998	28,929	0,991	28,138	0,984	27,361	1,152	52,170	1,144	50,691	1,137	49,460	1,335	95,960	1,327	93,472	1,318	91,025	1,553	179,928	1,543	175,285	1,533	170,716	1,787	323,667	1,775	314,898	1,764	306,961
5,4	0,671	5,653	0,734	8,106	0,730	7,925	0,871	16,123	0,865	15,681	0,859	15,300	1,007	29,214	1,001	28,416	0,994	27,631	1,163	52,682	1,155	51,189	1,148	49,946	1,348	96,898	1,340	94,386	1,331	91,915	1,568	181,679	1,558	176,991	1,548	172,379	1,804	326,807	1,792	317,953	1,781	309,939
5,5	0,678	5,708	0,741	8,185	0,737	8,003	0,879	16,280	0,873	15,834	0,868	15,449	1,017	29,497	1,010	28,691	1,003	27,899	1,174	53,190	1,166	51,682	1,159	50,428	1,361	97,827	1,352	95,292	1,344	92,797	1,583	183,415	1,573	178,682	1,563	174,026	1,821	329,918	1,809	320,980	1,798	312,891
5,6	0,684	5,763	0,748	8,264	0,744	8,080	0,887	16,435	0,881	15,985	0,876	15,597	1,027	29,777	1,020	28,964	1,013	28,164	1,185	53,693	1,177	52,171	1,170	50,905	1,374	98,748	1,365	96,189	1,356	93,671	1,598	185,135	1,588	180,358	1,578	175,658	1,838	333,001	1,826	323,980	1,815	315,816
5,7	0,691	5,818	0,755	8,342	0,751	8,156	0,896	16,589	0,890	16,135	0,884	15,743	1,036	30,055	1,029	29,234	1,022	28,427	1,197	54,191	1,188	52,656	1,181	51,378	1,386	99,661	1,378	97,079	1,369	94,538	1,612	186,840	1,602	182,020	1,592	177,277	1,855	336,057	1,843	326,954	1,832	318,715
5,8	0,697	5,872	0,762	8,419	0,758	8,232	0,904	16,742	0,898	16,283	0,892	15,888	1,046	30,330	1,039	29,502	1,032	28,688	1,207	54,686	1,199	53,136	1,192	51,847	1,399	100,567	1,390	97,961	1,381	95,397	1,627	188,530	1,617	183,666	1,607	178,881	1,872	339,086	1,860	329,902	1,848	321,589
5,9	0,703	5,926	0,769	8,496	0,765	8,307	0,912	16,894	0,906	16,431	0,900	16,032	1,055	30,603	1,048	29,768	1,041	28,946	1,218	55,176	1,210	53,613	1,203	52,311	1,412	101,464	1,403	98,835	1,394	96,248	1,641	190,206	1,631	185,299	1,621	180,471	1,888	342,090	1,876	332,825	1,865	324,438
6	0,710	5,979	0,776	8,572	0,772	8,381	0,920	17,044	0,914	16,577	0,908	16,175	1,065	30,874	1,057	30,031	1,050	29,202	1,229	55,662	1,220	54,085	1,213	52,772	1,424	102,354	1,415	99,702	1,406	97,093	1,656	191,868	1,646	186,919	1,635	182,049	1,905	345,069	1,892	335,723	1,881	327,264
6,1	0,716	6,032	0,783	8,647	0,779	8,455	0,928	17,193	0,922	16,722	0,916	16,316	1,074	31,143	1,067	30,292	1,059	29,456	1,240	56,144	1,231	54,554	1,224	53,230	1,436	103,237	1,427	100,562	1,418	97,931	1,670	193,516	1,660	188,525	1,649	183,613	1,921	348,023	1,909	338,598	1,897	330,067
6,2	0,722	6,084	0,790	8,722	0,786	8,528	0,936	17,341	0,930	16,865	0,924	16,456	1,083	31,409	1,076	30,552	1,068	29,709	1,250	56,622	1,241	55,018	1,234	53,683	1,448	104,113	1,439	101,416	1,430	98,762	1,684	195,151	1,674	190,118	1,663	185,165	1,937	350,953	1,925	341,449	1,913	332,847
6,3	0,728	6,136	0,797	8,796	0,792	8,600	0,944	17,487	0,938	17,008	0,932	16,596	1,092	31,674	1,085	30,809	1,077	29,959	1,261	57,097	1,252	55,480	1,244	54,133	1,461	104,982	1,451	102,262	1,442	99,586	1,698	196,773	1,688	191,698	1,677	186,704	1,953	353,860	1,941	344,278	1,929	335,604
6,4	0,734	6,187	0,803	8,870	0,799	8,672	0,952	17,633	0,946	17,150	0,940	16,734	1,101	31,936	1,094	31,064	1,086	30,207	1,271	57,568	1,262	55,937	1,255	54,580	1,473	105,844	1,463	103,102	1,454	100,404	1,712	198,382	1,701	193,266	1,691	188,232	1,969	356,744	1,956	347,084	1,945	338,341
6,5	0,740	6,238	0,810	8,943	0,805	8,744	0,960	17,777	0,953	17,290	0,948	16,871	1,110	32,196	1,103	31,317	1,095	30,453	1,281	58,035	1,272	56,391	1,265	55,023	1,484	106,699	1,475	103,935	1,466	101,216	1,726	199,979	1,715	194,822	1,704	189,747	1,985	359,606	1,972	349,869	1,960	341,056
6,6	0,746	6,289	0,817	9,016	0,812	8,815	0,968	17,921	0,961	17,430	0,955	17,007	1,119	32,455	1,112	31,569	1,104	30,698	1,292	58,498	1,283	56,842	1,275	55,463	1,496	107,548	1,487	104,762	1,477	102,021	1,740	201,564	1,729	196,366	1,718	191,251	2,001	362,446	1,988	352,633	1,976	343,750
6,7	0,752	6,340	0,823	9,088	0,818	8,885	0,975	18,063	0,969	17,568	0,963	17,142	1,128	32,711	1,120	31,818	1,113	30,940	1,302	58,959	1,293	57,289	1,285	55,899	1,508	108,390	1,498	105,583	1,489	102,821	1,753	203,137	1,742	197,899	1,731	192,744	2,016	365,265	2,003	355,376	1,991	346,424
6,8	0,758	6,390	0,829	9,159	0,825	8,955	0,983	18,204	0,976	17,705	0,970	17,276	1,137	32,965	1,129	32,066	1,121	31,181	1,312	59,415	1,303	57,733	1,295	56,332	1,520	109,227	1,510	106,398	1,500	103,614	1,767	204,698	1,756	199,420	1,745	194,226	2,032	368,063	2,018	358,098	2,006	349,079
6,9	0,764	6,439	0,836	9,230	0,831	9,024	0,990	18,344	0,984	17,842	0,978	17,409	1,146	33,218	1,138	32,312	1,130	31,420	1,322	59,869	1,313	58,174	1,305	56,763	1,531	110,057	1,521	107,207	1,512	104,402	1,780	206,248	1,769	200,930	1,758	195,697	2,047	370,841	2,034	360,801	2,021	351,714
7	0,770	6,489	0,842	9,301	0,838	9,093	0,998	18,483	0,991	17,977	0,985	17,541	1,154	33,469	1,146	32,556	1,139	31,658	1,332	60,319	1,323	58,611	1,315	57,190	1,543	110,881	1,533	108,010	1,523	105,185	1,793	207,787	1,782	202,429	1,771	197,158	2,062	373,599	2,049	363,485	2,036	354,330
7,1	0,776	6,538	0,849	9,371	0,844	9,162	1,005	18,622	0,999	18,112	0,993	17,673	1,163	33,718	1,155	32,798	1,147	31,894	1,342	60,766	1,332	59,046	1,324	57,614	1,554	111,700	1,544	108,807	1,534	105,961	1,806	209,315	1,795	203,918	1,784	198,608	2,077	376,337	2,064	366,149	2,051	356,928
7,2	0,782	6,586	0,855	9,440	0,850	9,230	1,013	18,759	1,006	18,245	1,000	17,803	1,171	33,966	1,163	33,039	1,156	32,128	1,351	61,210	1,342	59,477	1,334	58,035	1,565	112,513	1,555	109,599	1,546	106,733	1,820	210,832	1,808	205,397	1,797	200,049	2,092	379,057	2,079	368,796	2,066	359,508
7,3	0,787	6,635	0,861	9,509	0,856	9,297	1,020	18,895	1,013	18,378	1,007	17,933	1,180	34,211	1,172	33,278	1,164	32,360	1,361	61,651	1,352	59,906	1,344	58,453	1,577	113,320	1,567	110,386	1,557	107,499	1,833	212,339	1,821	206,865	1,810	201,479	2,107	381,757	2,094	371,423	2,081	362,070
7,4	0,793	6,683	0,867	9,578	0,863	9,364	1,028	19,031	1,021	18,510	1,014	18,061	1,188	34,456	1,180	33,515	1,172	32,591	1,371	62,089	1,361	60,332	1,353	58,869	1,588	114,122	1,578	111,167	1,568	108,260	1,845	213,836	1,834	208,324	1,822	202,900	2,122	384,440	2,108	374,034	2,096	364,615
7,5	0,799	6,730	0,874	9,646	0,869	9,431	1,035	19,165	1,028	18,641	1,022	18,189	1,197	34,698	1,189	33,751	1,180	32,821	1,380	62,525	1,371	60,755	1,363	59,281	1,599	114,918	1,589	111,943	1,579	109,016	1,858	215,323	1,847	209,772	1,835	204,311	2,137	387,104	2,123	376,626	2,110	367,143
7,6	0,804	6,778	0,880	9,713	0,875	9,497	1,042	19,299	1,035	18,771	1,029	18,316	1,205	34,939	1,197	33,986	1,189	33,049	1,390	62,957	1,380	61,175	1,372	59,691	1,610	115,710	1,600	112,714	1,589	109,766	1,871	216,800	1,859	211,212	1,848	205,713	2,151	389,751	2,137	379,202	2,124	369,654
7,7	0,810	6,825	0,886	9,781	0,881	9,563	1,049	19,432	1,042	18,900	1,036	18,442	1,213	35,178	1,205	34,219	1,197	33,275	1,400	63,386	1,390	61,592	1,382	60,099	1,621	116,496	1,611	113,480	1,600	110,513	1,884	218,268	1,872	212,642	1,860	207,106	2,166	392,381	2,152	381,761	2,139	372,148
7,8	0,816	6,872	0,892	9,847	0,887	9,628	1,056	19,564	1,049	19,028	1,043	18,567	1,221	35,416	1,213	34,450	1,205	33,500	1,409	63,813	1,399	62,007	1,391	60,503	1,632	117,277	1,621	114,241	1,611	111,254	1,896	219,726	1,884	214,062	1,873	208,490	2,180	394,993	2,166	384,303	2,153	374,627
7,9	0,821	6,918	0,898	9,914	0,893	9,693	1,063	19,695	1,056	19,156	1,050	18,692	1,229	35,652	1,221	34,680	1,213	33,724	1,418	64,237	1,408	62,419	1,400	60,906	1,642	118,053	1,632	114,997	1,622	111,990	1,909	221,174	1,897	215,474	1,885	209,865	2,195	397,589	2,180	386,829	2,167	377,090
8	0,827	6,964	0,904	9,980	0,899	9,758	1,070	19,825	1,063	19,283	1,057	18,815	1,238	35,887	1,229	34,908	1,221	33,946	1,428	64,658	1,418	62,828	1,409	61,305	1,653	118,825	1,643	115,749	1,632	112,722	1,921	222,614	1,909	216,877	1,897	211,231	2,209	400,169	2,195	389,340	2,181	379,538
8,1	0,832	7,010	0,910	10,045	0,905	9,822	1,077	19,955	1,070	19,409	1,064	18,938	1,246	36,121	1,237	35,135	1,229	34,167	1,437	65,077	1,427	63,235	1,418	61,702	1,664	119,591	1,653	116,496	1,643	113,450	1,934	224,045	1,922	218,271	1,909	212,589	2,223	402,733	2,209	391,835	2,195	381,970
8,2	0,837	7,056	0,916	10,111	0,911	9,886	1,084	20,084	1,077	19,534	1,071	19,061	1,254	36,353	1,245	35,361	1,237	34,387	1,446	65,493	1,436	63,640	1,428	62,097	1,674	120,353	1,664	117,238	1,653	114,173	1,946	225,467	1,934	219,657	1,922	213,939	2,237	405,282	2,223	394,314	2,209	384,388
8,3	0,843	7,101	0,922	10,175	0,916	9,949	1,091	20,212	1,084	19,658	1,077	19,182	1,262	36,583	1,253	35,586	1,245	34,605	1,455	65,907	1,445	64,042	1,437	62,490	1,685	121,110	1,674	117,976	1,664	114,892	1,958	226,881	1,946	221,034	1,934	215,281	2,251	407,814	2,236	396,779	2,223	386,791
8,4	0,848	7,146	0,927	10,240	0,922	10,012	1,098	20,339	1,091	19,782	1,084	19,303	1,269	36,813	1,261	35,809	1,252	34,822	1,464	66,318	1,454	64,442	1,446	62,880	1,695	121,863	1,685	118,709	1,674	115,606	1,970	228,286	1,958	222,403	1,946	216,614	2,265	410,332	2,250	399,229	2,237	389,179
8,5	0,854	7,191	0,933	10,304	0,928	10,075	1,105	20,465	1,098	19,905	1,091	19,423	1,277	37,041	1,269	36,030	1,260	35,037	1,473	66,727	1,463	64,839	1,454	63,268	1,706	122,612	1,695	119,438	1,684	116,316	1,982	229,683	1,970	223,764	1,958	217,940	2,279	412,835	2,264	401,665	2,250	391,554
8,6	0,859	7,236	0,939	10,368	0,934	10,137	1,112	20,591	1,104	20,028	1,098	19,543	1,285	37,267	1,277	36,251	1,268	35,252	1,482	67,134	1,472	65,234	1,463	63,653	1,716	123,356	1,705	120,163	1,695	117,022	1,994	231,071	1,982	225,117	1,969	219,258	2,293	415,324	2,278	404,086	2,264	393,915
8,7	0,864	7,280	0,945	10,431	0,939	10,199	1,119	20,716	1,111	20,149	1,104	19,661	1,293	37,492	1,284	36,470	1,276	35,465	1,491	67,538	1,481	65,627	1,472	64,037	1,726	124,096	1,716	120,884	1,705	117,724	2,006	232,452	1,994	226,463	1,981	220,569	2,306	417,798	2,291	406,493	2,277	396,262
8,8	0,869	7,324	0,950	10,494	0,945	10,260	1,125	20,841	1,118	20,270	1,111	19,779	1,301	37,716	1,292	36,688	1,283	35,677	1,500	67,940	1,490	66,018	1,481	64,418	1,737	124,831	1,726	121,601	1,715	118,422	2,018	233,825	2,005	227,800	1,993	221,872	2,320	420,258	2,305	408,887	2,291	398,595
8,9	0,874	7,368	0,956	10,556	0,951	10,322	1,132	20,964	1,124	20,391	1,118	19,897	1,308	37,939	1,300	36,905	1,291	35,888	1,509	68,340	1,498	66,406	1,490	64,797	1,747	125,563	1,736	122,313	1,725	119,116	2,030	235,190	2,017	229,130	2,004	223,168	2,333	422,704	2,318	411,267	2,304	400,916
9	0,880	7,412	0,962	10,619	0,956	10,382	1,139	21,087	1,131	20,510	1,124	20,013	1,316	38,161	1,307	37,120	1,298	36,097	1,518	68,737	1,507	66,792	1,498	65,174	1,757	126,290	1,746	123,022	1,735	119,807	2,041	236,548	2,029	230,453	2,016	224,456	2,347	425,136	2,331	413,634	2,317	403,224
9,1	0,885	7,455	0,967	10,681	0,962	10,443	1,145	21,209	1,137	20,629	1,131	20,130	1,324	38,381	1,315	37,335	1,306	36,306	1,526	69,132	1,516	67,177	1,507	65,549	1,767	127,014	1,756	123,727	1,745	120,493	2,053	237,898	2,040	231,769	2,028	225,738	2,360	427,555	2,345	415,988	2,331	405,519
9,2	0,890	7,498	0,973	10,742	0,967	10,503	1,152	21,331	1,144	20,747	1,137	20,245	1,331	38,600	1,322	37,548	1,313	36,513	1,535	69,525	1,524	67,559	1,515	65,922	1,777	127,733	1,766	124,428	1,755	121,176	2,065	239,241	2,052	233,077	2,039	227,012	2,373	429,961	2,358	418,330	2,344	407,801
9,3	0,895	7,541	0,978	10,804	0,973	10,563	1,158	21,452	1,150	20,865	1,144	20,360	1,339	38,818	1,330	37,760	1,321	36,720	1,544	69,916	1,533	67,939	1,524	66,292	1,787	128,449	1,776	125,125	1,765	121,855	2,076	240,576	2,063	234,379	2,050	228,280	2,387	432,354	2,371	420,658	2,357	410,072
9,4	0,900	7,584	0,984	10,864	0,978	10,623	1,165	21,572	1,157	20,982	1,150	20,474	1,346	39,035	1,337	37,971	1,328	36,925	1,552	70,305	1,542	68,317	1,532	66,661	1,797	129,161	1,786	125,819	1,774	122,531	2,088	241,905	2,075	235,673	2,062	229,541	2,400	434,734	2,384	422,974	2,370	412,330
9,5	0,905	7,626	0,989	10,925	0,984	10,682	1,171	21,692	1,163	21,099	1,156	20,588	1,354	39,251	1,344	38,181	1,335	37,129	1,561	70,692	1,550	68,693	1,541	67,028	1,807	129,869	1,795	126,509	1,784	123,203	2,099	243,226	2,086	236,961	2,073	230,795	2,413	437,102	2,397	425,278	2,383	414,576

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.1: roughness coefficient k=0,125 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,6	0,910	7,668	0,995	10,985	0,989	10,741	1,178	21,811	1,170	21,215	1,163	20,701	1,361	39,465	1,352	38,389	1,343	37,332	1,569	71,077	1,558	69,067	1,549	67,393	1,817	130,573	1,805	127,195	1,794	123,871	2,110	244,541	2,097	238,242	2,084	232,043	2,426	439,457	2,410	427,570	2,396	416,811
9,7	0,915	7,710	1,000	11,045	0,995	10,800	1,184	21,930	1,176	21,330	1,169	20,813	1,368	39,679	1,359	38,597	1,350	37,534	1,578	71,460	1,567	69,439	1,558	67,757	1,826	131,274	1,815	127,878	1,803	124,536	2,122	245,849	2,109	239,516	2,095	233,284	2,439	441,801	2,423	429,850	2,408	419,034
9,8	0,920	7,752	1,006	11,105	1,000	10,858	1,190	22,048	1,182	21,445	1,175	20,925	1,376	39,891	1,366	38,804	1,357	37,735	1,586	71,841	1,575	69,809	1,566	68,118	1,836	131,971	1,824	128,557	1,813	125,198	2,133	247,150	2,120	240,784	2,106	234,519	2,452	444,132	2,436	432,119	2,421	421,245
9,9	0,925	7,794	1,011	11,165	1,006	10,916	1,197	22,165	1,189	21,559	1,182	21,037	1,383	40,102	1,374	39,009	1,364	37,935	1,595	72,220	1,584	70,178	1,574	68,477	1,846	132,665	1,834	129,233	1,822	125,856	2,144	248,445	2,131	242,045	2,117	235,748	2,464	446,451	2,448	434,376	2,434	423,446
10	0,930	7,835	1,016	11,224	1,011	10,974	1,203	22,282	1,195	21,672	1,188	21,148	1,390	40,313	1,381	39,214	1,372	38,134	1,603	72,597	1,592	70,544	1,582	68,835	1,855	133,355	1,844	129,905	1,832	126,511	2,155	249,733	2,142	243,300	2,128	236,971	2,477	448,759	2,461	436,621	2,446	425,635
10,2	0,940	7,917	1,027	11,341	1,021	11,089	1,216	22,513	1,207	21,898	1,200	21,368	1,405	40,730	1,395	39,620	1,386	38,529	1,619	73,346	1,608	71,272	1,599	69,545	1,874	134,725	1,863	131,240	1,851	127,812	2,177	252,290	2,164	245,792	2,150	239,398	2,502	453,341	2,486	441,080	2,471	429,982
10,4	0,949	7,999	1,038	11,457	1,032	11,203	1,228	22,743	1,220	22,121	1,212	21,586	1,419	41,143	1,409	40,022	1,400	38,920	1,636	74,088	1,625	71,993	1,615	70,249	1,893	136,082	1,881	132,562	1,869	129,099	2,199	254,822	2,186	248,259	2,172	241,802	2,527	457,878	2,511	445,495	2,496	434,286
10,6	0,959	8,079	1,048	11,572	1,042	11,315	1,240	22,970	1,232	22,342	1,225	21,801	1,433	41,553	1,423	40,421	1,414	39,308	1,652	74,822	1,641	72,707	1,631	70,946	1,912	137,427	1,900	133,872	1,888	130,375	2,221	257,330	2,207	250,703	2,193	244,182	2,552	462,371	2,536	449,867	2,520	438,550
10,8	0,968	8,159	1,058	11,687	1,053	11,427	1,252	23,195	1,244	22,561	1,237	22,015	1,447	41,959	1,437	40,815	1,428	39,692	1,668	75,550	1,657	73,414	1,647	71,636	1,930	138,758	1,918	135,170	1,906	131,639	2,242	259,815	2,228	253,125	2,214	246,541	2,577	466,823	2,560	454,199	2,545	442,773
11	0,978	8,238	1,069	11,800	1,063	11,537	1,264	23,419	1,256	22,778	1,248	22,227	1,461	42,361	1,451	41,207	1,441	40,072	1,684	76,271	1,672	74,115	1,663	72,320	1,949	140,078	1,937	136,455	1,924	132,891	2,263	262,278	2,249	255,524	2,235	248,878	2,601	471,234	2,584	458,492	2,569	446,958
11,2	0,987	8,317	1,079	11,912	1,073	11,647	1,276	23,640	1,268	22,994	1,260	22,437	1,475	42,759	1,465	41,594	1,455	40,449	1,700	76,986	1,688	74,809	1,678	72,997	1,967	141,385	1,955	137,729	1,942	134,132	2,285	264,718	2,270	257,901	2,256	251,194	2,625	475,606	2,608	462,746	2,593	451,105
11,4	0,996	8,395	1,089	12,023	1,083	11,756	1,288	23,859	1,280	23,207	1,272	22,645	1,488	43,154	1,478	41,978	1,468	40,823	1,715	77,694	1,704	75,497	1,694	73,669	1,985	142,681	1,973	138,992	1,960	135,362	2,305	267,136	2,291	260,258	2,277	253,490	2,649	479,939	2,632	466,962	2,616	455,216
11,6	1,006	8,472	1,099	12,133	1,093	11,863	1,300	24,076	1,291	23,418	1,284	22,852	1,502	43,546	1,492	42,359	1,482	41,193	1,731	78,396	1,719	76,180	1,709	74,335	2,003	143,966	1,990	140,244	1,978	136,581	2,326	269,534	2,312	262,594	2,297	255,765	2,673	484,234	2,656	471,141	2,640	459,291
11,8	1,015	8,548	1,109	12,242	1,103	11,970	1,312	24,292	1,303	23,628	1,295	23,056	1,515	43,934	1,505	42,737	1,495	41,561	1,746	79,092	1,734	76,857	1,724	74,996	2,021	145,240	2,008	141,485	1,995	137,790	2,347	271,911	2,332	264,910	2,318	258,022	2,696	488,492	2,679	475,285	2,663	463,331
12	1,024	8,624	1,119	12,350	1,112	12,076	1,323	24,506	1,314	23,837	1,306	23,259	1,528	44,319	1,518	43,112	1,508	41,925	1,762	79,783	1,749	77,528	1,739	75,651	2,038	146,504	2,025	142,716	2,013	138,989	2,367	274,268	2,352	267,207	2,338	260,259	2,720	492,715	2,702	479,394	2,686	467,337
12,2	1,033	8,699	1,128	12,458	1,122	12,181	1,335	24,718	1,326	24,042	1,318	23,461	1,541	44,701	1,531	43,483	1,521	42,286	1,777	80,467	1,764	78,193	1,754	76,300	2,056	147,756	2,043	143,936	2,030	140,178	2,387	276,606	2,372	269,485	2,358	262,478	2,743	496,903	2,725	483,469	2,709	471,310
12,4	1,041	8,774	1,138	12,564	1,132	12,285	1,346	24,928	1,337	24,247	1,329	23,660	1,555	45,079	1,544	43,852	1,534	42,645	1,792	81,147	1,779	78,853	1,769	76,944	2,073	148,999	2,060	145,147	2,047	141,357	2,407	278,925	2,392	271,744	2,377	264,679	2,766	501,057	2,748	487,511	2,731	475,251
12,6	1,050	8,848	1,147	12,670	1,141	12,389	1,357	25,137	1,348	24,450	1,340	23,858	1,567	45,455	1,557	44,217	1,547	43,000	1,807	81,820	1,794	79,508	1,784	77,583	2,090	150,232	2,077	146,348	2,064	142,527	2,427	281,225	2,412	273,986	2,397	266,862	2,788	505,177	2,770	491,521	2,754	479,160
12,8	1,059	8,921	1,157	12,775	1,151	12,491	1,368	25,344	1,359	24,651	1,351	24,055	1,580	45,828	1,570	44,580	1,559	43,353	1,821	82,489	1,809	80,158	1,798	78,217	2,107	151,455	2,094	147,540	2,081	143,688	2,447	283,507	2,432	276,209	2,416	269,028	2,811	509,266	2,793	495,499	2,776	483,039
13	1,068	8,994	1,166	12,879	1,160	12,593	1,380	25,549	1,370	24,851	1,362	24,250	1,593	46,198	1,582	44,940	1,572	43,703	1,836	83,152	1,823	80,803	1,813	78,847	2,124	152,669	2,111	148,723	2,097	144,840	2,466	285,771	2,451	278,416	2,436	271,178	2,833	513,322	2,815	499,447	2,798	486,888
13,2	1,076	9,067	1,176	12,982	1,169	12,694	1,391	25,753	1,381	25,049	1,373	24,444	1,606	46,565	1,595	45,297	1,584	44,050	1,850	83,810	1,838	81,442	1,827	79,471	2,141	153,873	2,127	149,896	2,114	145,983	2,486	288,019	2,470	280,606	2,455	273,311	2,856	517,348	2,837	503,364	2,820	490,707
13,4	1,085	9,139	1,185	13,085	1,178	12,794	1,401	25,955	1,392	25,246	1,384	24,636	1,618	46,929	1,608	45,651	1,597	44,395	1,865	84,464	1,852	82,077	1,841	80,091	2,157	155,069	2,144	151,061	2,130	147,117	2,505	290,249	2,489	282,779	2,474	275,428	2,878	521,343	2,859	507,252	2,842	494,497
13,6	1,093	9,210	1,194	13,187	1,188	12,894	1,412	26,156	1,403	25,442	1,394	24,826	1,631	47,291	1,620	46,003	1,609	44,738	1,879	85,112	1,866	82,708	1,855	80,706	2,174	156,255	2,160	152,217	2,147	148,243	2,524	292,463	2,508	284,936	2,493	277,529	2,900	525,309	2,881	511,111	2,864	498,260
13,8	1,102	9,281	1,203	13,288	1,197	12,993	1,423	26,355	1,413	25,636	1,405	25,016	1,643	47,650	1,632	46,353	1,621	45,077	1,893	85,756	1,880	83,334	1,869	81,317	2,190	157,433	2,177	153,365	2,163	149,361	2,543	294,661	2,527	287,078	2,511	279,616	2,921	529,246	2,902	514,942	2,885	501,995
14	1,110	9,351	1,212	13,388	1,206	13,091	1,434	26,553	1,424	25,828	1,416	25,204	1,655	48,006	1,644	46,699	1,633	45,415	1,908	86,396	1,894	83,955	1,883	81,923	2,207	158,603	2,193	154,504	2,179	150,471	2,562	296,843	2,546	289,204	2,530	281,687	2,943	533,155	2,924	518,746	2,906	505,703
14,2	1,118	9,421	1,222	13,488	1,215	13,188	1,444	26,750	1,435	26,019	1,426	25,390	1,668	48,360	1,657	47,044	1,645	45,750	1,922	87,030	1,908	84,572	1,897	82,525	2,223	159,764	2,209	155,636	2,195	151,573	2,580	299,010	2,565	291,315	2,549	283,743	2,964	537,036	2,945	522,522	2,928	509,385
14,4	1,126	9,490	1,230	13,586	1,224	13,285	1,455	26,945	1,445	26,209	1,437	25,576	1,680	48,712	1,669	47,386	1,657	46,082	1,935	87,661	1,922	85,184	1,911	83,123	2,239	160,918	2,225	156,759	2,211	152,668	2,599	301,161	2,583	293,411	2,567	285,785	2,986	540,890	2,966	526,272	2,949	513,042
14,6	1,135	9,559	1,239	13,685	1,233	13,381	1,465	27,139	1,456	26,398	1,447	25,760	1,692	49,061	1,681	47,726	1,669	46,413	1,949	88,287	1,936	85,793	1,925	83,717	2,255	162,063	2,241	157,875	2,226	153,754	2,617	303,298	2,601	295,493	2,585	287,813	3,007	544,717	2,987	529,997	2,969	516,673
14,8	1,143	9,627	1,248	13,782	1,241	13,476	1,476	27,332	1,466	26,585	1,457	25,943	1,704	49,408	1,692	48,063	1,681	46,741	1,963	88,908	1,950	86,397	1,938	84,307	2,270	163,200	2,256	158,983	2,242	154,834	2,636	305,420	2,620	297,561	2,603	289,828	3,028	548,518	3,008	533,696	2,990	520,279
15	1,151	9,695	1,257	13,879	1,250	13,571	1,486	27,523	1,476	26,771	1,467	26,124	1,716	49,752	1,704	48,398	1,693	47,067	1,977	89,526	1,963	86,997	1,952	84,892	2,286	164,330	2,272	160,084	2,258	155,906	2,654	307,528	2,638	299,615	2,621	291,829	3,049	552,294	3,029	537,370	3,011	523,861
15,2	1,159	9,763	1,266	13,976	1,259	13,665	1,496	27,713	1,486	26,956	1,477	26,305	1,727	50,094	1,716	48,731	1,704	47,391	1,990	90,140	1,977	87,594	1,965	85,474	2,302	165,453	2,287	161,178	2,273	156,971	2,672	309,622	2,656	301,655	2,639	293,816	3,069	556,045	3,049	541,020	3,031	527,420
15,4	1,167	9,830	1,274	14,071	1,267	13,759	1,507	27,902	1,496	27,140	1,488	26,484	1,739	50,434	1,728	49,062	1,716	47,712	2,004	90,749	1,990	88,186	1,978	86,053	2,317	166,568	2,303	162,264	2,288	158,030	2,690	311,702	2,673	303,682	2,657	295,791	3,090	559,771	3,070	544,646	3,052	530,955
15,6	1,175	9,896	1,283	14,166	1,276	13,852	1,517	28,089	1,506	27,322	1,498	26,662	1,751	50,772	1,739	49,390	1,728	48,032	2,017	91,355	2,003	88,775	1,991	86,627	2,333	167,676	2,318	163,344	2,304	159,081	2,708	313,769	2,691	305,696	2,674	297,753	3,110	563,473	3,090	548,249	3,072	534,468
15,8	1,182	9,962	1,292	14,261	1,284	13,944	1,527	28,276	1,516	27,504	1,507	26,839	1,762	51,108	1,751	49,717	1,739	48,350	2,030	91,957	2,016	89,360	2,005	87,198	2,348	168,777	2,333	164,416	2,319	160,126	2,726	315,823	2,709	307,698	2,692	299,702	3,131	567,152	3,110	551,828	3,092	537,958
16	1,190	10,028	1,300	14,355	1,293	14,036	1,537	28,461	1,526	27,684	1,517	27,015	1,774	51,441	1,762	50,041	1,750	48,665	2,044	92,555	2,030	89,941	2,018	87,765	2,363	169,871	2,349	165,482	2,334	161,164	2,743	317,864	2,726	309,686	2,709	301,639	3,151	570,808	3,130	555,386	3,112	541,426
16,2	1,198	10,093	1,308	14,448	1,301	14,127	1,547	28,645	1,536	27,863	1,527	27,190	1,785	51,773	1,773	50,364	1,762	48,979	2,057	93,149	2,043	90,518	2,031	88,329	2,378	170,958	2,364	166,541	2,349	162,196	2,761	319,892	2,744	311,663	2,727	303,565	3,171	574,441	3,150	558,921	3,132	544,873
16,4	1,206	10,158	1,317	14,541	1,310	14,218	1,557	28,828	1,546	28,041	1,537	27,364	1,797	52,102	1,785	50,684	1,773	49,291	2,070	93,740	2,056	91,093	2,043	88,889	2,393	172,039	2,379	167,594	2,364	163,221	2,778	321,908	2,761	313,627	2,744	305,478	3,191	578,052	3,170	562,435	3,151	548,299
16,6	1,213	10,223	1,325	14,633	1,318	14,308	1,566	29,010	1,556	28,218	1,547	27,536	1,808	52,430	1,796	51,003	1,784	49,601	2,083	94,327	2,068	91,663	2,056	89,446	2,408	173,113	2,393	168,641	2,378	164,241	2,795	323,912	2,778	315,579	2,761	307,380	3,211	581,640	3,190	565,927	3,171	551,703
16,8	1,221	10,287	1,334	14,725	1,326	14,398	1,576	29,191	1,566	28,394	1,556	27,708	1,819	52,755	1,807	51,320	1,795	49,909	2,096	94,910	2,081	92,230	2,069	90,000	2,423	174,180	2,408	169,681	2,393	165,254	2,813	325,903	2,795	317,520	2,778	309,270	3,230	585,208	3,209	569,398	3,190	555,088
17	1,229	10,351	1,342	14,816	1,334	14,487	1,586	29,371	1,575	28,569	1,566	27,879	1,830	53,079	1,818	51,635	1,806	50,215	2,108	95,491	2,094	92,794	2,082	90,550	2,438	175,242	2,423	170,715	2,408	166,261	2,830	327,883	2,812	319,449	2,795	311,150	3,250	588,754	3,229	572,849	3,210	558,452
17,2	1,236	10,415	1,350	14,906	1,343	14,576	1,595	29,549	1,585	28,743	1,575	28,048	1,841	53,400	1,829	51,948	1,817	50,520	2,121	96,067	2,107	93,355	2,094	91,097	2,453	176,297	2,437	171,743	2,422	167,263	2,847	329,852	2,829	321,367	2,812	313,018	3,269	592,280	3,248	576,280	3,229	561,797
17,4	1,244	10,478	1,358	14,996	1,351	14,664	1,605	29,727	1,594	28,916	1,585	28,217	1,853	53,720	1,840	52,259	1,828	50,822	2,134	96,641	2,119	93,912	2,107	91,641	2,467	177,346	2,452	172,765	2,436	168,258	2,864	331,809	2,846	323,274	2,828	314,876	3,289	595,785	3,267	579,691	3,248	565,123
17,6	1,251	10,540	1,366	15,086	1,359	14,751	1,615	29,904	1,604	29,088	1,594	28,385	1,863	54,038	1,851	52,568	1,839	51,123	2,146	97,211	2,132	94,467	2,119	92,182	2,482	178,389	2,466	173,781	2,451	169,248	2,880	333,755	2,863	325,170	2,845	316,723	3,308	599,270	3,287	583,082	3,267	568,429
17,8	1,258	10,603	1,374	15,175	1,367	14,838	1,624	30,079	1,613	29,258	1,604	28,552	1,874	54,355	1,862	52,876	1,849	51,423	2,159	97,778	2,144	95,018	2,132	92,720	2,496	179,426	2,481	174,792	2,465	170,232	2,897	335,690	2,879	327,055	2,861	318,559	3,327	602,736	3,306	586,455	3,286	571,717
18	1,266	10,665	1,382	15,264	1,375	14,925	1,634	30,254	1,623	29,428	1,613	28,718	1,885	54,669	1,873	53,182	1,860	51,720	2,171	98,342	2,156	95,566	2,144	93,255	2,511	180,458	2,495	175,797	2,479	171,211	2,914	337,614	2,896	328,930	2,878	320,386	3,346	606,182	3,324	589,808	3,305	574,987
18,2	1,273	10,727	1,390	15,352	1,383	15,011	1,643	30,428	1,632	29,597	1,622	28,883	1,896	54,982	1,883	53,486	1,871	52,016	2,184	98,903	2,169	96,111	2,156	93,787	2,525	181,483	2,509	176,796	2,493	172,185	2,930	339,527	2,912	330,795	2,894	322,202	3,365	609,609	3,343	593,143	3,323	578,238
18,4	1,280	10,788	1,398	15,439	1,391	15,097	1,652	30,601	1,641	29,766	1,631	29,047	1,907	55,293	1,894	53,789	1,881	52,311	2,196	99,461	2,181	96,653	2,168	94,316	2,539	182,504	2,523	177,790	2,507	173,153	2,947	341,430	2,928	332,649	2,910	324,008	3,384	613,018	3,362	596,460	3,342	581,472
18,6	1,288	10,849	1,406	15,526	1,398	15,182	1,662	30,772	1,650	29,933	1,641	29,210	1,917	55,603	1,905	54,090	1,892	52,603	2,208	100,015	2,193	97,192	2,180	94,842	2,553	183,518	2,537	178,779	2,521	174,116	2,963	343,323	2,945	334,493	2,926	325,805	3,402	616,408	3,381	599,759	3,360	584,689

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.1: roughness coefficient k=0,125 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
18,8	1,295	10,910	1,414	15,613	1,406	15,267	1,671	30,943	1,660	30,099	1,650	29,372	1,928	55,910	1,915	54,390	1,902	52,895	2,220	100,567	2,205	97,728	2,192	95,365	2,567	184,528	2,551	179,762	2,535	175,074	2,979	345,206	2,961	336,328	2,942	327,592	3,421	619,780	3,399	603,040	3,379	587,888
19	1,302	10,970	1,422	15,699	1,414	15,351	1,680	31,113	1,669	30,265	1,659	29,534	1,939	56,216	1,926	54,688	1,913	53,185	2,233	101,116	2,217	98,262	2,204	95,886	2,581	185,532	2,565	180,741	2,549	176,026	2,995	347,078	2,977	338,153	2,958	329,370	3,440	623,134	3,417	606,304	3,397	591,070
19,2	1,309	11,030	1,430	15,785	1,422	15,435	1,689	31,283	1,678	30,429	1,668	29,694	1,949	56,521	1,936	54,984	1,923	53,473	2,245	101,662	2,229	98,792	2,216	96,404	2,595	186,530	2,579	181,714	2,563	176,974	3,011	348,941	2,993	339,968	2,974	331,138	3,458	626,470	3,436	609,551	3,415	594,235
19,4	1,316	11,090	1,437	15,870	1,429	15,518	1,698	31,451	1,687	30,593	1,677	29,854	1,960	56,824	1,947	55,279	1,934	53,759	2,257	102,205	2,241	99,320	2,228	96,919	2,609	187,524	2,593	182,682	2,576	177,917	3,027	350,795	3,009	341,774	2,990	332,897	3,476	629,790	3,454	612,781	3,433	597,385
19,6	1,323	11,149	1,445	15,955	1,437	15,601	1,707	31,618	1,696	30,756	1,686	30,013	1,970	57,125	1,957	55,572	1,944	54,045	2,269	102,746	2,253	99,846	2,240	97,432	2,623	188,512	2,606	183,645	2,590	178,855	3,043	352,639	3,025	343,570	3,006	334,647	3,495	633,092	3,472	615,994	3,451	600,518
19,8	1,330	11,209	1,453	16,040	1,445	15,684	1,716	31,785	1,705	30,918	1,695	30,171	1,980	57,425	1,967	55,864	1,954	54,329	2,280	103,283	2,265	100,368	2,252	97,942	2,636	189,496	2,620	184,603	2,603	179,789	3,059	354,473	3,040	345,358	3,021	336,389	3,513	636,378	3,490	619,191	3,469	603,635
20	1,337	11,268	1,460	16,124	1,452	15,766	1,725	31,951	1,714	31,079	1,703	30,329	1,991	57,724	1,977	56,154	1,964	54,611	2,292	103,818	2,277	100,888	2,263	98,449	2,650	190,474	2,633	185,556	2,617	180,717	3,075	356,298	3,056	347,136	3,037	338,121	3,531	639,647	3,508	622,373	3,487	606,736
20,2	1,344	11,326	1,468	16,207	1,460	15,848	1,734	32,116	1,722	31,240	1,712	30,485	2,001	58,021	1,988	56,443	1,974	54,892	2,304	104,351	2,288	101,406	2,275	98,954	2,663	191,448	2,647	186,505	2,630	181,641	3,091	358,115	3,072	348,906	3,052	339,845	3,549	642,900	3,526	625,538	3,505	609,823
20,4	1,351	11,384	1,475	16,291	1,467	15,929	1,743	32,280	1,731	31,399	1,721	30,641	2,011	58,316	1,998	56,731	1,984	55,172	2,316	104,880	2,300	101,920	2,286	99,457	2,677	192,417	2,660	187,449	2,644	182,561	3,106	359,922	3,087	350,667	3,068	341,561	3,567	646,137	3,544	628,688	3,522	612,893
20,6	1,358	11,442	1,483	16,373	1,475	16,010	1,752	32,443	1,740	31,558	1,730	30,796	2,021	58,610	2,008	57,017	1,994	55,450	2,327	105,407	2,311	102,433	2,298	99,957	2,690	193,381	2,674	188,388	2,657	183,476	3,122	361,720	3,102	352,420	3,083	343,268	3,584	649,358	3,561	631,822	3,540	615,949
20,8	1,365	11,500	1,490	16,456	1,482	16,091	1,761	32,606	1,749	31,717	1,738	30,951	2,031	58,903	2,018	57,301	2,004	55,727	2,339	105,932	2,323	102,943	2,309	100,454	2,704	194,341	2,687	189,323	2,670	184,387	3,137	363,510	3,118	354,164	3,098	344,967	3,602	652,563	3,579	634,941	3,557	618,991
21	1,372	11,558	1,498	16,538	1,490	16,171	1,769	32,768	1,757	31,874	1,747	31,104	2,041	59,194	2,028	57,585	2,014	56,003	2,350	106,454	2,334	103,450	2,321	100,950	2,717	195,296	2,700	190,254	2,683	185,293	3,153	365,291	3,133	355,899	3,114	346,657	3,620	655,753	3,596	638,046	3,575	622,017
21,2	1,379	11,615	1,505	16,620	1,497	16,251	1,778	32,929	1,766	32,031	1,756	31,257	2,051	59,484	2,038	57,867	2,024	56,277	2,362	106,974	2,346	103,955	2,332	101,442	2,730	196,246	2,713	191,180	2,696	186,195	3,168	367,064	3,148	357,627	3,129	348,340	3,637	658,928	3,614	641,135	3,592	625,030
21,4	1,385	11,672	1,513	16,701	1,504	16,331	1,787	33,089	1,775	32,187	1,764	31,410	2,061	59,773	2,048	58,148	2,034	56,550	2,373	107,491	2,357	104,458	2,343	101,933	2,743	197,192	2,726	192,102	2,709	187,093	3,183	368,829	3,163	359,346	3,144	350,015	3,655	662,089	3,631	644,211	3,609	628,028
21,6	1,392	11,729	1,520	16,782	1,512	16,410	1,795	33,249	1,783	32,342	1,773	31,561	2,071	60,060	2,057	58,427	2,044	56,822	2,385	108,006	2,368	104,958	2,355	102,421	2,756	198,134	2,739	193,019	2,722	187,986	3,198	370,585	3,179	361,058	3,159	351,682	3,672	665,234	3,648	647,271	3,627	631,012
21,8	1,399	11,785	1,527	16,862	1,519	16,488	1,804	33,407	1,792	32,496	1,781	31,712	2,081	60,346	2,067	58,705	2,053	57,092	2,396	108,518	2,380	105,456	2,366	102,908	2,769	199,071	2,752	193,932	2,735	188,876	3,213	372,333	3,194	362,761	3,174	353,342	3,689	668,365	3,666	650,318	3,644	633,983
22	1,405	11,841	1,534	16,942	1,526	16,567	1,812	33,566	1,800	32,650	1,790	31,862	2,091	60,630	2,077	58,982	2,063	57,362	2,407	109,028	2,391	105,952	2,377	103,391	2,782	200,004	2,765	194,841	2,748	189,761	3,228	374,074	3,208	364,457	3,189	354,994	3,706	671,482	3,683	653,351	3,661	636,940
22,2	1,412	11,897	1,542	17,022	1,533	16,645	1,821	33,723	1,809	32,803	1,798	32,011	2,101	60,914	2,087	59,258	2,073	57,630	2,418	109,536	2,402	106,446	2,388	103,873	2,795	200,933	2,778	195,746	2,761	190,643	3,243	375,806	3,223	366,145	3,203	356,638	3,724	674,585	3,700	656,370	3,678	639,883
22,4	1,419	11,953	1,549	17,102	1,540	16,723	1,829	33,880	1,817	32,956	1,806	32,160	2,110	61,196	2,096	59,532	2,082	57,897	2,430	110,042	2,413	106,937	2,399	104,353	2,808	201,858	2,791	196,647	2,773	191,520	3,258	377,531	3,238	367,825	3,218	358,275	3,741	677,673	3,717	659,376	3,694	642,814
22,6	1,425	12,008	1,556	17,181	1,547	16,800	1,838	34,036	1,825	33,107	1,815	32,308	2,120	61,476	2,106	59,805	2,092	58,162	2,441	110,545	2,424	107,426	2,410	104,830	2,821	202,778	2,804	197,544	2,786	192,394	3,273	379,248	3,253	369,498	3,233	359,905	3,758	680,748	3,733	662,368	3,711	645,731
22,8	1,432	12,063	1,563	17,260	1,555	16,877	1,846	34,191	1,834	33,259	1,823	32,456	2,130	61,756	2,116	60,077	2,101	58,427	2,452	111,046	2,435	107,913	2,421	105,305	2,834	203,695	2,816	198,437	2,799	193,264	3,288	380,957	3,267	371,164	3,247	361,527	3,775	683,810	3,750	665,347	3,728	648,636
23	1,438	12,118	1,570	17,338	1,562	16,954	1,854	34,346	1,842	33,409	1,831	32,603	2,139	62,034	2,125	60,348	2,111	58,690	2,463	111,545	2,446	108,398	2,432	105,779	2,847	204,607	2,829	199,326	2,811	194,130	3,302	382,659	3,282	372,823	3,262	363,143	3,791	686,858	3,767	668,314	3,744	651,528
23,2	1,445	12,173	1,577	17,416	1,569	17,030	1,863	34,500	1,850	33,559	1,839	32,749	2,149	62,312	2,135	60,618	2,120	58,953	2,474	112,042	2,457	108,881	2,443	106,250	2,859	205,516	2,841	200,211	2,824	194,992	3,317	384,354	3,297	374,474	3,276	364,752	3,808	689,893	3,784	671,267	3,761	654,407
23,4	1,451	12,227	1,584	17,494	1,576	17,106	1,871	34,653	1,859	33,708	1,848	32,894	2,158	62,587	2,144	60,886	2,130	59,214	2,485	112,537	2,468	109,362	2,453	106,719	2,872	206,421	2,854	201,093	2,836	195,850	3,332	386,042	3,311	376,118	3,291	366,353	3,825	692,915	3,800	674,208	3,777	657,274
23,6	1,458	12,282	1,591	17,571	1,583	17,182	1,879	34,806	1,867	33,857	1,856	33,039	2,168	62,862	2,153	61,154	2,139	59,474	2,496	113,029	2,479	109,841	2,464	107,186	2,884	207,322	2,866	201,971	2,848	196,705	3,346	387,722	3,326	377,755	3,305	367,948	3,841	695,924	3,817	677,136	3,794	660,129
23,8	1,464	12,336	1,598	17,648	1,590	17,257	1,888	34,958	1,875	34,004	1,864	33,184	2,177	63,136	2,163	61,420	2,148	59,733	2,506	113,520	2,489	110,317	2,475	107,652	2,897	208,219	2,879	202,845	2,861	197,557	3,361	389,395	3,340	379,386	3,319	369,536	3,858	698,920	3,833	680,052	3,810	662,972
24	1,471	12,390	1,605	17,725	1,597	17,332	1,896	35,109	1,883	34,152	1,872	33,328	2,187	63,408	2,172	61,685	2,158	59,991	2,517	114,008	2,500	110,792	2,485	108,115	2,909	209,112	2,891	203,715	2,873	198,405	3,375	391,061	3,354	381,009	3,333	371,118	3,874	701,904	3,849	682,955	3,827	665,803
24,2	1,477	12,443	1,612	17,802	1,603	17,407	1,904	35,260	1,891	34,298	1,880	33,471	2,196	63,680	2,181	61,949	2,167	60,248	2,528	114,495	2,511	111,265	2,496	108,576	2,922	210,002	2,903	204,582	2,885	199,249	3,389	392,720	3,368	382,626	3,348	372,693	3,891	704,876	3,866	685,847	3,843	668,622
24,4	1,483	12,496	1,619	17,878	1,610	17,481	1,912	35,410	1,899	34,445	1,888	33,613	2,205	63,950	2,191	62,212	2,176	60,503	2,539	114,979	2,521	111,736	2,507	109,036	2,934	210,888	2,916	205,445	2,897	200,090	3,403	394,373	3,383	384,236	3,362	374,261	3,907	707,835	3,882	688,727	3,859	671,430
24,6	1,490	12,550	1,626	17,953	1,617	17,556	1,920	35,559	1,907	34,590	1,896	33,755	2,215	64,219	2,200	62,474	2,185	60,758	2,549	115,461	2,532	112,205	2,517	109,494	2,946	211,770	2,928	206,305	2,910	200,927	3,418	396,019	3,397	385,840	3,376	375,824	3,923	710,783	3,898	691,595	3,875	674,226
24,8	1,496	12,603	1,633	18,029	1,624	17,630	1,928	35,708	1,915	34,735	1,904	33,897	2,224	64,487	2,209	62,735	2,194	61,012	2,560	115,942	2,542	112,672	2,528	109,949	2,958	212,649	2,940	207,161	2,922	201,761	3,432	397,658	3,411	387,437	3,390	377,379	3,940	713,718	3,914	694,451	3,891	677,011
25	1,502	12,655	1,640	18,104	1,631	17,703	1,936	35,857	1,923	34,879	1,912	34,038	2,233	64,754	2,218	62,995	2,203	61,265	2,570	116,421	2,553	113,137	2,538	110,403	2,971	213,524	2,952	208,014	2,934	202,592	3,446	399,290	3,425	389,028	3,404	378,929	3,956	716,641	3,930	697,296	3,907	679,785
25,2	1,508	12,708	1,646	18,179	1,637	17,776	1,944	36,005	1,931	35,023	1,920	34,178	2,242	65,020	2,227	63,253	2,212	61,516	2,581	116,897	2,563	113,600	2,548	110,856	2,983	214,396	2,964	208,863	2,946	203,419	3,460	400,916	3,439	390,612	3,417	380,472	3,972	719,553	3,946	700,129	3,923	682,547
25,4	1,514	12,760	1,653	18,254	1,644	17,849	1,952	36,152	1,939	35,166	1,928	34,318	2,251	65,285	2,236	63,511	2,222	61,767	2,591	117,372	2,574	114,062	2,559	111,306	2,995	215,264	2,976	209,709	2,958	204,243	3,474	402,536	3,453	392,190	3,431	382,010	3,988	722,454	3,962	702,952	3,939	685,299
25,6	1,521	12,812	1,660	18,328	1,651	17,922	1,960	36,298	1,947	35,309	1,935	34,457	2,260	65,549	2,245	63,768	2,230	62,017	2,602	117,845	2,584	114,521	2,569	111,755	3,007	216,129	2,988	210,552	2,969	205,064	3,488	404,149	3,466	393,762	3,445	383,541	4,004	725,343	3,978	705,763	3,954	688,040
25,8	1,527	12,864	1,667	18,402	1,658	17,995	1,968	36,444	1,955	35,451	1,943	34,596	2,269	65,812	2,254	64,024	2,239	62,265	2,612	118,316	2,595	114,979	2,579	112,201	3,019	216,991	3,000	211,391	2,981	205,882	3,502	405,756	3,480	395,328	3,459	385,066	4,020	728,221	3,994	708,564	3,970	690,770
26	1,533	12,916	1,673	18,476	1,664	18,067	1,976	36,590	1,962	35,593	1,951	34,734	2,279	66,074	2,263	64,278	2,248	62,513	2,623	118,785	2,605	115,435	2,590	112,647	3,031	217,849	3,012	212,228	2,993	206,696	3,516	407,357	3,494	396,888	3,472	386,586	4,035	731,087	4,010	711,353	3,986	693,490
26,2	1,539	12,967	1,680	18,550	1,671	18,139	1,983	36,735	1,970	35,734	1,959	34,871	2,288	66,335	2,272	64,532	2,257	62,760	2,633	119,253	2,615	115,890	2,600	113,090	3,043	218,704	3,024	213,061	3,005	207,508	3,529	408,951	3,508	398,441	3,486	388,099	4,051	733,943	4,025	714,132	4,001	696,200
26,4	1,545	13,019	1,687	18,623	1,677	18,210	1,991	36,879	1,978	35,874	1,966	35,009	2,296	66,594	2,281	64,785	2,266	63,006	2,643	119,719	2,625	116,342	2,610	113,532	3,054	219,556	3,036	213,891	3,017	208,316	3,543	410,540	3,521	399,989	3,499	389,607	4,067	736,788	4,041	716,900	4,017	698,899
26,6	1,551	13,070	1,693	18,696	1,684	18,282	1,999	37,023	1,986	36,014	1,974	35,145	2,305	66,853	2,290	65,037	2,275	63,251	2,654	120,183	2,635	116,793	2,620	113,972	3,066	220,404	3,047	214,717	3,028	209,121	3,557	412,123	3,535	401,531	3,513	391,110	4,083	739,622	4,056	719,658	4,032	701,588
26,8	1,557	13,121	1,700	18,768	1,690	18,353	2,007	37,166	1,993	36,153	1,982	35,281	2,314	67,111	2,299	65,288	2,284	63,495	2,664	120,645	2,646	117,243	2,630	114,410	3,078	221,250	3,059	215,541	3,040	209,924	3,570	413,699	3,548	403,068	3,526	392,606	4,098	742,446	4,072	722,406	4,048	704,267
27	1,563	13,171	1,706	18,841	1,697	18,423	2,014	37,309	2,001	36,292	1,989	35,417	2,323	67,368	2,308	65,538	2,292	63,738	2,674	121,106	2,656	117,690	2,640	114,847	3,090	222,092	3,071	216,362	3,051	210,723	3,584	415,270	3,562	404,598	3,540	394,097	4,114	745,259	4,087	725,143	4,063	706,935
27,2	1,569	13,222	1,713	18,913	1,704	18,494	2,022	37,451	2,009	36,431	1,997	35,552	2,332	67,624	2,317	65,787	2,301	63,981	2,684	121,564	2,666	118,136	2,650	115,283	3,101	222,931	3,082	217,179	3,063	211,519	3,597	416,835	3,575	406,123	3,553	395,583	4,129	748,061	4,103	727,871	4,078	709,595
27,4	1,575	13,272	1,719	18,985	1,710	18,564	2,030	37,593	2,016	36,569	2,004	35,686	2,341	67,879	2,325	66,035	2,310	64,222	2,694	122,022	2,676	118,581	2,660	115,716	3,113	223,767	3,094	217,994	3,074	212,313	3,611	418,395	3,589	407,643	3,566	397,063	4,145	750,854	4,118	730,588	4,093	712,244
27,6	1,581	13,323	1,726	19,056	1,716	18,634	2,037	37,734	2,024	36,706	2,012	35,821	2,350	68,133	2,334	66,282	2,318	64,463	2,704	122,477	2,686	119,023	2,670	116,148	3,125	224,600	3,105	218,805	3,086	213,104	3,624	419,948	3,602	409,157	3,580	398,538	4,160	753,636	4,133	733,296	4,109	714,884
27,8	1,587	13,373	1,732	19,128	1,723	18,704	2,045	37,875	2,031	36,843	2,019	35,954	2,358	68,387	2,343	66,529	2,327	64,702	2,714	122,931	2,696	119,465	2,680	116,579	3,136	225,430	3,117	219,614	3,097	213,891	3,638	421,496	3,615	410,665	3,593	400,007	4,175	756,409	4,148	735,993	4,124	717,514
28	1,593	13,422	1,739	19,199	1,729	18,774	2,053	38,015	2,039	36,979	2,027	36,087	2,367	68,639	2,351	66,774	2,336	64,941	2,724	123,383	2,706	119,904	2,690	117,008	3,148	226,258	3,128	220,420	3,109	214,676	3,651	423,039	3,628	412,168	3,606	401,471	4,190	759,171	4,164	738,681	4,139	720,135
28,2	1,599	13,472	1,745	19,270	1,736	18,843	2,060	38,155	2,046	37,115	2,034	36,220	2,376	68,890	2,360	67,019	2,344	65,179	2,734	123,834	2,716	120,342	2,700	117,435	3,159	227,082	3,140	221,223	3,120	215,458	3,664	424,576	3,642	413,666	3,619	402,930	4,206	761,923	4,179	741,360	4,154	722,746

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.1: roughness coefficient k=0,125 mm (5/5)

I (‰)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)	v (m/s)	Q (L/s)
28,4	1,605	13,522	1,752	19,340	1,742	18,912	2,068	38,294	2,054	37,251	2,042	36,352	2,384	69,141	2,369	67,263	2,353	65,416	2,744	124,283	2,725	120,779	2,709	117,861	3,171	227,903	3,151	222,023	3,131	216,238	3,677	426,108	3,655	415,158	3,632	404,384	4,221	764,666	4,194	744,029	4,169	725,348
28,6	1,611	13,571	1,758	19,411	1,748	18,981	2,075	38,433	2,061	37,386	2,049	36,484	2,393	69,391	2,377	67,506	2,361	65,652	2,754	124,731	2,735	121,214	2,719	118,286	3,182	228,721	3,162	222,821	3,143	217,014	3,691	427,634	3,668	416,646	3,645	405,833	4,236	767,399	4,209	746,688	4,184	727,941
28,8	1,617	13,620	1,764	19,481	1,755	19,049	2,083	38,571	2,069	37,520	2,057	36,615	2,401	69,640	2,386	67,748	2,370	65,888	2,764	125,177	2,745	121,647	2,729	118,709	3,193	229,537	3,174	223,615	3,154	217,788	3,704	429,155	3,681	418,128	3,658	407,277	4,251	770,123	4,224	749,339	4,198	730,526
29	1,622	13,669	1,771	19,551	1,761	19,118	2,090	38,709	2,076	37,654	2,064	36,746	2,410	69,887	2,394	67,989	2,378	66,123	2,774	125,621	2,755	122,079	2,739	119,130	3,205	230,350	3,185	224,407	3,165	218,560	3,717	430,670	3,694	419,605	3,671	408,715	4,266	772,837	4,239	751,980	4,213	733,101
29,2	1,628	13,718	1,777	19,620	1,767	19,186	2,097	38,846	2,084	37,788	2,071	36,876	2,419	70,135	2,403	68,229	2,387	66,356	2,783	126,064	2,764	122,509	2,748	119,551	3,216	231,160	3,196	225,196	3,176	219,328	3,730	432,181	3,707	421,076	3,684	410,149	4,281	775,542	4,253	754,612	4,228	735,667
29,4	1,634	13,766	1,783	19,690	1,773	19,254	2,105	38,983	2,091	37,921	2,079	37,006	2,427	70,381	2,411	68,469	2,395	66,590	2,793	126,505	2,774	122,938	2,758	119,969	3,227	231,967	3,207	225,983	3,187	220,094	3,743	433,686	3,720	422,543	3,697	411,578	4,296	778,238	4,268	757,236	4,243	738,225
29,6	1,640	13,815	1,789	19,759	1,780	19,321	2,112	39,120	2,098	38,054	2,086	37,136	2,436	70,626	2,419	68,708	2,403	66,822	2,803	126,945	2,784	123,366	2,768	120,387	3,238	232,771	3,218	226,766	3,198	220,858	3,756	435,187	3,733	424,005	3,710	413,002	4,311	780,925	4,283	759,850	4,257	740,773
29,8	1,645	13,863	1,796	19,828	1,786	19,389	2,120	39,255	2,105	38,186	2,093	37,265	2,444	70,871	2,428	68,946	2,412	67,053	2,813	127,384	2,793	123,792	2,777	120,802	3,249	233,573	3,229	227,547	3,209	221,619	3,769	436,682	3,746	425,462	3,722	414,421	4,325	783,602	4,298	762,455	4,272	743,314
30	1,651	13,911	1,802	19,897	1,792	19,456	2,127	39,391	2,113	38,318	2,100	37,394	2,452	71,115	2,436	69,183	2,420	67,284	2,822	127,820	2,803	124,217	2,787	121,217	3,261	234,372	3,240	228,326	3,220	222,377	3,781	438,172	3,758	426,914	3,735	415,836	4,340	786,271	4,312	765,052	4,287	745,846
30,5	1,665	14,031	1,817	20,067	1,808	19,623	2,145	39,728	2,131	38,645	2,118	37,713	2,473	71,721	2,457	69,773	2,441	67,858	2,846	128,907	2,827	125,272	2,810	122,247	3,288	236,358	3,268	230,261	3,247	224,262	3,813	441,876	3,790	430,523	3,767	419,352	4,377	792,904	4,349	771,507	4,323	752,139
31	1,679	14,150	1,833	20,237	1,823	19,789	2,163	40,062	2,149	38,970	2,136	38,031	2,494	72,322	2,478	70,358	2,461	68,426	2,870	129,984	2,850	126,319	2,834	123,269	3,316	238,328	3,295	232,180	3,275	226,131	3,845	445,550	3,822	434,103	3,798	422,839	4,413	799,483	4,385	777,909	4,359	758,380
31,5	1,693	14,268	1,848	20,405	1,838	19,953	2,181	40,393	2,166	39,293	2,154	38,345	2,515	72,918	2,498	70,938	2,481	68,991	2,894	131,052	2,874	127,358	2,857	124,283	3,343	240,282	3,322	234,084	3,301	227,986	3,877	449,194	3,853	437,654	3,829	426,298	4,449	806,009	4,421	784,259	4,394	764,572
32	1,707	14,384	1,863	20,572	1,853	20,116	2,199	40,722	2,184	39,613	2,171	38,657	2,535	73,510	2,518	71,513	2,501	69,551	2,917	132,113	2,897	128,389	2,880	125,288	3,370	242,221	3,349	235,973	3,328	229,826	3,908	452,810	3,884	441,177	3,860	429,731	4,485	812,483	4,456	790,560	4,429	770,715
32,5	1,721	14,500	1,878	20,737	1,868	20,278	2,216	41,048	2,202	39,930	2,189	38,967	2,555	74,097	2,538	72,084	2,521	70,106	2,940	133,165	2,920	129,411	2,903	126,286	3,397	244,145	3,376	237,848	3,354	231,652	3,939	456,398	3,915	444,673	3,890	433,136	4,520	818,908	4,491	796,812	4,464	776,810
33	1,735	14,616	1,893	20,901	1,883	20,439	2,234	41,372	2,219	40,245	2,206	39,275	2,575	74,679	2,558	72,651	2,541	70,658	2,963	134,209	2,943	130,426	2,926	127,277	3,423	246,054	3,402	239,708	3,381	233,464	3,969	459,958	3,945	448,142	3,921	436,515	4,555	825,283	4,526	803,015	4,499	782,859
33,5	1,748	14,730	1,908	21,064	1,897	20,598	2,251	41,693	2,236	40,557	2,223	39,580	2,595	75,257	2,578	73,214	2,561	71,205	2,986	135,245	2,966	131,433	2,949	128,260	3,449	247,949	3,428	241,554	3,407	235,262	4,000	463,492	3,975	451,585	3,951	439,869	4,590	831,611	4,561	809,173	4,534	788,862
34	1,762	14,843	1,922	21,226	1,912	20,756	2,268	42,012	2,253	40,868	2,240	39,883	2,615	75,831	2,598	73,772	2,580	71,748	3,009	136,273	2,988	132,432	2,971	129,235	3,476	249,829	3,454	243,386	3,433	237,047	4,030	466,999	4,006	455,003	3,981	443,199	4,625	837,891	4,595	815,284	4,568	794,821
34,5	1,775	14,956	1,937	21,387	1,926	20,913	2,286	42,329	2,270	41,176	2,257	40,183	2,635	76,401	2,617	74,326	2,600	72,287	3,031	137,294	3,011	133,425	2,993	130,204	3,502	251,696	3,480	245,205	3,458	238,818	4,060	470,480	4,035	458,395	4,010	446,503	4,659	844,125	4,630	821,351	4,602	800,736
35	1,788	15,067	1,951	21,546	1,941	21,069	2,302	42,643	2,287	41,482	2,274	40,482	2,654	76,967	2,637	74,877	2,619	72,822	3,054	138,308	3,033	134,410	3,015	131,165	3,527	253,550	3,506	247,011	3,484	240,578	4,090	473,937	4,065	461,764	4,040	449,784	4,694	850,315	4,664	827,374	4,636	806,608
35,5	1,802	15,178	1,966	21,704	1,955	21,224	2,319	42,955	2,304	41,785	2,290	40,778	2,674	77,528	2,656	75,423	2,638	73,354	3,076	139,314	3,055	135,388	3,037	132,120	3,553	255,390	3,531	248,804	3,509	242,324	4,120	477,369	4,095	465,108	4,069	453,042	4,728	856,461	4,697	833,354	4,669	812,439
36	1,815	15,289	1,980	21,862	1,969	21,378	2,336	43,265	2,321	42,087	2,307	41,072	2,693	78,086	2,675	75,966	2,657	73,882	3,098	140,314	3,077	136,360	3,059	133,068	3,578	257,218	3,556	250,585	3,534	244,058	4,149	480,777	4,124	468,429	4,098	456,277	4,761	862,563	4,731	839,293	4,703	818,229
36,5	1,828	15,398	1,994	22,018	1,983	21,531	2,353	43,573	2,337	42,386	2,323	41,365	2,712	78,640	2,694	76,505	2,676	74,406	3,120	141,306	3,099	137,324	3,081	134,009	3,604	259,033	3,581	252,353	3,559	245,781	4,178	484,162	4,153	471,726	4,127	459,490	4,795	868,624	4,764	845,190	4,736	823,979
37	1,840	15,507	2,008	22,173	1,997	21,682	2,369	43,878	2,353	42,684	2,340	41,655	2,731	79,190	2,713	77,040	2,695	74,927	3,142	142,292	3,120	138,282	3,102	134,944	3,629	260,835	3,606	254,110	3,584	247,492	4,207	487,523	4,182	475,002	4,156	462,680	4,828	874,643	4,797	851,048	4,768	829,689
37,5	1,853	15,615	2,022	22,327	2,011	21,833	2,386	44,182	2,370	42,979	2,356	41,943	2,750	79,736	2,732	77,572	2,713	75,444	3,163	143,271	3,142	139,234	3,124	135,873	3,654	262,626	3,631	255,854	3,608	249,191	4,236	490,862	4,210	478,255	4,184	465,850	4,861	880,622	4,830	856,865	4,801	835,362
38	1,866	15,722	2,036	22,480	2,025	21,983	2,402	44,484	2,386	43,273	2,372	42,230	2,768	80,279	2,750	78,100	2,732	75,957	3,185	144,244	3,163	140,179	3,145	136,796	3,678	264,404	3,656	257,587	3,633	250,879	4,265	494,179	4,239	481,487	4,213	468,998	4,894	886,561	4,862	862,645	4,833	840,996
38,5	1,879	15,829	2,050	22,632	2,039	22,131	2,418	44,783	2,402	43,564	2,388	42,514	2,787	80,818	2,769	78,624	2,750	76,468	3,206	145,210	3,184	141,119	3,166	137,713	3,703	266,171	3,680	259,309	3,657	252,556	4,293	497,474	4,267	484,698	4,241	472,126	4,926	892,461	4,895	868,386	4,866	846,594
39	1,891	15,934	2,063	22,783	2,052	22,279	2,434	45,081	2,418	43,854	2,404	42,797	2,805	81,354	2,787	79,146	2,768	76,975	3,227	146,171	3,205	142,052	3,187	138,623	3,727	267,927	3,704	261,019	3,681	254,222	4,321	500,747	4,295	487,888	4,269	475,233	4,959	898,323	4,927	874,091	4,898	852,156
39,5	1,904	16,040	2,077	22,933	2,066	22,426	2,450	45,377	2,434	44,142	2,420	43,078	2,824	81,886	2,805	79,664	2,787	77,479	3,248	147,125	3,226	142,979	3,208	139,528	3,752	269,671	3,729	262,719	3,705	255,877	4,350	504,000	4,323	491,057	4,296	478,321	4,991	904,148	4,959	879,759	4,929	857,682
40	1,916	16,144	2,090	23,082	2,079	22,572	2,466	45,671	2,450	44,428	2,435	43,357	2,842	82,415	2,823	80,178	2,805	77,979	3,269	148,073	3,247	143,901	3,228	140,428	3,776	271,405	3,752	264,407	3,729	257,522	4,377	507,233	4,351	494,207	4,324	481,389	5,023	909,936	4,991	885,391	4,961	863,174
40,5	1,928	16,248	2,104	23,231	2,092	22,717	2,482	45,963	2,465	44,712	2,451	43,635	2,860	82,941	2,841	80,690	2,822	78,477	3,290	149,015	3,268	144,816	3,249	141,321	3,800	273,127	3,776	266,086	3,753	259,157	4,405	510,445	4,378	497,337	4,351	484,439	5,054	915,688	5,022	890,988	4,992	868,631
41	1,941	16,351	2,117	23,378	2,106	22,861	2,497	46,254	2,481	44,995	2,466	43,910	2,878	83,464	2,859	81,198	2,840	78,971	3,311	149,951	3,288	145,726	3,269	142,209	3,824	274,840	3,800	267,754	3,776	260,782	4,433	513,638	4,406	500,448	4,378	487,469	5,086	921,404	5,053	896,551	5,023	874,055
41,5	1,953	16,454	2,130	23,524	2,119	23,004	2,513	46,542	2,496	45,275	2,482	44,185	2,896	83,983	2,877	81,704	2,858	79,463	3,331	150,882	3,309	146,631	3,290	143,092	3,847	276,541	3,824	269,412	3,800	262,397	4,460	516,811	4,433	503,540	4,405	490,481	5,117	927,086	5,085	902,081	5,054	879,446
42	1,965	16,556	2,144	23,670	2,132	23,146	2,529	46,829	2,512	45,555	2,497	44,457	2,914	84,499	2,895	82,206	2,876	79,952	3,352	151,807	3,329	147,530	3,310	143,970	3,871	278,233	3,847	271,060	3,823	264,002	4,487	519,965	4,460	506,614	4,432	493,475	5,149	932,734	5,116	907,577	5,085	884,804
42,5	1,977	16,657	2,157	23,815	2,145	23,288	2,544	47,115	2,527	45,832	2,512	44,728	2,932	85,013	2,912	82,705	2,893	80,437	3,372	152,726	3,349	148,424	3,330	144,842	3,894	279,914	3,870	272,698	3,846	265,598	4,514	523,101	4,487	509,669	4,459	496,452	5,180	938,349	5,146	913,040	5,116	890,131
43	1,989	16,758	2,170	23,959	2,158	23,429	2,559	47,398	2,542	46,108	2,527	44,997	2,949	85,523	2,930	83,202	2,910	80,920	3,392	153,641	3,369	149,312	3,350	145,709	3,917	281,586	3,893	274,327	3,869	267,185	4,541	526,218	4,514	512,706	4,486	499,411	5,210	943,930	5,177	918,472	5,146	895,427
43,5	2,001	16,859	2,183	24,102	2,171	23,568	2,574	47,680	2,557	46,382	2,542	45,265	2,967	86,030	2,947	83,695	2,928	81,400	3,412	154,550	3,389	150,196	3,370	146,572	3,941	283,248	3,916	275,946	3,892	268,762	4,568	529,317	4,540	515,726	4,512	502,352	5,241	949,480	5,207	923,872	5,176	900,692
44	2,013	16,958	2,196	24,244	2,184	23,708	2,590	47,960	2,572	46,655	2,557	45,531	2,984	86,534	2,964	84,186	2,945	81,878	3,432	155,453	3,409	151,074	3,389	147,429	3,964	284,900	3,939	277,557	3,915	270,330	4,595	532,399	4,567	518,729	4,538	505,277	5,271	954,997	5,238	929,241	5,207	905,926
44,5	2,025	17,057	2,208	24,385	2,196	23,846	2,605	48,239	2,587	46,926	2,572	45,796	3,001	87,036	2,982	84,674	2,962	82,352	3,452	156,352	3,429	151,948	3,409	148,281	3,986	286,544	3,962	279,158	3,937	271,890	4,621	535,463	4,593	521,715	4,564	508,186	5,302	960,484	5,268	934,580	5,236	911,132
45	2,036	17,156	2,221	24,526	2,209	23,983	2,620	48,516	2,602	47,196	2,587	46,059	3,019	87,535	2,999	85,159	2,979	82,824	3,472	157,246	3,448	152,816	3,428	149,129	4,009	288,178	3,984	280,750	3,960	273,441	4,647	538,510	4,619	524,684	4,590	511,078	5,332	965,939	5,298	939,889	5,266	916,308
45,5	2,048	17,254	2,234	24,666	2,222	24,120	2,634	48,792	2,617	47,464	2,602	46,321	3,036	88,031	3,016	85,642	2,996	83,294	3,491	158,135	3,468	153,680	3,448	149,972	4,032	289,803	4,007	282,333	3,982	274,983	4,674	541,540	4,645	527,636	4,616	513,954	5,362	971,365	5,327	945,168	5,296	921,455
46	2,059	17,352	2,246	24,805	2,234	24,256	2,649	49,066	2,632	47,731	2,616	46,581	3,053	88,524	3,033	86,122	3,013	83,760	3,511	159,018	3,487	154,539	3,467	150,811	4,054	291,419	4,029	283,907	4,004	276,516	4,700	544,553	4,671	530,572	4,642	516,815	5,392	976,761	5,357	950,419	5,325	926,575
46,5	2,071	17,449	2,259	24,943	2,247	24,392	2,664	49,339	2,646	47,996	2,631	46,840	3,070	89,015	3,049	86,599	3,029	84,225	3,530	159,898	3,506	155,394	3,486	151,645	4,077	293,026	4,051	285,473	4,026	278,042	4,725	547,551	4,697	533,493	4,668	519,660	5,421	982,127	5,387	955,641	5,354	931,666
47	2,082	17,545	2,271	25,081	2,259	24,526	2,679	49,610	2,661	48,260	2,645	47,098	3,086	89,503	3,066	87,074	3,046	84,687	3,550	160,772	3,526	156,244	3,505	152,474	4,099	294,625	4,074	287,031	4,048	279,559	4,751	550,532	4,722	536,398	4,693	522,490	5,451	987,465	5,416	960,836	5,384	936,731
47,5	2,094	17,641	2,284	25,218	2,271	24,660	2,693	49,880	2,675	48,523	2,660	47,354	3,103	89,988	3,083	87,546	3,062	85,146	3,569	161,642	3,545	157,089	3,524	153,299	4,121	296,215	4,096	288,581	4,070	281,068	4,777	553,497	4,748	539,287	4,718	525,304	5,480	992,775	5,445	966,003	5,413	941,769
48	2,105	17,736	2,296	25,354	2,284	24,793	2,708	50,148	2,690	48,784	2,674	47,609	3,120	90,471	3,099	88,016	3,079	85,603	3,588	162,507	3,564	157,930	3,543	154,120	4,143	297,797	4,117	290,122	4,092	282,570	4,802	556,447	4,773	542,162	4,743	528,104	5,509	998,057	5,474	971,143	5,441	946,780
48,5	2,116	17,831	2,308	25,489	2,296	24,926	2,722	50,415	2,704	49,044	2,688	47,862	3,136	90,951	3,116	88,484	3,095	86,058	3,607	163,368	3,583	158,767	3,562	154,936	4,165	299,371	4,139	291,655	4,113	284,063	4,828	559,382	4,798	545,021	4,768	530,890	5,538	1003,311	5,503	976,256	5,470	951,765
49	2,128	17,926	2,321	25,624	2,308	25,058	2,736	50,681	2,718	49,302	2,702	48,115	3,153	91,429	3,132	88,949	3,111	86,510	3,626	164,224	3,601	159,599	3,580	155,749	4,187	300,937	4,161	293,181	4,135	285,549	4,853	562,301	4,823	547,866	4,793	533,661	5,567	1008,539	5,531	981,343	5,499	956,725
49,5	2,139	18,020	2,333	25,758	2,320	25,189	2,751	50,945	2,733	49,559	2,717	48,366	3,169	91,905	3,148	89,411	3,128	86,960	3,645	165,076	3,620	160,427	3,599	156,557	4,208	302,494	4,182	294,699	4,156	287,028	4,878	565,206	4,848	550,696	4,818	536,418	5,596	1013,740	5,560	986,404	5,527	961,659
50	2,150	18,113	2,345	25,892	2,332	25,319	2,765	51,208	2,747	49,815	2,731	48,615	3,186	92,378	3,165	89,872	3,144	87,408	3,663	165,924	3,639	161,251	3,618	157,361	4,230	304,044	4,204	296,209	4,178	288,499	4,903	568,096	4,873	553,512	4,843	539,162	5,624	1018,914	5,588	991,439	5,555	966,569

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.2: roughness coefficient k=0,25 mm (1/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,072	0,610	0,080	0,883	0,080	0,863	0,096	1,786	0,096	1,736	0,095	1,692	0,113	3,277	0,112	3,186	0,111	3,096	0,132	5,979	0,131	5,806	0,130	5,663	0,155	11,121	0,154	10,828	0,153	10,539	0,182	21,076	0,181	20,523	0,179	19,979	0,211	38,264	0,210	37,212	0,208	36,260
0,2	0,107	0,901	0,118	1,302	0,117	1,272	0,142	2,621	0,140	2,548	0,140	2,485	0,165	4,797	0,164	4,664	0,163	4,533	0,193	8,729	0,191	8,478	0,190	8,269	0,225	16,195	0,224	15,769	0,222	15,351	0,264	30,617	0,262	29,817	0,261	29,030	0,306	55,468	0,304	53,948	0,302	52,572
0,3	0,134	1,129	0,147	1,629	0,147	1,592	0,177	3,273	0,175	3,182	0,174	3,104	0,206	5,981	0,205	5,815	0,203	5,652	0,240	10,867	0,238	10,556	0,237	10,296	0,280	20,134	0,278	19,607	0,276	19,087	0,328	38,014	0,326	37,022	0,324	36,047	0,380	68,789	0,377	66,907	0,375	65,205
0,4	0,157	1,323	0,173	1,907	0,172	1,864	0,207	3,828	0,205	3,722	0,204	3,630	0,241	6,987	0,239	6,794	0,238	6,604	0,280	12,683	0,278	12,320	0,276	12,017	0,327	23,476	0,324	22,862	0,322	22,257	0,382	44,283	0,380	43,129	0,377	41,995	0,442	80,071	0,439	77,883	0,436	75,904
0,5	0,177	1,495	0,195	2,154	0,194	2,106	0,233	4,320	0,232	4,200	0,230	4,097	0,272	7,878	0,270	7,660	0,268	7,447	0,316	14,290	0,313	13,881	0,311	13,541	0,368	26,432	0,365	25,740	0,363	25,061	0,430	49,824	0,427	48,528	0,424	47,253	0,497	90,039	0,494	87,581	0,491	85,358
0,6	0,196	1,652	0,215	2,379	0,214	2,325	0,257	4,766	0,256	4,634	0,254	4,520	0,300	8,686	0,297	8,447	0,295	8,211	0,348	15,747	0,345	15,297	0,343	14,923	0,405	29,111	0,402	28,350	0,400	27,602	0,473	54,846	0,470	53,420	0,467	52,018	0,547	99,069	0,543	96,367	0,540	93,922
0,7	0,213	1,796	0,234	2,586	0,233	2,528	0,280	5,178	0,278	5,035	0,276	4,911	0,325	9,432	0,323	9,172	0,321	8,916	0,377	17,091	0,375	16,602	0,372	16,196	0,439	31,580	0,436	30,756	0,434	29,945	0,513	59,472	0,510	57,927	0,507	56,408	0,593	107,386	0,589	104,458	0,585	101,809
0,8	0,229	1,931	0,252	2,779	0,250	2,717	0,300	5,562	0,298	5,408	0,296	5,276	0,349	10,127	0,347	9,848	0,344	9,574	0,405	18,343	0,402	17,820	0,400	17,384	0,471	33,882	0,468	32,998	0,465	32,128	0,550	63,784	0,547	62,128	0,543	60,499	0,636	115,135	0,631	111,998	0,627	109,160
0,9	0,244	2,059	0,268	2,961	0,267	2,895	0,320	5,924	0,318	5,760	0,316	5,619	0,372	10,781	0,369	10,485	0,367	10,193	0,431	19,522	0,428	18,965	0,425	18,501	0,501	36,047	0,498	35,107	0,495	34,182	0,585	67,838	0,582	66,078	0,578	64,346	0,676	122,421	0,671	119,087	0,667	116,070
1	0,259	2,179	0,284	3,134	0,282	3,064	0,338	6,266	0,336	6,093	0,334	5,944	0,393	11,401	0,390	11,088	0,388	10,779	0,456	20,638	0,452	20,049	0,450	19,560	0,530	38,096	0,527	37,103	0,523	36,127	0,619	71,676	0,615	69,817	0,611	67,988	0,714	129,317	0,709	125,796	0,705	122,610
1,1	0,272	2,294	0,299	3,298	0,297	3,224	0,356	6,593	0,353	6,411	0,351	6,254	0,414	11,991	0,411	11,662	0,408	11,338	0,479	21,700	0,476	21,082	0,473	20,567	0,557	40,048	0,554	39,004	0,550	37,978	0,650	75,329	0,646	73,376	0,642	71,454	0,750	135,880	0,745	132,182	0,740	128,835
1,2	0,285	2,404	0,313	3,456	0,311	3,378	0,373	6,905	0,370	6,714	0,368	6,550	0,433	12,556	0,430	12,211	0,427	11,872	0,502	22,717	0,498	22,069	0,495	21,531	0,583	41,914	0,579	40,822	0,576	39,748	0,680	78,822	0,676	76,779	0,672	74,769	0,785	142,154	0,779	138,287	0,775	134,787
1,3	0,298	2,509	0,327	3,607	0,325	3,526	0,389	7,205	0,386	7,006	0,384	6,835	0,452	13,098	0,449	12,738	0,445	12,385	0,523	23,692	0,519	23,017	0,516	22,456	0,608	43,705	0,604	42,566	0,600	41,447	0,709	82,174	0,705	80,045	0,700	77,950	0,818	148,175	0,812	144,145	0,807	140,498
1,4	0,310	2,611	0,340	3,753	0,338	3,668	0,405	7,493	0,402	7,287	0,399	7,109	0,470	13,620	0,466	13,246	0,463	12,878	0,544	24,631	0,540	23,930	0,537	23,346	0,632	45,429	0,628	44,246	0,624	43,083	0,737	85,401	0,732	83,188	0,728	81,012	0,850	153,971	0,844	149,784	0,839	145,995
1,5	0,322	2,709	0,353	3,893	0,351	3,806	0,420	7,772	0,417	7,558	0,414	7,374	0,487	14,124	0,484	13,736	0,480	13,355	0,564	25,538	0,560	24,811	0,556	24,206	0,655	47,093	0,651	45,868	0,647	44,662	0,764	88,516	0,759	86,223	0,754	83,968	0,881	159,565	0,875	155,227	0,870	151,301
1,6	0,333	2,804	0,365	4,029	0,363	3,939	0,434	8,042	0,431	7,821	0,429	7,630	0,504	14,612	0,500	14,211	0,497	13,817	0,583	26,416	0,579	25,664	0,576	25,039	0,678	48,704	0,673	47,437	0,669	46,190	0,790	91,530	0,785	89,160	0,780	86,828	0,911	164,978	0,905	160,493	0,899	156,435
1,7	0,344	2,897	0,377	4,161	0,375	4,068	0,448	8,304	0,445	8,075	0,443	7,878	0,520	15,085	0,517	14,671	0,513	14,264	0,602	27,267	0,598	26,491	0,594	25,846	0,699	50,266	0,695	48,958	0,690	47,672	0,815	94,452	0,810	92,006	0,805	89,601	0,940	170,225	0,933	165,599	0,928	161,412
1,8	0,354	2,986	0,389	4,290	0,386	4,194	0,462	8,558	0,459	8,323	0,456	8,120	0,536	15,544	0,532	15,118	0,529	14,699	0,620	28,094	0,616	27,295	0,612	26,630	0,720	51,783	0,716	50,436	0,711	49,111	0,840	97,290	0,834	94,772	0,829	92,294	0,968	175,321	0,961	170,558	0,955	166,246
1,9	0,365	3,074	0,400	4,415	0,398	4,316	0,475	8,806	0,472	8,563	0,469	8,355	0,551	15,992	0,548	15,553	0,544	15,122	0,638	28,898	0,634	28,076	0,630	27,392	0,741	53,259	0,736	51,874	0,731	50,511	0,863	100,051	0,858	97,462	0,853	94,914	0,995	180,279	0,989	175,381	0,982	170,949
2	0,375	3,159	0,411	4,536	0,409	4,435	0,488	9,047	0,485	8,798	0,482	8,584	0,566	16,427	0,563	15,977	0,559	15,535	0,655	29,682	0,651	28,838	0,647	28,136	0,761	54,697	0,756	53,275	0,751	51,876	0,887	102,741	0,881	100,083	0,875	97,467	1,022	185,109	1,015	180,081	1,009	175,530
2,1	0,385	3,242	0,422	4,655	0,419	4,551	0,501	9,282	0,498	9,027	0,495	8,807	0,581	16,853	0,577	16,391	0,573	15,937	0,672	30,447	0,667	29,581	0,663	28,861	0,780	56,100	0,775	54,641	0,770	53,207	0,909	105,366	0,904	102,640	0,898	99,958	1,048	189,821	1,041	184,665	1,034	179,999
2,2	0,394	3,323	0,432	4,771	0,430	4,665	0,514	9,512	0,510	9,251	0,507	9,025	0,595	17,268	0,591	16,795	0,587	16,330	0,689	31,193	0,684	30,307	0,680	29,569	0,800	57,470	0,794	55,976	0,789	54,507	0,931	107,929	0,926	105,137	0,920	102,390	1,073	194,422	1,066	189,143	1,060	184,364
2,3	0,404	3,402	0,442	4,885	0,440	4,776	0,526	9,737	0,522	9,469	0,519	9,239	0,609	17,674	0,605	17,190	0,601	16,714	0,705	31,924	0,700	31,017	0,696	30,262	0,818	58,809	0,813	57,281	0,808	55,778	0,953	110,435	0,947	107,578	0,941	104,768	1,098	198,921	1,091	193,520	1,084	188,632
2,4	0,413	3,480	0,452	4,996	0,450	4,884	0,538	9,957	0,534	9,684	0,531	9,448	0,623	18,072	0,619	17,577	0,615	17,090	0,721	32,639	0,716	31,711	0,711	30,939	0,836	60,121	0,831	58,559	0,826	57,022	0,974	112,887	0,968	109,968	0,962	107,095	1,122	203,324	1,115	197,804	1,108	192,808
2,5	0,422	3,556	0,462	5,105	0,460	4,991	0,549	10,173	0,545	9,893	0,542	9,653	0,637	18,461	0,632	17,956	0,628	17,459	0,736	33,339	0,731	32,392	0,727	31,603	0,854	61,405	0,849	59,810	0,843	58,241	0,995	115,289	0,989	112,308	0,982	109,375	1,146	207,636	1,139	202,000	1,132	196,898
2,6	0,431	3,631	0,472	5,212	0,469	5,095	0,561	10,384	0,557	10,099	0,553	9,853	0,650	18,843	0,645	18,327	0,641	17,820	0,751	34,025	0,746	33,059	0,741	32,255	0,872	62,664	0,866	61,037	0,861	59,436	1,015	117,645	1,009	114,603	1,002	111,610	1,169	211,864	1,162	206,113	1,155	200,909
2,7	0,440	3,704	0,481	5,316	0,479	5,197	0,572	10,592	0,568	10,301	0,564	10,050	0,663	19,218	0,658	18,692	0,654	18,174	0,766	34,699	0,761	33,714	0,756	32,893	0,889	63,900	0,883	62,240	0,878	60,608	1,035	119,955	1,029	116,854	1,022	113,803	1,192	216,012	1,185	210,149	1,177	204,843
2,8	0,448	3,776	0,491	5,419	0,488	5,298	0,583	10,796	0,579	10,499	0,575	10,244	0,675	19,586	0,671	19,049	0,666	18,522	0,781	35,360	0,775	34,356	0,771	33,521	0,906	65,113	0,900	63,422	0,894	61,759	1,055	122,224	1,048	119,064	1,042	115,956	1,215	220,084	1,207	214,111	1,199	208,705
2,9	0,457	3,846	0,500	5,520	0,497	5,397	0,594	10,996	0,590	10,694	0,586	10,434	0,688	19,947	0,683	19,401	0,678	18,864	0,795	36,010	0,790	34,988	0,785	34,137	0,922	66,305	0,917	64,583	0,911	62,889	1,074	124,452	1,067	121,236	1,061	118,071	1,237	224,084	1,229	218,003	1,221	212,500
3	0,465	3,916	0,509	5,620	0,506	5,494	0,604	11,193	0,600	10,885	0,597	10,621	0,700	20,302	0,695	19,747	0,691	19,201	0,809	36,649	0,804	35,609	0,799	34,743	0,939	67,476	0,933	65,724	0,927	64,001	1,093	126,643	1,086	123,370	1,079	120,150	1,259	228,016	1,250	221,829	1,243	216,230
3,1	0,473	3,984	0,518	5,718	0,515	5,590	0,615	11,386	0,611	11,074	0,607	10,804	0,712	20,652	0,707	20,087	0,702	19,531	0,823	37,277	0,817	36,219	0,812	35,338	0,955	68,629	0,949	66,847	0,943	65,094	1,112	128,798	1,105	125,470	1,098	122,195	1,280	231,884	1,272	225,593	1,264	219,899
3,2	0,481	4,052	0,527	5,814	0,524	5,684	0,625	11,577	0,621	11,259	0,617	10,985	0,724	20,996	0,719	20,422	0,714	19,857	0,837	37,896	0,831	36,820	0,826	35,925	0,971	69,763	0,964	67,952	0,958	66,170	1,130	130,919	1,123	127,536	1,116	124,207	1,301	235,690	1,292	229,296	1,285	223,509
3,3	0,489	4,118	0,535	5,909	0,532	5,777	0,635	11,764	0,631	11,441	0,627	11,163	0,736	21,335	0,731	20,751	0,726	20,177	0,850	38,505	0,844	37,412	0,839	36,502	0,986	70,879	0,980	69,040	0,974	67,230	1,148	133,006	1,141	129,570	1,133	126,189	1,322	239,438	1,313	232,942	1,305	227,064
3,4	0,497	4,183	0,544	6,002	0,541	5,868	0,645	11,949	0,641	11,621	0,637	11,339	0,747	21,669	0,742	21,076	0,737	20,493	0,863	39,105	0,857	37,995	0,852	37,071	1,001	71,979	0,995	70,111	0,989	68,273	1,166	135,063	1,158	131,574	1,151	128,140	1,342	243,129	1,333	236,534	1,325	230,565
3,5	0,504	4,248	0,552	6,094	0,549	5,958	0,655	12,132	0,651	11,798	0,647	11,512	0,759	21,997	0,753	21,396	0,748	20,804	0,876	39,696	0,870	38,569	0,865	37,632	1,016	73,063	1,010	71,167	1,004	69,302	1,183	137,090	1,176	133,548	1,168	130,064	1,362	246,767	1,353	240,074	1,345	234,016
3,6	0,512	4,311	0,560	6,185	0,557	6,047	0,665	12,311	0,660	11,973	0,656	11,682	0,770	22,322	0,765	21,711	0,759	21,111	0,889	40,279	0,883	39,136	0,878	38,185	1,031	74,132	1,025	72,208	1,018	70,316	1,200	139,088	1,193	135,495	1,185	131,960	1,382	250,353	1,373	243,563	1,364	237,418
3,7	0,519	4,374	0,568	6,274	0,565	6,134	0,674	12,488	0,670	12,146	0,666	11,851	0,781	22,642	0,775	22,022	0,770	21,414	0,902	40,853	0,896	39,694	0,890	38,730	1,046	75,186	1,039	73,235	1,033	71,316	1,217	141,059	1,210	137,416	1,202	133,831	1,401	253,890	1,392	247,005	1,384	240,773
3,8	0,526	4,435	0,576	6,363	0,573	6,221	0,684	12,663	0,679	12,316	0,675	12,017	0,792	22,957	0,786	22,329	0,781	21,712	0,915	41,421	0,908	40,246	0,903	39,268	1,060	76,226	1,054	74,249	1,047	72,303	1,234	143,004	1,226	139,310	1,219	135,676	1,421	257,380	1,411	250,401	1,403	244,084
3,9	0,534	4,496	0,584	6,450	0,581	6,306	0,693	12,836	0,688	12,484	0,684	12,180	0,802	23,269	0,797	22,633	0,792	22,007	0,927	41,981	0,920	40,790	0,915	39,799	1,075	77,253	1,068	75,249	1,061	73,277	1,251	144,923	1,243	141,180	1,235	137,498	1,440	260,825	1,430	253,752	1,422	247,351
4	0,541	4,557	0,592	6,536	0,589	6,390	0,702	13,006	0,697	12,649	0,693	12,342	0,813	23,576	0,808	22,932	0,802	22,298	0,939	42,533	0,933	41,327	0,927	40,323	1,089	78,266	1,082	76,236	1,075	74,239	1,267	146,818	1,259	143,027	1,251	139,296	1,458	264,225	1,449	257,061	1,440	250,577
4,1	0,548	4,616	0,600	6,621	0,596	6,473	0,711	13,175	0,706	12,813	0,702	12,502	0,823	23,880	0,818	23,227	0,812	22,586	0,951	43,079	0,945	41,858	0,939	40,841	1,103	79,267	1,096	77,211	1,089	75,189	1,283	148,690	1,275	144,850	1,267	141,072	1,477	267,584	1,467	260,329	1,458	253,763
4,2	0,555	4,675	0,607	6,705	0,604	6,556	0,720	13,341	0,715	12,975	0,711	12,660	0,834	24,180	0,828	23,519	0,823	22,870	0,963	43,619	0,956	42,382	0,951	41,352	1,117	80,256	1,109	78,175	1,102	76,127	1,299	150,539	1,291	146,652	1,283	142,827	1,495	270,902	1,486	263,558	1,477	256,910
4,3	0,562	4,733	0,615	6,788	0,611	6,637	0,729	13,505	0,724	13,135	0,720	12,816	0,844	24,477	0,838	23,808	0,833	23,150	0,975	44,152	0,968	42,900	0,962	41,858	1,130	81,234	1,123	79,127	1,116	77,054	1,315	152,366	1,307	148,432	1,298	144,561	1,513	274,181	1,504	266,748	1,494	260,021
4,4	0,569	4,790	0,622	6,870	0,619	6,717	0,738	13,668	0,733	13,293	0,728	12,970	0,854	24,770	0,848	24,093	0,843	23,428	0,986	44,679	0,980	43,412	0,974	42,358	1,144	82,200	1,136	80,068	1,129	77,971	1,331	154,172	1,322	150,192	1,314	146,275	1,531	277,423	1,521	269,902	1,512	263,096
4,5	0,575	4,847	0,630	6,952	0,626	6,796	0,747	13,829	0,742	13,449	0,737	13,123	0,864	25,060	0,858	24,375	0,852	23,702	0,998	45,200	0,991	43,919	0,985	42,852	1,157	83,155	1,150	80,999	1,142	78,878	1,346	155,958	1,338	151,932	1,329	147,970	1,549	280,628	1,539	273,021	1,530	266,136
4,6	0,582	4,903	0,637	7,032	0,633	6,875	0,755	13,987	0,750	13,604	0,746	13,274	0,874	25,347	0,868	24,654	0,862	23,974	1,009	45,715	1,002	44,419	0,996	43,341	1,170	84,100	1,163	81,919	1,155	79,774	1,361	157,724	1,353	153,653	1,344	149,646	1,567	283,797	1,556	276,105	1,547	269,142
4,7	0,589	4,959	0,644	7,111	0,640	6,953	0,764	14,145	0,759	13,757	0,754	13,423	0,884	25,631	0,878	24,931	0,872	24,242	1,021	46,225	1,014	44,915	1,007	43,824	1,183	85,035	1,176	82,830	1,168	80,661	1,376	159,472	1,368	155,355	1,359	151,305	1,584	286,933	1,573	279,156	1,564	272,117
49,5	2,139	18,020	2,333	25,758	2,320	25,189	2,751	50,945	2,733	49,559	2,717	48,366	3,169	91,905	3,148	89,411	3,128	86,960	3,645	165,076	3,620	160,427	3,599	156,557	4,208	302,494	4,182	294,699	4,156	287,028	4,878	565,206	4,848	550,696	4,818	536,418	5,596	1013,740	5,560	986,404	5,527	961,659
50	2,150	18,113	2,345	25,892	2,332	25,319	2,765	51,208	2,747	49,815	2,731	48,615	3,186	92,378	3,165	89,872	3,144	87,408	3,663	165,924	3,639	161,251	3,618	157,361	4,230	304,044	4,204	296,209	4,178	288,499	4,903	568,096	4,873	553,512	4,843	539,162	5,624	1018,914	5,588	991,439	5,555	966,569

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.2: roughness coefficient k=0,25 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,8	0,595	5,014	0,651	7,190	0,648	7,030	0,772	14,300	0,767	13,908	0,762	13,571	0,894	25,912	0,888	25,204	0,881	24,508	1,032	46,730	1,025	45,405	1,018	44,303	1,196	85,960	1,188	83,731	1,181	81,538	1,391	161,201	1,382	157,040	1,374	152,945	1,601	290,035	1,590	282,174	1,581	275,059
4,9	0,602	5,068	0,658	7,268	0,655	7,106	0,780	14,454	0,775	14,058	0,770	13,717	0,903	26,190	0,897	25,474	0,891	24,771	1,043	47,229	1,036	45,890	1,029	44,776	1,209	86,875	1,201	84,623	1,193	82,407	1,406	162,912	1,397	158,707	1,388	154,569	1,618	293,106	1,607	285,162	1,598	277,972
5	0,608	5,122	0,665	7,345	0,661	7,181	0,789	14,607	0,783	14,206	0,779	13,862	0,913	26,465	0,906	25,742	0,900	25,031	1,054	47,723	1,046	46,371	1,040	45,245	1,221	87,781	1,214	85,505	1,206	83,267	1,421	164,605	1,412	160,357	1,403	156,177	1,635	296,145	1,624	288,119	1,614	280,855
5,1	0,614	5,176	0,672	7,421	0,668	7,256	0,797	14,758	0,791	14,353	0,787	14,005	0,922	26,737	0,916	26,007	0,910	25,289	1,065	48,213	1,057	46,846	1,051	45,709	1,234	88,678	1,226	86,379	1,218	84,118	1,435	166,282	1,426	161,991	1,417	157,768	1,651	299,154	1,640	291,047	1,631	283,710
5,2	0,621	5,229	0,679	7,497	0,675	7,330	0,805	14,907	0,799	14,498	0,795	14,147	0,931	27,007	0,925	26,269	0,919	25,544	1,075	48,697	1,068	47,317	1,061	46,169	1,246	89,567	1,238	87,245	1,230	84,961	1,449	167,943	1,440	163,609	1,431	159,344	1,668	302,134	1,657	293,947	1,647	286,536
5,3	0,627	5,281	0,686	7,572	0,682	7,403	0,813	15,055	0,807	14,643	0,802	14,287	0,941	27,274	0,934	26,529	0,928	25,797	1,086	49,177	1,078	47,784	1,072	46,624	1,258	90,447	1,250	88,102	1,242	85,796	1,464	169,588	1,454	165,212	1,445	160,905	1,684	305,086	1,673	296,819	1,663	289,336
5,4	0,633	5,333	0,692	7,646	0,689	7,475	0,821	15,202	0,815	14,785	0,810	14,427	0,950	27,539	0,943	26,786	0,937	26,047	1,096	49,653	1,089	48,246	1,082	47,075	1,270	91,318	1,262	88,951	1,254	86,623	1,478	171,218	1,468	166,799	1,459	162,452	1,700	308,010	1,689	299,664	1,679	292,110
5,5	0,639	5,384	0,699	7,719	0,695	7,547	0,829	15,347	0,823	14,927	0,818	14,565	0,959	27,801	0,952	27,042	0,946	26,295	1,107	50,124	1,099	48,704	1,092	47,522	1,282	92,182	1,274	89,793	1,266	87,442	1,492	172,832	1,482	168,372	1,473	163,984	1,716	310,907	1,705	302,483	1,695	294,858
5,6	0,645	5,435	0,706	7,792	0,702	7,618	0,836	15,491	0,831	15,067	0,826	14,701	0,968	28,061	0,961	27,294	0,955	26,541	1,117	50,591	1,109	49,158	1,103	47,965	1,294	93,038	1,286	90,627	1,278	88,255	1,505	174,432	1,496	169,931	1,487	165,503	1,732	313,778	1,721	305,276	1,710	297,581
5,7	0,651	5,486	0,712	7,864	0,708	7,689	0,844	15,634	0,838	15,206	0,833	14,837	0,977	28,318	0,970	27,545	0,963	26,785	1,127	51,054	1,119	49,607	1,113	48,403	1,306	93,886	1,298	91,453	1,290	89,060	1,519	176,018	1,510	171,476	1,500	167,008	1,748	316,623	1,736	308,045	1,726	300,281
5,8	0,657	5,536	0,719	7,936	0,715	7,759	0,852	15,776	0,846	15,343	0,841	14,971	0,985	28,574	0,979	27,794	0,972	27,027	1,137	51,513	1,129	50,053	1,123	48,839	1,318	94,727	1,310	92,273	1,301	89,858	1,533	177,590	1,523	173,008	1,513	168,500	1,763	319,444	1,752	310,790	1,741	302,956
5,9	0,663	5,585	0,725	8,007	0,721	7,828	0,859	15,916	0,854	15,480	0,848	15,104	0,994	28,827	0,987	28,040	0,981	27,266	1,147	51,968	1,139	50,495	1,133	49,270	1,329	95,561	1,321	93,085	1,313	90,649	1,546	179,149	1,536	174,527	1,527	169,979	1,779	322,241	1,767	313,511	1,756	305,609
6	0,669	5,635	0,731	8,077	0,727	7,897	0,867	16,055	0,861	15,615	0,856	15,237	1,003	29,078	0,996	28,284	0,989	27,504	1,157	52,419	1,149	50,934	1,142	49,698	1,341	96,388	1,333	93,891	1,324	91,433	1,559	180,694	1,550	176,032	1,540	171,445	1,794	325,014	1,782	316,209	1,772	308,240
6,1	0,675	5,683	0,738	8,147	0,734	7,965	0,874	16,193	0,868	15,750	0,863	15,368	1,011	29,327	1,005	28,526	0,998	27,739	1,167	52,866	1,159	51,369	1,152	50,122	1,352	97,208	1,344	94,689	1,335	92,211	1,573	182,227	1,563	177,526	1,553	172,900	1,809	327,764	1,797	318,885	1,787	310,848
6,2	0,680	5,732	0,744	8,216	0,740	8,033	0,882	16,330	0,876	15,883	0,870	15,498	1,020	29,574	1,013	28,767	1,006	27,973	1,177	53,310	1,169	51,800	1,162	50,543	1,364	98,022	1,355	95,482	1,346	92,983	1,586	183,747	1,576	179,007	1,566	174,343	1,824	330,492	1,812	321,539	1,801	313,436
6,3	0,686	5,780	0,750	8,285	0,746	8,100	0,889	16,466	0,883	16,015	0,878	15,627	1,028	29,819	1,021	29,005	1,014	28,205	1,187	53,750	1,179	52,228	1,172	50,960	1,375	98,828	1,366	96,268	1,358	93,749	1,599	185,255	1,589	180,476	1,579	175,774	1,839	333,198	1,827	324,172	1,816	316,003
6,4	0,692	5,828	0,756	8,353	0,752	8,167	0,896	16,601	0,890	16,146	0,885	15,754	1,037	30,062	1,030	29,242	1,023	28,435	1,196	54,187	1,188	52,652	1,181	51,375	1,386	99,629	1,377	97,048	1,369	94,508	1,612	186,752	1,602	181,934	1,592	177,194	1,854	335,882	1,842	326,784	1,831	318,549
6,5	0,697	5,875	0,763	8,420	0,758	8,233	0,904	16,734	0,897	16,276	0,892	15,881	1,045	30,303	1,038	29,476	1,031	28,663	1,206	54,620	1,198	53,073	1,190	51,786	1,397	100,423	1,388	97,822	1,379	95,262	1,624	188,236	1,614	183,381	1,604	178,603	1,869	338,546	1,857	329,376	1,845	321,076
6,6	0,703	5,922	0,769	8,488	0,764	8,299	0,911	16,867	0,905	16,405	0,899	16,007	1,053	30,543	1,046	29,709	1,039	28,890	1,215	55,050	1,207	53,491	1,200	52,194	1,408	101,211	1,399	98,590	1,390	96,010	1,637	189,709	1,627	184,816	1,617	180,001	1,883	341,190	1,871	331,948	1,860	323,584
6,7	0,708	5,968	0,775	8,554	0,770	8,364	0,918	16,999	0,912	16,533	0,906	16,132	1,061	30,780	1,054	29,940	1,047	29,115	1,225	55,477	1,216	53,906	1,209	52,598	1,419	101,994	1,410	99,352	1,401	96,752	1,650	191,172	1,640	186,241	1,629	181,389	1,898	343,813	1,885	334,501	1,874	326,072
6,8	0,714	6,015	0,781	8,620	0,776	8,428	0,925	17,129	0,919	16,660	0,913	16,257	1,070	31,016	1,062	30,170	1,055	29,338	1,234	55,901	1,226	54,318	1,218	53,000	1,430	102,770	1,421	100,108	1,412	97,489	1,662	192,623	1,652	187,655	1,642	182,766	1,912	346,417	1,900	337,035	1,888	328,543
6,9	0,719	6,061	0,787	8,686	0,782	8,492	0,932	17,259	0,926	16,787	0,920	16,380	1,078	31,250	1,070	30,398	1,063	29,559	1,244	56,321	1,235	54,727	1,228	53,399	1,440	103,541	1,431	100,859	1,422	98,220	1,675	194,064	1,664	189,059	1,654	184,134	1,926	349,002	1,914	339,550	1,902	330,995
7	0,725	6,106	0,793	8,751	0,788	8,556	0,939	17,388	0,932	16,912	0,927	16,502	1,086	31,483	1,078	30,624	1,071	29,779	1,253	56,739	1,244	55,132	1,237	53,795	1,451	104,307	1,442	101,605	1,433	98,947	1,687	195,494	1,677	190,452	1,666	185,491	1,941	351,569	1,928	342,047	1,916	333,429
7,1	0,730	6,151	0,798	8,816	0,794	8,619	0,946	17,516	0,939	17,036	0,934	16,624	1,094	31,714	1,086	30,848	1,079	29,998	1,262	57,154	1,253	55,535	1,246	54,188	1,462	105,066	1,452	102,345	1,443	99,668	1,699	196,915	1,689	191,836	1,678	186,839	1,955	354,117	1,942	344,527	1,930	335,847
7,2	0,735	6,196	0,804	8,880	0,800	8,682	0,953	17,643	0,946	17,160	0,940	16,744	1,102	31,943	1,094	31,071	1,087	30,215	1,271	57,565	1,262	55,935	1,255	54,579	1,472	105,821	1,463	103,080	1,454	100,384	1,712	198,325	1,701	193,210	1,690	188,178	1,969	356,648	1,956	346,989	1,944	338,247
7,3	0,741	6,241	0,810	8,944	0,805	8,745	0,959	17,769	0,953	17,283	0,947	16,864	1,109	32,171	1,102	31,293	1,094	30,430	1,280	57,974	1,271	56,333	1,264	54,966	1,483	106,570	1,473	103,810	1,464	101,095	1,724	199,726	1,713	194,575	1,702	189,507	1,982	359,160	1,970	349,434	1,958	340,631
7,4	0,746	6,285	0,816	9,007	0,811	8,807	0,966	17,895	0,960	17,405	0,954	16,983	1,117	32,397	1,110	31,513	1,102	30,644	1,289	58,380	1,280	56,727	1,272	55,352	1,493	107,315	1,484	104,535	1,474	101,801	1,736	201,117	1,725	195,930	1,714	190,827	1,996	361,656	1,983	351,863	1,971	342,998
7,5	0,751	6,329	0,821	9,070	0,817	8,868	0,973	18,019	0,966	17,526	0,961	17,101	1,125	32,621	1,117	31,731	1,110	30,856	1,298	58,784	1,289	57,119	1,281	55,734	1,503	108,054	1,494	105,256	1,484	102,503	1,748	202,498	1,737	197,277	1,726	192,139	2,010	364,135	1,997	354,275	1,985	345,350
7,6	0,756	6,373	0,827	9,133	0,822	8,929	0,980	18,143	0,973	17,646	0,967	17,219	1,133	32,844	1,125	31,948	1,117	31,067	1,307	59,184	1,298	57,509	1,290	56,114	1,513	108,788	1,504	105,971	1,494	103,199	1,759	203,871	1,748	198,614	1,737	193,441	2,024	366,598	2,010	356,671	1,998	347,686
7,7	0,762	6,417	0,833	9,195	0,828	8,990	0,986	18,266	0,980	17,766	0,974	17,335	1,140	33,066	1,133	32,164	1,125	31,277	1,316	59,583	1,306	57,896	1,299	56,492	1,524	109,518	1,514	106,682	1,504	103,892	1,771	205,235	1,760	199,943	1,749	194,735	2,037	369,045	2,024	359,052	2,012	350,007
7,8	0,767	6,460	0,838	9,257	0,834	9,050	0,993	18,388	0,986	17,884	0,980	17,451	1,148	33,286	1,140	32,378	1,132	31,485	1,324	59,978	1,315	58,280	1,307	56,867	1,534	110,243	1,524	107,388	1,514	104,580	1,783	206,590	1,772	201,263	1,761	196,021	2,050	371,475	2,037	361,417	2,025	352,313
7,9	0,772	6,503	0,844	9,318	0,839	9,110	0,999	18,509	0,993	18,002	0,987	17,566	1,155	33,505	1,148	32,591	1,140	31,693	1,333	60,371	1,324	58,662	1,316	57,240	1,544	110,963	1,534	108,090	1,524	105,263	1,795	207,936	1,783	202,574	1,772	197,299	2,064	373,891	2,050	363,767	2,038	354,604
8	0,777	6,545	0,849	9,379	0,845	9,170	1,006	18,630	0,999	18,120	0,993	17,681	1,163	33,722	1,155	32,803	1,147	31,898	1,342	60,762	1,332	59,042	1,324	57,610	1,554	111,679	1,544	108,787	1,534	105,942	1,806	209,273	1,795	203,878	1,784	198,568	2,077	376,291	2,064	366,102	2,051	356,881
8,1	0,782	6,588	0,855	9,439	0,850	9,229	1,012	18,749	1,005	18,236	0,999	17,794	1,170	33,939	1,162	33,013	1,155	32,103	1,350	61,150	1,341	59,419	1,333	57,978	1,564	112,390	1,554	109,480	1,544	106,617	1,818	210,603	1,806	205,173	1,795	199,830	2,090	378,676	2,077	368,423	2,064	359,143
8,2	0,787	6,630	0,860	9,500	0,856	9,288	1,019	18,868	1,012	18,352	1,006	17,907	1,178	34,153	1,170	33,222	1,162	32,306	1,359	61,536	1,349	59,794	1,341	58,344	1,573	113,097	1,564	110,169	1,554	107,288	1,829	211,924	1,818	206,460	1,806	201,084	2,103	381,046	2,090	370,730	2,077	361,392
8,3	0,792	6,672	0,866	9,559	0,861	9,347	1,025	18,987	1,018	18,467	1,012	18,020	1,185	34,367	1,177	33,429	1,169	32,508	1,367	61,919	1,358	60,166	1,350	58,708	1,583	113,800	1,573	110,854	1,563	107,955	1,840	213,237	1,829	207,740	1,817	202,330	2,116	383,403	2,103	373,022	2,090	363,627
8,4	0,797	6,713	0,871	9,619	0,866	9,405	1,032	19,104	1,025	18,582	1,018	18,131	1,192	34,579	1,184	33,636	1,176	32,709	1,376	62,300	1,366	60,537	1,358	59,069	1,593	114,499	1,583	111,534	1,573	108,618	1,852	214,543	1,840	209,012	1,828	203,569	2,129	385,745	2,115	375,301	2,103	365,848
8,5	0,802	6,755	0,876	9,678	0,872	9,463	1,038	19,221	1,031	18,695	1,025	18,243	1,200	34,790	1,192	33,841	1,184	32,908	1,384	62,679	1,374	60,905	1,366	59,429	1,603	115,193	1,593	112,211	1,582	109,276	1,863	215,841	1,851	210,276	1,840	204,801	2,142	388,073	2,128	377,566	2,115	368,057
8,6	0,807	6,796	0,882	9,737	0,877	9,520	1,044	19,338	1,037	18,808	1,031	18,353	1,207	35,000	1,199	34,045	1,191	33,107	1,392	63,056	1,383	61,271	1,374	59,786	1,612	115,883	1,602	112,883	1,592	109,931	1,874	217,131	1,862	211,533	1,851	206,025	2,155	390,387	2,141	379,818	2,128	370,252
8,7	0,811	6,837	0,887	9,795	0,882	9,577	1,050	19,453	1,043	18,921	1,037	18,463	1,214	35,208	1,206	34,248	1,198	33,304	1,400	63,430	1,391	61,635	1,383	60,141	1,622	116,570	1,612	113,552	1,601	110,583	1,885	218,413	1,873	212,783	1,861	207,243	2,168	392,688	2,153	382,057	2,140	372,435
8,8	0,816	6,878	0,892	9,854	0,887	9,634	1,057	19,568	1,049	19,033	1,043	18,572	1,221	35,415	1,213	34,450	1,205	33,500	1,409	63,803	1,399	61,997	1,391	60,494	1,631	117,252	1,621	114,217	1,611	111,230	1,896	219,689	1,884	214,025	1,872	208,453	2,180	394,976	2,166	384,284	2,153	374,606
8,9	0,821	6,918	0,898	9,911	0,893	9,691	1,063	19,682	1,056	19,144	1,049	18,680	1,228	35,622	1,220	34,650	1,212	33,695	1,417	64,173	1,407	62,357	1,399	60,845	1,641	117,931	1,630	114,878	1,620	111,874	1,907	220,957	1,895	215,261	1,883	209,656	2,193	397,251	2,179	386,497	2,165	376,764
9	0,826	6,958	0,903	9,969	0,898	9,747	1,069	19,796	1,062	19,254	1,055	18,788	1,235	35,827	1,227	34,850	1,219	33,889	1,425	64,541	1,415	62,715	1,407	61,194	1,650	118,605	1,640	115,535	1,629	112,514	1,918	222,218	1,906	216,489	1,894	210,853	2,205	399,514	2,191	388,699	2,178	378,910
9,1	0,831	6,998	0,908	10,026	0,903	9,803	1,075	19,909	1,068	19,364	1,061	18,895	1,242	36,030	1,234	35,048	1,226	34,082	1,433	64,907	1,423	63,071	1,415	61,542	1,659	119,276	1,649	116,189	1,638	113,151	1,929	223,472	1,917	217,711	1,905	212,043	2,218	401,764	2,203	390,888	2,190	381,044
9,2	0,835	7,038	0,913	10,083	0,908	9,859	1,081	20,022	1,074	19,474	1,067	19,002	1,249	36,233	1,241	35,245	1,233	34,274	1,441	65,271	1,431	63,424	1,423	61,887	1,669	119,944	1,658	116,839	1,648	113,784	1,939	224,719	1,927	218,926	1,915	213,227	2,230	404,001	2,216	393,065	2,202	383,167
9,3	0,840	7,078	0,918	10,139	0,913	9,914	1,087	20,133	1,080	19,583	1,073	19,108	1,256	36,435	1,248	35,441	1,240	34,465	1,449	65,634	1,439	63,776	1,431	62,231	1,678	120,608	1,667	117,486	1,657	114,414	1,950	225,959	1,938	220,135	1,926	214,404	2,242	406,227	2,228	395,230	2,214	385,278
9,4	0,845	7,117	0,923	10,196	0,918	9,969	1,093	20,245	1,086	19,691	1,079	19,214	1,263	36,636	1,255	35,637	1,246	34,655	1,457	65,994	1,447	64,127	1,438	62,572	1,687	121,268	1,676	118,129	1,666	115,041	1,961	227,193	1,949	221,337	1,936	215,575	2,255	408,440	2,240	397,384	2,226	387,377
9,5	0,849	7,156	0,928	10,252	0,923	10,024	1,099	20,355	1,092	19,798	1,085	19,319	1,270	36,835	1,262	35,831	1,253	34,843	1,465	66,352	1,455	64,475	1,446	62,912	1,696	121,925	1,686	118,769	1,675	115,664	1,971	228,421	1,959	222,533	1,947	216,740	2,267	410,642	2,252	399,527	2,238	389,466
50	2,150	18,113	2,345	25,892	2,332	25,319	2,765	51,208	2,747	49,815	2,731	48,615	3,186	92,378	3,165	89,872	3,144	87,408	3,663	165,924	3,639	161,251	3,618	157,361	4,230	304,044	4,204	296,209	4,178	288,499	4,903	568,096	4,873	553,512	4,843	539,162	5,624	1018,914	5,588	991,439	5,555	966,569

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.2: roughness coefficient k=0,25 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,6	0,854	7,195	0,933	10,307	0,928	10,078	1,105	20,465	1,098	19,905	1,091	19,423	1,277	37,034	1,269	36,024	1,260	35,031	1,473	66,709	1,463	64,821	1,454	63,250	1,705	122,578	1,695	119,405	1,684	116,284	1,982	229,641	1,970	223,723	1,957	217,899	2,279	412,832	2,264	401,658	2,250	391,544
9,7	0,859	7,234	0,938	10,363	0,933	10,132	1,111	20,575	1,103	20,012	1,097	19,527	1,284	37,231	1,275	36,216	1,267	35,218	1,481	67,063	1,470	65,166	1,462	63,587	1,714	123,228	1,704	120,038	1,693	116,900	1,992	230,856	1,980	224,906	1,968	219,051	2,291	415,011	2,276	403,778	2,262	393,611
9,8	0,863	7,272	0,943	10,418	0,938	10,186	1,117	20,684	1,109	20,118	1,103	19,631	1,291	37,427	1,282	36,407	1,273	35,404	1,489	67,416	1,478	65,509	1,469	63,921	1,723	123,874	1,713	120,668	1,702	117,514	2,003	232,064	1,990	226,083	1,978	220,198	2,303	417,179	2,288	405,887	2,274	395,667
9,9	0,868	7,311	0,948	10,473	0,943	10,240	1,123	20,792	1,115	20,223	1,108	19,734	1,297	37,623	1,289	36,597	1,280	35,589	1,496	67,767	1,486	65,850	1,477	64,254	1,732	124,518	1,721	121,295	1,711	118,124	2,013	233,267	2,001	227,255	1,988	221,339	2,315	419,336	2,300	407,986	2,286	397,713
10	0,872	7,349	0,953	10,527	0,948	10,293	1,128	20,900	1,121	20,328	1,114	19,836	1,304	37,817	1,295	36,786	1,287	35,773	1,504	68,117	1,494	66,190	1,485	64,586	1,741	125,158	1,730	121,919	1,719	118,732	2,023	234,463	2,011	228,420	1,998	222,474	2,326	421,482	2,311	410,074	2,297	399,749
10,2	0,881	7,425	0,963	10,635	0,958	10,399	1,140	21,114	1,132	20,536	1,126	20,039	1,317	38,203	1,309	37,162	1,300	36,138	1,519	68,810	1,509	66,863	1,500	65,243	1,759	126,428	1,748	123,156	1,737	119,937	2,044	236,837	2,031	230,734	2,018	224,728	2,350	425,741	2,335	414,219	2,321	403,789
10,4	0,890	7,500	0,973	10,743	0,968	10,504	1,151	21,326	1,144	20,743	1,137	20,241	1,331	38,586	1,322	37,534	1,313	36,500	1,534	69,497	1,524	67,531	1,515	65,894	1,776	127,687	1,765	124,382	1,754	121,131	2,064	239,189	2,051	233,025	2,039	226,959	2,373	429,960	2,358	418,323	2,344	407,791
10,6	0,899	7,574	0,983	10,849	0,977	10,608	1,163	21,536	1,155	20,947	1,148	20,440	1,344	38,965	1,335	37,902	1,326	36,858	1,549	70,177	1,539	68,192	1,530	66,539	1,794	128,933	1,782	125,596	1,771	122,314	2,084	241,518	2,071	235,294	2,058	229,170	2,396	434,138	2,381	422,389	2,366	411,755
10,8	0,908	7,648	0,992	10,954	0,987	10,711	1,174	21,744	1,166	21,149	1,159	20,637	1,357	39,340	1,348	38,267	1,338	37,213	1,564	70,851	1,554	68,847	1,544	67,178	1,811	130,168	1,800	126,799	1,788	123,485	2,104	243,825	2,091	237,542	2,078	231,359	2,419	438,277	2,404	426,416	2,389	415,681
11	0,916	7,721	1,001	11,058	0,996	10,812	1,185	21,950	1,177	21,350	1,170	20,833	1,369	39,711	1,360	38,629	1,351	37,565	1,579	71,518	1,568	69,495	1,559	67,812	1,828	131,391	1,816	127,991	1,805	124,646	2,124	246,111	2,111	239,769	2,098	233,529	2,442	442,378	2,426	430,407	2,411	419,571
11,2	0,925	7,793	1,011	11,162	1,005	10,914	1,196	22,154	1,188	21,549	1,181	21,027	1,382	40,080	1,373	38,987	1,364	37,914	1,594	72,180	1,583	70,138	1,573	68,439	1,845	132,603	1,833	129,172	1,822	125,796	2,144	248,376	2,130	241,976	2,117	235,679	2,464	446,442	2,448	434,361	2,434	423,426
11,4	0,933	7,865	1,020	11,264	1,014	11,014	1,207	22,357	1,199	21,745	1,192	21,219	1,395	40,445	1,385	39,343	1,376	38,259	1,608	72,835	1,597	70,775	1,588	69,061	1,862	133,805	1,850	130,343	1,838	126,936	2,163	250,621	2,149	244,164	2,136	237,810	2,487	450,470	2,470	438,280	2,455	427,247
11,6	0,942	7,936	1,029	11,366	1,024	11,113	1,218	22,557	1,210	21,941	1,203	21,410	1,407	40,807	1,398	39,695	1,388	38,602	1,623	73,485	1,611	71,407	1,602	69,677	1,878	134,996	1,866	131,503	1,854	128,066	2,182	252,847	2,169	246,332	2,155	239,922	2,509	454,462	2,492	442,165	2,477	431,034
11,8	0,950	8,006	1,038	11,466	1,033	11,211	1,229	22,756	1,220	22,134	1,213	21,599	1,420	41,166	1,410	40,044	1,401	38,941	1,637	74,130	1,625	72,033	1,616	70,288	1,895	136,177	1,883	132,653	1,871	129,187	2,201	255,054	2,187	248,482	2,174	242,016	2,530	458,421	2,514	446,017	2,499	434,789
12	0,959	8,076	1,047	11,566	1,042	11,309	1,239	22,954	1,231	22,326	1,224	21,786	1,432	41,521	1,422	40,390	1,413	39,278	1,651	74,769	1,639	72,654	1,630	70,894	1,911	137,348	1,899	133,794	1,887	130,298	2,220	257,242	2,206	250,614	2,192	244,093	2,552	462,346	2,536	449,836	2,520	438,513
12,2	0,967	8,145	1,056	11,665	1,051	11,406	1,250	23,149	1,241	22,517	1,234	21,972	1,444	41,874	1,434	40,733	1,425	39,612	1,665	75,403	1,653	73,270	1,644	71,495	1,927	138,509	1,915	134,925	1,903	131,400	2,239	259,412	2,225	252,728	2,211	246,152	2,574	466,239	2,557	453,624	2,541	442,205
12,4	0,975	8,214	1,065	11,763	1,059	11,502	1,260	23,343	1,252	22,705	1,244	22,156	1,456	42,224	1,446	41,074	1,437	39,943	1,679	76,031	1,667	73,881	1,657	72,092	1,943	139,660	1,931	136,047	1,919	132,493	2,257	261,564	2,243	254,825	2,229	248,195	2,595	470,100	2,578	457,380	2,562	445,868
12,6	0,983	8,282	1,074	11,861	1,068	11,597	1,271	23,536	1,262	22,893	1,255	22,339	1,468	42,572	1,458	41,412	1,448	40,271	1,692	76,655	1,681	74,487	1,671	72,683	1,959	140,803	1,947	137,161	1,934	133,577	2,276	263,699	2,262	256,905	2,247	250,221	2,616	473,930	2,599	461,107	2,583	449,501
12,8	0,991	8,350	1,083	11,957	1,077	11,692	1,281	23,727	1,272	23,079	1,265	22,520	1,480	42,916	1,470	41,747	1,460	40,597	1,706	77,273	1,694	75,088	1,684	73,270	1,975	141,937	1,962	138,265	1,950	134,652	2,294	265,817	2,280	258,969	2,266	252,231	2,637	477,729	2,620	464,804	2,604	453,105
13	0,999	8,417	1,092	12,053	1,086	11,785	1,291	23,917	1,283	23,263	1,275	22,700	1,492	43,258	1,482	42,079	1,472	40,921	1,720	77,887	1,708	75,685	1,698	73,852	1,990	143,061	1,978	139,361	1,965	135,720	2,312	267,919	2,298	261,017	2,283	254,226	2,658	481,500	2,641	468,473	2,625	456,682
13,2	1,007	8,484	1,100	12,148	1,094	11,878	1,302	24,105	1,293	23,446	1,285	22,879	1,503	43,597	1,493	42,409	1,483	41,242	1,733	78,496	1,721	76,277	1,711	74,430	2,006	144,177	1,993	140,448	1,981	136,779	2,330	270,004	2,316	263,049	2,301	256,205	2,678	485,241	2,661	472,113	2,645	460,231
13,4	1,015	8,550	1,109	12,243	1,103	11,971	1,312	24,291	1,303	23,628	1,295	23,056	1,515	43,934	1,505	42,737	1,495	41,560	1,746	79,101	1,734	76,864	1,724	75,003	2,021	145,285	2,009	141,527	1,996	137,830	2,348	272,074	2,333	265,066	2,319	258,170	2,699	488,954	2,681	475,726	2,665	463,753
13,6	1,023	8,615	1,117	12,337	1,111	12,062	1,322	24,477	1,313	23,808	1,305	23,232	1,527	44,268	1,516	43,062	1,506	41,877	1,760	79,701	1,748	77,448	1,737	75,572	2,037	146,385	2,024	142,598	2,011	138,873	2,366	274,129	2,351	267,067	2,336	260,119	2,719	492,640	2,702	479,312	2,685	467,249
13,8	1,030	8,680	1,126	12,430	1,119	12,154	1,332	24,661	1,323	23,987	1,315	23,407	1,538	44,600	1,528	43,385	1,517	42,190	1,773	80,297	1,761	78,027	1,750	76,137	2,052	147,476	2,039	143,662	2,026	139,909	2,383	276,168	2,369	269,055	2,354	262,055	2,739	496,298	2,722	482,872	2,705	470,720
14	1,038	8,745	1,134	12,522	1,128	12,244	1,341	24,843	1,332	24,164	1,324	23,580	1,549	44,929	1,539	43,705	1,529	42,502	1,786	80,888	1,774	78,601	1,763	76,698	2,067	148,560	2,054	144,717	2,041	140,937	2,401	278,193	2,386	271,027	2,371	263,977	2,760	499,931	2,742	486,407	2,725	474,166
14,2	1,046	8,809	1,142	12,614	1,136	12,334	1,351	25,025	1,342	24,341	1,334	23,752	1,561	45,256	1,550	44,023	1,540	42,812	1,799	81,475	1,787	79,172	1,776	77,255	2,082	149,636	2,069	145,766	2,056	141,958	2,418	280,204	2,403	272,986	2,388	265,885	2,779	503,537	2,761	489,916	2,745	477,587
14,4	1,053	8,873	1,151	12,705	1,144	12,423	1,361	25,205	1,352	24,516	1,344	23,923	1,572	45,581	1,561	44,339	1,551	43,119	1,812	82,058	1,799	79,739	1,789	77,808	2,097	150,704	2,083	146,807	2,070	142,972	2,435	282,200	2,420	274,931	2,405	267,779	2,799	507,118	2,781	493,400	2,764	480,984
14,6	1,061	8,936	1,159	12,795	1,152	12,511	1,371	25,384	1,361	24,690	1,353	24,093	1,583	45,903	1,572	44,653	1,562	43,424	1,825	82,637	1,812	80,301	1,801	78,357	2,111	151,765	2,098	147,840	2,085	143,978	2,453	284,183	2,437	276,863	2,422	269,661	2,819	510,675	2,801	496,861	2,784	484,358
14,8	1,068	8,999	1,167	12,885	1,161	12,599	1,380	25,561	1,371	24,863	1,363	24,261	1,594	46,223	1,583	44,965	1,573	43,727	1,837	83,213	1,825	80,860	1,814	78,903	2,126	152,819	2,113	148,867	2,099	144,978	2,470	286,152	2,454	278,782	2,439	271,530	2,838	514,207	2,820	500,298	2,803	487,708
15	1,076	9,062	1,175	12,975	1,169	12,686	1,390	25,738	1,380	25,034	1,372	24,429	1,605	46,542	1,594	45,274	1,584	44,028	1,850	83,784	1,837	81,416	1,826	79,444	2,141	153,866	2,127	149,887	2,114	145,972	2,486	288,107	2,471	280,687	2,456	273,386	2,858	517,715	2,839	503,712	2,822	491,036
15,2	1,083	9,124	1,183	13,063	1,177	12,773	1,399	25,913	1,390	25,205	1,381	24,595	1,616	46,858	1,605	45,581	1,594	44,327	1,862	84,351	1,850	81,967	1,839	79,983	2,155	154,905	2,142	150,900	2,128	146,958	2,503	290,050	2,488	282,580	2,472	275,230	2,877	521,201	2,858	507,103	2,841	494,343
15,4	1,090	9,185	1,191	13,151	1,184	12,859	1,409	26,087	1,399	25,374	1,391	24,761	1,627	47,172	1,616	45,887	1,605	44,624	1,875	84,915	1,862	82,515	1,851	80,517	2,169	155,938	2,156	151,906	2,142	147,938	2,520	291,980	2,504	284,461	2,489	277,062	2,896	524,663	2,877	510,472	2,860	497,627
15,6	1,097	9,247	1,199	13,239	1,192	12,945	1,418	26,260	1,408	25,543	1,400	24,925	1,637	47,484	1,627	46,190	1,616	44,919	1,887	85,475	1,874	83,059	1,863	81,048	2,184	156,965	2,170	152,906	2,156	148,912	2,536	293,898	2,521	286,329	2,505	278,882	2,915	528,103	2,896	513,819	2,879	500,890
15,8	1,105	9,308	1,207	13,326	1,200	13,030	1,427	26,432	1,418	25,710	1,409	25,088	1,648	47,793	1,637	46,492	1,626	45,213	1,900	86,032	1,886	83,600	1,875	81,576	2,198	157,985	2,184	153,899	2,170	149,880	2,553	295,804	2,537	288,186	2,521	280,690	2,934	531,521	2,915	517,145	2,897	504,133
16	1,112	9,368	1,215	13,412	1,208	13,114	1,436	26,603	1,427	25,876	1,418	25,250	1,659	48,101	1,648	46,792	1,637	45,504	1,912	86,585	1,899	84,138	1,887	82,101	2,212	158,998	2,198	154,887	2,184	150,841	2,569	297,697	2,553	290,031	2,537	282,487	2,953	534,918	2,934	520,450	2,916	507,355
16,2	1,119	9,428	1,222	13,498	1,216	13,198	1,446	26,772	1,436	26,041	1,427	25,411	1,669	48,408	1,658	47,089	1,647	45,794	1,924	87,135	1,911	84,672	1,899	82,622	2,226	160,005	2,212	155,868	2,198	151,797	2,585	299,579	2,569	291,864	2,553	284,273	2,971	538,293	2,952	523,734	2,934	510,556
16,4	1,126	9,488	1,230	13,584	1,223	13,282	1,455	26,941	1,445	26,205	1,436	25,572	1,680	48,712	1,669	47,385	1,657	46,082	1,936	87,681	1,923	85,203	1,911	83,140	2,240	161,006	2,226	156,843	2,212	152,747	2,602	301,449	2,585	293,686	2,569	286,048	2,990	541,648	2,970	526,998	2,953	513,739
16,6	1,133	9,547	1,238	13,668	1,231	13,365	1,464	27,109	1,454	26,368	1,445	25,731	1,690	49,014	1,679	47,680	1,668	46,368	1,948	88,224	1,935	85,731	1,923	83,655	2,254	162,001	2,240	157,812	2,226	153,691	2,618	303,308	2,601	295,497	2,585	287,812	3,008	544,982	2,989	530,243	2,971	516,902
16,8	1,140	9,606	1,246	13,753	1,239	13,447	1,473	27,275	1,463	26,531	1,454	25,889	1,701	49,315	1,689	47,972	1,678	46,652	1,960	88,763	1,946	86,255	1,935	84,167	2,268	162,989	2,253	158,775	2,239	154,629	2,634	305,155	2,617	297,297	2,601	289,565	3,026	548,296	3,007	533,467	2,989	520,046
17	1,147	9,665	1,253	13,837	1,246	13,529	1,482	27,441	1,472	26,692	1,463	26,046	1,711	49,614	1,699	48,263	1,688	46,935	1,972	89,300	1,958	86,776	1,947	84,676	2,281	163,972	2,267	159,733	2,253	155,562	2,649	306,992	2,633	299,087	2,617	291,308	3,045	551,591	3,025	536,673	3,007	523,171
17,2	1,154	9,723	1,261	13,920	1,254	13,611	1,491	27,606	1,481	26,852	1,472	26,203	1,721	49,911	1,710	48,552	1,698	47,216	1,983	89,833	1,970	87,295	1,958	85,182	2,295	164,950	2,280	160,685	2,266	156,489	2,665	308,818	2,649	300,866	2,632	293,041	3,063	554,866	3,043	539,860	3,025	526,278
17,4	1,161	9,781	1,268	14,003	1,261	13,692	1,499	27,770	1,489	27,011	1,480	26,358	1,731	50,206	1,720	48,839	1,708	47,495	1,995	90,364	1,981	87,810	1,970	85,685	2,308	165,921	2,294	161,631	2,279	157,411	2,681	310,633	2,664	302,635	2,648	294,764	3,081	558,122	3,061	543,029	3,042	529,367
17,6	1,168	9,839	1,276	14,085	1,269	13,773	1,508	27,933	1,498	27,170	1,489	26,513	1,741	50,500	1,730	49,125	1,718	47,773	2,007	90,891	1,993	88,323	1,981	86,185	2,322	166,887	2,307	162,573	2,293	158,327	2,696	312,438	2,680	304,393	2,663	296,477	3,099	561,360	3,079	546,179	3,060	532,438
17,8	1,175	9,897	1,283	14,167	1,276	13,853	1,517	28,095	1,507	27,327	1,498	26,667	1,752	50,791	1,740	49,409	1,728	48,049	2,018	91,415	2,005	88,832	1,993	86,682	2,335	167,848	2,321	163,508	2,306	159,239	2,712	314,233	2,695	306,142	2,678	298,181	3,116	564,579	3,096	549,312	3,078	535,492
18	1,181	9,954	1,290	14,249	1,283	13,932	1,526	28,256	1,515	27,484	1,506	26,820	1,762	51,082	1,750	49,691	1,738	48,324	2,030	91,936	2,016	89,339	2,004	87,176	2,348	168,803	2,334	164,439	2,319	160,145	2,727	316,017	2,710	307,881	2,693	299,874	3,134	567,781	3,114	552,427	3,095	538,529
18,2	1,188	10,010	1,298	14,330	1,291	14,012	1,534	28,416	1,524	27,640	1,515	26,972	1,771	51,371	1,760	49,972	1,748	48,597	2,041	92,455	2,027	89,843	2,015	87,668	2,362	169,753	2,347	165,364	2,332	161,046	2,743	317,792	2,726	309,610	2,709	301,559	3,152	570,964	3,131	555,524	3,112	541,549
18,4	1,195	10,067	1,305	14,410	1,298	14,090	1,543	28,575	1,533	27,795	1,523	27,123	1,781	51,658	1,770	50,251	1,758	48,869	2,053	92,971	2,039	90,344	2,027	88,157	2,375	170,697	2,360	166,285	2,345	161,943	2,758	319,557	2,741	311,330	2,724	303,234	3,169	574,131	3,149	558,605	3,130	544,553
18,6	1,201	10,123	1,312	14,490	1,305	14,169	1,551	28,733	1,541	27,949	1,532	27,273	1,791	51,943	1,779	50,529	1,767	49,139	2,064	93,483	2,050	90,842	2,038	88,643	2,388	171,637	2,373	167,200	2,358	162,834	2,773	321,313	2,756	313,040	2,739	304,900	3,186	577,280	3,166	561,669	3,147	547,540
50	2,150	18,113	2,345	25,892	2,332	25,319	2,765	51,208	2,747	49,815	2,731	48,615	3,186	92,378	3,165	89,872	3,144	87,408	3,663	165,924	3,639	161,251	3,618	157,361	4,230	304,044	4,204	296,209	4,178	288,499	4,903	568,096	4,873	553,512	4,843	539,162	5,624	1018,914	5,588	991,439	5,555	966,569

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.2: roughness coefficient k=0,25 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
18,8	1,208	10,179	1,320	14,570	1,312	14,247	1,560	28,891	1,549	28,102	1,540	27,423	1,801	52,227	1,789	50,806	1,777	49,408	2,075	93,994	2,061	91,338	2,049	89,127	2,401	172,572	2,386	168,110	2,371	163,721	2,788	323,059	2,771	314,742	2,753	306,557	3,204	580,412	3,183	564,717	3,164	550,511
19	1,215	10,234	1,327	14,649	1,319	14,324	1,568	29,048	1,558	28,254	1,549	27,572	1,811	52,510	1,799	51,081	1,787	49,676	2,087	94,501	2,072	91,831	2,060	89,608	2,414	173,501	2,399	169,016	2,384	164,603	2,803	324,796	2,786	316,434	2,768	308,206	3,221	583,528	3,200	567,749	3,181	553,467
19,2	1,221	10,289	1,334	14,728	1,327	14,401	1,577	29,204	1,566	28,406	1,557	27,720	1,820	52,791	1,808	51,354	1,796	49,942	2,098	95,006	2,083	92,321	2,071	90,087	2,427	174,426	2,411	169,917	2,396	165,481	2,818	326,524	2,801	318,117	2,783	309,846	3,238	586,627	3,217	570,764	3,198	556,407
19,4	1,228	10,344	1,341	14,807	1,334	14,478	1,585	29,359	1,575	28,557	1,565	27,867	1,830	53,071	1,818	51,626	1,806	50,206	2,109	95,508	2,094	92,809	2,082	90,563	2,439	175,346	2,424	170,813	2,409	166,354	2,833	328,243	2,815	319,792	2,798	311,477	3,255	589,710	3,234	573,765	3,215	559,331
19,6	1,234	10,399	1,348	14,885	1,341	14,555	1,594	29,513	1,583	28,707	1,573	28,013	1,840	53,349	1,827	51,897	1,815	50,469	2,120	96,007	2,105	93,295	2,093	91,037	2,452	176,261	2,437	171,705	2,421	167,222	2,848	329,953	2,830	321,458	2,812	313,100	3,272	592,778	3,251	576,749	3,231	562,241
19,8	1,241	10,453	1,355	14,963	1,348	14,631	1,602	29,666	1,591	28,856	1,582	28,159	1,849	53,626	1,837	52,166	1,825	50,731	2,131	96,504	2,116	93,778	2,104	91,509	2,465	177,172	2,449	172,592	2,434	168,086	2,862	331,654	2,845	323,116	2,827	314,715	3,289	595,829	3,268	579,719	3,248	565,136
20	1,247	10,507	1,362	15,040	1,355	14,706	1,610	29,819	1,599	29,005	1,590	28,304	1,859	53,901	1,846	52,434	1,834	50,992	2,142	96,999	2,127	94,259	2,114	91,978	2,477	178,078	2,462	173,475	2,446	168,946	2,877	333,347	2,859	324,765	2,841	316,321	3,306	598,866	3,284	582,673	3,265	568,017
20,2	1,254	10,561	1,369	15,117	1,362	14,781	1,618	29,971	1,607	29,153	1,598	28,448	1,868	54,175	1,856	52,701	1,843	51,251	2,153	97,491	2,138	94,737	2,125	92,444	2,490	178,979	2,474	174,353	2,459	169,801	2,891	335,031	2,873	326,406	2,856	317,920	3,322	601,887	3,301	585,613	3,281	570,883
20,4	1,260	10,615	1,376	15,193	1,368	14,856	1,626	30,122	1,616	29,300	1,606	28,592	1,878	54,448	1,865	52,966	1,853	51,509	2,163	97,981	2,148	95,213	2,136	92,909	2,502	179,876	2,487	175,227	2,471	170,652	2,906	336,707	2,888	328,039	2,870	319,510	3,339	604,894	3,317	588,538	3,297	573,735
20,6	1,266	10,668	1,383	15,270	1,375	14,931	1,635	30,273	1,624	29,447	1,614	28,735	1,887	54,719	1,874	53,230	1,862	51,766	2,174	98,468	2,159	95,686	2,146	93,371	2,515	180,769	2,499	176,097	2,483	171,499	2,920	338,375	2,902	329,665	2,884	321,093	3,355	607,885	3,334	591,449	3,314	576,573
20,8	1,272	10,721	1,390	15,345	1,382	15,005	1,643	30,423	1,632	29,592	1,622	28,877	1,896	54,989	1,884	53,493	1,871	52,022	2,185	98,953	2,170	96,157	2,157	93,831	2,527	181,657	2,511	176,962	2,496	172,342	2,935	340,035	2,916	331,282	2,898	322,669	3,372	610,863	3,350	594,346	3,330	579,397
21	1,279	10,774	1,397	15,421	1,389	15,079	1,651	30,572	1,640	29,737	1,630	29,019	1,906	55,258	1,893	53,754	1,880	52,276	2,195	99,435	2,180	96,626	2,168	94,288	2,540	182,541	2,524	177,823	2,508	173,181	2,949	341,687	2,931	332,891	2,912	324,236	3,388	613,826	3,366	597,229	3,346	582,208
21,2	1,285	10,827	1,403	15,496	1,396	15,152	1,659	30,720	1,648	29,882	1,638	29,160	1,915	55,526	1,902	54,014	1,889	52,529	2,206	99,915	2,191	97,093	2,178	94,744	2,552	183,421	2,536	178,681	2,520	174,016	2,963	343,331	2,945	334,493	2,926	325,797	3,404	616,775	3,382	600,099	3,362	585,005
21,4	1,291	10,879	1,410	15,571	1,402	15,225	1,667	30,868	1,655	30,025	1,646	29,300	1,924	55,792	1,911	54,273	1,898	52,781	2,217	100,393	2,201	97,558	2,188	95,197	2,564	184,297	2,548	179,534	2,532	174,847	2,977	344,967	2,959	336,087	2,940	327,350	3,421	619,710	3,399	602,955	3,378	587,789
21,6	1,297	10,931	1,417	15,645	1,409	15,298	1,675	31,015	1,663	30,168	1,654	29,439	1,933	56,057	1,920	54,531	1,907	53,032	2,227	100,869	2,212	98,020	2,199	95,648	2,576	185,169	2,560	180,383	2,544	175,674	2,991	346,596	2,973	337,674	2,954	328,895	3,437	622,631	3,415	605,797	3,394	590,561
21,8	1,304	10,983	1,424	15,719	1,416	15,370	1,683	31,161	1,671	30,311	1,661	29,578	1,942	56,321	1,929	54,788	1,916	53,281	2,238	101,343	2,222	98,480	2,209	96,098	2,588	186,036	2,572	181,228	2,556	176,498	3,005	348,217	2,987	339,254	2,968	330,434	3,453	625,539	3,431	608,627	3,410	593,319
22	1,310	11,034	1,430	15,793	1,422	15,442	1,690	31,307	1,679	30,452	1,669	29,716	1,951	56,583	1,938	55,043	1,925	53,530	2,248	101,814	2,233	98,938	2,219	96,545	2,600	186,900	2,584	182,070	2,568	177,317	3,019	349,831	3,000	340,826	2,982	331,965	3,469	628,434	3,446	611,443	3,426	596,065
22,2	1,316	11,086	1,437	15,866	1,429	15,514	1,698	31,452	1,687	30,593	1,677	29,854	1,960	56,845	1,947	55,298	1,934	53,777	2,258	102,284	2,243	99,395	2,230	96,990	2,612	187,760	2,596	182,907	2,579	178,133	3,033	351,437	3,014	342,391	2,995	333,490	3,485	631,315	3,462	614,247	3,441	598,798
22,4	1,322	11,137	1,444	15,939	1,436	15,585	1,706	31,596	1,695	30,734	1,685	29,991	1,969	57,105	1,956	55,551	1,943	54,023	2,269	102,751	2,253	99,849	2,240	97,433	2,624	188,616	2,608	183,741	2,591	178,945	3,047	353,036	3,028	343,949	3,009	335,008	3,501	634,184	3,478	617,038	3,457	601,520
22,6	1,328	11,188	1,450	16,012	1,442	15,657	1,714	31,740	1,702	30,873	1,692	30,128	1,978	57,364	1,965	55,803	1,952	54,268	2,279	103,216	2,263	100,301	2,250	97,874	2,636	189,468	2,619	184,572	2,603	179,754	3,060	354,629	3,042	345,501	3,023	336,519	3,516	637,039	3,494	619,817	3,473	604,229
22,8	1,334	11,238	1,457	16,084	1,449	15,727	1,721	31,883	1,710	31,013	1,700	30,263	1,987	57,622	1,974	56,054	1,961	54,512	2,289	103,679	2,273	100,751	2,260	98,313	2,648	190,316	2,631	185,398	2,615	180,559	3,074	356,214	3,055	347,045	3,036	338,023	3,532	639,883	3,509	622,584	3,488	606,926
23	1,340	11,289	1,463	16,156	1,455	15,798	1,729	32,025	1,718	31,151	1,707	30,399	1,996	57,879	1,983	56,304	1,969	54,755	2,299	104,140	2,284	101,199	2,270	98,750	2,659	191,161	2,643	186,221	2,626	181,360	3,088	357,792	3,069	348,583	3,050	339,521	3,548	642,713	3,525	625,338	3,504	609,611
23,2	1,346	11,339	1,470	16,228	1,462	15,868	1,737	32,167	1,725	31,289	1,715	30,533	2,005	58,134	1,991	56,552	1,978	54,997	2,309	104,599	2,294	101,645	2,280	99,186	2,671	192,002	2,654	187,040	2,638	182,158	3,101	359,363	3,082	350,114	3,063	341,012	3,563	645,532	3,540	628,081	3,519	612,285
23,4	1,352	11,389	1,476	16,300	1,468	15,938	1,744	32,308	1,733	31,426	1,722	30,667	2,014	58,389	2,000	56,800	1,987	55,238	2,320	105,056	2,304	102,089	2,290	99,619	2,683	192,839	2,666	187,856	2,649	182,953	3,115	360,928	3,096	351,638	3,076	342,497	3,579	648,338	3,556	630,811	3,534	614,947
23,6	1,358	11,439	1,483	16,371	1,474	16,008	1,752	32,449	1,740	31,563	1,730	30,801	2,022	58,642	2,009	57,047	1,995	55,478	2,330	105,511	2,314	102,531	2,300	100,051	2,694	193,673	2,678	188,668	2,661	183,744	3,128	362,486	3,109	353,156	3,090	343,976	3,594	651,133	3,571	633,530	3,549	617,598
23,8	1,364	11,489	1,489	16,442	1,481	16,077	1,760	32,589	1,748	31,699	1,737	30,934	2,031	58,895	2,017	57,292	2,004	55,717	2,340	105,965	2,324	102,972	2,310	100,481	2,706	194,504	2,689	189,477	2,672	184,532	3,142	364,037	3,122	354,667	3,103	345,448	3,609	653,915	3,586	636,238	3,565	620,237
24	1,369	11,538	1,495	16,512	1,487	16,146	1,767	32,728	1,755	31,835	1,745	31,066	2,040	59,146	2,026	57,537	2,012	55,955	2,350	106,416	2,333	103,411	2,320	100,909	2,717	195,330	2,701	190,283	2,684	185,317	3,155	365,582	3,136	356,173	3,116	346,914	3,625	656,686	3,601	638,934	3,580	622,866
24,2	1,375	11,587	1,502	16,582	1,494	16,215	1,775	32,867	1,763	31,970	1,752	31,198	2,048	59,396	2,035	57,780	2,021	56,192	2,360	106,865	2,343	103,847	2,330	101,335	2,729	196,154	2,712	191,085	2,695	186,098	3,168	367,120	3,149	357,672	3,129	348,374	3,640	659,446	3,617	641,619	3,595	625,484
24,4	1,381	11,636	1,508	16,652	1,500	16,283	1,782	33,005	1,770	32,105	1,760	31,329	2,057	59,646	2,043	58,023	2,029	56,428	2,369	107,313	2,353	104,282	2,339	101,760	2,740	196,974	2,723	191,884	2,706	186,876	3,182	368,652	3,162	359,164	3,142	349,828	3,655	662,194	3,632	644,293	3,610	628,091
24,6	1,387	11,685	1,514	16,722	1,506	16,351	1,790	33,143	1,778	32,239	1,767	31,460	2,065	59,894	2,052	58,264	2,038	56,663	2,379	107,759	2,363	104,716	2,349	102,182	2,752	197,791	2,735	192,680	2,717	187,651	3,195	370,178	3,175	360,651	3,155	351,276	3,670	664,931	3,647	646,956	3,625	630,687
24,8	1,393	11,734	1,521	16,791	1,512	16,419	1,797	33,280	1,785	32,372	1,774	31,590	2,074	60,141	2,060	58,505	2,046	56,897	2,389	108,203	2,373	105,147	2,359	102,604	2,763	198,604	2,746	193,472	2,728	188,423	3,208	371,698	3,188	362,132	3,168	352,719	3,685	667,657	3,662	649,609	3,640	633,273
25	1,398	11,782	1,527	16,861	1,519	16,487	1,804	33,417	1,792	32,505	1,782	31,720	2,082	60,388	2,069	58,745	2,055	57,130	2,399	108,645	2,382	105,577	2,368	103,023	2,774	199,414	2,757	194,261	2,740	189,191	3,221	373,211	3,201	363,606	3,181	354,155	3,700	670,372	3,676	652,250	3,654	635,848
25,2	1,404	11,830	1,533	16,929	1,525	16,554	1,812	33,553	1,800	32,637	1,789	31,849	2,091	60,633	2,077	58,983	2,063	57,362	2,409	109,085	2,392	106,005	2,378	103,441	2,785	200,221	2,768	195,047	2,751	189,957	3,234	374,719	3,214	365,075	3,194	355,586	3,715	673,076	3,691	654,881	3,669	638,413
25,4	1,410	11,878	1,539	16,998	1,531	16,621	1,819	33,688	1,807	32,769	1,796	31,978	2,099	60,877	2,085	59,221	2,071	57,593	2,418	109,524	2,402	106,431	2,388	103,857	2,797	201,025	2,779	195,830	2,762	190,720	3,247	376,220	3,227	366,538	3,207	357,011	3,730	675,769	3,706	657,502	3,684	640,968
25,6	1,415	11,926	1,546	17,066	1,537	16,688	1,826	33,823	1,814	32,901	1,803	32,106	2,108	61,121	2,094	59,458	2,080	57,823	2,428	109,961	2,411	106,856	2,397	104,271	2,808	201,825	2,790	196,610	2,773	191,479	3,260	377,716	3,240	367,995	3,219	358,430	3,745	678,452	3,721	660,112	3,698	643,513
25,8	1,421	11,974	1,552	17,134	1,543	16,754	1,834	33,958	1,821	33,031	1,810	32,234	2,116	61,363	2,102	59,694	2,088	58,053	2,437	110,396	2,421	107,279	2,407	104,684	2,819	202,622	2,801	197,387	2,784	192,236	3,273	379,206	3,252	369,447	3,232	359,844	3,760	681,124	3,735	662,713	3,713	646,048
26	1,427	12,021	1,558	17,202	1,549	16,821	1,841	34,092	1,828	33,162	1,818	32,361	2,124	61,604	2,110	59,929	2,096	58,281	2,447	110,830	2,430	107,700	2,416	105,095	2,830	203,417	2,812	198,161	2,795	192,990	3,285	380,690	3,265	370,893	3,245	361,253	3,774	683,786	3,750	665,303	3,727	648,573
26,2	1,432	12,068	1,564	17,270	1,555	16,887	1,848	34,225	1,836	33,291	1,825	32,487	2,133	61,845	2,119	60,163	2,104	58,509	2,457	111,262	2,440	108,120	2,425	105,505	2,841	204,208	2,823	198,932	2,805	193,740	3,298	382,168	3,278	372,333	3,257	362,656	3,789	686,438	3,765	667,883	3,742	651,088
26,4	1,438	12,115	1,570	17,337	1,562	16,953	1,855	34,358	1,843	33,421	1,832	32,614	2,141	62,085	2,127	60,396	2,112	58,736	2,466	111,692	2,449	108,538	2,435	105,913	2,852	204,996	2,834	199,700	2,816	194,488	3,311	383,641	3,290	373,768	3,270	364,054	3,804	689,079	3,779	670,453	3,756	653,594
26,6	1,444	12,162	1,576	17,404	1,568	17,018	1,862	34,491	1,850	33,550	1,839	32,739	2,149	62,323	2,135	60,628	2,121	58,961	2,476	112,121	2,459	108,955	2,444	106,319	2,863	205,782	2,845	200,465	2,827	195,234	3,324	385,108	3,303	375,198	3,282	365,446	3,818	691,711	3,793	673,014	3,771	656,091
26,8	1,449	12,209	1,582	17,471	1,574	17,083	1,869	34,623	1,857	33,678	1,846	32,865	2,157	62,561	2,143	60,859	2,129	59,186	2,485	112,548	2,468	109,370	2,453	106,724	2,874	206,564	2,856	201,227	2,838	195,976	3,336	386,570	3,316	376,622	3,295	366,833	3,833	694,333	3,808	675,565	3,785	658,578
27	1,455	12,256	1,588	17,537	1,580	17,148	1,877	34,754	1,864	33,806	1,853	32,989	2,166	62,798	2,151	61,090	2,137	59,411	2,494	112,973	2,477	109,783	2,463	107,128	2,885	207,343	2,867	201,986	2,849	196,716	3,349	388,026	3,328	378,041	3,307	368,215	3,847	696,945	3,822	678,107	3,799	661,056
27,2	1,460	12,302	1,594	17,604	1,586	17,213	1,884	34,885	1,871	33,933	1,860	33,114	2,174	63,034	2,159	61,320	2,145	59,634	2,504	113,397	2,487	110,195	2,472	107,530	2,895	208,120	2,877	202,743	2,859	197,452	3,361	389,477	3,340	379,454	3,320	369,592	3,861	699,547	3,836	680,639	3,813	663,524
27,4	1,466	12,348	1,600	17,670	1,591	17,278	1,891	35,015	1,878	34,060	1,867	33,238	2,182	63,270	2,167	61,549	2,153	59,857	2,513	113,819	2,496	110,606	2,481	107,931	2,906	208,894	2,888	203,497	2,870	198,187	3,374	390,922	3,353	380,863	3,332	370,964	3,876	702,140	3,851	683,162	3,828	665,984
27,6	1,471	12,394	1,606	17,736	1,597	17,342	1,898	35,145	1,885	34,187	1,874	33,361	2,190	63,504	2,175	61,777	2,161	60,079	2,522	114,240	2,505	111,015	2,490	108,330	2,917	209,665	2,899	204,248	2,880	198,918	3,386	392,363	3,365	382,266	3,344	372,331	3,890	704,723	3,865	685,676	3,842	668,435
27,8	1,477	12,440	1,612	17,801	1,603	17,406	1,905	35,275	1,892	34,313	1,881	33,484	2,198	63,738	2,183	62,004	2,169	60,299	2,532	114,660	2,514	111,422	2,500	108,727	2,928	210,433	2,909	204,996	2,891	199,647	3,399	393,798	3,378	383,664	3,356	373,693	3,904	707,297	3,879	688,180	3,856	670,876
28	1,482	12,486	1,618	17,866	1,609	17,470	1,912	35,404	1,899	34,438	1,888	33,607	2,206	63,970	2,191	62,230	2,177	60,520	2,541	115,077	2,523	111,828	2,509	109,124	2,938	211,198	2,920	205,742	2,902	200,373	3,411	395,228	3,390	385,058	3,369	375,050	3,918	709,862	3,893	690,676	3,870	673,309
28,2	1,487	12,532	1,624	17,931	1,615	17,534	1,919	35,533	1,906	34,563	1,894	33,729	2,214	64,202	2,199	62,456	2,185	60,739	2,550	115,494	2,533	112,233	2,518	109,518	2,949	211,961	2,930	206,485	2,912	201,097	3,423	396,653	3,402	386,446	3,381	376,402	3,932	712,418	3,907	693,163	3,884	675,734
50	2,150	18,113	2,345	25,892	2,332	25,319	2,765	51,208	2,747	49,815	2,731	48,615	3,186	92,378	3,165	89,872	3,144	87,408	3,663	165,924	3,639	161,251	3,618	157,361	4,230	304,044	4,204	296,209	4,178	288,499	4,903	568,096	4,873	553,512	4,843	539,162	5,624	1018,914	5,588	991,439	5,555	966,569

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.2: roughness coefficient k=0,25 mm (5/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
28,4	1,493	12,577	1,630	17,996	1,621	17,597	1,925	35,661	1,913	34,688	1,901	33,850	2,222	64,433	2,207	62,681	2,192	60,958	2,559	115,908	2,542	112,636	2,527	109,912	2,959	212,721	2,941	207,225	2,922	201,818	3,435	398,072	3,414	387,829	3,393	377,750	3,946	714,965	3,921	695,641	3,897	678,150
28,6	1,498	12,622	1,636	18,061	1,627	17,661	1,932	35,789	1,919	34,812	1,908	33,972	2,230	64,663	2,215	62,905	2,200	61,176	2,568	116,322	2,551	113,038	2,536	110,304	2,970	213,478	2,951	207,963	2,933	202,536	3,448	399,487	3,426	389,208	3,405	379,093	3,960	717,502	3,935	698,110	3,911	680,557
28,8	1,503	12,667	1,642	18,125	1,633	17,724	1,939	35,916	1,926	34,936	1,915	34,092	2,238	64,893	2,223	63,128	2,208	61,393	2,577	116,734	2,560	113,438	2,545	110,695	2,980	214,233	2,962	208,698	2,943	203,253	3,460	400,897	3,438	390,581	3,417	380,431	3,974	720,031	3,949	700,571	3,925	682,956
29	1,509	12,712	1,647	18,190	1,638	17,786	1,946	36,043	1,933	35,059	1,922	34,213	2,246	65,121	2,231	63,350	2,216	61,609	2,586	117,144	2,569	113,837	2,554	111,084	2,991	214,985	2,972	209,431	2,954	203,966	3,472	402,302	3,450	391,950	3,429	381,764	3,988	722,551	3,963	703,023	3,939	685,347
29,2	1,514	12,757	1,653	18,254	1,644	17,849	1,953	36,169	1,940	35,182	1,928	34,333	2,254	65,349	2,239	63,572	2,224	61,825	2,595	117,553	2,578	114,234	2,563	111,472	3,001	215,734	2,983	210,161	2,964	204,677	3,484	403,702	3,462	393,315	3,441	383,093	4,002	725,063	3,976	705,467	3,953	687,729
29,4	1,519	12,802	1,659	18,317	1,650	17,911	1,960	36,295	1,947	35,305	1,935	34,452	2,261	65,576	2,246	63,793	2,231	62,040	2,604	117,961	2,587	114,631	2,571	111,858	3,012	216,481	2,993	210,888	2,974	205,386	3,496	405,098	3,474	394,674	3,453	384,417	4,016	727,566	3,990	707,902	3,966	690,103
29,6	1,525	12,846	1,665	18,381	1,656	17,973	1,967	36,421	1,953	35,427	1,942	34,572	2,269	65,803	2,254	64,013	2,239	62,254	2,613	118,367	2,596	115,026	2,580	112,244	3,022	217,225	3,003	211,614	2,984	206,092	3,508	406,488	3,486	396,029	3,465	385,737	4,030	730,060	4,004	710,329	3,980	692,469
29,8	1,530	12,891	1,670	18,444	1,661	18,035	1,973	36,546	1,960	35,549	1,948	34,690	2,277	66,028	2,262	64,232	2,247	62,467	2,622	118,772	2,604	115,419	2,589	112,628	3,032	217,967	3,013	212,336	2,995	206,796	3,520	407,874	3,498	397,379	3,476	387,053	4,044	732,546	4,017	712,748	3,993	694,828
30	1,535	12,935	1,676	18,507	1,667	18,097	1,980	36,670	1,967	35,670	1,955	34,809	2,285	66,253	2,270	64,451	2,254	62,680	2,631	119,176	2,613	115,811	2,598	113,011	3,043	218,706	3,024	213,057	3,005	207,498	3,532	409,256	3,510	398,725	3,488	388,364	4,057	735,024	4,031	715,159	4,007	697,178
30,5	1,548	13,045	1,690	18,664	1,681	18,250	1,997	36,980	1,983	35,972	1,972	35,103	2,304	66,812	2,289	64,995	2,273	63,209	2,653	120,179	2,635	116,786	2,620	113,962	3,068	220,544	3,049	214,847	3,030	209,241	3,562	412,689	3,540	402,071	3,518	391,622	4,091	741,182	4,065	721,151	4,040	703,020
31	1,561	13,153	1,704	18,820	1,695	18,403	2,013	37,288	2,000	36,271	1,988	35,395	2,323	67,366	2,308	65,534	2,292	63,733	2,675	121,174	2,657	117,753	2,642	114,906	3,094	222,367	3,074	216,623	3,055	210,971	3,591	416,094	3,569	405,389	3,547	394,854	4,125	747,290	4,098	727,094	4,074	708,814
31,5	1,574	13,262	1,718	18,974	1,709	18,554	2,030	37,593	2,016	36,567	2,004	35,684	2,342	67,916	2,327	66,069	2,311	64,253	2,697	122,161	2,679	118,712	2,663	115,842	3,119	224,175	3,099	218,384	3,080	212,687	3,620	419,472	3,598	408,680	3,575	398,060	4,158	753,349	4,132	732,990	4,107	714,562
32	1,587	13,369	1,732	19,127	1,723	18,703	2,046	37,895	2,032	36,862	2,020	35,972	2,361	68,461	2,345	66,599	2,329	64,769	2,719	123,140	2,700	119,664	2,684	116,770	3,144	225,969	3,124	220,132	3,104	214,389	3,649	422,824	3,627	411,945	3,604	401,241	4,192	759,360	4,164	738,839	4,140	720,264
32,5	1,599	13,475	1,746	19,279	1,736	18,852	2,062	38,195	2,049	37,154	2,036	36,257	2,380	69,002	2,364	67,126	2,348	65,281	2,740	124,112	2,722	120,608	2,706	117,692	3,168	227,749	3,149	221,866	3,129	216,078	3,678	426,149	3,655	415,185	3,632	404,397	4,224	765,325	4,197	744,642	4,172	725,922
33	1,612	13,581	1,760	19,430	1,750	18,999	2,078	38,493	2,065	37,443	2,052	36,540	2,398	69,539	2,382	67,648	2,366	65,789	2,762	125,076	2,743	121,545	2,727	118,606	3,193	229,515	3,173	223,587	3,153	217,754	3,706	429,449	3,683	418,400	3,660	407,528	4,257	771,243	4,230	750,402	4,204	731,537
33,5	1,624	13,685	1,773	19,580	1,764	19,146	2,094	38,789	2,080	37,731	2,068	36,820	2,416	70,072	2,400	68,167	2,384	66,294	2,783	126,033	2,764	122,475	2,747	119,514	3,217	231,268	3,197	225,294	3,177	219,417	3,734	432,724	3,711	421,591	3,688	410,637	4,290	777,118	4,262	756,117	4,236	737,109
34	1,637	13,789	1,787	19,728	1,777	19,291	2,110	39,082	2,096	38,017	2,084	37,099	2,435	70,601	2,419	68,682	2,402	66,794	2,804	126,982	2,784	123,398	2,768	120,415	3,242	233,008	3,221	226,989	3,201	221,068	3,763	435,974	3,739	424,758	3,716	413,722	4,322	782,948	4,294	761,790	4,268	742,640
34,5	1,649	13,893	1,800	19,876	1,790	19,435	2,126	39,374	2,112	38,300	2,099	37,375	2,453	71,127	2,437	69,193	2,420	67,291	2,824	127,925	2,805	124,315	2,789	121,309	3,266	234,735	3,245	228,672	3,225	222,707	3,790	439,201	3,767	427,902	3,744	416,784	4,354	788,736	4,326	767,422	4,300	748,130
35	1,661	13,995	1,813	20,022	1,803	19,578	2,142	39,663	2,127	38,581	2,115	37,650	2,471	71,648	2,454	69,700	2,438	67,785	2,845	128,861	2,826	125,224	2,809	122,197	3,290	236,450	3,269	230,343	3,249	224,334	3,818	442,405	3,794	431,024	3,771	419,824	4,385	794,482	4,357	773,013	4,331	753,581
35,5	1,673	14,097	1,826	20,167	1,816	19,720	2,157	39,950	2,143	38,861	2,130	37,923	2,489	72,166	2,472	70,203	2,456	68,275	2,866	129,791	2,846	126,127	2,829	123,078	3,313	238,152	3,293	232,001	3,272	225,949	3,845	445,586	3,822	434,123	3,798	422,843	4,417	800,187	4,388	778,564	4,362	758,993
36	1,685	14,198	1,840	20,312	1,829	19,862	2,172	40,235	2,158	39,138	2,145	38,193	2,506	72,680	2,490	70,704	2,473	68,761	2,886	130,714	2,866	127,024	2,850	123,953	3,337	239,843	3,316	233,648	3,295	227,554	3,873	448,744	3,849	437,200	3,825	425,841	4,448	805,852	4,419	784,077	4,393	764,367
36,5	1,697	14,298	1,853	20,455	1,842	20,002	2,188	40,518	2,173	39,414	2,160	38,462	2,524	73,190	2,507	71,200	2,490	69,244	2,906	131,630	2,886	127,915	2,870	124,823	3,360	241,522	3,339	235,284	3,318	229,147	3,900	451,881	3,876	440,256	3,852	428,818	4,479	811,478	4,450	789,551	4,424	769,704
37	1,709	14,398	1,865	20,597	1,855	20,141	2,203	40,800	2,188	39,687	2,175	38,729	2,541	73,697	2,525	71,693	2,508	69,724	2,926	132,540	2,906	128,800	2,889	125,686	3,383	243,189	3,362	236,909	3,341	230,729	3,927	454,996	3,902	443,291	3,878	431,774	4,510	817,065	4,481	794,988	4,454	775,004
37,5	1,721	14,497	1,878	20,739	1,868	20,279	2,218	41,079	2,203	39,959	2,190	38,995	2,559	74,201	2,542	72,183	2,525	70,200	2,946	133,444	2,926	129,678	2,909	126,543	3,406	244,845	3,385	238,522	3,364	232,301	3,953	458,090	3,929	446,306	3,905	434,711	4,541	822,615	4,511	800,388	4,484	780,269
38	1,732	14,595	1,891	20,879	1,881	20,417	2,233	41,357	2,218	40,229	2,205	39,258	2,576	74,701	2,559	72,670	2,542	70,674	2,966	134,343	2,946	130,551	2,929	127,395	3,429	246,491	3,408	240,125	3,386	233,862	3,980	461,164	3,955	449,301	3,931	437,628	4,571	828,129	4,542	805,752	4,514	785,499
38,5	1,744	14,693	1,904	21,019	1,893	20,553	2,248	41,632	2,233	40,497	2,220	39,520	2,593	75,198	2,576	73,154	2,559	71,144	2,986	135,235	2,965	131,418	2,948	128,241	3,452	248,125	3,430	241,717	3,409	235,413	4,006	464,217	3,982	452,276	3,957	440,526	4,601	833,606	4,572	811,082	4,544	790,694
39	1,755	14,790	1,916	21,157	1,906	20,689	2,263	41,906	2,248	40,764	2,234	39,780	2,610	75,692	2,593	73,634	2,576	71,611	3,005	136,121	2,985	132,280	2,967	129,082	3,475	249,749	3,453	243,299	3,431	236,954	4,032	467,251	4,008	455,232	3,983	443,406	4,631	839,047	4,602	816,376	4,574	795,856
39,5	1,767	14,887	1,929	21,295	1,918	20,823	2,277	42,178	2,262	41,028	2,249	40,038	2,627	76,182	2,610	74,111	2,592	72,075	3,025	137,002	3,004	133,136	2,987	129,917	3,497	251,363	3,475	244,871	3,453	238,485	4,058	470,266	4,033	458,169	4,008	446,266	4,661	844,454	4,631	821,637	4,603	800,985
40	1,778	14,982	1,941	21,432	1,930	20,957	2,292	42,449	2,277	41,291	2,263	40,295	2,644	76,670	2,626	74,586	2,609	72,537	3,044	137,877	3,023	133,986	3,006	130,748	3,519	252,966	3,497	246,433	3,475	240,006	4,084	473,261	4,059	461,088	4,034	449,109	4,691	849,827	4,661	826,865	4,633	806,082
40,5	1,790	15,078	1,953	21,568	1,943	21,090	2,307	42,718	2,291	41,553	2,278	40,550	2,661	77,154	2,643	75,057	2,625	72,995	3,063	138,747	3,042	134,832	3,025	131,573	3,541	254,559	3,519	247,986	3,497	241,518	4,110	476,238	4,085	463,988	4,059	451,935	4,720	855,166	4,690	832,061	4,662	811,147
41	1,801	15,172	1,966	21,703	1,955	21,223	2,321	42,985	2,305	41,813	2,292	40,804	2,677	77,636	2,660	75,526	2,642	73,451	3,083	139,612	3,061	135,672	3,044	132,392	3,563	256,143	3,541	249,529	3,519	243,021	4,136	479,196	4,110	466,871	4,084	454,742	4,750	860,472	4,719	837,224	4,691	816,181
41,5	1,812	15,266	1,978	21,838	1,967	21,354	2,335	43,250	2,320	42,071	2,306	41,056	2,694	78,115	2,676	75,991	2,658	73,904	3,101	140,471	3,080	136,507	3,062	133,207	3,585	257,717	3,563	251,062	3,541	244,514	4,161	482,137	4,135	469,736	4,110	457,533	4,779	865,746	4,748	842,356	4,720	821,184
42	1,823	15,360	1,990	21,971	1,979	21,485	2,350	43,514	2,334	42,328	2,320	41,306	2,710	78,590	2,692	76,454	2,674	74,354	3,120	141,325	3,099	137,337	3,081	134,017	3,607	259,281	3,585	252,586	3,562	245,999	4,186	485,060	4,160	472,584	4,134	460,307	4,808	870,989	4,777	847,457	4,748	826,157
42,5	1,834	15,453	2,002	22,104	1,991	21,615	2,364	43,776	2,348	42,583	2,334	41,555	2,726	79,063	2,708	76,914	2,690	74,801	3,139	142,174	3,118	138,162	3,099	134,823	3,629	260,837	3,606	254,101	3,584	247,474	4,211	487,965	4,185	475,415	4,159	463,065	4,836	876,200	4,805	852,528	4,777	831,100
43	1,845	15,545	2,014	22,236	2,003	21,744	2,378	44,037	2,362	42,837	2,348	41,803	2,743	79,533	2,725	77,372	2,706	75,246	3,158	143,018	3,136	138,982	3,118	135,623	3,650	262,383	3,628	255,608	3,605	248,942	4,236	490,854	4,210	478,229	4,184	465,806	4,865	881,381	4,834	857,569	4,805	836,015
43,5	1,856	15,637	2,026	22,367	2,015	21,872	2,392	44,297	2,376	43,089	2,362	42,049	2,759	80,001	2,741	77,826	2,722	75,689	3,176	143,857	3,155	139,798	3,136	136,419	3,672	263,920	3,649	257,105	3,626	250,400	4,261	493,726	4,235	481,027	4,208	468,532	4,893	886,532	4,862	862,581	4,833	840,901
44	1,867	15,729	2,038	22,498	2,026	22,000	2,406	44,554	2,390	43,340	2,376	42,294	2,775	80,466	2,756	78,278	2,738	76,128	3,195	144,691	3,173	140,609	3,154	137,210	3,693	265,448	3,670	258,594	3,647	251,850	4,286	496,581	4,259	483,809	4,233	471,242	4,922	891,653	4,890	867,564	4,861	845,760
44,5	1,878	15,819	2,049	22,628	2,038	22,127	2,420	44,811	2,403	43,589	2,389	42,537	2,791	80,928	2,772	78,728	2,754	76,566	3,213	145,521	3,191	141,415	3,172	137,997	3,714	266,968	3,691	260,075	3,668	253,293	4,310	499,420	4,284	486,575	4,257	473,936	4,950	896,746	4,918	872,519	4,889	850,590
45	1,888	15,910	2,061	22,757	2,050	22,253	2,433	45,066	2,417	43,837	2,403	42,780	2,807	81,387	2,788	79,175	2,769	77,001	3,231	146,346	3,209	142,217	3,190	138,780	3,735	268,479	3,712	261,547	3,689	254,727	4,334	502,243	4,308	489,326	4,281	476,616	4,978	901,810	4,946	877,446	4,916	855,394
45,5	1,899	16,000	2,073	22,885	2,061	22,378	2,447	45,319	2,431	44,084	2,416	43,020	2,822	81,844	2,804	79,620	2,785	77,433	3,249	147,166	3,227	143,014	3,208	139,558	3,756	269,982	3,733	263,011	3,709	256,153	4,359	505,051	4,332	492,062	4,305	479,280	5,006	906,845	4,973	882,346	4,944	860,171
46	1,910	16,089	2,084	23,013	2,073	22,503	2,461	45,571	2,444	44,329	2,430	43,260	2,838	82,299	2,819	80,062	2,800	77,863	3,267	147,982	3,245	143,807	3,226	140,331	3,777	271,477	3,753	264,467	3,730	257,571	4,383	507,843	4,356	494,782	4,329	481,930	5,033	911,854	5,001	887,219	4,971	864,922
46,5	1,920	16,178	2,096	23,140	2,084	22,627	2,474	45,822	2,458	44,573	2,443	43,498	2,854	82,751	2,835	80,502	2,816	78,291	3,285	148,794	3,263	144,596	3,244	141,101	3,797	272,963	3,774	265,916	3,750	258,981	4,407	510,621	4,380	497,488	4,352	484,566	5,061	916,835	5,028	892,066	4,998	869,647
47	1,931	16,266	2,107	23,266	2,096	22,751	2,488	46,071	2,471	44,816	2,456	43,734	2,869	83,200	2,850	80,939	2,831	78,716	3,303	149,601	3,281	145,380	3,261	141,867	3,818	274,442	3,794	267,356	3,771	260,384	4,431	513,383	4,403	500,180	4,376	487,188	5,088	921,789	5,055	896,887	5,025	874,347
47,5	1,941	16,354	2,118	23,392	2,107	22,873	2,501	46,320	2,484	45,057	2,470	43,970	2,885	83,648	2,865	81,374	2,846	79,139	3,321	150,404	3,298	146,160	3,279	142,628	3,839	275,913	3,815	268,789	3,791	261,780	4,454	516,130	4,427	502,857	4,399	489,795	5,115	926,717	5,082	901,682	5,052	879,022
48	1,951	16,442	2,130	23,516	2,118	22,996	2,514	46,566	2,498	45,297	2,483	44,204	2,900	84,092	2,881	81,807	2,861	79,560	3,338	151,202	3,316	146,937	3,296	143,386	3,859	277,376	3,835	270,214	3,811	263,168	4,478	518,864	4,450	505,520	4,423	492,389	5,142	931,619	5,109	906,452	5,079	883,672
48,5	1,962	16,529	2,141	23,641	2,129	23,117	2,528	46,812	2,511	45,536	2,496	44,437	2,915	84,535	2,896	82,238	2,877	79,979	3,356	151,997	3,333	147,709	3,314	144,139	3,879	278,831	3,855	271,632	3,831	264,549	4,501	521,583	4,474	508,169	4,446	494,970	5,169	936,496	5,136	911,198	5,105	888,298
49	1,972	16,615	2,152	23,764	2,141	23,238	2,541	47,056	2,524	45,774	2,509	44,669	2,930	84,975	2,911	82,666	2,892	80,396	3,373	152,787	3,350	148,477	3,331	144,889	3,899	280,279	3,875	273,043	3,851	265,923	4,525	524,288	4,497	510,805	4,469	497,537	5,196	941,348	5,163	915,918	5,132	892,901
49,5	1,982	16,701	2,163	23,887	2,152	23,358	2,554	47,299	2,537	46,010	2,522	44,900	2,945	85,413	2,926	83,092	2,906	80,810	3,391	153,574	3,368	149,241	3,348	145,635	3,919	281,720	3,895	274,446	3,871	267,290	4,548	526,979	4,520	513,427	4,492	500,092	5,223	946,175	5,189	920,615	5,158	897,480
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

Hydraulic table 1.3: roughness coefficient k=0,5 mm (1/5)

DN (mm)	110		125		125		160		160		160		200		200		200		250		250		250		315		315		315		400		400		400		500		500		500	
Class of pipes	SN4,SN8		SN4		SN8		SN2		SN4		SN8		SN2		SN4		SN8		SN2		SN4		SN8		SN2		SN4		SN8		SN2		SN4		SN8		SN2		SN4		SN8	
s (mm)	3,2		3,2		3,7		3,2		4		4,7		3,9		4,9		5,9		4,9		6,2		7,3		6,2		7,7		9,2		7,9		9,8		11,7		9,8		12,3		14,6	
d (mm)	103,6		118,6		117,6		153,6		152		150,6		192,2		190,2		188,2		240,2		237,6		235,4		302,6		299,6		296,6		384,2		380,4		376,6		480,4		475,4		470,8	
d (m)	0,1036		0,1186		0,1176		0,1536		0,152		0,1506		0,1922		0,1902		0,1882		0,2402		0,2376		0,2354		0,3026		0,2996		0,2966		0,3842		0,3804		0,3766		0,4804		0,4754		0,4708	
F (m²)	0,008425374		0,011041779		0,010856362		0,018520474		0,01813664		0,017804083		0,028998559		0,028398191		0,027804103		0,045291391		0,044316202		0,043499331		0,071879907		0,070461726		0,069057675		0,115873567		0,113592766		0,111334635		0,181165566		0,177414051		0,173997322	
I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,070	0,589	0,077	0,852	0,077	0,833	0,093	1,720	0,092	1,672	0,092	1,631	0,109	3,154	0,108	3,067	0,107	2,980	0,127	5,750	0,126	5,584	0,125	5,446	0,149	10,684	0,148	10,402	0,147	10,126	0,175	20,226	0,173	19,696	0,172	19,176	0,203	36,687	0,201	35,679	0,200	34,768
0,2	0,102	0,863	0,113	1,246	0,112	1,218	0,135	2,507	0,134	2,437	0,134	2,377	0,158	4,584	0,157	4,457	0,156	4,332	0,184	8,335	0,183	8,095	0,182	7,896	0,215	15,450	0,214	15,044	0,212	14,646	0,252	29,183	0,250	28,422	0,249	27,673	0,292	52,832	0,290	51,386	0,288	50,077
0,3	0,128	1,077	0,141	1,552	0,140	1,517	0,168	3,117	0,167	3,031	0,166	2,956	0,196	5,691	0,195	5,533	0,193	5,379	0,228	10,333	0,226	10,037	0,225	9,791	0,266	19,130	0,264	18,630	0,263	18,137	0,311	36,093	0,309	35,153	0,307	34,228	0,360	65,277	0,358	63,493	0,356	61,879
0,4	0,149	1,258	0,164	1,812	0,163	1,771	0,196	3,634	0,195	3,533	0,194	3,446	0,229	6,628	0,227	6,445	0,225	6,265	0,265	12,024	0,264	11,680	0,262	11,394	0,309	22,243	0,307	21,661	0,305	21,089	0,362	41,934	0,360	40,843	0,357	39,770	0,418	75,792	0,416	73,722	0,413	71,850
0,5	0,168	1,418	0,185	2,041	0,184	1,995	0,221	4,091	0,219	3,977	0,218	3,880	0,257	7,456	0,255	7,250	0,253	7,048	0,298	13,517	0,296	13,131	0,294	12,809	0,348	24,990	0,345	24,337	0,343	23,695	0,406	47,088	0,404	45,864	0,401	44,659	0,470	85,067	0,466	82,746	0,463	80,646
0,6	0,185	1,563	0,204	2,250	0,203	2,199	0,243	4,505	0,241	4,380	0,240	4,273	0,283	8,205	0,281	7,979	0,279	7,757	0,328	14,869	0,326	14,445	0,324	14,091	0,382	27,477	0,380	26,760	0,377	26,054	0,447	51,752	0,444	50,407	0,441	49,085	0,516	93,460	0,512	90,911	0,509	88,605
0,7	0,201	1,697	0,221	2,441	0,220	2,386	0,264	4,886	0,262	4,751	0,260	4,634	0,307	8,896	0,305	8,651	0,302	8,410	0,356	16,114	0,353	15,654	0,351	15,271	0,414	29,767	0,411	28,990	0,409	28,226	0,484	56,044	0,481	54,589	0,477	53,157	0,559	101,182	0,555	98,425	0,551	95,929
0,8	0,216	1,821	0,237	2,620	0,236	2,561	0,283	5,241	0,281	5,096	0,279	4,971	0,329	9,539	0,327	9,277	0,324	9,019	0,381	17,274	0,379	16,781	0,376	16,371	0,444	31,899	0,441	31,067	0,438	30,248	0,518	60,042	0,515	58,483	0,512	56,950	0,598	108,374	0,594	105,421	0,591	102,749
0,9	0,230	1,939	0,253	2,788	0,251	2,725	0,301	5,575	0,299	5,421	0,297	5,288	0,350	10,144	0,347	9,865	0,345	9,591	0,405	18,363	0,403	17,840	0,400	17,404	0,472	33,903	0,469	33,019	0,466	32,149	0,551	63,798	0,547	62,143	0,544	60,514	0,635	115,131	0,631	111,995	0,627	109,157
1	0,243	2,050	0,267	2,947	0,265	2,881	0,318	5,891	0,316	5,728	0,314	5,588	0,370	10,716	0,367	10,421	0,364	10,132	0,428	19,395	0,425	18,842	0,423	18,382	0,498	35,799	0,495	34,866	0,492	33,948	0,581	67,352	0,578	65,605	0,574	63,886	0,671	121,523	0,666	118,215	0,662	115,220
1,1	0,256	2,155	0,281	3,099	0,279	3,029	0,334	6,192	0,332	6,021	0,330	5,874	0,388	11,261	0,386	10,951	0,383	10,647	0,450	20,376	0,447	19,795	0,444	19,312	0,523	37,603	0,520	36,623	0,516	35,659	0,610	70,734	0,607	68,899	0,603	67,095	0,704	127,605	0,700	124,132	0,695	120,988
1,2	0,268	2,256	0,294	3,244	0,292	3,171	0,350	6,480	0,347	6,301	0,345	6,147	0,406	11,781	0,403	11,458	0,401	11,140	0,471	21,314	0,467	20,707	0,464	20,202	0,547	39,327	0,544	38,303	0,540	37,295	0,638	73,965	0,634	72,048	0,630	70,161	0,736	133,418	0,732	129,787	0,727	126,501
1,3	0,279	2,354	0,306	3,383	0,305	3,307	0,365	6,756	0,362	6,569	0,360	6,409	0,424	12,281	0,421	11,944	0,418	11,612	0,490	22,214	0,487	21,582	0,484	21,055	0,570	40,981	0,566	39,914	0,563	38,864	0,665	77,066	0,661	75,068	0,657	73,103	0,767	138,993	0,762	135,211	0,757	131,789
1,4	0,290	2,447	0,318	3,517	0,317	3,438	0,379	7,021	0,376	6,828	0,374	6,661	0,440	12,762	0,437	12,411	0,434	12,067	0,510	23,081	0,506	22,423	0,503	21,876	0,592	42,574	0,588	41,465	0,585	40,375	0,691	80,049	0,686	77,975	0,682	75,934	0,797	144,360	0,792	140,432	0,787	136,878
1,5	0,301	2,537	0,330	3,646	0,328	3,564	0,393	7,278	0,390	7,077	0,388	6,905	0,456	13,226	0,453	12,863	0,450	12,506	0,528	23,917	0,524	23,236	0,521	22,669	0,614	44,110	0,610	42,962	0,606	41,832	0,716	82,929	0,711	80,780	0,707	78,666	0,825	149,538	0,820	145,470	0,815	141,789
1,6	0,311	2,624	0,342	3,771	0,340	3,686	0,406	7,526	0,404	7,319	0,401	7,140	0,472	13,675	0,468	13,300	0,465	12,931	0,546	24,726	0,542	24,022	0,539	23,436	0,634	45,597	0,630	44,410	0,626	43,242	0,740	85,714	0,735	83,494	0,730	81,309	0,853	154,547	0,847	150,343	0,842	146,539
1,7	0,322	2,709	0,352	3,892	0,350	3,805	0,419	7,767	0,416	7,553	0,414	7,369	0,487	14,110	0,483	13,723	0,480	13,343	0,563	25,510	0,559	24,784	0,556	24,179	0,654	47,037	0,650	45,813	0,646	44,609	0,763	88,414	0,758	86,124	0,753	83,871	0,880	159,402	0,874	155,067	0,869	151,144
1,8	0,331	2,791	0,363	4,010	0,361	3,920	0,432	8,000	0,429	7,780	0,426	7,590	0,501	14,533	0,498	14,134	0,494	13,743	0,580	26,271	0,576	25,524	0,572	24,901	0,674	48,437	0,670	47,176	0,665	45,937	0,786	91,036	0,781	88,678	0,776	86,359	0,906	164,117	0,900	159,654	0,894	155,616
1,9	0,341	2,871	0,374	4,124	0,371	4,032	0,444	8,228	0,441	8,001	0,438	7,806	0,515	14,944	0,512	14,534	0,508	14,132	0,596	27,012	0,592	26,243	0,589	25,604	0,693	49,798	0,688	48,502	0,684	47,228	0,808	93,587	0,803	91,163	0,797	88,778	0,931	168,703	0,925	164,116	0,919	159,965
2	0,350	2,949	0,384	4,236	0,381	4,141	0,456	8,449	0,453	8,217	0,450	8,016	0,529	15,345	0,526	14,924	0,522	14,511	0,612	27,734	0,608	26,945	0,604	26,288	0,711	51,124	0,707	49,794	0,702	48,486	0,829	96,071	0,824	93,583	0,819	91,136	0,956	173,170	0,950	168,462	0,944	164,202
2,1	0,359	3,025	0,393	4,345	0,391	4,247	0,468	8,665	0,465	8,427	0,462	8,221	0,543	15,736	0,539	15,304	0,535	14,880	0,628	28,437	0,623	27,629	0,620	26,955	0,729	52,417	0,725	51,054	0,720	49,713	0,850	98,494	0,845	95,944	0,839	93,435	0,980	177,527	0,973	172,701	0,967	168,334
2,2	0,368	3,100	0,403	4,451	0,401	4,351	0,479	8,876	0,476	8,632	0,473	8,422	0,556	16,118	0,552	15,676	0,548	15,241	0,643	29,125	0,639	28,297	0,635	27,607	0,747	53,680	0,742	52,284	0,737	50,911	0,870	100,860	0,865	98,249	0,859	95,680	1,003	181,782	0,997	176,841	0,991	172,369
2,3	0,377	3,172	0,413	4,555	0,410	4,453	0,490	9,082	0,487	8,833	0,484	8,617	0,569	16,491	0,565	16,039	0,561	15,594	0,658	29,797	0,653	28,950	0,649	28,244	0,764	54,915	0,759	53,487	0,754	52,082	0,890	103,174	0,885	100,503	0,879	97,875	1,026	185,941	1,020	180,888	1,013	176,314
2,4	0,385	3,243	0,422	4,657	0,419	4,553	0,501	9,284	0,498	9,029	0,495	8,809	0,581	16,856	0,577	16,394	0,573	15,940	0,672	30,454	0,668	29,589	0,664	28,868	0,781	56,123	0,776	54,664	0,771	53,228	0,910	105,437	0,904	102,708	0,898	100,023	1,049	190,011	1,042	184,848	1,036	180,174
2,5	0,393	3,313	0,431	4,757	0,428	4,650	0,512	9,482	0,508	9,221	0,505	8,997	0,594	17,214	0,590	16,742	0,585	16,278	0,687	31,099	0,682	30,214	0,678	29,479	0,797	57,307	0,792	55,817	0,787	54,351	0,929	107,655	0,923	104,868	0,917	102,127	1,071	193,998	1,064	188,726	1,057	183,955
2,6	0,401	3,381	0,440	4,854	0,437	4,746	0,522	9,676	0,519	9,410	0,516	9,181	0,606	17,564	0,602	17,083	0,597	16,610	0,701	31,730	0,696	30,828	0,691	30,077	0,813	58,467	0,808	56,947	0,803	55,451	0,948	109,828	0,942	106,986	0,936	104,189	1,092	197,905	1,085	192,528	1,079	187,661
2,7	0,409	3,448	0,448	4,950	0,446	4,839	0,533	9,866	0,529	9,595	0,526	9,361	0,618	17,908	0,613	17,418	0,609	16,935	0,714	32,349	0,709	31,430	0,705	30,665	0,829	59,605	0,824	58,055	0,819	56,531	0,966	111,960	0,960	109,063	0,954	106,212	1,114	201,739	1,106	196,257	1,099	191,297
2,8	0,417	3,514	0,457	5,044	0,454	4,931	0,543	10,053	0,539	9,776	0,536	9,539	0,629	18,246	0,625	17,746	0,621	17,255	0,728	32,958	0,723	32,021	0,718	31,241	0,845	60,722	0,839	59,144	0,834	57,591	0,984	114,053	0,978	111,102	0,972	108,198	1,134	205,502	1,127	199,919	1,120	194,866
2,9	0,425	3,578	0,465	5,137	0,463	5,022	0,553	10,236	0,549	9,955	0,546	9,713	0,641	18,578	0,636	18,069	0,632	17,569	0,741	33,555	0,736	32,601	0,731	31,808	0,860	61,819	0,855	60,213	0,849	58,632	1,002	116,109	0,996	113,105	0,989	110,149	1,155	209,198	1,147	203,515	1,140	198,372
3	0,432	3,642	0,473	5,228	0,471	5,111	0,562	10,417	0,559	10,130	0,555	9,884	0,652	18,904	0,647	18,386	0,643	17,877	0,754	34,142	0,749	33,172	0,744	32,364	0,875	62,898	0,869	61,264	0,864	59,656	1,019	118,130	1,013	115,074	1,007	112,067	1,175	212,832	1,167	207,050	1,160	201,818
3,1	0,440	3,704	0,482	5,317	0,479	5,198	0,572	10,594	0,568	10,303	0,565	10,052	0,663	19,225	0,658	18,698	0,654	18,180	0,767	34,720	0,761	33,733	0,757	32,912	0,890	63,959	0,884	62,297	0,878	60,662	1,037	120,118	1,030	117,010	1,024	113,953	1,195	216,405	1,187	210,527	1,179	205,207
3,2	0,447	3,766	0,490	5,405	0,487	5,284	0,581	10,769	0,577	10,473	0,574	10,218	0,674	19,540	0,669	19,005	0,665	18,479	0,779	35,288	0,774	34,285	0,769	33,451	0,904	65,003	0,899	63,314	0,893	61,653	1,054	122,074	1,047	118,916	1,040	115,808	1,214	219,922	1,206	213,948	1,199	208,542
3,3	0,454	3,826	0,497	5,492	0,495	5,369	0,591	10,940	0,587	10,640	0,583	10,381	0,685	19,851	0,680	19,307	0,675	18,773	0,791	35,848	0,786	34,829	0,781	33,982	0,919	66,031	0,913	64,316	0,907	62,628	1,070	123,999	1,063	120,792	1,057	117,636	1,233	223,384	1,225	217,317	1,217	211,826
3,4	0,461	3,886	0,505	5,577	0,502	5,452	0,600	11,110	0,596	10,804	0,592	10,542	0,695	20,157	0,690	19,605	0,686	19,063	0,804	36,399	0,798	35,365	0,793	34,504	0,933	67,044	0,927	65,302	0,921	63,588	1,086	125,896	1,080	122,639	1,073	119,435	1,252	226,794	1,244	220,635	1,236	215,060
3,5	0,468	3,945	0,513	5,661	0,510	5,535	0,609	11,276	0,605	10,967	0,601	10,700	0,706	20,459	0,701	19,899	0,696	19,348	0,816	36,942	0,810	35,893	0,805	35,019	0,947	68,042	0,941	66,274	0,935	64,535	1,103	127,765	1,096	124,460	1,089	121,209	1,270	230,155	1,262	223,904	1,254	218,247
3,6	0,475	4,003	0,520	5,744	0,517	5,616	0,618	11,441	0,613	11,127	0,610	10,856	0,716	20,756	0,711	20,188	0,706	19,629	0,827	37,477	0,822	36,413	0,817	35,527	0,960	69,025	0,954	67,232	0,948	65,468	1,119	129,608	1,111	126,256	1,104	122,957	1,289	233,467	1,280	227,127	1,272	221,389
3,7	0,482	4,060	0,528	5,826	0,525	5,696	0,627	11,603	0,622	11,284	0,618	11,010	0,726	21,049	0,721	20,473	0,716	19,907	0,839	38,006	0,833	36,926	0,828	36,028	0,974	69,995	0,968	68,177	0,961	66,388	1,134	131,425	1,127	128,026	1,120	124,682	1,307	236,735	1,298	230,306	1,290	224,488
3,8	0,489	4,116	0,535	5,906	0,532	5,775	0,635	11,763	0,631	11,440	0,627	11,162	0,736	21,339	0,731	20,755	0,726	20,181	0,851	38,527	0,845	37,432	0,840	36,522	0,987	70,953	0,981	69,110	0,974	67,296	1,150	133,218	1,142	129,773	1,135	126,383	1,325	239,958	1,316	233,442	1,308	227,545
3,9	0,495	4,172	0,542	5,986	0,539	5,852	0,644	11,921	0,639	11,594	0,635	11,312	0,746	21,625	0,741	21,033	0,736	20,451	0,862	39,041	0,856	37,932	0,851	37,009	1,000	71,897	0,994	70,030	0,987	68,193	1,165	134,988	1,158	131,497	1,150	128,062	1,342	243,139	1,333	236,537	1,325	230,562
4	0,502	4,227	0,549	6,065	0,546	5,929	0,652	12,077	0,648	11,745	0,644	11,460	0,755	21,907	0,750	21,307	0,745	20,718	0,873	39,549	0,867	38,426	0,862	37,491	1,013	72,830	1,007	70,938	1,000	69,077	1,180	136,735	1,173	133,199	1,165	129,720	1,359	246,280	1,350	239,593	1,342	233,541
4,1	0,508	4,281	0,556	6,142	0,553	6,005	0,660	12,231	0,656	11,895	0,652	11,606	0,765	22,185	0,760	21,578	0,755	20,981	0,884	40,050	0,878	38,913	0,873	37,966	1,026	73,751	1,019	71,836	1,013	69,951	1,195	138,460	1,187	134,880	1,180	131,357	1,377	249,382	1,367	242,611	1,359	236,483
4,2	0,514	4,335	0,563	6,219	0,560	6,080	0,669	12,383	0,664	12,043	0,660	11,750	0,775	22,460	0,769	21,846	0,764	21,241	0,895	40,545	0,889	39,394	0,884	38,436	1,039	74,661	1,032	72,722	1,025	70,814	1,210	140,165	1,202	136,540	1,194	132,974	1,393	252,446	1,384	245,592	1,376	239,389
4,3	0,521	4,388	0,570	6,295	0,567	6,154	0,677	12,534	0,672	12,189	0,668	11,893	0,784	22,732	0,779	22,110	0,773	21,499	0,906	41,035	0,900	39,870	0,894	38,900	1,051	75,560	1,045	73,598	1,038	71,668	1,224	141,849	1,216	138,181	1,209	134,573	1,410	255,475	1,401	248,539	1,392	242,261
4,4	0,527	4,440	0,577	6,370	0,574	6,228	0,685	12,682	0,680	12,334	0,676	12,034	0,793	23,001	0,788	22,371	0,782	21,753	0,917	41,519	0,910	40,340	0,905	39,359	1,064	76,449	1,057	74,464	1,050	72,511	1,239	143,514	1,231	139,803	1,223	136,153	1,427	258,468	1,417	251,451	1,409	245,100
4,5	0,533	4,492	0,584	6,444	0,580	6,300	0,693	12,829	0,688	12,477	0,684	12,174	0,802	23,267	0,797	22,630	0,791	22,004	0,927	41,997	0,921	40,805	0,915	39,813	1,076	77,328	1,069	75,320	1,062	73,344	1,253	145,160	1,245	141,407	1,237	137,715	1,443	261,427	1,434	254,330	1,425	247,907
4,6	0,539	4,543	0,590	6,517	0,587	6,372	0,701	12,975	0,696	12,618	0,692	12,312	0,811	23,529	0,806	22,886	0,800	22,253	0,938	42,470	0,931	41,265	0,926	40,261	1,088	78,197	1,081	76,167	1,074	74,169	1,267	146,788	1,259	142,993	1,251	139,259	1,459	264,354	1,450	257,177	1,441	250,682
4,7	0,545	4,594	0,597	6,590	0,593	6,443	0,708	13,118	0,703	12,758	0,699	12,448	0,820	23,789	0,815	23,139	0,809	22,499	0,948	42,938	0,941	41,720	0,936	40,705	1,100	79,057	1,093	77,004	1,086	74,985	1,281	148,398	1,273	144,562	1,265	140,787	1,475	267,249	1,465	259,994	1,457	253,428
4,8	0,551	4,644	0,603	6,662	0,600	6,513	0,716	13,261	0,711	12,897	0,707	12,583	0,829	24,047	0,824	23,389	0,818	22,742	0,958	43,402	0,952	42,170	0,946	41,144	1,112	79,907	1,105	77,833	1,098	75,792	1,294	149,992	1,286	146,114	1,278	142,299	1,491	270,114	1,481	262,781	1,472	256,145
49,5	1,982	16,701	2,163	23,887	2,152	23,358	2,554	47,299	2,537	46,010	2,522	44,900	2,945	85,413	2,926	83,092	2,906	80,810	3,391	153,574	3,368	149,241	3,348	145,635	3,919	281,720	3,895	274,446	3,871	267,290	4,548	526,979	4,520	513,427	4,492	500,092	5,223	946,175	5,189	920,615	5,158	897,480
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.3: roughness coefficient k=0,5 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,9	0,557	4,693	0,610	6,733	0,606	6,582	0,724	13,401	0,719	13,034	0,714	12,717	0,838	24,301	0,832	23,636	0,827	22,983	0,968	43,860	0,962	42,615	0,956	41,579	1,123	80,749	1,116	78,653	1,109	76,590	1,308	151,569	1,300	147,651	1,292	143,796	1,507	272,948	1,497	265,539	1,488	258,834
5	0,563	4,742	0,616	6,803	0,613	6,651	0,731	13,541	0,726	13,169	0,722	12,849	0,847	24,553	0,841	23,882	0,835	23,221	0,978	44,314	0,972	43,056	0,966	42,009	1,135	81,583	1,128	79,465	1,121	77,381	1,322	153,130	1,313	149,171	1,305	145,277	1,522	275,755	1,512	268,270	1,503	261,495
5,1	0,569	4,791	0,622	6,872	0,619	6,719	0,739	13,679	0,734	13,303	0,729	12,980	0,855	24,803	0,850	24,124	0,844	23,457	0,988	44,763	0,981	43,492	0,976	42,435	1,146	82,408	1,139	80,268	1,132	78,164	1,335	154,675	1,326	150,677	1,318	146,743	1,537	278,533	1,527	270,973	1,518	264,130
5,2	0,574	4,839	0,629	6,941	0,625	6,786	0,746	13,816	0,741	13,436	0,736	13,110	0,864	25,050	0,858	24,365	0,852	23,691	0,998	45,208	0,991	43,925	0,985	42,857	1,158	83,225	1,150	81,064	1,143	78,939	1,348	156,206	1,340	152,168	1,331	148,195	1,553	281,284	1,542	273,649	1,533	266,740
5,3	0,580	4,887	0,635	7,010	0,631	6,853	0,753	13,951	0,748	13,568	0,744	13,238	0,872	25,295	0,866	24,603	0,860	23,923	1,008	45,648	1,001	44,353	0,995	43,274	1,169	84,034	1,162	81,853	1,154	79,706	1,361	157,721	1,353	153,645	1,344	149,634	1,568	284,009	1,557	276,300	1,548	269,324
5,4	0,586	4,934	0,641	7,077	0,637	6,919	0,761	14,085	0,755	13,698	0,751	13,366	0,881	25,537	0,875	24,839	0,869	24,152	1,018	46,085	1,010	44,777	1,004	43,688	1,180	84,836	1,173	82,633	1,165	80,467	1,374	159,223	1,365	155,107	1,357	151,058	1,583	286,708	1,572	278,927	1,563	271,884
5,5	0,591	4,981	0,647	7,144	0,643	6,985	0,768	14,218	0,762	13,828	0,758	13,492	0,889	25,777	0,883	25,072	0,877	24,379	1,027	46,517	1,020	45,197	1,014	44,098	1,191	85,630	1,184	83,407	1,176	81,220	1,387	160,711	1,378	156,557	1,369	152,470	1,597	289,383	1,587	281,529	1,577	274,421
5,6	0,597	5,027	0,653	7,211	0,649	7,050	0,775	14,349	0,769	13,956	0,765	13,617	0,897	26,015	0,891	25,304	0,885	24,604	1,037	46,946	1,029	45,613	1,023	44,505	1,202	86,417	1,195	84,174	1,187	81,967	1,400	162,185	1,391	157,993	1,382	153,869	1,612	292,033	1,601	284,107	1,592	276,934
5,7	0,602	5,073	0,659	7,276	0,655	7,114	0,782	14,480	0,776	14,083	0,772	13,741	0,905	26,251	0,899	25,533	0,893	24,828	1,046	47,370	1,039	46,026	1,032	44,907	1,213	87,197	1,205	84,934	1,198	82,707	1,412	163,646	1,403	159,417	1,394	155,255	1,626	294,660	1,616	286,663	1,606	279,425
5,8	0,608	5,119	0,665	7,342	0,661	7,178	0,789	14,609	0,783	14,208	0,779	13,863	0,913	26,485	0,907	25,761	0,901	25,049	1,055	47,791	1,048	46,435	1,042	45,307	1,224	87,970	1,216	85,687	1,208	83,441	1,425	165,095	1,416	160,828	1,407	156,630	1,641	297,264	1,630	289,196	1,620	281,895
5,9	0,613	5,164	0,671	7,406	0,667	7,241	0,796	14,738	0,790	14,333	0,785	13,985	0,921	26,717	0,915	25,986	0,909	25,268	1,064	48,209	1,057	46,841	1,051	45,702	1,235	88,737	1,227	86,434	1,219	84,168	1,437	166,531	1,428	162,227	1,419	157,992	1,655	299,845	1,644	291,708	1,634	284,343
6	0,618	5,209	0,677	7,471	0,673	7,304	0,803	14,865	0,797	14,457	0,792	14,106	0,929	26,947	0,923	26,210	0,917	25,486	1,074	48,623	1,066	47,243	1,060	46,095	1,245	89,497	1,237	87,175	1,229	84,889	1,449	167,954	1,440	163,614	1,431	159,344	1,669	302,405	1,658	294,198	1,648	286,771
6,1	0,624	5,253	0,682	7,534	0,679	7,366	0,809	14,991	0,804	14,580	0,799	14,225	0,937	27,175	0,931	26,432	0,924	25,701	1,083	49,033	1,075	47,642	1,069	46,484	1,256	90,251	1,248	87,909	1,240	85,605	1,462	169,367	1,452	164,990	1,443	160,683	1,683	304,943	1,672	296,668	1,662	289,179
6,2	0,629	5,297	0,688	7,597	0,684	7,428	0,816	15,116	0,811	14,701	0,806	14,344	0,945	27,401	0,939	26,652	0,932	25,915	1,092	49,440	1,084	48,038	1,077	46,870	1,266	90,999	1,258	88,637	1,250	86,314	1,474	170,767	1,464	166,354	1,455	162,012	1,697	307,461	1,686	299,118	1,676	291,567
6,3	0,634	5,341	0,694	7,660	0,690	7,489	0,823	15,240	0,817	14,822	0,812	14,462	0,953	27,625	0,946	26,870	0,940	26,128	1,101	49,844	1,093	48,430	1,086	47,253	1,276	91,741	1,268	89,360	1,260	87,018	1,486	172,157	1,476	167,708	1,467	163,331	1,711	309,959	1,700	301,548	1,689	293,936
6,4	0,639	5,384	0,699	7,722	0,695	7,550	0,830	15,363	0,824	14,942	0,819	14,579	0,960	27,848	0,954	27,087	0,947	26,338	1,109	50,245	1,102	48,819	1,095	47,633	1,287	92,477	1,278	90,077	1,270	87,716	1,498	173,535	1,488	169,051	1,479	164,639	1,725	312,437	1,713	303,959	1,703	296,286
6,5	0,644	5,427	0,705	7,784	0,701	7,610	0,836	15,485	0,830	15,061	0,825	14,695	0,968	28,069	0,961	27,301	0,955	26,547	1,118	50,642	1,110	49,206	1,104	48,010	1,297	93,207	1,288	90,788	1,280	88,409	1,509	174,903	1,500	170,383	1,490	165,937	1,738	314,895	1,727	306,351	1,716	298,618
6,6	0,649	5,470	0,710	7,845	0,706	7,670	0,843	15,607	0,837	15,178	0,832	14,810	0,975	28,288	0,969	27,515	0,962	26,755	1,127	51,037	1,119	49,589	1,112	48,384	1,307	93,932	1,298	91,494	1,290	89,096	1,521	176,260	1,512	171,705	1,502	167,224	1,752	317,335	1,740	308,725	1,730	300,932
6,7	0,654	5,513	0,716	7,905	0,712	7,729	0,849	15,727	0,843	15,295	0,838	14,924	0,983	28,506	0,976	27,726	0,970	26,960	1,136	51,428	1,128	49,970	1,121	48,755	1,317	94,651	1,308	92,195	1,300	89,778	1,533	177,607	1,523	173,018	1,513	168,503	1,765	319,757	1,753	311,081	1,743	303,228
6,8	0,659	5,555	0,721	7,966	0,717	7,788	0,856	15,846	0,850	15,412	0,845	15,037	0,990	28,721	0,984	27,936	0,977	27,165	1,144	51,817	1,136	50,347	1,129	49,124	1,327	95,365	1,318	92,890	1,310	90,456	1,544	178,944	1,535	174,320	1,525	169,771	1,778	322,160	1,767	313,419	1,756	305,508
6,9	0,664	5,596	0,727	8,025	0,723	7,846	0,862	15,965	0,856	15,527	0,851	15,150	0,998	28,936	0,991	28,145	0,984	27,367	1,153	52,203	1,145	50,722	1,138	49,490	1,337	96,073	1,328	93,580	1,320	91,128	1,556	180,271	1,546	175,613	1,536	171,030	1,791	324,546	1,780	315,740	1,769	307,770
7	0,669	5,638	0,732	8,085	0,728	7,904	0,868	16,083	0,862	15,641	0,857	15,262	1,005	29,149	0,998	28,352	0,992	27,569	1,161	52,586	1,153	51,094	1,146	49,853	1,346	96,777	1,338	94,266	1,329	91,795	1,567	181,589	1,557	176,897	1,547	172,281	1,805	326,915	1,793	318,045	1,782	310,017
7,1	0,674	5,679	0,738	8,144	0,733	7,962	0,875	16,199	0,869	15,755	0,863	15,373	1,012	29,360	1,006	28,557	0,999	27,768	1,169	52,966	1,161	51,464	1,154	50,213	1,356	97,475	1,347	94,946	1,339	92,458	1,578	182,897	1,569	178,172	1,559	173,522	1,817	329,266	1,806	320,333	1,795	312,247
7,2	0,679	5,720	0,743	8,202	0,739	8,019	0,881	16,315	0,875	15,868	0,870	15,483	1,020	29,570	1,013	28,761	1,006	27,967	1,178	53,344	1,170	51,831	1,163	50,572	1,366	98,169	1,357	95,622	1,348	93,116	1,590	184,196	1,580	179,437	1,570	174,755	1,830	331,602	1,818	322,605	1,807	314,462
7,3	0,684	5,761	0,748	8,260	0,744	8,076	0,887	16,431	0,881	15,980	0,876	15,592	1,027	29,778	1,020	28,964	1,013	28,164	1,186	53,719	1,178	52,195	1,171	50,927	1,375	98,858	1,367	96,293	1,358	93,769	1,601	185,486	1,591	180,694	1,581	175,979	1,843	333,921	1,831	324,861	1,820	316,662
7,4	0,689	5,801	0,753	8,318	0,749	8,133	0,893	16,545	0,887	16,091	0,882	15,701	1,034	29,985	1,027	29,165	1,020	28,360	1,194	54,091	1,186	52,557	1,179	51,280	1,385	99,542	1,376	96,959	1,367	94,418	1,612	186,768	1,602	181,942	1,592	177,195	1,856	336,224	1,844	327,102	1,832	318,846
7,5	0,693	5,841	0,759	8,375	0,754	8,189	0,899	16,659	0,893	16,202	0,888	15,809	1,041	30,190	1,034	29,365	1,027	28,554	1,202	54,461	1,194	52,917	1,187	51,631	1,394	100,221	1,385	97,621	1,377	95,063	1,623	188,040	1,613	183,182	1,602	178,402	1,869	338,512	1,856	329,328	1,845	321,016
7,6	0,698	5,881	0,764	8,432	0,759	8,244	0,906	16,772	0,899	16,312	0,894	15,916	1,048	30,395	1,041	29,564	1,034	28,747	1,211	54,829	1,202	53,274	1,195	51,980	1,404	100,896	1,395	98,279	1,386	95,703	1,634	189,305	1,623	184,414	1,613	179,602	1,881	340,785	1,869	331,539	1,857	323,172
7,7	0,703	5,920	0,769	8,489	0,765	8,300	0,912	16,884	0,905	16,421	0,900	16,022	1,055	30,597	1,048	29,761	1,041	28,939	1,219	55,194	1,210	53,629	1,203	52,326	1,413	101,567	1,404	98,932	1,395	96,339	1,645	190,560	1,634	185,638	1,624	180,794	1,894	343,042	1,881	333,736	1,870	325,313
7,8	0,707	5,960	0,774	8,545	0,770	8,355	0,918	16,995	0,911	16,529	0,906	16,128	1,062	30,799	1,055	29,957	1,048	29,130	1,227	55,557	1,218	53,981	1,211	52,670	1,422	102,233	1,413	99,581	1,404	96,972	1,655	191,808	1,645	186,853	1,635	181,978	1,906	345,286	1,893	335,918	1,882	327,440
7,9	0,712	5,999	0,779	8,601	0,775	8,409	0,924	17,106	0,917	16,637	0,912	16,233	1,069	30,999	1,062	30,152	1,054	29,319	1,235	55,917	1,226	54,331	1,219	53,012	1,431	102,895	1,422	100,226	1,413	97,600	1,666	193,048	1,656	188,061	1,645	183,154	1,918	347,514	1,906	338,087	1,894	329,554
8	0,717	6,038	0,784	8,657	0,780	8,464	0,930	17,216	0,923	16,744	0,918	16,338	1,076	31,198	1,069	30,346	1,061	29,508	1,243	56,275	1,234	54,679	1,226	53,351	1,441	103,553	1,432	100,867	1,422	98,224	1,677	194,280	1,666	189,261	1,656	184,323	1,930	349,729	1,918	340,242	1,906	331,655
8,1	0,721	6,076	0,789	8,712	0,785	8,518	0,935	17,326	0,929	16,851	0,923	16,442	1,083	31,396	1,075	30,538	1,068	29,695	1,250	56,631	1,242	55,025	1,234	53,689	1,450	104,207	1,441	101,503	1,431	98,844	1,687	195,505	1,677	190,454	1,666	185,485	1,943	351,930	1,930	342,383	1,918	333,742
8,2	0,726	6,114	0,794	8,767	0,790	8,571	0,941	17,434	0,935	16,956	0,929	16,545	1,089	31,592	1,082	30,729	1,075	29,880	1,258	56,985	1,249	55,369	1,242	54,024	1,459	104,856	1,450	102,136	1,440	99,460	1,698	196,722	1,687	191,640	1,676	186,640	1,955	354,118	1,942	344,511	1,930	335,817
8,3	0,730	6,152	0,799	8,821	0,794	8,624	0,947	17,542	0,941	17,061	0,935	16,647	1,096	31,788	1,089	30,919	1,081	30,065	1,266	57,337	1,257	55,711	1,250	54,357	1,468	105,502	1,458	102,765	1,449	100,073	1,708	197,931	1,697	192,818	1,687	187,788	1,967	356,292	1,954	346,627	1,942	337,879
8,4	0,735	6,190	0,804	8,875	0,799	8,677	0,953	17,650	0,946	17,166	0,941	16,749	1,103	31,982	1,095	31,108	1,088	30,249	1,274	57,686	1,265	56,050	1,257	54,689	1,477	106,144	1,467	103,391	1,458	100,682	1,719	199,133	1,708	193,989	1,697	188,928	1,979	358,453	1,966	348,729	1,954	339,929
8,5	0,739	6,228	0,809	8,929	0,804	8,730	0,959	17,757	0,952	17,270	0,946	16,851	1,110	32,175	1,102	31,296	1,094	30,432	1,281	58,034	1,272	56,388	1,265	55,018	1,486	106,782	1,476	104,012	1,467	101,287	1,729	200,328	1,718	195,154	1,707	190,062	1,990	360,601	1,977	350,819	1,965	341,966
8,6	0,744	6,265	0,814	8,983	0,809	8,782	0,964	17,863	0,958	17,373	0,952	16,951	1,116	32,367	1,109	31,482	1,101	30,613	1,289	58,379	1,280	56,724	1,272	55,346	1,494	107,417	1,485	104,630	1,475	101,889	1,739	201,516	1,728	196,311	1,717	191,190	2,002	362,737	1,989	352,897	1,977	343,992
8,7	0,748	6,303	0,818	9,036	0,814	8,835	0,970	17,968	0,964	17,476	0,958	17,052	1,123	32,558	1,115	31,668	1,108	30,794	1,297	58,722	1,288	57,057	1,280	55,671	1,503	108,047	1,494	105,245	1,484	102,487	1,749	202,698	1,738	197,462	1,727	192,311	2,014	364,860	2,001	354,963	1,989	346,006
8,8	0,752	6,340	0,823	9,089	0,819	8,886	0,976	18,073	0,969	17,578	0,963	17,151	1,129	32,747	1,122	31,853	1,114	30,973	1,304	59,064	1,295	57,389	1,287	55,995	1,512	108,674	1,502	105,855	1,493	103,082	1,759	203,872	1,748	198,606	1,737	193,425	2,026	366,971	2,012	357,017	2,000	348,008
8,9	0,757	6,376	0,828	9,141	0,823	8,938	0,981	18,178	0,975	17,679	0,969	17,250	1,136	32,936	1,128	32,036	1,120	31,151	1,312	59,403	1,302	57,719	1,295	56,317	1,521	109,298	1,511	106,463	1,501	103,674	1,770	205,040	1,758	199,744	1,747	194,533	2,037	369,071	2,024	359,060	2,012	349,999
9	0,761	6,413	0,833	9,194	0,828	8,989	0,987	18,281	0,980	17,780	0,974	17,349	1,142	33,123	1,135	32,218	1,127	31,329	1,319	59,741	1,310	58,047	1,302	56,637	1,529	109,918	1,520	107,067	1,510	104,262	1,780	206,201	1,768	200,875	1,757	195,635	2,049	371,158	2,035	361,091	2,023	351,979
9,1	0,765	6,449	0,837	9,246	0,833	9,040	0,993	18,384	0,986	17,880	0,980	17,447	1,149	33,310	1,141	32,400	1,133	31,505	1,326	60,077	1,317	58,373	1,309	56,956	1,538	110,534	1,528	107,667	1,518	104,847	1,790	207,356	1,778	202,000	1,767	196,731	2,060	373,234	2,047	363,110	2,034	353,948
9,2	0,770	6,485	0,842	9,298	0,837	9,090	0,998	18,487	0,991	17,980	0,985	17,544	1,155	33,495	1,147	32,580	1,139	31,681	1,334	60,411	1,325	58,698	1,317	57,272	1,546	111,148	1,537	108,265	1,527	105,429	1,799	208,505	1,788	203,119	1,777	197,821	2,072	375,299	2,058	365,119	2,045	355,906
9,3	0,774	6,521	0,847	9,349	0,842	9,141	1,004	18,589	0,997	18,080	0,991	17,641	1,161	33,680	1,154	32,760	1,146	31,855	1,341	60,743	1,332	59,020	1,324	57,587	1,555	111,758	1,545	108,859	1,535	106,007	1,809	209,647	1,798	204,232	1,787	198,904	2,083	377,352	2,069	367,117	2,057	357,853
9,4	0,778	6,557	0,851	9,400	0,847	9,191	1,009	18,691	1,002	18,178	0,996	17,737	1,168	33,863	1,160	32,938	1,152	32,029	1,348	61,073	1,339	59,341	1,331	57,900	1,563	112,364	1,553	109,450	1,543	106,583	1,819	210,783	1,808	205,339	1,796	199,983	2,094	379,394	2,080	369,104	2,068	359,790
9,5	0,782	6,593	0,856	9,451	0,851	9,241	1,015	18,792	1,008	18,277	1,002	17,833	1,174	34,046	1,166	33,116	1,158	32,202	1,356	61,402	1,346	59,661	1,338	58,212	1,572	112,968	1,562	110,038	1,552	107,155	1,829	211,913	1,817	206,440	1,806	201,055	2,105	381,426	2,092	371,080	2,079	361,717
9,6	0,787	6,628	0,861	9,502	0,856	9,290	1,020	18,892	1,013	18,374	1,007	17,928	1,180	34,228	1,172	33,292	1,164	32,373	1,363	61,728	1,353	59,978	1,345	58,522	1,580	113,568	1,570	110,622	1,560	107,725	1,839	213,037	1,827	207,535	1,815	202,122	2,117	383,447	2,103	373,047	2,090	363,634
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.3: roughness coefficient k=0,5 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,7	0,791	6,663	0,865	9,552	0,860	9,339	1,025	18,992	1,018	18,471	1,012	18,023	1,187	34,408	1,179	33,468	1,170	32,544	1,370	62,054	1,361	60,294	1,352	58,830	1,588	114,165	1,578	111,204	1,568	108,291	1,848	214,156	1,837	208,625	1,825	203,183	2,128	385,457	2,114	375,003	2,101	365,541
9,8	0,795	6,698	0,870	9,602	0,865	9,388	1,031	19,091	1,024	18,568	1,018	18,118	1,193	34,588	1,185	33,643	1,177	32,714	1,377	62,377	1,368	60,609	1,359	59,137	1,597	114,759	1,586	111,783	1,576	108,855	1,858	215,268	1,846	209,709	1,834	204,239	2,139	387,457	2,125	376,949	2,112	367,438
9,9	0,799	6,733	0,874	9,652	0,869	9,437	1,036	19,190	1,029	18,664	1,023	18,212	1,199	34,767	1,191	33,817	1,183	32,883	1,384	62,699	1,375	60,921	1,367	59,442	1,605	115,350	1,595	112,359	1,584	109,415	1,867	216,375	1,856	210,787	1,844	205,289	2,150	389,447	2,136	378,885	2,123	369,325
10	0,803	6,768	0,879	9,702	0,874	9,486	1,041	19,289	1,034	18,760	1,028	18,305	1,205	34,945	1,197	33,990	1,189	33,052	1,391	63,019	1,382	61,233	1,373	59,746	1,613	115,938	1,603	112,932	1,592	109,973	1,877	217,477	1,865	211,860	1,853	206,334	2,161	391,427	2,146	380,811	2,133	371,203
10,2	0,811	6,837	0,888	9,801	0,883	9,582	1,052	19,484	1,045	18,950	1,039	18,490	1,217	35,298	1,209	34,334	1,201	33,386	1,405	63,655	1,396	61,850	1,387	60,348	1,629	117,106	1,619	114,069	1,609	111,081	1,896	219,663	1,884	213,990	1,872	208,409	2,182	395,357	2,168	384,635	2,155	374,930
10,4	0,820	6,905	0,896	9,898	0,891	9,678	1,062	19,678	1,055	19,138	1,049	18,674	1,229	35,648	1,221	34,674	1,213	33,717	1,419	64,284	1,409	62,462	1,401	60,945	1,645	118,262	1,635	115,195	1,624	112,178	1,914	221,828	1,902	216,100	1,890	210,463	2,204	399,249	2,189	388,421	2,176	378,622
10,6	0,828	6,973	0,905	9,995	0,900	9,772	1,073	19,869	1,066	19,325	1,059	18,856	1,241	35,994	1,233	35,011	1,224	34,044	1,433	64,908	1,423	63,068	1,415	61,536	1,661	119,407	1,651	116,310	1,640	113,264	1,933	223,973	1,921	218,189	1,909	212,498	2,225	403,104	2,210	392,172	2,197	382,277
10,8	0,836	7,040	0,914	10,091	0,909	9,866	1,083	20,059	1,076	19,509	1,069	19,036	1,253	36,337	1,245	35,344	1,236	34,369	1,447	65,525	1,437	63,668	1,428	62,122	1,677	120,541	1,666	117,415	1,656	114,340	1,951	226,097	1,939	220,259	1,927	214,514	2,246	406,923	2,231	395,887	2,218	385,899
11	0,843	7,106	0,922	10,185	0,917	9,959	1,093	20,247	1,086	19,692	1,079	19,215	1,265	36,677	1,256	35,675	1,248	34,691	1,460	66,137	1,450	64,262	1,441	62,702	1,693	121,665	1,682	118,510	1,671	115,406	1,969	228,202	1,957	222,309	1,945	216,511	2,267	410,706	2,252	399,568	2,238	389,487
11,2	0,851	7,171	0,931	10,279	0,926	10,050	1,103	20,433	1,096	19,873	1,089	19,391	1,276	37,014	1,268	36,003	1,259	35,009	1,474	66,744	1,463	64,852	1,455	63,277	1,708	122,779	1,697	119,595	1,686	116,463	1,987	230,288	1,975	224,341	1,962	218,490	2,288	414,455	2,273	403,216	2,259	393,043
11,4	0,859	7,237	0,939	10,373	0,934	10,142	1,113	20,618	1,106	20,053	1,099	19,567	1,288	37,348	1,279	36,328	1,270	35,325	1,487	67,345	1,477	65,436	1,468	63,847	1,723	123,882	1,713	120,670	1,702	117,510	2,005	232,355	1,993	226,355	1,980	220,452	2,308	418,171	2,293	406,831	2,279	396,568
11,6	0,867	7,301	0,948	10,465	0,942	10,232	1,123	20,801	1,115	20,231	1,109	19,741	1,299	37,679	1,291	36,650	1,282	35,638	1,500	67,940	1,490	66,015	1,481	64,412	1,739	124,976	1,728	121,736	1,717	118,548	2,023	234,404	2,010	228,351	1,998	222,396	2,329	421,855	2,313	410,415	2,299	400,061
11,8	0,874	7,365	0,956	10,557	0,951	10,321	1,133	20,983	1,125	20,408	1,118	19,913	1,311	38,007	1,302	36,969	1,293	35,949	1,513	68,531	1,503	66,589	1,494	64,972	1,754	126,061	1,743	122,792	1,732	119,577	2,040	236,436	2,028	230,331	2,015	224,324	2,349	425,506	2,333	413,968	2,319	403,525
12	0,882	7,429	0,964	10,647	0,959	10,410	1,143	21,163	1,135	20,583	1,128	20,084	1,322	38,332	1,313	37,285	1,304	36,256	1,526	69,117	1,515	67,158	1,506	65,527	1,769	127,137	1,758	123,840	1,746	120,597	2,058	238,450	2,045	232,293	2,032	226,235	2,369	429,127	2,353	417,491	2,339	406,959
12,2	0,889	7,492	0,972	10,737	0,967	10,498	1,152	21,341	1,144	20,757	1,138	20,253	1,333	38,655	1,324	37,599	1,315	36,562	1,539	69,697	1,528	67,722	1,519	66,078	1,784	128,203	1,772	124,879	1,761	121,609	2,075	240,448	2,062	234,239	2,049	228,131	2,389	432,718	2,373	420,985	2,358	410,365
12,4	0,897	7,554	0,981	10,827	0,975	10,586	1,162	21,518	1,154	20,929	1,147	20,421	1,344	38,975	1,335	37,911	1,326	36,865	1,552	70,274	1,541	68,282	1,532	66,624	1,798	129,261	1,787	125,910	1,776	122,613	2,092	242,429	2,079	236,170	2,066	230,011	2,408	436,280	2,392	424,450	2,378	413,743
12,6	0,904	7,616	0,989	10,915	0,983	10,672	1,171	21,694	1,163	21,100	1,156	20,588	1,355	39,293	1,346	38,220	1,337	37,165	1,564	70,845	1,553	68,837	1,544	67,166	1,813	130,311	1,801	126,932	1,790	123,608	2,109	244,395	2,096	238,085	2,083	231,876	2,428	439,813	2,412	427,887	2,397	417,094
12,8	0,911	7,677	0,997	11,003	0,991	10,758	1,181	21,868	1,173	21,269	1,166	20,753	1,366	39,608	1,357	38,526	1,347	37,463	1,577	71,412	1,566	69,388	1,556	67,704	1,827	131,352	1,816	127,947	1,804	124,596	2,126	246,345	2,113	239,984	2,099	233,726	2,447	443,318	2,431	431,298	2,416	420,418
13	0,918	7,738	1,004	11,091	0,999	10,844	1,190	22,041	1,182	21,437	1,175	20,918	1,377	39,920	1,367	38,830	1,358	37,759	1,589	71,974	1,578	69,935	1,569	68,237	1,842	132,385	1,830	128,953	1,818	125,576	2,143	248,280	2,129	241,869	2,116	235,562	2,466	446,796	2,450	434,682	2,435	423,717
13,2	0,926	7,799	1,012	11,177	1,007	10,928	1,199	22,213	1,191	21,604	1,184	21,080	1,387	40,230	1,378	39,132	1,369	38,052	1,601	72,533	1,590	70,477	1,581	68,766	1,856	133,410	1,844	129,952	1,833	126,549	2,159	250,200	2,146	243,740	2,132	237,384	2,485	450,248	2,469	438,039	2,454	426,990
13,4	0,933	7,859	1,020	11,263	1,014	11,012	1,209	22,383	1,200	21,770	1,193	21,242	1,398	40,538	1,389	39,431	1,379	38,343	1,614	73,087	1,602	71,016	1,593	69,292	1,870	134,428	1,858	130,943	1,846	127,514	2,176	252,105	2,162	245,596	2,148	239,192	2,504	453,673	2,488	441,372	2,473	430,239
13,6	0,940	7,918	1,028	11,348	1,022	11,096	1,218	22,552	1,209	21,934	1,202	21,402	1,408	40,844	1,399	39,728	1,389	38,632	1,626	73,637	1,615	71,550	1,605	69,813	1,884	135,438	1,872	131,927	1,860	128,472	2,192	253,996	2,178	247,439	2,165	240,987	2,523	457,073	2,506	444,680	2,491	433,463
13,8	0,947	7,978	1,035	11,433	1,030	11,178	1,227	22,720	1,218	22,097	1,211	21,562	1,419	41,147	1,409	40,023	1,400	38,919	1,638	74,183	1,627	72,080	1,617	70,331	1,898	136,440	1,886	132,903	1,874	129,423	2,208	255,874	2,194	249,268	2,181	242,768	2,542	460,448	2,525	447,963	2,510	436,664
14	0,954	8,036	1,043	11,517	1,037	11,260	1,236	22,886	1,227	22,259	1,220	21,720	1,429	41,448	1,420	40,316	1,410	39,204	1,650	74,724	1,638	72,607	1,629	70,845	1,912	137,436	1,900	133,873	1,888	130,367	2,224	257,738	2,210	251,084	2,196	244,537	2,560	463,798	2,543	451,223	2,528	439,842
14,2	0,961	8,095	1,051	11,600	1,045	11,342	1,245	23,052	1,236	22,420	1,229	21,877	1,440	41,747	1,430	40,607	1,420	39,487	1,662	75,263	1,650	73,130	1,640	71,355	1,926	138,424	1,914	134,835	1,901	131,305	2,240	259,589	2,226	252,887	2,212	246,293	2,578	467,125	2,562	454,460	2,546	442,997
14,4	0,968	8,152	1,058	11,683	1,052	11,423	1,254	23,216	1,245	22,580	1,238	22,033	1,450	42,044	1,440	40,896	1,430	39,768	1,674	75,797	1,662	73,649	1,652	71,862	1,939	139,405	1,927	135,791	1,915	132,236	2,256	261,426	2,242	254,677	2,228	248,037	2,597	470,428	2,580	457,674	2,564	446,130
14,6	0,974	8,210	1,066	11,766	1,060	11,504	1,262	23,379	1,254	22,739	1,246	22,188	1,460	42,339	1,450	41,183	1,440	40,047	1,685	76,328	1,674	74,165	1,664	72,365	1,953	140,380	1,941	136,741	1,928	133,160	2,272	263,251	2,258	256,455	2,243	249,769	2,615	473,709	2,598	460,865	2,582	449,241
14,8	0,981	8,267	1,073	11,847	1,067	11,583	1,271	23,541	1,262	22,896	1,255	22,341	1,470	42,631	1,460	41,468	1,450	40,324	1,697	76,855	1,685	74,677	1,675	72,865	1,966	141,347	1,954	137,683	1,942	134,079	2,288	265,064	2,273	258,221	2,259	251,489	2,633	476,967	2,616	464,035	2,600	452,332
15	0,988	8,324	1,080	11,928	1,074	11,663	1,280	23,702	1,271	23,053	1,263	22,494	1,480	42,922	1,470	41,750	1,460	40,599	1,708	77,378	1,697	75,186	1,686	73,361	1,980	142,309	1,967	138,620	1,955	134,991	2,303	266,864	2,289	259,975	2,274	253,197	2,651	480,203	2,633	467,184	2,617	455,401
15,2	0,995	8,380	1,088	12,009	1,082	11,742	1,288	23,862	1,280	23,208	1,272	22,646	1,490	43,211	1,480	42,031	1,470	40,872	1,720	77,898	1,708	75,691	1,698	73,854	1,993	143,264	1,981	139,550	1,968	135,896	2,318	268,653	2,304	261,718	2,289	254,894	2,668	483,418	2,651	470,312	2,635	458,450
15,4	1,001	8,436	1,095	12,089	1,089	11,820	1,297	24,021	1,288	23,363	1,280	22,796	1,500	43,498	1,490	42,311	1,480	41,143	1,731	78,415	1,719	76,193	1,709	74,344	2,006	144,212	1,994	140,474	1,981	136,796	2,334	270,429	2,319	263,449	2,305	256,580	2,686	486,611	2,668	473,419	2,652	461,479
15,6	1,008	8,492	1,102	12,169	1,096	11,898	1,305	24,178	1,297	23,516	1,289	22,946	1,510	43,783	1,500	42,588	1,489	41,413	1,743	78,928	1,731	76,692	1,720	74,830	2,019	145,155	2,007	141,392	1,994	137,691	2,349	272,195	2,334	265,168	2,320	258,255	2,704	489,784	2,686	476,506	2,670	464,488
15,8	1,014	8,547	1,109	12,248	1,103	11,975	1,314	24,335	1,305	23,669	1,297	23,095	1,520	44,067	1,509	42,864	1,499	41,681	1,754	79,438	1,742	77,187	1,731	75,314	2,032	146,091	2,020	142,305	2,007	138,579	2,364	273,949	2,349	266,877	2,335	259,919	2,721	492,937	2,703	479,573	2,687	467,478
16	1,021	8,602	1,116	12,326	1,110	12,052	1,322	24,491	1,313	23,820	1,305	23,243	1,529	44,348	1,519	43,138	1,509	41,948	1,765	79,945	1,753	77,680	1,742	75,794	2,045	147,022	2,032	143,211	2,020	139,462	2,379	275,691	2,364	268,575	2,349	261,573	2,738	496,070	2,720	482,621	2,704	470,450
16,2	1,027	8,657	1,123	12,404	1,117	12,128	1,331	24,646	1,322	23,971	1,314	23,390	1,539	44,628	1,529	43,410	1,518	42,212	1,776	80,448	1,764	78,169	1,753	76,272	2,058	147,947	2,045	144,112	2,032	140,339	2,394	277,424	2,379	270,262	2,364	263,216	2,755	499,183	2,737	485,651	2,721	473,402
16,4	1,034	8,711	1,130	12,482	1,124	12,204	1,339	24,799	1,330	24,120	1,322	23,536	1,549	44,906	1,538	43,680	1,528	42,475	1,787	80,949	1,775	78,655	1,764	76,747	2,071	148,866	2,058	145,007	2,045	141,211	2,409	279,145	2,394	271,939	2,379	264,850	2,772	502,277	2,754	488,661	2,738	476,337
16,6	1,040	8,765	1,137	12,559	1,131	12,280	1,347	24,952	1,338	24,269	1,330	23,681	1,558	45,182	1,548	43,949	1,537	42,737	1,798	81,446	1,786	79,139	1,775	77,218	2,084	149,780	2,071	145,897	2,057	142,078	2,424	280,856	2,409	273,606	2,393	266,473	2,789	505,353	2,771	491,653	2,754	479,254
16,8	1,047	8,818	1,144	12,636	1,138	12,355	1,355	25,104	1,346	24,417	1,338	23,825	1,568	45,457	1,557	44,216	1,546	42,997	1,809	81,941	1,797	79,619	1,786	77,687	2,096	150,688	2,083	146,782	2,070	142,940	2,438	282,556	2,423	275,263	2,408	268,087	2,806	508,410	2,788	494,627	2,771	482,153
17	1,053	8,872	1,151	12,712	1,145	12,429	1,364	25,255	1,354	24,564	1,346	23,969	1,577	45,730	1,566	44,482	1,556	43,255	1,820	82,432	1,807	80,097	1,797	78,153	2,109	151,590	2,096	147,661	2,082	143,796	2,453	284,247	2,438	276,910	2,422	269,691	2,823	511,448	2,805	497,584	2,788	485,035
17,2	1,059	8,924	1,158	12,788	1,152	12,503	1,372	25,406	1,362	24,710	1,354	24,111	1,586	46,002	1,576	44,746	1,565	43,512	1,831	82,921	1,818	80,572	1,807	78,617	2,121	152,488	2,108	148,536	2,095	144,647	2,468	285,928	2,452	278,547	2,437	271,286	2,840	514,469	2,821	500,523	2,804	487,900
17,4	1,065	8,977	1,165	12,863	1,158	12,577	1,380	25,555	1,370	24,855	1,362	24,253	1,596	46,272	1,585	45,009	1,574	43,767	1,842	83,407	1,829	81,044	1,818	79,077	2,134	153,380	2,120	149,405	2,107	145,494	2,482	287,599	2,466	280,175	2,451	272,871	2,856	517,473	2,838	503,445	2,820	490,749
17,6	1,072	9,029	1,172	12,938	1,165	12,650	1,388	25,703	1,378	25,000	1,370	24,394	1,605	46,540	1,594	45,270	1,583	44,021	1,852	83,890	1,839	81,513	1,828	79,535	2,146	154,267	2,133	150,269	2,119	146,335	2,496	289,260	2,481	281,794	2,465	274,448	2,873	520,459	2,854	506,351	2,837	493,581
17,8	1,078	9,082	1,178	13,013	1,172	12,723	1,396	25,851	1,386	25,143	1,378	24,534	1,614	46,807	1,603	45,529	1,592	44,274	1,863	84,370	1,850	81,980	1,839	79,991	2,158	155,149	2,145	151,128	2,131	147,172	2,511	290,912	2,495	283,403	2,479	276,015	2,889	523,428	2,870	509,239	2,853	496,397
18	1,084	9,133	1,185	13,087	1,179	12,796	1,404	25,998	1,394	25,286	1,386	24,673	1,623	47,072	1,612	45,788	1,601	44,525	1,873	84,848	1,860	82,444	1,849	80,444	2,171	156,026	2,157	151,982	2,143	148,004	2,525	292,554	2,509	285,003	2,493	277,574	2,906	526,381	2,887	512,112	2,869	499,198
18,2	1,090	9,185	1,192	13,160	1,185	12,868	1,412	26,144	1,402	25,428	1,394	24,812	1,632	47,336	1,621	46,044	1,610	44,774	1,884	85,323	1,871	82,906	1,860	80,894	2,183	156,898	2,169	152,832	2,155	148,832	2,539	294,188	2,523	286,595	2,507	279,124	2,922	529,317	2,903	514,969	2,885	501,983
18,4	1,096	9,236	1,199	13,234	1,192	12,939	1,419	26,289	1,410	25,569	1,401	24,950	1,641	47,599	1,630	46,300	1,619	45,023	1,894	85,795	1,881	83,365	1,870	81,342	2,195	157,766	2,181	153,677	2,167	149,655	2,553	295,813	2,537	288,178	2,521	280,666	2,938	532,238	2,919	517,810	2,901	504,752
18,6	1,102	9,287	1,205	13,307	1,198	13,010	1,427	26,434	1,418	25,710	1,409	25,087	1,650	47,860	1,639	46,554	1,628	45,270	1,905	86,265	1,891	83,821	1,880	81,787	2,207	158,629	2,193	154,518	2,179	150,473	2,567	297,428	2,551	289,752	2,535	282,199	2,954	535,142	2,935	520,636	2,917	507,507
18,8	1,108	9,338	1,212	13,379	1,205	13,081	1,435	26,577	1,425	25,850	1,417	25,223	1,659	48,119	1,648	46,806	1,637	45,515	1,915	86,732	1,902	84,275	1,890	82,231	2,219	159,487	2,205	155,354	2,191	151,287	2,581	299,036	2,565	291,318	2,548	283,724	2,970	538,031	2,950	523,447	2,932	510,247
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.3: roughness coefficient k=0,5 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
19	1,114	9,388	1,218	13,451	1,211	13,152	1,443	26,720	1,433	25,989	1,424	25,359	1,668	48,378	1,657	47,057	1,646	45,760	1,925	87,197	1,912	84,727	1,901	82,671	2,231	160,341	2,217	156,185	2,202	152,097	2,595	300,634	2,578	292,875	2,562	285,241	2,986	540,905	2,966	526,243	2,948	512,972
19,2	1,120	9,438	1,225	13,523	1,218	13,222	1,450	26,862	1,441	26,127	1,432	25,494	1,677	48,635	1,666	47,307	1,655	46,003	1,935	87,659	1,922	85,176	1,911	83,110	2,242	161,190	2,228	157,012	2,214	152,903	2,608	302,225	2,592	294,424	2,576	286,750	3,001	543,763	2,982	529,024	2,964	515,684
19,4	1,126	9,488	1,231	13,594	1,224	13,292	1,458	27,004	1,448	26,264	1,439	25,628	1,686	48,890	1,675	47,556	1,663	46,244	1,946	88,119	1,932	85,623	1,921	83,546	2,254	162,034	2,240	157,835	2,226	153,704	2,622	303,807	2,605	295,966	2,589	288,251	3,017	546,607	2,997	531,790	2,979	518,381
19,6	1,132	9,537	1,238	13,665	1,231	13,361	1,466	27,144	1,456	26,401	1,447	25,761	1,695	49,144	1,683	47,803	1,672	46,485	1,956	88,577	1,942	86,068	1,931	83,980	2,266	162,875	2,252	158,654	2,237	154,501	2,635	305,380	2,619	297,499	2,602	289,744	3,033	549,436	3,013	534,543	2,995	521,064
19,8	1,138	9,587	1,244	13,736	1,237	13,430	1,473	27,284	1,463	26,537	1,454	25,894	1,703	49,397	1,692	48,049	1,680	46,724	1,966	89,032	1,952	86,510	1,941	84,412	2,278	163,711	2,263	159,468	2,249	155,295	2,649	306,946	2,632	299,024	2,616	291,230	3,048	552,250	3,028	537,281	3,010	523,733
20	1,144	9,636	1,250	13,806	1,243	13,499	1,481	27,423	1,471	26,673	1,462	26,026	1,712	49,649	1,701	48,294	1,689	46,962	1,976	89,485	1,962	86,951	1,950	84,841	2,289	164,543	2,275	160,279	2,260	156,084	2,662	308,504	2,646	300,542	2,629	292,708	3,064	555,051	3,044	540,006	3,025	526,389
20,2	1,149	9,685	1,257	13,876	1,250	13,567	1,488	27,562	1,478	26,808	1,469	26,158	1,721	49,900	1,709	48,538	1,698	47,199	1,986	89,936	1,972	87,389	1,960	85,268	2,301	165,371	2,286	161,085	2,272	156,869	2,676	310,054	2,659	302,053	2,642	294,179	3,079	557,837	3,059	542,717	3,040	529,032
20,4	1,155	9,733	1,263	13,945	1,256	13,635	1,496	27,700	1,485	26,942	1,477	26,289	1,729	50,149	1,718	48,780	1,706	47,435	1,996	90,384	1,982	87,825	1,970	85,694	2,312	166,194	2,298	161,888	2,283	157,651	2,689	311,597	2,672	303,555	2,655	295,643	3,094	560,610	3,074	545,415	3,056	531,662
20,6	1,161	9,782	1,269	14,015	1,262	13,703	1,503	27,837	1,493	27,075	1,484	26,419	1,738	50,397	1,726	49,021	1,714	47,670	2,005	90,831	1,992	88,258	1,980	86,117	2,324	167,014	2,309	162,686	2,294	158,428	2,702	313,132	2,685	305,051	2,669	297,100	3,110	563,369	3,089	548,099	3,071	534,279
20,8	1,167	9,830	1,275	14,084	1,268	13,770	1,510	27,974	1,500	27,208	1,491	26,549	1,746	50,644	1,735	49,262	1,723	47,903	2,015	91,275	2,001	88,690	1,989	86,538	2,335	167,830	2,320	163,481	2,305	159,202	2,716	314,660	2,699	306,539	2,682	298,549	3,125	566,115	3,104	550,771	3,086	536,883
21	1,172	9,878	1,282	14,152	1,275	13,837	1,518	28,110	1,507	27,340	1,498	26,678	1,755	50,889	1,743	49,500	1,731	48,135	2,025	91,717	2,011	89,119	1,999	86,957	2,346	168,641	2,331	164,271	2,317	159,972	2,729	316,180	2,712	308,020	2,695	299,992	3,140	568,848	3,119	553,429	3,100	539,475
21,2	1,178	9,926	1,288	14,220	1,281	13,904	1,525	28,245	1,515	27,472	1,506	26,806	1,763	51,134	1,751	49,738	1,740	48,367	2,035	92,157	2,021	89,547	2,009	87,374	2,357	169,449	2,343	165,058	2,328	160,739	2,742	317,693	2,725	309,494	2,707	301,427	3,155	571,567	3,134	556,075	3,115	542,054
21,4	1,184	9,973	1,294	14,288	1,287	13,970	1,532	28,379	1,522	27,603	1,513	26,934	1,772	51,377	1,760	49,975	1,748	48,597	2,044	92,595	2,030	89,972	2,018	87,790	2,369	170,253	2,354	165,842	2,339	161,501	2,755	319,199	2,738	310,961	2,720	302,856	3,170	574,274	3,149	558,709	3,130	544,621
21,6	1,189	10,020	1,300	14,356	1,293	14,036	1,540	28,513	1,529	27,733	1,520	27,061	1,780	51,619	1,768	50,210	1,756	48,826	2,054	93,031	2,040	90,396	2,028	88,203	2,380	171,054	2,365	166,621	2,350	162,261	2,768	320,698	2,750	312,422	2,733	304,279	3,185	576,968	3,164	561,330	3,145	547,177
21,8	1,195	10,067	1,306	14,423	1,299	14,102	1,547	28,647	1,536	27,863	1,527	27,188	1,788	51,860	1,776	50,445	1,764	49,054	2,064	93,465	2,049	90,817	2,037	88,614	2,391	171,850	2,376	167,398	2,361	163,017	2,781	322,190	2,763	313,875	2,746	305,694	3,200	579,650	3,179	563,940	3,159	549,720
22	1,200	10,114	1,312	14,490	1,305	14,168	1,554	28,779	1,543	27,992	1,534	27,314	1,797	52,100	1,785	50,678	1,772	49,281	2,073	93,896	2,059	91,237	2,047	89,024	2,402	172,644	2,387	168,170	2,371	163,769	2,793	323,675	2,776	315,322	2,758	307,104	3,214	582,320	3,193	566,537	3,174	552,252
22,2	1,206	10,161	1,318	14,557	1,311	14,233	1,561	28,912	1,550	28,120	1,541	27,439	1,805	52,339	1,793	50,911	1,781	49,507	2,083	94,326	2,068	91,655	2,056	89,431	2,413	173,433	2,398	168,939	2,382	164,518	2,806	325,153	2,789	316,762	2,771	308,506	3,229	584,977	3,208	569,122	3,188	554,773
22,4	1,211	10,207	1,324	14,623	1,317	14,298	1,568	29,043	1,558	28,248	1,548	27,564	1,813	52,577	1,801	51,142	1,789	49,732	2,092	94,754	2,078	92,071	2,065	89,837	2,424	174,219	2,408	169,705	2,393	165,263	2,819	326,625	2,801	318,196	2,784	309,903	3,244	587,623	3,222	571,696	3,203	557,282
22,6	1,217	10,253	1,330	14,689	1,323	14,362	1,575	29,174	1,565	28,376	1,555	27,688	1,821	52,813	1,809	51,372	1,797	49,956	2,102	95,180	2,087	92,485	2,075	90,241	2,435	175,001	2,419	170,467	2,404	166,006	2,831	328,090	2,814	319,624	2,796	311,293	3,258	590,256	3,237	574,259	3,217	559,780
22,8	1,222	10,299	1,336	14,755	1,329	14,427	1,582	29,305	1,572	28,502	1,562	27,812	1,829	53,049	1,817	51,602	1,805	50,179	2,111	95,604	2,096	92,897	2,084	90,643	2,445	175,780	2,430	171,226	2,415	166,745	2,844	329,549	2,826	321,045	2,808	312,678	3,273	592,879	3,251	576,810	3,231	562,267
23	1,228	10,345	1,342	14,821	1,335	14,491	1,589	29,434	1,579	28,629	1,569	27,935	1,837	53,284	1,825	51,830	1,813	50,401	2,120	96,027	2,105	93,307	2,093	91,044	2,456	176,556	2,441	171,981	2,425	167,480	2,857	331,001	2,839	322,460	2,821	314,056	3,287	595,489	3,266	579,350	3,246	564,743
23,2	1,233	10,391	1,348	14,886	1,341	14,555	1,596	29,564	1,585	28,754	1,576	28,058	1,846	53,517	1,833	52,057	1,821	50,622	2,129	96,447	2,115	93,716	2,102	91,443	2,467	177,328	2,451	172,733	2,436	168,213	2,869	332,448	2,851	323,869	2,833	315,428	3,301	598,088	3,280	581,879	3,260	567,208
23,4	1,239	10,436	1,354	14,951	1,347	14,618	1,603	29,692	1,592	28,880	1,583	28,180	1,854	53,750	1,841	52,283	1,829	50,842	2,139	96,866	2,124	94,123	2,111	91,840	2,478	178,097	2,462	173,482	2,446	168,942	2,881	333,887	2,863	325,272	2,845	316,794	3,316	600,677	3,294	584,397	3,274	569,663
23,6	1,244	10,481	1,360	15,015	1,352	14,681	1,610	29,820	1,599	29,004	1,590	28,302	1,862	53,982	1,849	52,509	1,836	51,061	2,148	97,283	2,133	94,528	2,120	92,235	2,488	178,862	2,473	174,228	2,457	169,669	2,894	335,321	2,876	326,668	2,858	318,155	3,330	603,254	3,308	586,904	3,288	572,107
23,8	1,249	10,526	1,366	15,080	1,358	14,744	1,617	29,948	1,606	29,128	1,596	28,423	1,869	54,212	1,857	52,733	1,844	51,279	2,157	97,698	2,142	94,931	2,129	92,628	2,499	179,625	2,483	174,971	2,467	170,392	2,906	336,749	2,888	328,059	2,870	319,509	3,344	605,820	3,322	589,401	3,302	574,541
24	1,255	10,571	1,372	15,144	1,364	14,807	1,624	30,075	1,613	29,252	1,603	28,543	1,877	54,442	1,865	52,957	1,852	51,497	2,166	98,111	2,151	95,333	2,138	93,020	2,510	180,384	2,494	175,710	2,478	171,112	2,918	338,171	2,900	329,444	2,882	320,858	3,358	608,375	3,336	591,887	3,316	576,964
24,2	1,260	10,616	1,377	15,208	1,370	14,869	1,631	30,202	1,620	29,375	1,610	28,664	1,885	54,671	1,873	53,179	1,860	51,713	2,175	98,523	2,160	95,733	2,147	93,411	2,520	181,140	2,504	176,447	2,488	171,829	2,931	339,586	2,912	330,824	2,894	322,202	3,372	610,920	3,350	594,363	3,330	579,378
24,4	1,265	10,660	1,383	15,271	1,375	14,932	1,638	30,328	1,626	29,498	1,617	28,783	1,893	54,898	1,880	53,401	1,868	51,928	2,184	98,933	2,169	96,131	2,156	93,800	2,531	181,893	2,515	177,180	2,499	172,543	2,943	340,996	2,924	332,197	2,906	323,540	3,386	613,455	3,364	596,829	3,344	581,782
24,6	1,270	10,704	1,389	15,335	1,381	14,994	1,644	30,453	1,633	29,620	1,623	28,902	1,901	55,125	1,888	53,621	1,875	52,143	2,193	99,341	2,178	96,528	2,165	94,187	2,541	182,642	2,525	177,910	2,509	173,255	2,955	342,400	2,936	333,565	2,918	324,872	3,400	615,978	3,378	599,285	3,357	584,175
24,8	1,276	10,748	1,394	15,398	1,387	15,055	1,651	30,578	1,640	29,741	1,630	29,021	1,909	55,351	1,896	53,841	1,883	52,357	2,202	99,748	2,187	96,923	2,174	94,572	2,551	183,389	2,535	178,638	2,519	173,963	2,967	343,799	2,948	334,928	2,930	326,199	3,414	618,492	3,392	601,730	3,371	586,560
25	1,281	10,792	1,400	15,461	1,392	15,117	1,658	30,703	1,647	29,863	1,637	29,139	1,917	55,576	1,904	54,060	1,891	52,570	2,211	100,153	2,196	97,317	2,183	94,956	2,562	184,133	2,546	179,362	2,529	174,669	2,979	345,192	2,960	336,285	2,942	327,521	3,428	620,996	3,405	604,166	3,385	588,934
25,2	1,286	10,836	1,406	15,523	1,398	15,178	1,664	30,827	1,653	29,983	1,643	29,257	1,924	55,800	1,911	54,278	1,898	52,782	2,220	100,556	2,205	97,709	2,192	95,339	2,572	184,874	2,556	180,084	2,539	175,372	2,991	346,579	2,972	337,636	2,954	328,837	3,442	623,489	3,419	606,592	3,398	591,299
25,4	1,291	10,879	1,411	15,585	1,404	15,239	1,671	30,950	1,660	30,103	1,650	29,374	1,932	56,024	1,919	54,495	1,906	52,993	2,229	100,958	2,214	98,099	2,200	95,720	2,582	185,612	2,566	180,803	2,550	176,072	3,003	347,961	2,984	338,982	2,965	330,148	3,455	625,973	3,433	609,009	3,412	593,655
25,6	1,296	10,923	1,417	15,647	1,409	15,299	1,678	31,073	1,666	30,223	1,656	29,491	1,940	56,246	1,927	54,712	1,914	53,203	2,238	101,358	2,222	98,488	2,209	96,099	2,592	186,347	2,576	181,519	2,560	176,769	3,015	349,337	2,996	340,323	2,977	331,454	3,469	628,447	3,446	611,416	3,425	596,001
25,8	1,302	10,966	1,423	15,709	1,415	15,360	1,684	31,196	1,673	30,342	1,663	29,607	1,947	56,468	1,934	54,927	1,921	53,413	2,247	101,757	2,231	98,876	2,218	96,477	2,603	187,079	2,586	182,232	2,570	177,463	3,027	350,708	3,008	341,659	2,989	332,755	3,483	630,912	3,460	613,814	3,439	598,339
26	1,307	11,009	1,428	15,771	1,420	15,420	1,691	31,318	1,680	30,461	1,669	29,723	1,955	56,688	1,942	55,142	1,929	53,622	2,255	102,154	2,240	99,261	2,227	96,854	2,613	187,808	2,596	182,942	2,580	178,155	3,038	352,074	3,019	342,989	3,000	334,051	3,496	633,366	3,473	616,202	3,452	600,667
26,2	1,312	11,052	1,434	15,832	1,426	15,480	1,698	31,440	1,686	30,579	1,676	29,839	1,962	56,908	1,949	55,355	1,936	53,829	2,264	102,550	2,249	99,646	2,235	97,229	2,623	188,534	2,606	183,650	2,590	178,844	3,050	353,434	3,031	344,315	3,012	335,342	3,510	635,812	3,487	618,581	3,465	602,986
26,4	1,317	11,095	1,439	15,893	1,431	15,540	1,704	31,561	1,693	30,697	1,682	29,954	1,970	57,127	1,957	55,569	1,943	54,037	2,273	102,944	2,257	100,029	2,244	97,603	2,633	189,258	2,616	184,355	2,600	179,531	3,062	354,790	3,043	345,635	3,024	336,628	3,523	638,248	3,500	620,951	3,479	605,297
26,6	1,322	11,137	1,445	15,954	1,437	15,599	1,711	31,681	1,699	30,814	1,689	30,068	1,978	57,345	1,964	55,781	1,951	54,243	2,282	103,336	2,266	100,410	2,252	97,975	2,643	189,979	2,626	185,057	2,610	180,215	3,074	356,140	3,054	346,951	3,035	337,909	3,536	640,675	3,513	623,313	3,492	607,598
26,8	1,327	11,180	1,450	16,015	1,442	15,659	1,717	31,802	1,705	30,931	1,695	30,182	1,985	57,562	1,972	55,992	1,958	54,449	2,290	103,727	2,274	100,790	2,261	98,346	2,653	190,697	2,636	185,757	2,619	180,896	3,085	357,485	3,066	348,261	3,047	339,186	3,550	643,093	3,527	625,665	3,505	609,891
27	1,332	11,222	1,456	16,075	1,448	15,718	1,724	31,921	1,712	31,048	1,702	30,296	1,992	57,779	1,979	56,203	1,966	54,653	2,299	104,117	2,283	101,169	2,269	98,715	2,663	191,413	2,646	186,454	2,629	181,575	3,097	358,825	3,077	349,567	3,058	340,457	3,563	645,501	3,540	628,008	3,518	612,176
27,2	1,337	11,264	1,461	16,136	1,453	15,777	1,730	32,041	1,718	31,164	1,708	30,409	2,000	57,995	1,986	56,413	1,973	54,857	2,307	104,505	2,291	101,546	2,278	99,083	2,673	192,126	2,656	187,148	2,639	182,252	3,108	360,160	3,089	350,867	3,069	341,724	3,576	647,901	3,553	630,343	3,531	614,452
27,4	1,342	11,306	1,467	16,196	1,459	15,835	1,736	32,160	1,725	31,280	1,714	30,522	2,007	58,210	1,994	56,622	1,980	55,061	2,316	104,892	2,300	101,922	2,286	99,450	2,683	192,836	2,666	187,840	2,649	182,925	3,120	361,490	3,100	352,163	3,081	342,986	3,589	650,292	3,566	632,670	3,544	616,720
27,6	1,347	11,348	1,472	16,255	1,464	15,894	1,743	32,278	1,731	31,395	1,721	30,635	2,015	58,424	2,001	56,830	1,988	55,263	2,324	105,278	2,308	102,297	2,295	99,816	2,693	193,544	2,676	188,530	2,659	183,597	3,131	362,816	3,112	353,455	3,092	344,244	3,603	652,675	3,579	634,988	3,557	618,979
27,8	1,352	11,389	1,478	16,315	1,469	15,952	1,749	32,396	1,737	31,510	1,727	30,747	2,022	58,637	2,008	57,038	1,995	55,465	2,333	105,662	2,317	102,670	2,303	100,180	2,702	194,249	2,685	189,217	2,668	184,266	3,143	364,136	3,123	354,741	3,103	345,497	3,616	655,048	3,592	637,297	3,570	621,231
28	1,357	11,431	1,483	16,374	1,475	16,010	1,756	32,514	1,744	31,624	1,733	30,858	2,029	58,850	2,016	57,244	2,002	55,666	2,341	106,044	2,325	103,042	2,311	100,543	2,712	194,952	2,695	189,901	2,678	184,932	3,154	365,452	3,134	356,023	3,114	346,746	3,629	657,414	3,605	639,598	3,583	623,474
28,2	1,362	11,472	1,488	16,433	1,480	16,068	1,762	32,631	1,750	31,738	1,739	30,969	2,037	59,062	2,023	57,450	2,009	55,867	2,350	106,425	2,334	103,412	2,320	100,904	2,722	195,652	2,705	190,583	2,688	185,597	3,165	366,764	3,145	357,301	3,126	347,990	3,642	659,770	3,618	641,891	3,596	625,709
28,4	1,367	11,513	1,494	16,492	1,485	16,126	1,768	32,748	1,756	31,852	1,746	31,080	2,044	59,273	2,030	57,656	2,016	56,066	2,358	106,805	2,342	103,781	2,328	101,264	2,732	196,350	2,714	191,263	2,697	186,259	3,176	368,070	3,157	358,573	3,137	349,230	3,655	662,119	3,631	644,176	3,609	627,937
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.3: roughness coefficient k=0,5 mm (5/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
28,6	1,371	11,554	1,499	16,551	1,491	16,183	1,774	32,864	1,762	31,965	1,752	31,191	2,051	59,483	2,037	57,860	2,024	56,265	2,367	107,184	2,350	104,149	2,336	101,623	2,741	197,045	2,724	191,940	2,707	186,918	3,188	369,372	3,168	359,842	3,148	350,465	3,668	664,459	3,644	646,453	3,622	630,156
28,8	1,376	11,595	1,504	16,610	1,496	16,240	1,781	32,980	1,769	32,078	1,758	31,301	2,058	59,693	2,045	58,064	2,031	56,464	2,375	107,561	2,358	104,516	2,344	101,981	2,751	197,738	2,734	192,615	2,716	187,575	3,199	370,669	3,179	361,106	3,159	351,696	3,681	666,791	3,657	648,722	3,634	632,368
29	1,381	11,636	1,510	16,668	1,501	16,297	1,787	33,096	1,775	32,190	1,764	31,411	2,066	59,901	2,052	58,267	2,038	56,661	2,383	107,937	2,367	104,881	2,353	102,338	2,761	198,428	2,743	193,288	2,726	188,230	3,210	371,962	3,190	362,365	3,170	352,923	3,693	669,115	3,669	650,983	3,647	634,572
29,2	1,386	11,677	1,515	16,726	1,506	16,354	1,793	33,211	1,781	32,302	1,770	31,520	2,073	60,110	2,059	58,470	2,045	56,858	2,391	108,312	2,375	105,245	2,361	102,693	2,770	199,116	2,753	193,958	2,735	188,883	3,221	373,251	3,201	363,621	3,181	354,145	3,706	671,431	3,682	653,236	3,660	636,769
29,4	1,391	11,717	1,520	16,784	1,512	16,411	1,799	33,326	1,787	32,414	1,776	31,629	2,080	60,317	2,066	58,672	2,052	57,055	2,400	108,685	2,383	105,608	2,369	103,047	2,780	199,802	2,762	194,626	2,745	189,533	3,232	374,535	3,212	364,872	3,192	355,364	3,719	673,739	3,695	655,482	3,672	638,958
29,6	1,395	11,757	1,525	16,842	1,517	16,467	1,806	33,440	1,793	32,525	1,783	31,737	2,087	60,524	2,073	58,873	2,059	57,250	2,408	109,057	2,391	105,970	2,377	103,400	2,789	200,485	2,772	195,291	2,754	190,182	3,243	375,815	3,223	366,118	3,203	356,578	3,732	676,039	3,707	657,720	3,685	641,139
29,8	1,400	11,798	1,530	16,899	1,522	16,523	1,812	33,554	1,799	32,636	1,789	31,846	2,094	60,730	2,080	59,073	2,066	57,445	2,416	109,428	2,399	106,330	2,385	103,751	2,799	201,166	2,781	195,955	2,763	190,828	3,254	377,090	3,234	367,361	3,214	357,788	3,744	678,332	3,720	659,950	3,697	643,314
30	1,405	11,838	1,536	16,957	1,527	16,579	1,818	33,668	1,806	32,747	1,795	31,954	2,101	60,935	2,087	59,273	2,073	57,639	2,424	109,798	2,407	106,689	2,393	104,102	2,808	201,845	2,790	196,616	2,773	191,472	3,265	378,361	3,245	368,599	3,224	358,995	3,757	680,616	3,732	662,173	3,710	645,481
30,5	1,417	11,937	1,549	17,099	1,540	16,719	1,833	33,950	1,821	33,021	1,810	32,222	2,119	61,446	2,105	59,770	2,090	58,122	2,445	110,716	2,428	107,582	2,413	104,973	2,832	203,532	2,814	198,259	2,796	193,072	3,293	381,520	3,272	371,677	3,251	361,992	3,788	686,295	3,764	667,698	3,741	650,867
31	1,429	12,036	1,561	17,240	1,553	16,857	1,848	34,230	1,836	33,294	1,825	32,487	2,136	61,952	2,122	60,262	2,108	58,601	2,465	111,628	2,448	108,467	2,433	105,837	2,855	205,205	2,837	199,889	2,819	194,660	3,320	384,654	3,299	374,730	3,278	364,966	3,819	691,928	3,794	673,178	3,771	656,209
31,5	1,440	12,134	1,574	17,381	1,565	16,994	1,863	34,508	1,851	33,564	1,840	32,751	2,154	62,454	2,139	60,751	2,125	59,076	2,485	112,531	2,467	109,346	2,453	106,694	2,878	206,865	2,860	201,506	2,842	196,234	3,346	387,762	3,326	377,758	3,305	367,915	3,850	697,515	3,825	678,614	3,802	661,508
32	1,452	12,231	1,587	17,520	1,578	17,130	1,878	34,784	1,865	33,832	1,854	33,013	2,171	62,952	2,156	61,235	2,142	59,548	2,504	113,428	2,487	110,217	2,472	107,544	2,901	208,512	2,883	203,110	2,864	197,797	3,373	390,846	3,352	380,763	3,331	370,842	3,881	703,058	3,855	684,008	3,832	666,765
32,5	1,463	12,328	1,599	17,658	1,590	17,265	1,893	35,057	1,880	34,098	1,869	33,273	2,188	63,447	2,173	61,716	2,159	60,015	2,524	114,318	2,507	111,082	2,492	108,388	2,924	210,145	2,905	204,702	2,887	199,347	3,399	393,906	3,378	383,744	3,357	373,745	3,911	708,558	3,886	689,359	3,862	671,981
33	1,475	12,423	1,612	17,795	1,603	17,399	1,908	35,329	1,895	34,362	1,883	33,530	2,205	63,937	2,190	62,194	2,175	60,480	2,544	115,201	2,526	111,940	2,511	109,225	2,946	211,767	2,928	206,282	2,909	200,885	3,426	396,943	3,404	386,702	3,383	376,626	3,941	714,016	3,916	694,669	3,892	677,158
33,5	1,486	12,518	1,624	17,931	1,615	17,532	1,922	35,598	1,909	34,624	1,898	33,786	2,222	64,424	2,207	62,667	2,192	60,940	2,563	116,077	2,545	112,791	2,530	110,056	2,969	213,376	2,950	207,849	2,931	202,411	3,452	399,956	3,430	389,638	3,409	379,486	3,971	719,433	3,945	699,939	3,921	682,295
34	1,497	12,613	1,636	18,065	1,627	17,664	1,937	35,865	1,923	34,884	1,912	34,040	2,238	64,908	2,223	63,137	2,208	61,397	2,582	116,947	2,564	113,636	2,549	110,881	2,991	214,973	2,972	209,405	2,953	203,927	3,477	402,947	3,456	392,552	3,434	382,324	4,001	724,809	3,975	705,170	3,951	687,394
34,5	1,508	12,706	1,648	18,199	1,639	17,795	1,951	36,131	1,938	35,143	1,926	34,292	2,255	65,387	2,240	63,604	2,225	61,851	2,601	117,810	2,583	114,475	2,568	111,699	3,013	216,559	2,994	210,949	2,975	205,431	3,503	405,916	3,481	395,445	3,459	385,141	4,030	730,146	4,004	710,362	3,980	692,456
35	1,519	12,799	1,660	18,332	1,651	17,925	1,965	36,394	1,952	35,399	1,940	34,542	2,271	65,864	2,256	64,067	2,241	62,302	2,620	118,667	2,602	115,308	2,587	112,512	3,035	218,133	3,016	212,483	2,996	206,924	3,529	408,864	3,507	398,316	3,484	387,938	4,060	735,444	4,033	715,517	4,009	697,481
35,5	1,530	12,892	1,672	18,464	1,663	18,054	1,979	36,656	1,966	35,653	1,954	34,790	2,288	66,337	2,272	64,527	2,257	62,749	2,639	119,519	2,621	116,135	2,605	113,319	3,056	219,696	3,037	214,005	3,018	208,407	3,554	411,791	3,532	401,168	3,509	390,716	4,089	740,705	4,062	720,636	4,037	702,471
36	1,541	12,983	1,684	18,595	1,675	18,182	1,993	36,916	1,980	35,906	1,968	35,037	2,304	66,806	2,288	64,984	2,273	63,193	2,658	120,364	2,639	116,956	2,624	114,121	3,078	221,248	3,059	215,517	3,039	209,879	3,579	414,697	3,557	403,999	3,534	393,473	4,117	745,929	4,091	725,718	4,066	707,426
36,5	1,552	13,074	1,696	18,726	1,687	18,309	2,007	37,174	1,994	36,157	1,982	35,282	2,320	67,272	2,304	65,438	2,289	63,634	2,676	121,203	2,658	117,772	2,642	114,916	3,099	222,789	3,080	217,018	3,060	211,341	3,604	417,583	3,581	406,811	3,559	396,212	4,146	751,117	4,119	730,765	4,094	712,346
37	1,562	13,164	1,708	18,855	1,698	18,436	2,021	37,430	2,007	36,406	1,995	35,525	2,336	67,736	2,320	65,888	2,304	64,073	2,694	122,036	2,676	118,582	2,660	115,707	3,121	224,319	3,101	218,509	3,081	212,793	3,629	420,450	3,606	409,604	3,583	398,932	4,174	756,269	4,147	735,778	4,122	717,232
37,5	1,573	13,254	1,719	18,983	1,710	18,561	2,035	37,685	2,021	36,654	2,009	35,766	2,352	68,196	2,336	66,336	2,320	64,508	2,713	122,864	2,694	119,386	2,678	116,492	3,142	225,840	3,122	219,990	3,102	214,236	3,653	423,297	3,630	412,377	3,607	401,634	4,203	761,387	4,175	740,757	4,150	722,086
38	1,584	13,343	1,731	19,111	1,721	18,686	2,048	37,937	2,035	36,900	2,022	36,006	2,367	68,653	2,352	66,780	2,336	64,940	2,731	123,687	2,712	120,186	2,696	117,272	3,163	227,350	3,143	221,462	3,123	215,668	3,678	426,125	3,655	415,133	3,632	404,317	4,231	766,470	4,203	745,703	4,178	726,908
38,5	1,594	13,432	1,742	19,238	1,733	18,810	2,062	38,189	2,048	37,144	2,036	36,245	2,383	69,107	2,367	67,222	2,351	65,370	2,749	124,504	2,730	120,980	2,714	118,046	3,184	228,850	3,164	222,923	3,144	217,092	3,702	428,935	3,679	417,870	3,655	406,983	4,259	771,521	4,231	750,617	4,205	731,697
39	1,605	13,520	1,754	19,364	1,744	18,933	2,075	38,438	2,061	37,387	2,049	36,482	2,399	69,558	2,383	67,661	2,366	65,796	2,767	125,315	2,748	121,768	2,731	118,816	3,205	230,341	3,184	224,375	3,164	218,506	3,726	431,726	3,703	420,590	3,679	409,632	4,286	776,538	4,258	755,499	4,233	736,456
39,5	1,615	13,607	1,765	19,489	1,755	19,055	2,089	38,686	2,075	37,628	2,062	36,717	2,414	70,006	2,398	68,097	2,382	66,220	2,785	126,122	2,765	122,552	2,749	119,581	3,225	231,822	3,205	225,818	3,184	219,911	3,750	434,500	3,726	423,292	3,703	412,264	4,314	781,524	4,286	760,349	4,260	741,185
40	1,625	13,694	1,776	19,613	1,766	19,177	2,102	38,933	2,088	37,868	2,075	36,951	2,429	70,451	2,413	68,530	2,397	66,642	2,802	126,924	2,783	123,331	2,766	120,341	3,246	233,294	3,225	227,252	3,205	221,307	3,774	437,256	3,750	425,977	3,726	414,879	4,341	786,478	4,313	765,169	4,287	745,884
40,5	1,636	13,781	1,787	19,737	1,778	19,298	2,115	39,177	2,101	38,106	2,088	37,183	2,445	70,894	2,428	68,960	2,412	67,060	2,820	127,720	2,800	124,105	2,784	121,096	3,266	234,756	3,245	228,676	3,225	222,695	3,797	439,995	3,774	428,646	3,750	417,478	4,368	791,401	4,340	769,959	4,314	750,553
41	1,646	13,866	1,799	19,859	1,789	19,418	2,128	39,421	2,114	38,343	2,101	37,414	2,460	71,333	2,443	69,388	2,427	67,476	2,837	128,512	2,818	124,874	2,801	121,847	3,286	236,210	3,265	230,092	3,245	224,074	3,821	442,717	3,797	431,298	3,773	420,061	4,395	796,294	4,367	774,720	4,340	755,194
41,5	1,656	13,952	1,810	19,981	1,800	19,537	2,142	39,663	2,127	38,578	2,114	37,644	2,475	71,771	2,458	69,814	2,442	67,890	2,855	129,298	2,835	125,639	2,818	122,593	3,306	237,655	3,285	231,500	3,265	225,444	3,844	445,423	3,820	433,933	3,796	422,629	4,422	801,157	4,393	779,451	4,367	759,806
42	1,666	14,037	1,821	20,103	1,811	19,656	2,155	39,903	2,140	38,812	2,127	37,872	2,490	72,205	2,473	70,236	2,457	68,301	2,872	130,080	2,852	126,399	2,835	123,334	3,326	239,091	3,305	232,899	3,284	226,807	3,867	448,112	3,843	436,554	3,819	425,181	4,449	805,991	4,420	784,155	4,393	764,391
42,5	1,676	14,121	1,832	20,223	1,821	19,774	2,167	40,142	2,153	39,044	2,140	38,099	2,505	72,637	2,488	70,656	2,471	68,710	2,889	130,858	2,869	127,154	2,852	124,071	3,346	240,518	3,325	234,289	3,304	228,161	3,890	450,786	3,866	439,158	3,842	427,717	4,475	810,796	4,446	788,830	4,419	768,948
43	1,686	14,205	1,842	20,343	1,832	19,891	2,180	40,380	2,166	39,275	2,153	38,325	2,520	73,067	2,503	71,074	2,486	69,116	2,906	131,631	2,886	127,905	2,869	124,804	3,366	241,938	3,345	235,672	3,323	229,508	3,913	453,444	3,889	441,747	3,864	430,239	4,502	815,574	4,472	793,478	4,445	773,479
43,5	1,696	14,288	1,853	20,462	1,843	20,008	2,193	40,616	2,178	39,505	2,165	38,549	2,534	73,493	2,517	71,490	2,500	69,520	2,923	132,399	2,903	128,652	2,886	125,533	3,385	243,349	3,364	237,046	3,343	230,846	3,936	456,086	3,912	444,322	3,887	432,747	4,528	820,323	4,499	798,099	4,471	777,984
44	1,706	14,371	1,864	20,581	1,854	20,123	2,206	40,851	2,191	39,734	2,178	38,772	2,549	73,918	2,532	71,902	2,515	69,921	2,940	133,163	2,920	129,394	2,903	126,257	3,405	244,751	3,384	238,413	3,362	232,177	3,959	458,713	3,934	446,881	3,909	435,239	4,554	825,045	4,524	802,693	4,497	782,462
44,5	1,715	14,453	1,875	20,699	1,864	20,239	2,218	41,084	2,203	39,961	2,190	38,993	2,564	74,340	2,546	72,313	2,529	70,321	2,957	133,923	2,936	130,132	2,919	126,977	3,424	246,146	3,403	239,772	3,381	233,500	3,981	461,325	3,956	449,426	3,932	437,718	4,580	829,741	4,550	807,261	4,523	786,916
45	1,725	14,535	1,885	20,816	1,875	20,353	2,231	41,316	2,216	40,187	2,203	39,214	2,578	74,760	2,561	72,721	2,543	70,718	2,974	134,678	2,953	130,866	2,936	127,694	3,444	247,533	3,422	241,123	3,400	234,816	4,004	463,923	3,979	451,957	3,954	440,183	4,606	834,410	4,576	811,804	4,548	791,344
45,5	1,735	14,616	1,896	20,932	1,885	20,467	2,243	41,547	2,228	40,411	2,215	39,433	2,592	75,177	2,575	73,127	2,558	71,113	2,990	135,429	2,969	131,596	2,952	128,406	3,463	248,913	3,441	242,467	3,419	236,125	4,026	466,506	4,001	454,474	3,976	442,634	4,631	839,053	4,601	816,322	4,573	795,748
46	1,744	14,697	1,906	21,048	1,896	20,581	2,256	41,777	2,240	40,635	2,227	39,651	2,607	75,592	2,589	73,531	2,572	71,505	3,007	136,176	2,986	132,322	2,968	129,114	3,482	250,285	3,460	243,803	3,438	237,427	4,048	469,075	4,023	456,977	3,998	445,072	4,657	843,671	4,627	820,815	4,599	800,128
46,5	1,754	14,778	1,917	21,164	1,906	20,693	2,268	42,006	2,253	40,857	2,239	39,868	2,621	76,005	2,603	73,933	2,586	71,896	3,023	136,919	3,002	133,044	2,984	129,819	3,501	251,649	3,479	245,133	3,457	238,721	4,070	471,631	4,045	459,466	4,019	447,497	4,682	848,264	4,652	825,283	4,624	804,484
47	1,763	14,858	1,927	21,278	1,916	20,805	2,280	42,233	2,265	41,078	2,251	40,084	2,635	76,416	2,618	74,332	2,600	72,284	3,039	137,658	3,018	133,762	3,000	130,520	3,520	253,006	3,498	246,455	3,475	240,009	4,092	474,172	4,067	461,942	4,041	449,908	4,707	852,832	4,677	829,728	4,648	808,817
47,5	1,773	14,938	1,937	21,392	1,927	20,917	2,293	42,459	2,277	41,298	2,263	40,298	2,649	76,824	2,631	74,730	2,614	72,671	3,056	138,393	3,034	134,477	3,017	131,217	3,539	254,356	3,516	247,770	3,494	241,289	4,114	476,700	4,088	464,405	4,063	452,307	4,733	857,376	4,702	834,149	4,673	813,126
48	1,782	15,017	1,948	21,506	1,937	21,028	2,305	42,684	2,289	41,516	2,275	40,511	2,663	77,231	2,645	75,125	2,627	73,055	3,072	139,125	3,051	135,187	3,032	131,910	3,557	255,699	3,535	249,078	3,512	242,563	4,136	479,215	4,110	466,855	4,084	454,693	4,758	861,896	4,726	838,547	4,698	817,413
48,5	1,792	15,096	1,958	21,619	1,947	21,138	2,317	42,907	2,301	41,734	2,287	40,724	2,677	77,635	2,659	75,518	2,641	73,438	3,088	139,852	3,066	135,894	3,048	132,600	3,576	257,035	3,553	250,379	3,531	243,830	4,157	481,717	4,131	469,292	4,105	457,067	4,782	866,393	4,751	842,922	4,722	821,678
49	1,801	15,174	1,968	21,731	1,957	21,248	2,329	43,130	2,313	41,950	2,299	40,935	2,691	78,037	2,673	75,909	2,655	73,818	3,104	140,576	3,082	136,598	3,064	133,286	3,594	258,364	3,572	251,674	3,549	245,091	4,179	484,206	4,153	471,717	4,127	459,429	4,807	870,866	4,776	847,274	4,747	825,921
49,5	1,810	15,253	1,978	21,843	1,967	21,357	2,341	43,351	2,325	42,166	2,311	41,145	2,705	78,437	2,687	76,299	2,669	74,197	3,120	141,296	3,098	137,297	3,080	133,969	3,613	259,686	3,590	252,962	3,567	246,346	4,200	486,682	4,174	474,129	4,148	461,779	4,832	875,317	4,800	851,604	4,771	830,142
50	1,820	15,330	1,988	21,954	1,977	21,466	2,353	43,571	2,337	42,380	2,323	41,354	2,719	78,835	2,700	76,686	2,682	74,573	3,136	142,012	3,114	137,993	3,095	134,648	3,631	261,002	3,608	254,243	3,585	247,594	4,221	489,145	4,195	476,529	4,169	464,116	4,856	879,746	4,824	855,913	4,795	834,342
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.4: roughness coefficient k=0,75 mm (1/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,068	0,572	0,075	0,826	0,074	0,808	0,090	1,668	0,089	1,621	0,089	1,581	0,105	3,056	0,105	2,971	0,104	2,888	0,123	5,569	0,122	5,409	0,121	5,275	0,144	10,344	0,143	10,072	0,142	9,804	0,169	19,577	0,168	19,065	0,167	18,561	0,196	35,499	0,195	34,525	0,193	33,644
0,2	0,099	0,833	0,109	1,203	0,108	1,175	0,131	2,419	0,130	2,352	0,129	2,294	0,152	4,422	0,151	4,299	0,150	4,179	0,177	8,038	0,176	7,807	0,175	7,615	0,207	14,897	0,206	14,507	0,204	14,122	0,243	28,137	0,241	27,403	0,240	26,681	0,281	50,935	0,279	49,540	0,277	48,279
0,3	0,123	1,036	0,135	1,494	0,134	1,460	0,162	2,999	0,161	2,916	0,160	2,844	0,189	5,475	0,187	5,324	0,186	5,175	0,219	9,941	0,218	9,656	0,217	9,419	0,256	18,405	0,254	17,923	0,253	17,449	0,300	34,727	0,298	33,822	0,296	32,932	0,347	62,811	0,344	61,094	0,342	59,541
0,4	0,143	1,208	0,158	1,740	0,157	1,701	0,188	3,490	0,187	3,393	0,186	3,310	0,220	6,366	0,218	6,190	0,216	6,017	0,255	11,550	0,253	11,219	0,252	10,944	0,297	21,368	0,295	20,809	0,293	20,259	0,348	40,291	0,345	39,243	0,343	38,211	0,402	72,836	0,399	70,847	0,397	69,047
0,5	0,161	1,359	0,177	1,958	0,176	1,914	0,212	3,923	0,210	3,815	0,209	3,721	0,247	7,152	0,245	6,955	0,243	6,761	0,286	12,969	0,284	12,598	0,283	12,289	0,334	23,981	0,331	23,354	0,329	22,738	0,390	45,198	0,388	44,022	0,385	42,866	0,451	81,675	0,448	79,445	0,445	77,428
0,6	0,178	1,497	0,195	2,155	0,194	2,106	0,233	4,316	0,231	4,196	0,230	4,093	0,271	7,863	0,269	7,647	0,267	7,434	0,315	14,253	0,312	13,845	0,310	13,507	0,367	26,346	0,364	25,657	0,362	24,980	0,428	49,636	0,426	48,346	0,423	47,077	0,495	89,669	0,492	87,223	0,489	85,009
0,7	0,193	1,623	0,212	2,336	0,210	2,284	0,253	4,677	0,251	4,548	0,249	4,436	0,294	8,518	0,292	8,283	0,290	8,053	0,341	15,434	0,338	14,994	0,336	14,627	0,397	28,521	0,394	27,776	0,392	27,044	0,464	53,720	0,461	52,324	0,458	50,951	0,536	97,024	0,532	94,378	0,529	91,983
0,8	0,207	1,741	0,227	2,505	0,226	2,449	0,271	5,013	0,269	4,875	0,267	4,755	0,315	9,128	0,313	8,876	0,310	8,629	0,365	16,535	0,362	16,063	0,360	15,670	0,425	30,547	0,422	29,749	0,419	28,965	0,496	57,522	0,493	56,028	0,490	54,558	0,573	103,871	0,570	101,039	0,566	98,476
0,9	0,220	1,852	0,241	2,664	0,240	2,604	0,288	5,329	0,286	5,182	0,284	5,055	0,335	9,701	0,332	9,434	0,330	9,171	0,388	17,569	0,385	17,067	0,383	16,650	0,451	32,450	0,449	31,603	0,446	30,770	0,527	61,094	0,524	59,507	0,520	57,946	0,609	110,303	0,605	107,296	0,601	104,576
1	0,232	1,957	0,255	2,815	0,253	2,751	0,304	5,629	0,302	5,473	0,300	5,339	0,353	10,243	0,351	9,961	0,348	9,684	0,409	18,547	0,407	18,018	0,404	17,577	0,476	34,250	0,473	33,357	0,470	32,478	0,556	64,473	0,553	62,799	0,549	61,152	0,642	116,388	0,638	113,216	0,634	110,346
1,1	0,244	2,057	0,268	2,958	0,266	2,891	0,319	5,913	0,317	5,750	0,315	5,609	0,371	10,759	0,368	10,463	0,366	10,172	0,430	19,477	0,427	18,922	0,424	18,459	0,500	35,963	0,497	35,025	0,494	34,102	0,584	67,687	0,580	65,930	0,577	64,202	0,674	122,176	0,670	118,847	0,666	115,834
1,2	0,255	2,152	0,280	3,095	0,279	3,025	0,334	6,185	0,332	6,014	0,330	5,867	0,388	11,252	0,385	10,942	0,383	10,638	0,450	20,367	0,446	19,786	0,444	19,303	0,523	37,600	0,520	36,619	0,516	35,655	0,611	70,759	0,607	68,922	0,603	67,116	0,705	127,707	0,700	124,228	0,696	121,080
1,3	0,266	2,244	0,292	3,226	0,290	3,153	0,348	6,446	0,346	6,268	0,343	6,115	0,404	11,725	0,402	11,402	0,399	11,086	0,469	21,220	0,465	20,615	0,462	20,111	0,545	39,170	0,541	38,149	0,538	37,144	0,636	73,705	0,632	71,793	0,628	69,911	0,734	133,012	0,729	129,389	0,725	126,111
1,4	0,277	2,332	0,304	3,352	0,302	3,277	0,362	6,697	0,359	6,513	0,357	6,354	0,420	12,180	0,417	11,845	0,414	11,516	0,487	22,041	0,483	21,413	0,480	20,890	0,566	40,681	0,562	39,621	0,559	38,578	0,661	76,541	0,656	74,555	0,652	72,602	0,762	138,118	0,757	134,356	0,753	130,952
1,5	0,287	2,417	0,315	3,474	0,313	3,396	0,375	6,940	0,372	6,748	0,370	6,584	0,435	12,619	0,432	12,272	0,429	11,932	0,504	22,833	0,501	22,183	0,498	21,641	0,586	42,139	0,582	41,041	0,579	39,961	0,684	79,277	0,680	77,220	0,675	75,197	0,790	143,044	0,784	139,149	0,779	135,624
1,6	0,297	2,499	0,325	3,592	0,323	3,511	0,387	7,174	0,385	6,977	0,382	6,806	0,450	13,044	0,447	12,686	0,444	12,334	0,521	23,600	0,517	22,927	0,514	22,368	0,606	43,550	0,602	42,415	0,598	41,299	0,707	81,923	0,702	79,799	0,698	77,708	0,816	147,810	0,810	143,785	0,805	140,143
1,7	0,306	2,579	0,336	3,706	0,334	3,623	0,400	7,402	0,397	7,198	0,394	7,022	0,464	13,456	0,461	13,086	0,458	12,723	0,537	24,343	0,534	23,649	0,530	23,072	0,625	44,917	0,621	43,747	0,617	42,595	0,729	84,489	0,724	82,298	0,720	80,142	0,841	152,428	0,836	148,279	0,831	144,523
1,8	0,315	2,656	0,346	3,817	0,344	3,732	0,412	7,622	0,409	7,412	0,406	7,231	0,478	13,856	0,475	13,476	0,471	13,102	0,553	25,064	0,549	24,350	0,546	23,756	0,643	46,244	0,639	45,040	0,635	43,855	0,751	86,980	0,746	84,724	0,741	82,505	0,866	156,913	0,860	152,642	0,855	148,776
1,9	0,324	2,732	0,356	3,926	0,353	3,837	0,423	7,837	0,420	7,621	0,418	7,435	0,491	14,245	0,488	13,854	0,484	13,470	0,569	25,766	0,565	25,032	0,561	24,421	0,661	47,536	0,657	46,297	0,653	45,079	0,772	89,403	0,767	87,085	0,762	84,804	0,890	161,276	0,884	156,886	0,879	152,913
2	0,333	2,805	0,365	4,031	0,363	3,940	0,434	8,046	0,431	7,825	0,429	7,634	0,504	14,624	0,501	14,223	0,497	13,828	0,584	26,450	0,580	25,696	0,576	25,069	0,679	48,793	0,674	47,523	0,670	46,273	0,792	91,763	0,787	89,384	0,782	87,043	0,914	165,525	0,908	161,019	0,902	156,942
2,1	0,341	2,877	0,374	4,133	0,372	4,041	0,445	8,251	0,442	8,023	0,440	7,827	0,517	14,994	0,513	14,582	0,510	14,178	0,599	27,116	0,594	26,344	0,591	25,701	0,696	50,020	0,691	48,718	0,687	47,436	0,812	94,065	0,807	91,626	0,801	89,227	0,937	169,669	0,930	165,051	0,925	160,872
2,2	0,350	2,947	0,383	4,234	0,381	4,139	0,456	8,450	0,453	8,217	0,450	8,017	0,530	15,355	0,526	14,933	0,522	14,519	0,613	27,767	0,609	26,977	0,605	26,319	0,713	51,218	0,708	49,885	0,703	48,573	0,831	96,312	0,826	93,816	0,821	91,360	0,959	173,716	0,953	168,988	0,947	164,710
2,3	0,358	3,015	0,392	4,332	0,390	4,235	0,467	8,645	0,464	8,406	0,461	8,201	0,542	15,708	0,538	15,277	0,534	14,853	0,627	28,404	0,623	27,595	0,619	26,922	0,729	52,389	0,724	51,025	0,719	49,683	0,850	98,510	0,845	95,956	0,839	93,444	0,981	177,672	0,974	172,837	0,968	168,461
2,4	0,366	3,082	0,401	4,428	0,399	4,328	0,477	8,835	0,474	8,592	0,471	8,382	0,554	16,053	0,550	15,613	0,546	15,180	0,641	29,027	0,636	28,200	0,632	27,513	0,745	53,535	0,740	52,142	0,735	50,770	0,869	100,660	0,863	98,051	0,858	95,484	1,002	181,543	0,995	176,603	0,989	172,132
2,5	0,374	3,148	0,409	4,522	0,407	4,420	0,487	9,022	0,484	8,773	0,481	8,560	0,565	16,391	0,561	15,942	0,557	15,499	0,654	29,637	0,650	28,793	0,646	28,091	0,760	54,658	0,756	53,235	0,751	51,835	0,887	102,766	0,881	100,102	0,876	97,482	1,023	185,334	1,016	180,291	1,010	175,727
2,6	0,381	3,212	0,418	4,614	0,415	4,510	0,497	9,205	0,494	8,952	0,491	8,733	0,577	16,723	0,573	16,264	0,569	15,813	0,668	30,235	0,663	29,374	0,659	28,658	0,776	55,758	0,771	54,306	0,766	52,879	0,905	104,830	0,899	102,113	0,893	99,440	1,044	189,050	1,037	183,906	1,030	179,251
2,7	0,389	3,275	0,426	4,704	0,424	4,599	0,507	9,385	0,503	9,126	0,500	8,904	0,588	17,048	0,584	16,580	0,580	16,121	0,681	30,821	0,676	29,944	0,672	29,214	0,791	56,837	0,786	55,358	0,781	53,902	0,922	106,855	0,916	104,086	0,910	101,361	1,064	192,696	1,057	187,453	1,050	182,708
2,8	0,396	3,337	0,434	4,793	0,432	4,685	0,516	9,561	0,513	9,298	0,509	9,071	0,599	17,368	0,595	16,891	0,591	16,423	0,693	31,397	0,688	30,504	0,684	29,760	0,805	57,897	0,800	56,390	0,795	54,907	0,939	108,842	0,933	106,022	0,927	103,247	1,083	196,274	1,076	190,934	1,070	186,102
2,9	0,403	3,398	0,442	4,880	0,439	4,771	0,526	9,734	0,522	9,466	0,519	9,235	0,610	17,681	0,606	17,196	0,601	16,719	0,706	31,963	0,701	31,053	0,696	30,296	0,820	58,937	0,815	57,404	0,809	55,895	0,956	110,795	0,950	107,924	0,944	105,100	1,103	199,790	1,095	194,354	1,089	189,436
3	0,410	3,457	0,450	4,965	0,447	4,854	0,535	9,904	0,531	9,632	0,528	9,397	0,620	17,990	0,616	17,496	0,612	17,011	0,718	32,519	0,713	31,593	0,709	30,823	0,834	59,960	0,829	58,400	0,823	56,865	0,973	112,714	0,967	109,794	0,960	106,921	1,122	203,245	1,114	197,716	1,108	192,712
3,1	0,417	3,516	0,457	5,050	0,455	4,937	0,544	10,072	0,540	9,794	0,537	9,556	0,631	18,293	0,626	17,791	0,622	17,298	0,730	33,066	0,725	32,125	0,721	31,342	0,848	60,967	0,843	59,380	0,837	57,819	0,989	114,602	0,983	111,633	0,976	108,712	1,141	206,643	1,133	201,022	1,126	195,935
3,2	0,424	3,574	0,465	5,133	0,462	5,018	0,553	10,236	0,549	9,955	0,545	9,712	0,641	18,591	0,637	18,081	0,632	17,580	0,742	33,604	0,737	32,648	0,732	31,852	0,862	61,957	0,856	60,344	0,851	58,758	1,005	116,459	0,999	113,442	0,992	110,474	1,159	209,987	1,151	204,275	1,144	199,106
3,3	0,431	3,631	0,472	5,214	0,470	5,097	0,561	10,399	0,558	10,112	0,554	9,866	0,651	18,885	0,647	18,367	0,642	17,858	0,754	34,134	0,748	33,162	0,744	32,354	0,876	62,931	0,870	61,294	0,864	59,683	1,021	118,288	1,014	115,224	1,008	112,209	1,177	213,279	1,169	207,478	1,162	202,228
3,4	0,438	3,687	0,480	5,295	0,477	5,176	0,570	10,558	0,566	10,268	0,563	10,018	0,661	19,174	0,657	18,649	0,652	18,132	0,765	34,655	0,760	33,669	0,755	32,849	0,889	63,891	0,883	62,229	0,877	60,594	1,036	120,089	1,030	116,978	1,023	113,918	1,195	216,522	1,187	210,633	1,180	205,303
3,5	0,444	3,742	0,487	5,374	0,484	5,254	0,579	10,716	0,575	10,421	0,571	10,167	0,671	19,460	0,666	18,926	0,662	18,401	0,777	35,170	0,771	34,169	0,766	33,336	0,902	64,838	0,896	63,151	0,890	61,491	1,052	121,864	1,045	118,707	1,038	115,602	1,213	219,717	1,205	213,741	1,197	208,333
3,6	0,451	3,797	0,494	5,452	0,491	5,330	0,587	10,871	0,583	10,572	0,579	10,314	0,681	19,741	0,676	19,199	0,671	18,667	0,788	35,677	0,782	34,662	0,777	33,817	0,915	65,770	0,909	64,059	0,903	62,376	1,067	123,614	1,060	120,412	1,053	117,262	1,230	222,867	1,222	216,806	1,215	211,320
3,7	0,457	3,851	0,501	5,529	0,498	5,405	0,595	11,024	0,591	10,721	0,587	10,460	0,690	20,018	0,686	19,469	0,681	18,930	0,799	36,177	0,793	35,147	0,788	34,291	0,928	66,690	0,922	64,955	0,916	63,248	1,082	125,340	1,075	122,093	1,068	118,899	1,247	225,974	1,239	219,828	1,231	214,266
3,8	0,463	3,904	0,508	5,605	0,505	5,480	0,603	11,175	0,599	10,868	0,596	10,603	0,700	20,291	0,695	19,735	0,690	19,188	0,810	36,670	0,804	35,627	0,799	34,759	0,940	67,598	0,934	65,839	0,928	64,109	1,096	127,042	1,089	123,752	1,082	120,514	1,264	229,039	1,256	222,810	1,248	217,173
3,9	0,470	3,956	0,514	5,680	0,511	5,553	0,611	11,324	0,607	11,013	0,603	10,744	0,709	20,561	0,704	19,998	0,699	19,444	0,820	37,157	0,815	36,100	0,810	35,220	0,953	68,493	0,947	66,711	0,941	64,959	1,111	128,722	1,104	125,389	1,097	122,109	1,281	232,064	1,272	225,753	1,265	220,042
4	0,476	4,008	0,521	5,754	0,518	5,625	0,619	11,471	0,615	11,156	0,611	10,884	0,718	20,828	0,713	20,257	0,708	19,696	0,831	37,637	0,825	36,567	0,820	35,676	0,965	69,377	0,959	67,573	0,953	65,797	1,125	130,381	1,118	127,005	1,111	123,682	1,297	235,050	1,289	228,658	1,281	222,874
4,1	0,482	4,059	0,528	5,827	0,525	5,697	0,627	11,617	0,623	11,297	0,619	11,022	0,727	21,091	0,722	20,513	0,717	19,945	0,841	38,112	0,836	37,028	0,830	36,126	0,977	70,251	0,971	68,423	0,965	66,626	1,139	132,020	1,132	128,601	1,125	125,237	1,314	237,999	1,305	231,528	1,297	225,671
4,2	0,488	4,109	0,534	5,899	0,531	5,767	0,635	11,760	0,631	11,437	0,627	11,158	0,736	21,351	0,731	20,766	0,726	20,191	0,852	38,581	0,846	37,484	0,841	36,570	0,989	71,113	0,983	69,264	0,977	67,444	1,153	133,638	1,146	130,177	1,139	126,772	1,330	240,913	1,321	234,362	1,313	228,434
4,3	0,494	4,159	0,541	5,971	0,538	5,837	0,643	11,902	0,638	11,575	0,634	11,293	0,745	21,608	0,740	21,016	0,735	20,434	0,862	39,044	0,856	37,934	0,851	37,010	1,001	71,966	0,995	70,094	0,988	68,253	1,167	135,237	1,160	131,735	1,152	128,290	1,346	243,792	1,337	237,163	1,329	231,164
4,4	0,499	4,208	0,547	6,041	0,544	5,906	0,650	12,042	0,646	11,711	0,642	11,426	0,754	21,862	0,749	21,263	0,744	20,674	0,872	39,502	0,866	38,379	0,861	37,444	1,013	72,809	1,006	70,915	1,000	69,052	1,181	136,818	1,173	133,275	1,166	129,789	1,361	246,638	1,352	239,932	1,344	233,863
4,5	0,505	4,257	0,553	6,111	0,550	5,975	0,658	12,181	0,653	11,846	0,649	11,558	0,763	22,113	0,757	21,507	0,752	20,912	0,882	39,955	0,876	38,819	0,871	37,873	1,025	73,642	1,018	71,726	1,011	69,842	1,194	138,381	1,187	134,798	1,179	131,272	1,377	249,452	1,368	242,669	1,359	236,531
4,6	0,511	4,305	0,560	6,180	0,557	6,042	0,665	12,318	0,661	11,979	0,656	11,688	0,771	22,362	0,766	21,749	0,761	21,147	0,892	40,403	0,886	39,254	0,880	38,298	1,036	74,466	1,029	72,529	1,023	70,624	1,208	139,927	1,200	136,304	1,192	132,739	1,392	252,235	1,383	245,376	1,375	239,170
4,7	0,517	4,353	0,566	6,249	0,563	6,109	0,672	12,454	0,668	12,111	0,664	11,817	0,780	22,608	0,774	21,988	0,769	21,379	0,902	40,846	0,895	39,685	0,890	38,718	1,047	75,281	1,041	73,323	1,034	71,397	1,221	141,456	1,213	137,793	1,205	134,190	1,407	254,987	1,398	248,054	1,390	241,780
4,8	0,522	4,400	0,572	6,316	0,569	6,175	0,680	12,588	0,675	12,242	0,671	11,944	0,788	22,851	0,783	22,224	0,777	21,609	0,912	41,284	0,905	40,111	0,900	39,134	1,059	76,087	1,052	74,108	1,045	72,162	1,234	142,969	1,226	139,267	1,218	135,625	1,423	257,711	1,413	250,704	1,404	244,363
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.4: roughness coefficient k=0,75 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,9	0,528	4,447	0,578	6,383	0,575	6,240	0,687	12,721	0,682	12,371	0,678	12,070	0,796	23,091	0,791	22,458	0,785	21,837	0,921	41,718	0,915	40,532	0,909	39,545	1,070	76,885	1,063	74,886	1,056	72,919	1,247	144,466	1,239	140,726	1,231	137,045	1,437	260,406	1,428	253,326	1,419	246,919
5	0,533	4,493	0,584	6,449	0,581	6,305	0,694	12,852	0,689	12,499	0,685	12,195	0,805	23,329	0,799	22,690	0,793	22,062	0,931	42,148	0,924	40,949	0,918	39,952	1,081	77,675	1,074	75,655	1,067	73,668	1,260	145,948	1,252	142,169	1,244	138,452	1,452	263,074	1,443	255,922	1,434	249,449
5,1	0,539	4,538	0,590	6,515	0,587	6,369	0,701	12,983	0,696	12,626	0,692	12,318	0,813	23,565	0,807	22,919	0,801	22,285	0,940	42,573	0,933	41,362	0,928	40,355	1,092	78,457	1,085	76,417	1,078	74,410	1,272	147,416	1,264	143,599	1,256	139,844	1,467	265,715	1,457	258,491	1,448	251,954
5,2	0,544	4,584	0,596	6,579	0,592	6,432	0,708	13,112	0,703	12,751	0,699	12,441	0,821	23,799	0,815	23,147	0,809	22,506	0,949	42,994	0,943	41,772	0,937	40,754	1,102	79,232	1,095	77,172	1,088	75,145	1,285	148,869	1,277	145,014	1,268	141,222	1,481	268,331	1,471	261,036	1,462	254,434
5,3	0,549	4,629	0,602	6,644	0,598	6,495	0,715	13,239	0,710	12,875	0,706	12,562	0,829	24,030	0,823	23,372	0,817	22,724	0,958	43,411	0,952	42,177	0,946	41,150	1,113	79,999	1,106	77,919	1,099	75,872	1,297	150,308	1,289	146,416	1,281	142,587	1,495	270,922	1,486	263,557	1,476	256,891
5,4	0,555	4,673	0,607	6,707	0,604	6,557	0,722	13,366	0,717	12,998	0,712	12,682	0,837	24,259	0,831	23,594	0,825	22,941	0,968	43,824	0,961	42,578	0,955	41,541	1,124	80,759	1,116	78,659	1,109	76,593	1,309	151,733	1,301	147,805	1,293	143,940	1,510	273,488	1,500	266,053	1,490	259,325
5,5	0,560	4,717	0,613	6,770	0,610	6,619	0,728	13,491	0,723	13,120	0,719	12,801	0,844	24,486	0,839	23,815	0,833	23,156	0,977	44,233	0,970	42,976	0,964	41,929	1,134	81,512	1,127	79,392	1,119	77,307	1,322	153,146	1,313	149,181	1,305	145,280	1,524	276,031	1,514	268,527	1,504	261,736
5,6	0,565	4,761	0,619	6,833	0,615	6,680	0,735	13,615	0,730	13,241	0,726	12,919	0,852	24,711	0,846	24,034	0,840	23,369	0,986	44,639	0,979	43,370	0,973	42,314	1,144	82,258	1,137	80,119	1,130	78,015	1,334	154,545	1,325	150,544	1,317	146,608	1,538	278,550	1,527	270,978	1,518	264,125
5,7	0,570	4,804	0,624	6,895	0,621	6,741	0,742	13,738	0,737	13,361	0,732	13,036	0,860	24,934	0,854	24,251	0,848	23,579	0,994	45,041	0,987	43,760	0,982	42,695	1,155	82,998	1,147	80,840	1,140	78,717	1,346	155,933	1,337	151,896	1,329	147,924	1,551	281,048	1,541	273,408	1,532	266,494
5,8	0,575	4,847	0,630	6,956	0,626	6,801	0,748	13,860	0,743	13,479	0,739	13,151	0,867	25,155	0,862	24,466	0,856	23,788	1,003	45,439	0,996	44,148	0,990	43,073	1,165	83,731	1,157	81,554	1,150	79,412	1,358	157,308	1,349	153,235	1,340	149,229	1,565	283,523	1,555	275,816	1,545	268,841
5,9	0,580	4,889	0,636	7,017	0,632	6,860	0,755	13,981	0,750	13,597	0,745	13,266	0,875	25,374	0,869	24,679	0,863	23,996	1,012	45,834	1,005	44,531	0,999	43,447	1,175	84,457	1,167	82,261	1,160	80,101	1,369	158,671	1,361	154,564	1,352	150,522	1,579	285,977	1,568	278,204	1,558	271,169
6	0,585	4,931	0,641	7,078	0,637	6,919	0,761	14,101	0,756	13,714	0,752	13,380	0,882	25,591	0,876	24,890	0,870	24,201	1,021	46,226	1,013	44,912	1,007	43,818	1,185	85,178	1,177	82,963	1,170	80,785	1,381	160,023	1,372	155,880	1,364	151,805	1,592	288,411	1,581	280,571	1,572	273,476
6,1	0,590	4,973	0,646	7,138	0,643	6,978	0,768	14,220	0,763	13,829	0,758	13,493	0,890	25,807	0,884	25,100	0,878	24,405	1,029	46,614	1,022	45,289	1,016	44,187	1,195	85,893	1,187	83,660	1,180	81,463	1,393	161,364	1,384	157,186	1,375	153,077	1,605	290,824	1,595	282,919	1,585	275,765
6,2	0,595	5,015	0,652	7,197	0,648	7,036	0,774	14,338	0,769	13,944	0,764	13,605	0,897	26,020	0,891	25,308	0,885	24,607	1,038	47,000	1,030	45,664	1,024	44,552	1,205	86,601	1,197	84,350	1,189	82,135	1,404	162,693	1,395	158,482	1,386	154,338	1,619	293,218	1,608	285,248	1,598	278,035
6,3	0,600	5,056	0,657	7,256	0,653	7,094	0,781	14,455	0,775	14,058	0,770	13,716	0,905	26,232	0,898	25,514	0,892	24,808	1,046	47,382	1,039	46,035	1,033	44,914	1,215	87,305	1,207	85,035	1,199	82,802	1,415	164,012	1,406	159,767	1,397	155,590	1,632	295,593	1,621	287,558	1,611	280,287
6,4	0,605	5,097	0,662	7,314	0,659	7,151	0,787	14,571	0,781	14,171	0,777	13,826	0,912	26,443	0,906	25,718	0,899	25,006	1,055	47,761	1,047	46,404	1,041	45,274	1,224	88,002	1,216	85,714	1,209	83,464	1,427	165,321	1,418	161,042	1,409	156,831	1,645	297,948	1,634	289,850	1,624	282,521
6,5	0,610	5,137	0,668	7,372	0,664	7,207	0,793	14,687	0,788	14,283	0,783	13,936	0,919	26,651	0,913	25,921	0,906	25,204	1,063	48,137	1,055	46,769	1,049	45,631	1,234	88,694	1,226	86,389	1,218	84,120	1,438	166,619	1,429	162,306	1,420	158,063	1,658	300,286	1,647	292,124	1,636	284,737
6,6	0,614	5,177	0,673	7,430	0,669	7,264	0,799	14,801	0,794	14,394	0,789	14,044	0,926	26,858	0,920	26,123	0,914	25,400	1,071	48,511	1,064	47,132	1,057	45,985	1,243	89,381	1,236	87,058	1,228	84,772	1,449	167,908	1,440	163,562	1,431	159,286	1,670	302,605	1,659	294,380	1,649	286,937
6,7	0,619	5,217	0,678	7,487	0,674	7,320	0,805	14,915	0,800	14,505	0,795	14,152	0,933	27,064	0,927	26,323	0,921	25,594	1,079	48,881	1,072	47,492	1,065	46,336	1,253	90,063	1,245	87,722	1,237	85,418	1,460	169,187	1,451	164,807	1,442	160,499	1,683	304,907	1,672	296,620	1,662	289,120
6,8	0,624	5,257	0,683	7,544	0,679	7,375	0,811	15,027	0,806	14,614	0,801	14,259	0,940	27,268	0,934	26,521	0,927	25,787	1,087	49,249	1,080	47,849	1,073	46,685	1,262	90,739	1,254	88,381	1,246	86,060	1,471	170,456	1,462	166,044	1,452	161,703	1,696	307,192	1,684	298,843	1,674	291,287
6,9	0,629	5,296	0,688	7,600	0,684	7,430	0,817	15,139	0,812	14,723	0,807	14,365	0,947	27,470	0,941	26,718	0,934	25,979	1,095	49,614	1,088	48,204	1,081	47,031	1,272	91,411	1,264	89,035	1,255	86,697	1,482	171,716	1,473	167,271	1,463	162,899	1,708	309,460	1,697	301,049	1,686	293,438
7	0,633	5,335	0,693	7,656	0,689	7,485	0,823	15,250	0,818	14,831	0,813	14,470	0,954	27,671	0,948	26,914	0,941	26,169	1,103	49,977	1,096	48,556	1,089	47,374	1,281	92,078	1,273	89,684	1,265	87,330	1,493	172,967	1,483	168,490	1,474	164,085	1,721	311,712	1,709	303,240	1,699	295,573
7,1	0,638	5,374	0,698	7,711	0,694	7,539	0,829	15,360	0,824	14,938	0,819	14,575	0,961	27,871	0,955	27,108	0,948	26,357	1,111	50,336	1,104	48,906	1,097	47,716	1,290	92,740	1,282	90,329	1,274	87,958	1,503	174,209	1,494	169,700	1,484	165,264	1,733	313,948	1,721	305,415	1,711	297,693
7,2	0,642	5,412	0,703	7,766	0,699	7,593	0,835	15,470	0,830	15,045	0,824	14,679	0,968	28,069	0,961	27,300	0,955	26,545	1,119	50,694	1,111	49,253	1,105	48,054	1,299	93,397	1,291	90,970	1,283	88,581	1,514	175,442	1,505	170,901	1,495	166,434	1,745	316,168	1,734	307,575	1,723	299,798
7,3	0,647	5,450	0,708	7,821	0,704	7,646	0,841	15,578	0,835	15,150	0,830	14,782	0,975	28,266	0,968	27,492	0,961	26,731	1,127	51,049	1,119	49,598	1,112	48,391	1,308	94,050	1,300	91,606	1,292	89,201	1,525	176,667	1,515	172,094	1,505	167,596	1,757	318,372	1,746	309,720	1,735	301,889
7,4	0,651	5,488	0,713	7,875	0,709	7,699	0,847	15,686	0,841	15,255	0,836	14,884	0,981	28,462	0,975	27,682	0,968	26,916	1,135	51,401	1,127	49,941	1,120	48,725	1,317	94,699	1,309	92,237	1,301	89,816	1,535	177,883	1,525	173,279	1,516	168,750	1,769	320,562	1,758	311,850	1,747	303,966
7,5	0,656	5,526	0,718	7,929	0,714	7,752	0,853	15,793	0,847	15,360	0,842	14,986	0,988	28,656	0,981	27,871	0,975	27,100	1,143	51,751	1,135	50,281	1,128	49,057	1,326	95,343	1,318	92,864	1,309	90,427	1,546	179,091	1,536	174,456	1,526	169,896	1,781	322,737	1,770	313,966	1,759	306,028
7,6	0,660	5,563	0,723	7,983	0,719	7,805	0,859	15,900	0,853	15,463	0,847	15,087	0,995	28,849	0,988	28,059	0,981	27,282	1,150	52,099	1,142	50,619	1,135	49,387	1,335	95,982	1,327	93,488	1,318	91,033	1,556	180,291	1,546	175,625	1,536	171,035	1,793	324,897	1,782	316,068	1,771	308,077
7,7	0,665	5,600	0,728	8,036	0,724	7,857	0,864	16,006	0,858	15,566	0,853	15,187	1,001	29,040	0,995	28,245	0,988	27,463	1,158	52,445	1,150	50,954	1,143	49,714	1,344	96,618	1,336	94,107	1,327	91,636	1,566	181,484	1,556	176,787	1,546	172,166	1,805	327,044	1,793	318,156	1,782	310,112
7,8	0,669	5,637	0,733	8,089	0,728	7,908	0,870	16,111	0,864	15,668	0,859	15,287	1,008	29,231	1,001	28,430	0,994	27,643	1,166	52,788	1,157	51,288	1,150	50,040	1,353	97,250	1,344	94,722	1,336	92,235	1,576	182,668	1,566	177,941	1,556	173,290	1,817	329,176	1,805	320,231	1,794	312,135
7,9	0,673	5,674	0,737	8,142	0,733	7,960	0,876	16,215	0,870	15,770	0,864	15,386	1,015	29,420	1,008	28,614	1,001	27,822	1,173	53,129	1,165	51,619	1,158	50,363	1,362	97,877	1,353	95,333	1,344	92,830	1,587	183,845	1,577	179,088	1,567	174,407	1,829	331,295	1,817	322,292	1,805	314,144
8	0,678	5,710	0,742	8,194	0,738	8,011	0,881	16,319	0,875	15,871	0,870	15,485	1,021	29,608	1,014	28,797	1,007	28,000	1,181	53,468	1,172	51,949	1,165	50,684	1,370	98,500	1,362	95,940	1,353	93,422	1,597	185,015	1,587	180,227	1,576	175,516	1,840	333,401	1,828	324,340	1,817	316,141
8,1	0,682	5,747	0,747	8,246	0,743	8,062	0,887	16,422	0,881	15,971	0,875	15,583	1,027	29,795	1,020	28,979	1,013	28,177	1,188	53,805	1,180	52,276	1,173	51,004	1,379	99,120	1,370	96,544	1,361	94,010	1,607	186,177	1,597	181,359	1,586	176,619	1,852	335,493	1,840	326,376	1,828	318,125
8,2	0,686	5,783	0,751	8,297	0,747	8,112	0,892	16,525	0,886	16,071	0,881	15,680	1,034	29,980	1,027	29,159	1,020	28,352	1,195	54,139	1,187	52,601	1,180	51,321	1,388	99,736	1,379	97,144	1,370	94,594	1,617	187,332	1,606	182,485	1,596	177,715	1,863	337,572	1,851	328,399	1,840	320,097
8,3	0,691	5,819	0,756	8,349	0,752	8,162	0,898	16,627	0,892	16,170	0,886	15,777	1,040	30,165	1,033	29,339	1,026	28,527	1,203	54,472	1,194	52,925	1,187	51,636	1,396	100,348	1,387	97,740	1,378	95,174	1,627	188,481	1,616	183,603	1,606	178,804	1,875	339,639	1,862	330,410	1,851	322,057
8,4	0,695	5,854	0,761	8,400	0,756	8,212	0,903	16,728	0,897	16,269	0,892	15,873	1,047	30,348	1,039	29,517	1,032	28,701	1,210	54,803	1,201	53,246	1,194	51,950	1,405	100,956	1,396	98,333	1,387	95,751	1,636	189,622	1,626	184,715	1,616	179,887	1,886	341,694	1,874	332,408	1,862	324,005
8,5	0,699	5,889	0,765	8,450	0,761	8,262	0,909	16,829	0,902	16,366	0,897	15,968	1,053	30,530	1,046	29,695	1,038	28,873	1,217	55,132	1,209	53,565	1,201	52,262	1,413	101,561	1,404	98,922	1,395	96,325	1,646	190,756	1,636	185,820	1,625	180,963	1,897	343,736	1,885	334,395	1,873	325,942
8,6	0,703	5,925	0,770	8,501	0,766	8,311	0,914	16,929	0,908	16,464	0,902	16,063	1,059	30,712	1,052	29,871	1,045	29,044	1,224	55,458	1,216	53,883	1,209	52,572	1,421	102,162	1,412	99,507	1,403	96,895	1,656	191,884	1,646	186,919	1,635	182,033	1,909	345,766	1,896	336,370	1,884	327,867
8,7	0,707	5,960	0,774	8,551	0,770	8,360	0,919	17,028	0,913	16,561	0,908	16,158	1,065	30,892	1,058	30,046	1,051	29,215	1,232	55,783	1,223	54,199	1,216	52,880	1,430	102,760	1,420	100,089	1,411	97,462	1,666	193,005	1,655	188,011	1,645	183,097	1,920	347,785	1,907	338,334	1,895	329,781
8,8	0,711	5,994	0,779	8,601	0,775	8,409	0,925	17,127	0,918	16,657	0,913	16,252	1,071	31,071	1,064	30,220	1,057	29,384	1,239	56,106	1,230	54,512	1,223	53,186	1,438	103,354	1,429	100,668	1,419	98,026	1,675	194,120	1,665	189,097	1,654	184,155	1,931	349,791	1,918	340,287	1,906	331,684
8,9	0,716	6,029	0,783	8,650	0,779	8,457	0,930	17,226	0,924	16,753	0,918	16,345	1,078	31,249	1,070	30,394	1,063	29,553	1,246	56,428	1,237	54,825	1,230	53,490	1,446	103,945	1,437	101,244	1,428	98,587	1,685	195,229	1,674	190,177	1,664	185,207	1,942	351,787	1,929	342,228	1,917	333,577
9	0,720	6,063	0,788	8,699	0,783	8,505	0,935	17,324	0,929	16,848	0,923	16,438	1,084	31,427	1,076	30,566	1,069	29,720	1,253	56,747	1,244	55,135	1,237	53,793	1,454	104,533	1,445	101,816	1,436	99,144	1,694	196,331	1,684	191,251	1,673	186,253	1,953	353,771	1,940	344,159	1,928	335,459
9,1	0,724	6,097	0,792	8,748	0,788	8,553	0,941	17,421	0,934	16,942	0,928	16,530	1,090	31,603	1,082	30,738	1,075	29,887	1,260	57,065	1,251	55,444	1,244	54,094	1,462	105,117	1,453	101,816	1,444	99,698	1,704	197,428	1,693	192,319	1,682	187,293	1,964	355,745	1,951	346,078	1,939	337,330
9,2	0,728	6,131	0,797	8,797	0,792	8,601	0,946	17,518	0,939	17,036	0,934	16,622	1,096	31,778	1,088	30,908	1,081	30,053	1,267	57,381	1,258	55,751	1,250	54,394	1,470	105,699	1,461	102,952	1,452	100,250	1,713	198,518	1,702	193,381	1,692	188,327	1,974	357,707	1,961	347,988	1,949	339,191
9,3	0,732	6,165	0,801	8,846	0,797	8,648	0,951	17,614	0,944	17,130	0,939	16,714	1,102	31,952	1,094	31,077	1,087	30,218	1,274	57,695	1,265	56,056	1,257	54,692	1,479	106,277	1,469	103,515	1,460	100,798	1,723	199,602	1,712	194,437	1,701	189,356	1,985	359,659	1,972	349,887	1,960	341,042
9,4	0,736	6,199	0,805	8,894	0,801	8,695	0,956	17,710	0,950	17,223	0,944	16,804	1,108	32,126	1,100	31,246	1,093	30,382	1,281	58,008	1,272	56,360	1,264	54,988	1,487	106,851	1,477	104,075	1,468	101,343	1,732	200,681	1,721	195,488	1,710	190,379	1,996	361,601	1,983	351,776	1,971	342,883
9,5	0,740	6,232	0,810	8,942	0,805	8,742	0,961	17,805	0,955	17,316	0,949	16,895	1,114	32,298	1,106	31,414	1,099	30,545	1,288	58,318	1,279	56,662	1,271	55,283	1,494	107,423	1,485	104,632	1,475	101,886	1,741	201,753	1,730	196,533	1,719	191,397	2,007	363,532	1,993	353,654	1,981	344,715
9,6	0,744	6,266	0,814	8,989	0,810	8,789	0,966	17,899	0,960	17,408	0,954	16,985	1,120	32,470	1,112	31,581	1,104	30,707	1,294	58,628	1,285	56,962	1,278	55,576	1,502	107,992	1,493	105,186	1,483	102,425	1,750	202,821	1,739	197,573	1,728	192,409	2,017	365,453	2,004	355,523	1,992	346,537
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.4: roughness coefficient k=0,75 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,7	0,748	6,299	0,818	9,037	0,814	8,835	0,972	17,994	0,965	17,499	0,959	17,074	1,126	32,640	1,118	31,747	1,110	30,868	1,301	58,935	1,292	57,261	1,284	55,868	1,510	108,558	1,501	105,737	1,491	102,962	1,760	203,882	1,748	198,607	1,737	193,417	2,028	367,364	2,014	357,383	2,002	348,349
9,8	0,752	6,332	0,823	9,084	0,818	8,881	0,977	18,087	0,970	17,591	0,964	17,163	1,131	32,810	1,124	31,912	1,116	31,029	1,308	59,241	1,299	57,559	1,291	56,158	1,518	109,121	1,508	106,286	1,499	103,496	1,769	204,938	1,757	199,636	1,746	194,419	2,038	369,265	2,025	359,232	2,012	350,152
9,9	0,755	6,364	0,827	9,131	0,822	8,927	0,982	18,181	0,975	17,681	0,969	17,252	1,137	32,979	1,130	32,076	1,122	31,189	1,315	59,546	1,305	57,854	1,298	56,447	1,526	109,681	1,516	106,831	1,506	104,028	1,778	205,989	1,766	200,659	1,755	195,416	2,049	371,157	2,035	361,072	2,023	351,946
10	0,759	6,397	0,831	9,178	0,826	8,973	0,987	18,274	0,980	17,772	0,974	17,340	1,143	33,147	1,135	32,240	1,127	31,348	1,321	59,849	1,312	58,149	1,304	56,734	1,534	110,239	1,524	107,374	1,514	104,556	1,787	207,035	1,775	201,678	1,764	196,408	2,059	373,039	2,046	362,903	2,033	353,730
10,2	0,767	6,462	0,840	9,270	0,835	9,063	0,997	18,458	0,990	17,951	0,984	17,514	1,155	33,480	1,147	32,564	1,139	31,663	1,335	60,450	1,325	58,733	1,317	57,304	1,549	111,345	1,539	108,452	1,529	105,606	1,805	209,110	1,793	203,700	1,782	198,377	2,080	376,775	2,066	366,538	2,053	357,273
10,4	0,775	6,526	0,848	9,362	0,843	9,153	1,006	18,640	1,000	18,128	0,993	17,688	1,166	33,811	1,158	32,885	1,150	31,976	1,348	61,046	1,338	59,312	1,330	57,869	1,564	112,441	1,554	109,519	1,544	106,645	1,822	211,166	1,811	205,702	1,799	200,327	2,100	380,475	2,086	370,138	2,073	360,782
10,6	0,782	6,589	0,856	9,453	0,851	9,242	1,016	18,821	1,009	18,304	1,003	17,859	1,177	34,138	1,169	33,204	1,161	32,285	1,361	61,636	1,351	59,885	1,343	58,428	1,579	113,526	1,569	110,576	1,559	107,674	1,840	213,201	1,828	207,685	1,817	202,258	2,120	384,139	2,106	373,702	2,093	364,257
10,8	0,790	6,652	0,864	9,543	0,859	9,330	1,026	19,000	1,019	18,478	1,013	18,029	1,188	34,462	1,180	33,519	1,172	32,592	1,374	62,220	1,364	60,453	1,356	58,982	1,594	114,601	1,584	111,623	1,574	108,694	1,857	215,218	1,846	209,649	1,834	204,171	2,140	387,769	2,126	377,234	2,113	367,699
11	0,797	6,715	0,872	9,632	0,867	9,417	1,035	19,177	1,028	18,651	1,022	18,197	1,199	34,783	1,191	33,831	1,183	32,895	1,387	62,799	1,377	61,015	1,369	59,531	1,609	115,666	1,599	112,661	1,589	109,704	1,875	217,215	1,863	211,596	1,851	206,067	2,160	391,366	2,146	380,733	2,133	371,110
11,2	0,804	6,776	0,880	9,721	0,875	9,504	1,045	19,353	1,038	18,821	1,031	18,364	1,210	35,101	1,202	34,141	1,194	33,196	1,399	63,373	1,389	61,573	1,381	60,075	1,624	116,721	1,613	113,689	1,603	110,705	1,892	219,195	1,880	213,524	1,868	207,945	2,180	394,929	2,166	384,200	2,152	374,489
11,4	0,812	6,837	0,888	9,809	0,883	9,590	1,054	19,527	1,047	18,991	1,041	18,529	1,221	35,417	1,213	34,447	1,205	33,495	1,412	63,942	1,402	62,125	1,393	60,614	1,638	117,767	1,628	114,708	1,617	111,698	1,909	221,158	1,897	215,436	1,884	209,807	2,199	398,462	2,185	387,636	2,172	377,839
11,6	0,819	6,898	0,896	9,896	0,891	9,675	1,064	19,700	1,056	19,159	1,050	18,693	1,232	35,729	1,224	34,752	1,215	33,790	1,424	64,505	1,414	62,673	1,406	61,148	1,653	118,804	1,642	115,718	1,632	112,681	1,925	223,103	1,913	217,331	1,901	211,652	2,219	401,963	2,204	391,043	2,191	381,159
11,8	0,826	6,958	0,904	9,982	0,899	9,759	1,073	19,871	1,066	19,325	1,059	18,856	1,243	36,039	1,234	35,053	1,226	34,084	1,437	65,064	1,426	63,216	1,418	61,678	1,667	119,832	1,656	116,719	1,646	113,656	1,942	225,031	1,930	219,209	1,917	213,482	2,238	405,434	2,223	394,420	2,210	384,451
12	0,833	7,018	0,912	10,067	0,907	9,842	1,082	20,041	1,075	19,490	1,068	19,017	1,253	36,347	1,245	35,352	1,236	34,374	1,449	65,618	1,439	63,755	1,430	62,204	1,681	120,852	1,671	117,712	1,660	114,623	1,959	226,943	1,946	221,072	1,934	215,296	2,257	408,876	2,242	397,769	2,228	387,716
12,2	0,840	7,077	0,919	10,152	0,914	9,925	1,091	20,209	1,084	19,654	1,077	19,176	1,264	36,652	1,255	35,649	1,247	34,663	1,461	66,168	1,451	64,289	1,442	62,725	1,695	121,863	1,685	118,697	1,674	115,582	1,975	228,839	1,962	222,919	1,950	217,095	2,276	412,290	2,261	401,089	2,247	390,953
12,4	0,847	7,136	0,927	10,236	0,922	10,007	1,100	20,376	1,093	19,816	1,086	19,335	1,274	36,954	1,266	35,943	1,257	34,949	1,473	66,713	1,463	64,818	1,454	63,241	1,709	122,865	1,698	119,673	1,687	116,533	1,991	230,720	1,979	224,752	1,966	218,879	2,294	415,676	2,279	404,383	2,265	394,163
12,6	0,854	7,194	0,935	10,319	0,929	10,089	1,109	20,541	1,101	19,977	1,095	19,492	1,285	37,254	1,276	36,234	1,267	35,232	1,485	67,253	1,474	65,344	1,466	63,754	1,723	123,860	1,712	120,642	1,701	117,477	2,007	232,586	1,995	226,569	1,982	220,649	2,313	419,034	2,298	407,650	2,284	397,348
12,8	0,861	7,252	0,942	10,402	0,937	10,170	1,118	20,706	1,110	20,137	1,104	19,648	1,295	37,551	1,286	36,524	1,277	35,514	1,497	67,790	1,486	65,865	1,477	64,263	1,737	124,846	1,726	121,603	1,715	118,412	2,023	234,437	2,010	228,372	1,998	222,406	2,331	422,366	2,316	410,892	2,302	400,508
13	0,867	7,309	0,949	10,484	0,944	10,250	1,127	20,869	1,119	20,296	1,112	19,803	1,305	37,846	1,296	36,811	1,287	35,793	1,508	68,322	1,498	66,382	1,489	64,767	1,750	125,826	1,739	122,557	1,728	119,341	2,039	236,273	2,026	230,161	2,013	224,148	2,350	425,672	2,334	414,108	2,320	403,643
13,2	0,874	7,366	0,957	10,565	0,951	10,330	1,136	21,030	1,128	20,453	1,121	19,956	1,315	38,139	1,306	37,096	1,297	36,070	1,520	68,850	1,509	66,895	1,500	65,268	1,764	126,797	1,753	123,503	1,741	120,263	2,055	238,096	2,042	231,937	2,029	225,877	2,368	428,953	2,352	417,300	2,338	406,754
13,4	0,881	7,422	0,964	10,646	0,959	10,409	1,144	21,191	1,136	20,609	1,129	20,108	1,325	38,430	1,316	37,379	1,307	36,345	1,532	69,374	1,521	67,404	1,512	65,765	1,777	127,761	1,766	124,442	1,755	121,177	2,070	239,905	2,057	233,699	2,044	227,593	2,386	432,208	2,370	420,467	2,355	409,842
13,6	0,888	7,478	0,971	10,726	0,966	10,487	1,153	21,350	1,145	20,764	1,138	20,260	1,335	38,719	1,326	37,659	1,317	36,618	1,543	69,895	1,532	67,910	1,523	66,258	1,791	128,718	1,779	125,375	1,768	122,085	2,086	241,700	2,073	235,448	2,060	229,296	2,404	435,440	2,388	423,611	2,373	412,906
13,8	0,894	7,534	0,979	10,806	0,973	10,565	1,161	21,509	1,153	20,918	1,146	20,410	1,345	39,005	1,336	37,938	1,327	36,889	1,555	70,411	1,544	68,412	1,534	66,748	1,804	129,668	1,792	126,300	1,781	122,986	2,101	243,482	2,088	237,184	2,075	230,987	2,421	438,648	2,405	426,732	2,391	415,948
14	0,901	7,589	0,986	10,885	0,980	10,642	1,170	21,666	1,162	21,071	1,155	20,559	1,355	39,290	1,346	38,215	1,336	37,158	1,566	70,924	1,555	68,910	1,546	67,234	1,817	130,612	1,806	127,219	1,794	123,881	2,117	245,251	2,103	238,907	2,090	232,666	2,439	441,833	2,423	429,831	2,408	418,969
14,2	0,907	7,644	0,993	10,964	0,987	10,719	1,178	21,822	1,170	21,223	1,163	20,707	1,365	39,572	1,355	38,489	1,346	37,425	1,577	71,433	1,566	69,405	1,557	67,716	1,830	131,548	1,818	128,131	1,807	124,769	2,132	247,008	2,118	240,619	2,105	234,332	2,456	444,995	2,440	432,907	2,425	421,967
14,4	0,914	7,698	1,000	11,042	0,994	10,795	1,187	21,976	1,178	21,373	1,171	20,854	1,374	39,852	1,365	38,762	1,356	37,690	1,588	71,938	1,577	69,896	1,568	68,196	1,843	132,478	1,831	129,037	1,820	125,651	2,147	248,752	2,133	242,318	2,120	235,987	2,474	448,135	2,457	435,962	2,442	424,945
14,6	0,920	7,752	1,007	11,119	1,001	10,871	1,195	22,130	1,187	21,523	1,179	21,000	1,384	40,131	1,374	39,033	1,365	37,954	1,599	72,440	1,588	70,384	1,579	68,672	1,856	133,401	1,844	129,936	1,832	126,527	2,162	250,485	2,148	244,006	2,134	237,631	2,491	451,253	2,474	438,996	2,459	427,902
14,8	0,926	7,806	1,014	11,196	1,008	10,946	1,203	22,283	1,195	21,671	1,188	21,145	1,393	40,407	1,384	39,302	1,374	38,215	1,610	72,939	1,599	70,868	1,590	69,144	1,869	134,319	1,857	130,830	1,845	127,397	2,177	252,205	2,163	245,682	2,149	239,263	2,508	454,350	2,491	442,009	2,476	430,839
15	0,933	7,859	1,021	11,272	1,015	11,021	1,211	22,435	1,203	21,819	1,196	21,289	1,403	40,682	1,393	39,569	1,384	38,475	1,621	73,434	1,610	71,349	1,600	69,614	1,881	135,230	1,869	131,717	1,857	128,261	2,191	253,914	2,177	247,346	2,164	240,885	2,525	457,427	2,508	445,002	2,493	433,756
15,2	0,939	7,912	1,028	11,348	1,022	11,095	1,219	22,585	1,211	21,965	1,204	21,432	1,412	40,955	1,403	39,834	1,393	38,733	1,632	73,926	1,621	71,827	1,611	70,080	1,894	136,135	1,882	132,598	1,870	129,120	2,206	255,611	2,192	249,000	2,178	242,495	2,542	460,482	2,525	447,974	2,510	436,654
15,4	0,945	7,965	1,035	11,423	1,029	11,169	1,228	22,735	1,219	22,111	1,212	21,574	1,422	41,226	1,412	40,098	1,402	38,989	1,643	74,415	1,632	72,302	1,622	70,544	1,906	137,034	1,894	133,474	1,882	129,973	2,221	257,298	2,206	250,643	2,192	244,095	2,559	463,518	2,542	450,928	2,526	439,533
15,6	0,952	8,017	1,041	11,498	1,035	11,242	1,236	22,884	1,227	22,256	1,220	21,715	1,431	41,495	1,421	40,360	1,411	39,244	1,654	74,900	1,642	72,774	1,632	71,004	1,919	137,927	1,907	134,344	1,894	130,820	2,235	258,973	2,221	252,275	2,207	245,685	2,575	466,534	2,558	453,862	2,543	442,393
15,8	0,958	8,069	1,048	11,573	1,042	11,314	1,244	23,031	1,235	22,399	1,228	21,855	1,440	41,763	1,430	40,620	1,421	39,497	1,664	75,383	1,653	73,243	1,643	71,461	1,931	138,814	1,919	135,209	1,907	131,662	2,249	260,638	2,235	253,897	2,221	247,264	2,592	469,531	2,575	456,777	2,559	445,235
16	0,964	8,120	1,055	11,647	1,049	11,387	1,251	23,178	1,243	22,542	1,235	21,994	1,449	42,029	1,439	40,879	1,430	39,749	1,675	75,862	1,663	73,708	1,653	71,916	1,943	139,696	1,931	136,068	1,919	132,498	2,264	262,292	2,249	255,508	2,235	248,834	2,608	472,509	2,591	459,674	2,575	448,059
16,2	0,970	8,172	1,061	11,720	1,055	11,459	1,259	23,324	1,251	22,684	1,243	22,133	1,458	42,293	1,449	41,136	1,439	39,999	1,686	76,339	1,674	74,171	1,664	72,368	1,956	140,573	1,943	136,921	1,931	133,329	2,278	263,936	2,263	257,110	2,249	250,393	2,624	475,468	2,607	462,553	2,591	450,865
16,4	0,976	8,223	1,068	11,793	1,062	11,530	1,267	23,469	1,259	22,825	1,251	22,271	1,468	42,556	1,458	41,391	1,448	40,247	1,696	76,812	1,684	74,632	1,674	72,816	1,968	141,444	1,955	137,770	1,943	134,156	2,292	265,570	2,277	258,702	2,263	251,944	2,641	478,409	2,623	465,415	2,607	453,654
16,6	0,982	8,273	1,075	11,866	1,069	11,601	1,275	23,613	1,266	22,965	1,259	22,407	1,477	42,817	1,466	41,645	1,456	40,494	1,706	77,283	1,694	75,089	1,684	73,263	1,980	142,309	1,967	138,613	1,955	134,977	2,306	267,194	2,291	260,284	2,277	253,484	2,657	481,332	2,639	468,259	2,623	456,427
16,8	0,988	8,324	1,081	11,938	1,075	11,671	1,283	23,757	1,274	23,105	1,266	22,543	1,485	43,076	1,475	41,898	1,465	40,739	1,717	77,751	1,705	75,543	1,694	73,706	1,992	143,170	1,979	139,451	1,966	135,793	2,320	268,808	2,305	261,856	2,291	255,016	2,673	484,238	2,655	471,086	2,639	459,182
17	0,994	8,374	1,088	12,010	1,082	11,742	1,290	23,899	1,282	23,243	1,274	22,679	1,494	43,334	1,484	42,149	1,474	40,983	1,727	78,216	1,715	75,995	1,705	74,147	2,004	144,025	1,991	140,285	1,978	136,605	2,334	270,413	2,319	263,419	2,304	256,538	2,689	487,126	2,671	473,896	2,655	461,921
17,2	1,000	8,423	1,094	12,081	1,088	11,811	1,298	24,041	1,289	23,381	1,281	22,813	1,503	43,591	1,493	42,398	1,483	41,226	1,737	78,678	1,725	76,444	1,715	74,585	2,016	144,876	2,003	141,113	1,990	137,411	2,347	272,008	2,333	264,973	2,318	258,052	2,705	489,998	2,687	476,689	2,670	464,644
17,4	1,006	8,473	1,101	12,152	1,094	11,881	1,306	24,182	1,297	23,518	1,289	22,947	1,512	43,845	1,502	42,646	1,491	41,467	1,747	79,138	1,735	76,891	1,725	75,021	2,027	145,721	2,014	141,936	2,001	138,213	2,361	273,594	2,346	266,518	2,331	259,556	2,720	492,853	2,703	479,467	2,686	467,352
17,6	1,011	8,522	1,107	12,222	1,101	11,949	1,313	24,322	1,304	23,654	1,296	23,079	1,521	44,099	1,510	42,893	1,500	41,707	1,757	79,595	1,745	77,335	1,735	75,454	2,039	146,562	2,026	142,755	2,013	139,011	2,375	275,171	2,360	268,054	2,345	261,052	2,736	495,691	2,718	482,228	2,701	470,043
17,8	1,017	8,571	1,113	12,292	1,107	12,018	1,321	24,461	1,312	23,789	1,304	23,212	1,529	44,351	1,519	43,138	1,509	41,945	1,767	80,049	1,755	77,777	1,745	75,885	2,051	147,398	2,038	143,569	2,024	139,803	2,388	276,739	2,373	269,582	2,358	262,540	2,752	498,514	2,734	484,974	2,717	472,720
18	1,023	8,620	1,120	12,362	1,113	12,086	1,328	24,599	1,319	23,924	1,311	23,343	1,538	44,602	1,528	43,382	1,517	42,182	1,777	80,501	1,765	78,216	1,754	76,314	2,062	148,229	2,049	144,379	2,036	140,592	2,402	278,298	2,387	271,101	2,371	264,019	2,767	501,320	2,749	487,704	2,732	475,382
18,2	1,029	8,668	1,126	12,431	1,120	12,154	1,336	24,737	1,326	24,058	1,318	23,474	1,547	44,851	1,536	43,624	1,526	42,418	1,787	80,950	1,775	78,652	1,764	76,740	2,074	149,055	2,060	145,184	2,047	141,376	2,415	279,849	2,400	272,611	2,385	265,490	2,783	504,111	2,764	490,420	2,747	478,028
18,4	1,034	8,716	1,132	12,500	1,126	12,221	1,343	24,874	1,334	24,191	1,326	23,603	1,555	45,099	1,545	43,865	1,534	42,653	1,797	81,397	1,785	79,086	1,774	77,163	2,085	149,877	2,072	145,985	2,059	142,156	2,428	281,391	2,413	274,113	2,398	266,953	2,798	506,887	2,779	493,120	2,762	480,661
18,6	1,040	8,764	1,138	12,569	1,132	12,288	1,350	25,010	1,341	24,323	1,333	23,733	1,564	45,345	1,553	44,105	1,542	42,886	1,807	81,842	1,794	79,518	1,784	77,585	2,096	150,695	2,083	146,781	2,070	142,931	2,442	282,924	2,426	275,607	2,411	268,408	2,813	509,648	2,795	495,806	2,778	483,279
18,8	1,046	8,811	1,144	12,637	1,138	12,355	1,358	25,145	1,348	24,455	1,340	23,861	1,572	45,590	1,561	44,343	1,551	43,118	1,817	82,284	1,804	79,948	1,793	78,004	2,108	151,508	2,094	147,573	2,081	143,703	2,455	284,450	2,439	277,093	2,424	269,856	2,828	512,394	2,810	498,477	2,792	485,883
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.4: roughness coefficient k=0,75 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
19	1,051	8,859	1,151	12,705	1,144	12,421	1,365	25,280	1,356	24,586	1,347	23,989	1,581	45,834	1,570	44,581	1,559	43,348	1,826	82,723	1,814	80,375	1,803	78,421	2,119	152,317	2,106	148,361	2,092	144,470	2,468	285,967	2,452	278,572	2,437	271,295	2,843	515,125	2,825	501,135	2,807	488,473
19,2	1,057	8,906	1,157	12,772	1,150	12,487	1,372	25,414	1,363	24,717	1,355	24,116	1,589	46,077	1,578	44,817	1,567	43,578	1,836	83,161	1,823	80,800	1,812	78,835	2,130	153,122	2,117	149,145	2,103	145,233	2,481	287,477	2,465	280,042	2,450	272,727	2,858	517,842	2,840	503,778	2,822	491,050
19,4	1,063	8,953	1,163	12,839	1,156	12,553	1,379	25,547	1,370	24,846	1,362	24,243	1,597	46,318	1,586	45,051	1,576	43,806	1,846	83,596	1,833	81,223	1,822	79,248	2,141	153,922	2,128	149,925	2,114	145,992	2,494	288,978	2,478	281,505	2,462	274,152	2,873	520,545	2,854	506,408	2,837	493,613
19,6	1,068	8,999	1,169	12,906	1,162	12,618	1,387	25,680	1,377	24,975	1,369	24,368	1,606	46,559	1,595	45,285	1,584	44,033	1,855	84,029	1,842	81,644	1,831	79,658	2,152	154,719	2,139	150,701	2,125	146,748	2,507	290,472	2,491	282,960	2,475	275,569	2,888	523,234	2,869	509,024	2,852	496,163
19,8	1,074	9,046	1,175	12,972	1,168	12,683	1,394	25,812	1,384	25,103	1,376	24,494	1,614	46,797	1,603	45,517	1,592	44,259	1,865	84,460	1,852	82,062	1,841	80,067	2,163	155,511	2,150	151,472	2,136	147,499	2,520	291,958	2,504	284,408	2,488	276,979	2,903	525,909	2,884	511,626	2,866	498,700
20	1,079	9,092	1,181	13,038	1,174	12,748	1,401	25,943	1,391	25,231	1,383	24,618	1,622	47,035	1,611	45,749	1,600	44,484	1,874	84,888	1,861	82,479	1,850	80,473	2,174	156,299	2,161	152,240	2,147	148,247	2,532	293,437	2,516	285,848	2,500	278,382	2,918	528,571	2,898	514,216	2,881	501,224
20,2	1,085	9,138	1,187	13,104	1,180	12,812	1,408	26,074	1,398	25,358	1,390	24,742	1,630	47,272	1,619	45,979	1,608	44,708	1,884	85,315	1,870	82,893	1,859	80,877	2,185	157,084	2,171	153,004	2,157	148,991	2,545	294,908	2,529	287,282	2,513	279,778	2,932	531,220	2,913	516,793	2,895	503,736
20,4	1,090	9,183	1,193	13,170	1,186	12,876	1,415	26,204	1,405	25,485	1,397	24,866	1,638	47,507	1,627	46,208	1,616	44,930	1,893	85,739	1,880	83,305	1,869	81,280	2,196	157,864	2,182	153,765	2,168	149,731	2,558	296,372	2,542	288,708	2,525	281,167	2,947	533,855	2,927	519,357	2,909	506,235
20,6	1,095	9,229	1,199	13,235	1,192	12,939	1,422	26,333	1,412	25,610	1,404	24,988	1,646	47,741	1,635	46,435	1,624	45,152	1,902	86,161	1,889	83,715	1,878	81,680	2,207	158,641	2,193	154,521	2,179	150,468	2,570	297,829	2,554	290,127	2,538	282,550	2,961	536,478	2,942	521,908	2,924	508,722
20,8	1,101	9,274	1,204	13,299	1,198	13,003	1,429	26,462	1,419	25,736	1,410	25,110	1,654	47,974	1,643	46,662	1,632	45,372	1,912	86,581	1,898	84,124	1,887	82,078	2,218	159,414	2,204	155,274	2,189	151,201	2,583	299,279	2,567	291,540	2,550	283,925	2,976	539,088	2,956	524,447	2,938	511,197
21	1,106	9,319	1,210	13,364	1,204	13,066	1,436	26,590	1,426	25,860	1,417	25,232	1,662	48,206	1,651	46,888	1,640	45,592	1,921	87,000	1,907	84,530	1,896	82,475	2,228	160,183	2,214	156,023	2,200	151,931	2,595	300,722	2,579	292,945	2,562	285,294	2,990	541,685	2,970	526,974	2,952	513,660
21,2	1,111	9,364	1,216	13,428	1,209	13,129	1,443	26,717	1,433	25,984	1,424	25,353	1,670	48,437	1,659	47,112	1,648	45,810	1,930	87,416	1,917	84,934	1,905	82,869	2,239	160,949	2,225	156,769	2,211	152,657	2,608	302,158	2,591	294,344	2,575	286,657	3,004	544,270	2,984	529,489	2,966	516,112
21,4	1,117	9,408	1,222	13,492	1,215	13,191	1,449	26,844	1,439	26,108	1,431	25,473	1,678	48,667	1,667	47,336	1,655	46,027	1,939	87,830	1,926	85,337	1,914	83,262	2,250	161,710	2,235	157,511	2,221	153,380	2,620	303,588	2,603	295,737	2,587	288,013	3,018	546,843	2,999	531,992	2,980	518,552
21,6	1,122	9,453	1,228	13,556	1,221	13,253	1,456	26,970	1,446	26,230	1,437	25,593	1,686	48,896	1,675	47,558	1,663	46,244	1,948	88,242	1,935	85,738	1,923	83,653	2,260	162,469	2,246	158,250	2,231	154,099	2,632	305,010	2,616	297,123	2,599	289,363	3,033	549,404	3,013	534,484	2,994	520,980
21,8	1,127	9,497	1,233	13,619	1,226	13,315	1,463	27,096	1,453	26,353	1,444	25,713	1,694	49,123	1,682	47,780	1,671	46,459	1,957	88,653	1,944	86,136	1,932	84,042	2,271	163,224	2,256	158,985	2,242	154,816	2,644	306,426	2,628	298,502	2,611	290,706	3,047	551,953	3,027	536,964	3,008	523,398
22	1,132	9,541	1,239	13,682	1,232	13,377	1,470	27,221	1,460	26,474	1,451	25,831	1,702	49,350	1,690	48,000	1,679	46,673	1,966	89,061	1,953	86,533	1,941	84,429	2,281	163,975	2,267	159,717	2,252	155,528	2,657	307,836	2,640	299,876	2,623	292,044	3,061	554,491	3,041	539,432	3,022	525,804
22,2	1,138	9,585	1,245	13,745	1,238	13,438	1,477	27,346	1,466	26,596	1,458	25,950	1,710	49,575	1,698	48,219	1,686	46,887	1,975	89,468	1,962	86,928	1,950	84,815	2,292	164,723	2,277	160,446	2,262	156,238	2,669	309,239	2,652	301,243	2,635	293,375	3,075	557,017	3,054	541,890	3,036	528,199
22,4	1,143	9,628	1,250	13,807	1,243	13,499	1,483	27,470	1,473	26,716	1,464	26,067	1,717	49,800	1,706	48,438	1,694	47,099	1,984	89,873	1,970	87,322	1,959	85,199	2,302	165,468	2,287	161,171	2,273	156,944	2,681	310,636	2,664	302,603	2,647	294,700	3,089	559,531	3,068	544,336	3,049	530,584
22,6	1,148	9,672	1,256	13,869	1,249	13,560	1,490	27,593	1,480	26,836	1,471	26,184	1,725	50,023	1,713	48,655	1,702	47,311	1,993	90,276	1,979	87,713	1,967	85,581	2,312	166,209	2,298	161,894	2,283	157,648	2,693	312,027	2,676	303,958	2,659	296,020	3,102	562,035	3,082	546,772	3,063	532,958
22,8	1,153	9,715	1,262	13,931	1,255	13,620	1,497	27,716	1,486	26,956	1,477	26,301	1,733	50,246	1,721	48,872	1,709	47,521	2,002	90,677	1,988	88,103	1,976	85,961	2,323	166,948	2,308	162,612	2,293	158,348	2,705	313,411	2,688	305,307	2,671	297,333	3,116	564,527	3,096	549,196	3,077	535,322
23	1,158	9,758	1,267	13,993	1,260	13,681	1,503	27,839	1,493	27,075	1,484	26,417	1,740	50,468	1,729	49,087	1,717	47,731	2,011	91,077	1,997	88,491	1,985	86,340	2,333	167,682	2,318	163,328	2,303	159,045	2,717	314,790	2,700	306,650	2,682	298,641	3,130	567,008	3,109	551,610	3,090	537,675
23,2	1,163	9,801	1,273	14,054	1,266	13,741	1,510	27,960	1,499	27,193	1,490	26,533	1,748	50,688	1,736	49,302	1,724	47,939	2,020	91,474	2,006	88,878	1,994	86,717	2,343	168,414	2,328	164,041	2,313	159,739	2,729	316,162	2,711	307,987	2,694	299,943	3,143	569,479	3,123	554,014	3,104	540,018
23,4	1,168	9,843	1,278	14,115	1,271	13,800	1,516	28,082	1,506	27,311	1,497	26,648	1,756	50,908	1,744	49,516	1,732	48,147	2,028	91,870	2,014	89,263	2,002	87,093	2,353	169,143	2,338	164,751	2,323	160,430	2,740	317,529	2,723	309,318	2,706	301,240	3,157	571,939	3,136	556,407	3,117	542,351
23,6	1,173	9,886	1,284	14,176	1,277	13,860	1,523	28,203	1,512	27,429	1,503	26,763	1,763	51,127	1,751	49,728	1,739	48,354	2,037	92,265	2,023	89,646	2,011	87,467	2,363	169,868	2,348	165,457	2,333	161,118	2,752	318,890	2,735	310,644	2,717	302,531	3,171	574,389	3,150	558,790	3,130	544,673
23,8	1,178	9,928	1,289	14,236	1,282	13,919	1,529	28,323	1,519	27,546	1,510	26,877	1,771	51,345	1,759	49,940	1,747	48,560	2,046	92,657	2,031	90,028	2,019	87,839	2,373	170,591	2,358	166,161	2,343	161,803	2,764	320,245	2,746	311,964	2,729	303,817	3,184	576,828	3,163	561,163	3,144	546,987
24	1,183	9,970	1,295	14,297	1,288	13,978	1,536	28,443	1,525	27,662	1,516	26,991	1,778	51,561	1,766	50,151	1,754	48,765	2,054	93,049	2,040	90,408	2,028	88,210	2,383	171,310	2,368	166,862	2,353	162,486	2,775	321,594	2,758	313,278	2,740	305,097	3,197	579,257	3,176	563,526	3,157	549,290
24,2	1,188	10,012	1,300	14,357	1,293	14,037	1,542	28,562	1,532	27,778	1,522	27,104	1,786	51,777	1,773	50,361	1,761	48,970	2,063	93,438	2,049	90,786	2,036	88,579	2,393	172,026	2,378	167,559	2,363	163,165	2,787	322,938	2,769	314,587	2,752	306,372	3,211	581,676	3,190	565,880	3,170	551,584
24,4	1,193	10,054	1,306	14,417	1,298	14,095	1,549	28,681	1,538	27,894	1,529	27,217	1,793	51,993	1,781	50,571	1,769	49,173	2,072	93,826	2,057	91,163	2,045	88,947	2,403	172,740	2,388	168,254	2,373	163,842	2,799	324,276	2,781	315,891	2,763	307,641	3,224	584,084	3,203	568,223	3,183	553,868
24,6	1,198	10,095	1,311	14,476	1,304	14,153	1,555	28,799	1,544	28,009	1,535	27,329	1,800	52,207	1,788	50,779	1,776	49,376	2,080	94,212	2,066	91,538	2,053	89,313	2,413	173,450	2,398	168,946	2,382	164,516	2,810	325,609	2,792	317,189	2,775	308,906	3,237	586,483	3,216	570,557	3,196	556,143
24,8	1,203	10,137	1,316	14,535	1,309	14,211	1,561	28,917	1,551	28,124	1,541	27,441	1,808	52,420	1,795	50,987	1,783	49,578	2,089	94,597	2,074	91,912	2,062	89,677	2,423	174,158	2,407	169,636	2,392	165,187	2,821	326,936	2,804	318,483	2,786	310,165	3,250	588,873	3,229	572,882	3,209	558,409
25	1,208	10,178	1,322	14,595	1,314	14,269	1,568	29,034	1,557	28,238	1,548	27,552	1,815	52,633	1,803	51,193	1,790	49,779	2,097	94,980	2,082	92,284	2,070	90,041	2,433	174,863	2,417	170,322	2,402	165,855	2,833	328,258	2,815	319,770	2,797	311,419	3,264	591,252	3,242	575,197	3,222	560,666
25,2	1,213	10,219	1,327	14,653	1,320	14,327	1,574	29,151	1,563	28,351	1,554	27,663	1,822	52,844	1,810	51,399	1,798	49,979	2,106	95,361	2,091	92,655	2,078	90,402	2,442	175,564	2,427	171,006	2,411	166,521	2,844	329,575	2,826	321,053	2,808	312,669	3,277	593,623	3,255	577,503	3,235	562,913
25,4	1,218	10,260	1,332	14,712	1,325	14,384	1,580	29,268	1,569	28,465	1,560	27,773	1,830	53,055	1,817	51,604	1,805	50,178	2,114	95,742	2,099	93,024	2,087	90,763	2,452	176,264	2,437	171,687	2,421	167,184	2,856	330,887	2,838	322,331	2,820	313,913	3,290	595,983	3,268	579,799	3,248	565,152
25,6	1,223	10,301	1,338	14,770	1,330	14,441	1,587	29,384	1,576	28,577	1,566	27,883	1,837	53,265	1,824	51,809	1,812	50,377	2,122	96,120	2,107	93,392	2,095	91,122	2,462	176,960	2,446	172,365	2,431	167,845	2,867	332,193	2,849	323,603	2,831	315,152	3,303	598,335	3,281	582,087	3,261	567,382
25,8	1,227	10,341	1,343	14,829	1,335	14,498	1,593	29,499	1,582	28,690	1,572	27,993	1,844	53,474	1,832	52,012	1,819	50,575	2,131	96,497	2,116	93,759	2,103	91,479	2,472	177,654	2,456	173,041	2,440	168,503	2,878	333,494	2,860	324,871	2,842	316,387	3,316	600,677	3,294	584,366	3,274	569,604
26	1,232	10,382	1,348	14,886	1,341	14,554	1,599	29,614	1,588	28,802	1,578	28,102	1,851	53,683	1,839	52,215	1,826	50,772	2,139	96,873	2,124	94,124	2,111	91,835	2,481	178,345	2,465	173,714	2,450	169,159	2,889	334,790	2,871	326,134	2,853	317,617	3,329	603,011	3,307	586,636	3,286	571,816
26,2	1,237	10,422	1,353	14,944	1,346	14,611	1,605	29,729	1,594	28,913	1,585	28,211	1,858	53,890	1,846	52,417	1,833	50,968	2,147	97,247	2,132	94,487	2,119	92,190	2,491	179,033	2,475	174,385	2,459	169,812	2,900	336,082	2,882	327,392	2,864	318,842	3,341	605,335	3,319	588,897	3,299	574,020
26,4	1,242	10,462	1,359	15,002	1,351	14,667	1,611	29,843	1,600	29,024	1,591	28,320	1,866	54,097	1,853	52,618	1,840	51,164	2,155	97,620	2,140	94,849	2,127	92,544	2,500	179,719	2,484	175,053	2,468	170,462	2,912	337,368	2,893	328,645	2,875	320,062	3,354	607,650	3,332	591,150	3,312	576,216
26,6	1,246	10,502	1,364	15,059	1,356	14,723	1,617	29,957	1,606	29,135	1,597	28,427	1,873	54,303	1,860	52,818	1,847	51,359	2,164	97,991	2,148	95,210	2,136	92,896	2,510	180,402	2,494	175,718	2,478	171,110	2,923	338,649	2,904	329,893	2,886	321,278	3,367	609,957	3,345	593,394	3,324	578,404
26,8	1,251	10,542	1,369	15,116	1,361	14,779	1,624	30,070	1,612	29,245	1,603	28,535	1,880	54,508	1,867	53,018	1,854	51,553	2,172	98,361	2,157	95,570	2,144	93,247	2,519	181,083	2,503	176,381	2,487	171,756	2,934	339,926	2,915	331,137	2,897	322,489	3,380	612,255	3,357	595,630	3,337	580,583
27	1,256	10,582	1,374	15,173	1,366	14,834	1,630	30,183	1,619	29,355	1,609	28,642	1,887	54,713	1,874	53,217	1,861	51,746	2,180	98,730	2,165	95,928	2,152	93,596	2,529	181,761	2,513	177,041	2,496	172,399	2,945	341,198	2,926	332,376	2,907	323,696	3,392	614,545	3,370	597,857	3,349	582,754
27,2	1,261	10,621	1,379	15,229	1,372	14,890	1,636	30,295	1,625	29,464	1,615	28,749	1,894	54,916	1,881	53,415	1,868	51,939	2,188	99,097	2,173	96,285	2,160	93,944	2,538	182,436	2,522	177,700	2,506	173,040	2,956	342,465	2,937	333,610	2,918	324,898	3,405	616,826	3,382	600,076	3,362	584,917
27,4	1,265	10,660	1,384	15,286	1,377	14,945	1,642	30,408	1,631	29,573	1,621	28,855	1,901	55,119	1,888	53,612	1,875	52,131	2,196	99,463	2,181	96,640	2,168	94,291	2,547	183,109	2,531	178,355	2,515	173,678	2,966	343,728	2,948	334,840	2,929	326,096	3,417	619,099	3,395	602,287	3,374	587,073
27,6	1,270	10,700	1,389	15,342	1,382	15,000	1,648	30,519	1,637	29,682	1,627	28,961	1,908	55,322	1,895	53,809	1,882	52,322	2,204	99,828	2,189	96,995	2,176	94,637	2,557	183,780	2,541	179,008	2,524	174,314	2,977	344,986	2,959	336,066	2,940	327,290	3,430	621,363	3,407	604,490	3,386	589,220
27,8	1,275	10,739	1,395	15,398	1,387	15,055	1,654	30,630	1,643	29,790	1,633	29,067	1,915	55,523	1,902	54,005	1,889	52,513	2,212	100,191	2,197	97,348	2,184	94,981	2,566	184,448	2,550	179,659	2,533	174,948	2,988	346,239	2,969	337,287	2,950	328,479	3,442	623,619	3,420	606,685	3,399	591,360
28	1,279	10,778	1,400	15,454	1,392	15,109	1,660	30,741	1,648	29,898	1,639	29,172	1,922	55,724	1,909	54,200	1,895	52,702	2,220	100,553	2,205	97,699	2,191	95,324	2,575	185,114	2,559	180,308	2,543	175,580	2,999	347,488	2,980	338,503	2,961	329,664	3,455	625,867	3,432	608,873	3,411	593,492
28,2	1,284	10,817	1,405	15,510	1,397	15,164	1,666	30,852	1,654	30,006	1,644	29,277	1,929	55,924	1,915	54,395	1,902	52,892	2,228	100,914	2,213	98,050	2,199	95,666	2,585	185,777	2,568	180,954	2,552	176,209	3,010	348,732	2,991	339,716	2,972	330,844	3,467	628,107	3,444	611,052	3,423	595,616
28,4	1,288	10,855	1,410	15,565	1,402	15,218	1,672	30,962	1,660	30,113	1,650	29,381	1,935	56,123	1,922	54,589	1,909	53,080	2,236	101,273	2,220	98,399	2,207	96,007	2,594	186,438	2,577	181,598	2,561	176,836	3,020	349,973	3,001	340,924	2,982	332,021	3,479	630,340	3,456	613,223	3,435	597,733
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.4: roughness coefficient k=0,75 mm (5/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
28,6	1,293	10,894	1,415	15,620	1,407	15,272	1,678	31,072	1,666	30,219	1,656	29,486	1,942	56,322	1,929	54,782	1,916	53,268	2,244	101,631	2,228	98,747	2,215	96,346	2,603	187,097	2,586	182,240	2,570	177,461	3,031	351,208	3,012	342,128	2,993	333,193	3,492	632,564	3,469	615,387	3,447	599,842
28,8	1,298	10,932	1,420	15,675	1,412	15,326	1,684	31,181	1,672	30,326	1,662	29,589	1,949	56,520	1,936	54,974	1,923	53,455	2,252	101,988	2,236	99,094	2,223	96,685	2,612	187,754	2,595	182,879	2,579	178,083	3,042	352,440	3,022	343,327	3,003	334,362	3,504	634,781	3,481	617,544	3,460	601,944
29	1,302	10,971	1,425	15,730	1,417	15,379	1,689	31,290	1,678	30,432	1,668	29,693	1,956	56,717	1,943	55,166	1,929	53,642	2,260	102,344	2,244	99,439	2,230	97,022	2,621	188,408	2,604	183,516	2,588	178,704	3,052	353,667	3,033	344,523	3,014	335,526	3,516	636,989	3,493	619,693	3,472	604,039
29,2	1,307	11,009	1,430	15,785	1,422	15,433	1,695	31,398	1,684	30,537	1,674	29,796	1,963	56,914	1,949	55,358	1,936	53,828	2,267	102,698	2,252	99,784	2,238	97,358	2,630	189,060	2,613	184,151	2,597	179,322	3,063	354,890	3,043	345,714	3,024	336,686	3,528	639,191	3,505	621,834	3,484	606,126
29,4	1,311	11,047	1,434	15,839	1,426	15,486	1,701	31,507	1,690	30,642	1,679	29,898	1,969	57,110	1,956	55,548	1,943	54,013	2,275	103,051	2,259	100,127	2,246	97,693	2,639	189,709	2,622	184,784	2,606	179,939	3,073	356,108	3,054	346,901	3,034	337,842	3,540	641,384	3,517	623,969	3,495	608,207
29,6	1,316	11,085	1,439	15,893	1,431	15,539	1,707	31,614	1,695	30,747	1,685	30,001	1,976	57,305	1,963	55,738	1,949	54,198	2,283	103,403	2,267	100,469	2,254	98,027	2,648	190,357	2,631	185,415	2,615	180,553	3,084	357,323	3,064	348,084	3,045	338,995	3,552	643,571	3,529	626,096	3,507	610,280
29,8	1,320	11,122	1,444	15,948	1,436	15,592	1,713	31,722	1,701	30,852	1,691	30,103	1,983	57,499	1,969	55,927	1,956	54,382	2,291	103,754	2,275	100,810	2,261	98,359	2,657	191,002	2,640	186,043	2,623	181,165	3,094	358,533	3,075	349,263	3,055	340,143	3,564	645,750	3,541	628,216	3,519	612,346
30	1,325	11,160	1,449	16,001	1,441	15,645	1,719	31,829	1,707	30,956	1,696	30,204	1,990	57,693	1,976	56,116	1,962	54,565	2,299	104,104	2,282	101,149	2,269	98,691	2,666	191,645	2,649	186,670	2,632	181,775	3,105	359,740	3,085	350,439	3,065	341,288	3,576	647,921	3,553	630,328	3,531	614,406
30,5	1,336	11,254	1,461	16,136	1,453	15,776	1,733	32,095	1,721	31,215	1,711	30,457	2,006	58,175	1,993	56,585	1,979	55,021	2,318	104,973	2,302	101,994	2,288	99,515	2,688	193,244	2,671	188,227	2,654	183,291	3,130	362,738	3,111	353,360	3,091	344,133	3,606	653,319	3,582	635,579	3,561	619,525
31	1,347	11,346	1,473	16,268	1,465	15,906	1,747	32,359	1,735	31,472	1,725	30,708	2,023	58,654	2,009	57,050	1,995	55,474	2,337	105,835	2,320	102,831	2,307	100,332	2,710	194,830	2,693	189,771	2,676	184,795	3,156	365,712	3,136	356,257	3,116	346,954	3,636	658,673	3,612	640,788	3,590	624,601
31,5	1,358	11,438	1,485	16,400	1,477	16,035	1,761	32,621	1,749	31,726	1,739	30,956	2,039	59,128	2,025	57,511	2,011	55,922	2,356	106,690	2,339	103,662	2,325	101,142	2,732	196,402	2,715	191,303	2,698	186,287	3,182	368,663	3,162	359,131	3,141	349,753	3,665	663,983	3,641	645,954	3,619	629,638
32	1,368	11,530	1,497	16,531	1,489	16,163	1,775	32,881	1,763	31,979	1,753	31,203	2,055	59,598	2,041	57,969	2,027	56,367	2,374	107,538	2,358	104,486	2,344	101,947	2,754	197,963	2,737	192,823	2,719	187,767	3,207	371,590	3,187	361,982	3,166	352,530	3,694	669,252	3,670	651,080	3,647	634,634
32,5	1,379	11,620	1,509	16,661	1,500	16,289	1,789	33,139	1,777	32,230	1,766	31,447	2,071	60,065	2,057	58,423	2,043	56,809	2,393	108,380	2,376	105,304	2,362	102,745	2,776	199,511	2,758	194,331	2,740	189,236	3,232	374,494	3,212	364,812	3,191	355,286	3,723	674,479	3,698	656,166	3,676	639,591
33	1,390	11,710	1,521	16,790	1,512	16,415	1,803	33,395	1,791	32,479	1,780	31,690	2,087	60,528	2,073	58,874	2,059	57,247	2,411	109,215	2,395	106,116	2,380	103,536	2,797	201,047	2,779	195,828	2,761	190,693	3,257	377,376	3,236	367,619	3,216	358,020	3,752	679,667	3,727	661,213	3,704	644,511
33,5	1,400	11,799	1,532	16,918	1,524	16,540	1,817	33,649	1,804	32,726	1,793	31,931	2,103	60,988	2,089	59,321	2,075	57,682	2,430	110,044	2,413	106,921	2,398	104,322	2,818	202,572	2,800	197,313	2,782	192,139	3,281	380,236	3,261	370,405	3,240	360,733	3,780	684,815	3,755	666,221	3,732	649,393
34	1,411	11,888	1,544	17,044	1,535	16,664	1,830	33,901	1,818	32,971	1,807	32,170	2,119	61,445	2,105	59,765	2,090	58,114	2,448	110,866	2,431	107,721	2,416	105,102	2,839	204,085	2,821	198,787	2,803	193,575	3,306	383,075	3,285	373,171	3,264	363,427	3,808	689,925	3,783	671,193	3,760	654,239
34,5	1,421	11,976	1,555	17,170	1,546	16,788	1,844	34,151	1,831	33,214	1,820	32,408	2,135	61,898	2,120	60,205	2,106	58,542	2,466	111,683	2,449	108,514	2,434	105,877	2,860	205,588	2,842	200,251	2,824	195,000	3,330	385,893	3,309	375,916	3,288	366,100	3,836	694,998	3,811	676,128	3,788	659,050
35	1,432	12,063	1,566	17,295	1,558	16,910	1,857	34,399	1,845	33,456	1,833	32,644	2,150	62,347	2,135	60,643	2,121	58,967	2,484	112,494	2,466	109,302	2,452	106,645	2,881	207,079	2,863	201,703	2,844	196,415	3,354	388,690	3,333	378,642	3,312	368,755	3,864	700,034	3,839	681,027	3,815	663,825
35,5	1,442	12,150	1,578	17,420	1,569	17,031	1,871	34,646	1,858	33,696	1,847	32,878	2,165	62,794	2,151	61,077	2,136	59,390	2,502	113,299	2,484	110,084	2,469	107,409	2,902	208,560	2,883	203,146	2,865	197,819	3,378	391,468	3,357	381,348	3,336	371,390	3,892	705,034	3,866	685,892	3,842	668,567
36	1,452	12,236	1,589	17,543	1,580	17,152	1,884	34,891	1,871	33,934	1,860	33,110	2,181	63,237	2,166	61,508	2,151	59,809	2,519	114,098	2,502	110,861	2,487	108,167	2,922	210,031	2,903	204,578	2,885	199,214	3,402	394,226	3,381	384,035	3,359	374,007	3,919	710,000	3,893	690,722	3,869	673,276
36,5	1,462	12,321	1,600	17,665	1,591	17,271	1,897	35,134	1,884	34,170	1,873	33,341	2,196	63,678	2,181	61,937	2,166	60,226	2,537	114,892	2,519	111,632	2,504	108,919	2,942	211,491	2,924	206,001	2,905	200,600	3,426	396,966	3,404	386,703	3,383	376,606	3,946	714,930	3,920	695,519	3,896	677,952
37	1,472	12,406	1,611	17,787	1,602	17,390	1,910	35,375	1,897	34,405	1,886	33,570	2,211	64,115	2,196	62,362	2,181	60,639	2,554	115,681	2,536	112,398	2,521	109,667	2,962	212,941	2,944	207,413	2,925	201,975	3,449	399,686	3,428	389,353	3,406	379,187	3,973	719,828	3,947	700,284	3,923	682,596
37,5	1,482	12,490	1,622	17,908	1,613	17,508	1,923	35,615	1,910	34,639	1,898	33,798	2,226	64,549	2,211	62,785	2,196	61,050	2,571	116,464	2,553	113,159	2,538	110,409	2,982	214,382	2,964	208,817	2,945	203,342	3,473	402,388	3,451	391,986	3,429	381,751	4,000	724,692	3,974	705,016	3,950	687,209
38	1,492	12,574	1,633	18,028	1,624	17,626	1,936	35,854	1,923	34,870	1,911	34,024	2,241	64,981	2,226	63,205	2,210	61,458	2,589	117,242	2,571	113,915	2,555	111,147	3,002	215,813	2,983	210,211	2,964	204,699	3,496	405,073	3,474	394,601	3,452	384,298	4,027	729,524	4,000	709,717	3,976	691,791
38,5	1,502	12,657	1,643	18,147	1,634	17,742	1,949	36,090	1,935	35,101	1,924	34,249	2,256	65,410	2,240	63,621	2,225	61,864	2,606	118,015	2,587	114,666	2,572	111,879	3,022	217,234	3,003	211,595	2,984	206,048	3,519	407,739	3,497	397,199	3,474	386,828	4,053	734,324	4,027	714,387	4,002	696,343
39	1,512	12,740	1,654	18,265	1,645	17,858	1,961	36,326	1,948	35,329	1,936	34,472	2,270	65,836	2,255	64,036	2,239	62,267	2,623	118,783	2,604	115,412	2,589	112,607	3,042	218,647	3,023	212,971	3,003	207,387	3,542	410,389	3,519	399,780	3,497	389,341	4,080	739,093	4,053	719,026	4,028	700,865
39,5	1,522	12,822	1,665	18,383	1,656	17,973	1,974	36,559	1,960	35,557	1,949	34,694	2,285	66,259	2,269	64,447	2,254	62,667	2,639	119,546	2,621	116,154	2,605	113,331	3,061	220,050	3,042	214,338	3,022	208,719	3,564	413,021	3,542	402,344	3,519	391,839	4,106	743,831	4,079	723,636	4,054	705,359
40	1,532	12,904	1,675	18,500	1,666	18,087	1,987	36,792	1,973	35,783	1,961	34,914	2,299	66,679	2,284	64,856	2,268	63,065	2,656	120,304	2,638	116,890	2,622	114,050	3,081	221,445	3,061	215,696	3,042	210,041	3,587	415,637	3,564	404,892	3,542	394,321	4,132	748,540	4,105	728,217	4,080	709,824
40,5	1,541	12,985	1,686	18,616	1,677	18,201	1,999	37,022	1,985	36,007	1,973	35,133	2,314	67,097	2,298	65,263	2,282	63,460	2,673	121,057	2,654	117,622	2,638	114,764	3,100	222,831	3,080	217,046	3,061	211,356	3,609	418,237	3,587	407,425	3,564	396,787	4,158	753,219	4,130	732,770	4,105	714,262
41	1,551	13,065	1,696	18,731	1,687	18,314	2,011	37,252	1,998	36,230	1,986	35,351	2,328	67,512	2,312	65,667	2,297	63,853	2,689	121,806	2,671	118,350	2,655	115,474	3,119	224,208	3,099	218,388	3,079	212,662	3,632	420,820	3,609	409,942	3,586	399,238	4,183	757,870	4,156	737,294	4,130	718,672
41,5	1,560	13,146	1,707	18,846	1,697	18,426	2,024	37,480	2,010	36,452	1,998	35,567	2,342	67,925	2,327	66,068	2,311	64,243	2,706	122,550	2,687	119,073	2,671	116,179	3,138	225,577	3,118	219,721	3,098	213,961	3,654	423,388	3,631	412,443	3,608	401,675	4,209	762,492	4,181	741,791	4,156	723,056
42	1,570	13,225	1,717	18,960	1,708	18,538	2,036	37,706	2,022	36,672	2,010	35,782	2,357	68,336	2,341	66,468	2,325	64,632	2,722	123,290	2,703	119,792	2,687	116,881	3,157	226,938	3,137	221,047	3,117	215,252	3,676	425,941	3,653	414,930	3,630	404,096	4,234	767,087	4,206	746,261	4,181	727,413
42,5	1,579	13,304	1,727	19,074	1,718	18,649	2,048	37,932	2,034	36,891	2,022	35,996	2,371	68,744	2,355	66,864	2,338	65,017	2,738	124,025	2,719	120,506	2,703	117,578	3,176	228,290	3,156	222,364	3,136	216,535	3,698	428,478	3,675	417,401	3,651	406,504	4,259	771,654	4,231	750,704	4,205	731,744
43	1,588	13,383	1,738	19,186	1,728	18,759	2,060	38,155	2,046	37,109	2,034	36,209	2,385	69,149	2,368	67,259	2,352	65,401	2,755	124,756	2,735	121,217	2,719	118,271	3,195	229,635	3,174	223,674	3,154	217,810	3,720	431,000	3,696	419,859	3,673	408,897	4,284	776,195	4,256	755,122	4,230	736,050
43,5	1,598	13,461	1,748	19,299	1,738	18,868	2,072	38,378	2,058	37,326	2,046	36,420	2,398	69,552	2,382	67,651	2,366	65,782	2,771	125,483	2,751	121,923	2,735	118,960	3,213	230,972	3,193	224,977	3,172	219,078	3,741	433,508	3,718	422,302	3,694	411,276	4,309	780,709	4,281	759,513	4,255	740,331
44	1,607	13,539	1,758	19,410	1,748	18,977	2,084	38,599	2,070	37,541	2,057	36,630	2,412	69,953	2,396	68,041	2,380	66,161	2,787	126,206	2,767	122,625	2,751	119,645	3,232	232,301	3,211	226,271	3,191	220,339	3,763	436,002	3,739	424,731	3,715	413,642	4,334	785,197	4,306	763,880	4,279	744,587
44,5	1,616	13,616	1,768	19,521	1,758	19,086	2,096	38,820	2,082	37,755	2,069	36,839	2,426	70,352	2,410	68,429	2,393	66,538	2,802	126,924	2,783	123,323	2,766	120,326	3,250	233,623	3,230	227,559	3,209	221,593	3,784	438,481	3,760	427,146	3,736	415,994	4,359	789,660	4,330	768,222	4,304	748,819
45	1,625	13,693	1,778	19,631	1,768	19,193	2,108	39,038	2,093	37,968	2,081	37,047	2,440	70,748	2,423	68,814	2,407	66,913	2,818	127,639	2,798	124,018	2,782	121,004	3,268	234,937	3,248	228,839	3,227	222,840	3,805	440,946	3,781	429,548	3,757	418,333	4,383	794,098	4,354	772,539	4,328	753,028
45,5	1,634	13,770	1,788	19,741	1,778	19,301	2,120	39,256	2,105	38,180	2,092	37,253	2,453	71,142	2,437	69,197	2,420	67,286	2,834	128,349	2,814	124,708	2,797	121,677	3,287	236,244	3,266	230,112	3,245	224,080	3,827	443,398	3,802	431,936	3,778	420,659	4,408	798,511	4,379	776,833	4,352	757,213
46	1,643	13,846	1,798	19,850	1,788	19,407	2,131	39,473	2,117	38,390	2,104	37,459	2,467	71,534	2,450	69,579	2,433	67,657	2,849	129,056	2,830	125,395	2,813	122,347	3,305	237,544	3,284	231,378	3,263	225,313	3,848	445,836	3,823	434,312	3,799	422,973	4,432	802,900	4,403	781,103	4,376	761,375
46,5	1,652	13,922	1,807	19,958	1,797	19,513	2,143	39,688	2,128	38,600	2,115	37,663	2,480	71,924	2,463	69,958	2,447	68,026	2,865	129,759	2,845	126,078	2,828	123,014	3,323	238,837	3,302	232,638	3,280	226,539	3,869	448,261	3,844	436,674	3,820	425,273	4,456	807,266	4,427	785,350	4,400	765,515
47	1,661	13,997	1,817	20,066	1,807	19,619	2,154	39,902	2,140	38,808	2,127	37,866	2,494	72,312	2,477	70,335	2,460	68,392	2,880	130,458	2,860	126,757	2,843	123,677	3,341	240,123	3,319	233,890	3,298	227,759	3,889	450,674	3,865	439,024	3,840	427,562	4,480	811,608	4,450	789,574	4,423	769,633
47,5	1,670	14,072	1,827	20,173	1,817	19,723	2,166	40,115	2,151	39,015	2,138	38,068	2,507	72,697	2,490	70,710	2,473	68,757	2,896	131,153	2,876	127,433	2,858	124,336	3,358	241,402	3,337	235,136	3,316	228,972	3,910	453,073	3,885	441,361	3,861	429,838	4,504	815,927	4,474	793,776	4,447	773,728
48	1,679	14,146	1,837	20,280	1,826	19,828	2,177	40,327	2,163	39,221	2,149	38,269	2,520	73,081	2,503	71,083	2,486	69,120	2,911	131,845	2,891	128,105	2,873	124,992	3,376	242,674	3,355	236,376	3,333	230,179	3,931	455,460	3,906	443,686	3,881	432,103	4,527	820,223	4,498	797,955	4,470	777,802
48,5	1,688	14,220	1,846	20,386	1,836	19,931	2,189	40,538	2,174	39,426	2,161	38,469	2,533	73,463	2,516	71,455	2,499	69,481	2,926	132,533	2,906	128,773	2,888	125,644	3,394	243,940	3,372	237,609	3,351	231,380	3,951	457,834	3,926	445,999	3,901	434,355	4,551	824,497	4,521	802,113	4,493	781,855
49	1,697	14,294	1,856	20,491	1,845	20,035	2,200	40,748	2,185	39,630	2,172	38,669	2,546	73,842	2,529	71,824	2,512	69,840	2,941	133,218	2,921	129,438	2,903	126,293	3,411	245,200	3,390	238,835	3,368	232,574	3,972	460,196	3,947	448,300	3,921	436,597	4,575	828,749	4,544	806,250	4,517	785,888
49,5	1,705	14,367	1,865	20,596	1,855	20,137	2,211	40,956	2,196	39,833	2,183	38,867	2,559	74,220	2,542	72,192	2,525	70,198	2,956	133,899	2,936	130,100	2,918	126,939	3,429	246,452	3,407	240,056	3,385	233,763	3,992	462,546	3,967	450,590	3,942	438,826	4,598	832,979	4,568	810,365	4,540	789,899
50	1,714	14,440	1,875	20,701	1,864	20,240	2,223	41,164	2,207	40,035	2,194	39,064	2,572	74,596	2,555	72,557	2,538	70,553	2,971	134,577	2,951	130,759	2,933	127,581	3,446	247,699	3,424	241,270	3,402	234,945	4,012	464,884	3,987	452,868	3,961	441,045	4,621	837,188	4,591	814,460	4,563	793,891
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.5: roughness coefficient k=1,0 mm (1/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,066	0,556	0,073	0,805	0,072	0,786	0,088	1,623	0,087	1,578	0,086	1,539	0,103	2,975	0,102	2,892	0,101	2,811	0,120	5,420	0,119	5,264	0,118	5,134	0,140	10,067	0,139	9,802	0,138	9,542	0,164	19,052	0,163	18,553	0,162	18,063	0,191	34,547	0,189	33,599	0,188	32,741
0,2	0,096	0,808	0,106	1,167	0,105	1,140	0,127	2,347	0,126	2,281	0,125	2,225	0,148	4,290	0,147	4,171	0,146	4,054	0,172	7,800	0,171	7,576	0,170	7,389	0,201	14,458	0,200	14,079	0,198	13,706	0,236	27,312	0,234	26,599	0,233	25,898	0,273	49,451	0,271	48,097	0,269	46,872
0,3	0,119	1,003	0,131	1,446	0,130	1,413	0,157	2,905	0,156	2,824	0,155	2,754	0,183	5,303	0,182	5,157	0,180	5,013	0,213	9,632	0,211	9,356	0,210	9,126	0,248	17,837	0,247	17,370	0,245	16,910	0,291	33,665	0,289	32,788	0,287	31,925	0,336	60,909	0,334	59,243	0,332	57,736
0,4	0,139	1,168	0,152	1,683	0,151	1,645	0,182	3,376	0,181	3,282	0,180	3,202	0,212	6,159	0,211	5,989	0,209	5,822	0,247	11,179	0,245	10,859	0,244	10,592	0,288	20,689	0,286	20,148	0,284	19,615	0,337	39,026	0,335	38,010	0,332	37,010	0,390	70,576	0,387	68,647	0,385	66,902
0,5	0,156	1,313	0,171	1,891	0,170	1,849	0,205	3,792	0,203	3,687	0,202	3,596	0,238	6,914	0,237	6,724	0,235	6,536	0,277	12,543	0,275	12,184	0,273	11,885	0,323	23,204	0,321	22,597	0,319	22,000	0,378	43,753	0,375	42,614	0,373	41,494	0,437	79,097	0,434	76,937	0,431	74,982
0,6	0,171	1,444	0,188	2,080	0,187	2,033	0,225	4,168	0,223	4,053	0,222	3,953	0,262	7,597	0,260	7,388	0,258	7,182	0,304	13,777	0,302	13,383	0,300	13,055	0,354	25,479	0,352	24,813	0,350	24,157	0,414	48,027	0,412	46,778	0,409	45,548	0,479	86,803	0,476	84,433	0,473	82,288
0,7	0,186	1,566	0,204	2,254	0,203	2,203	0,244	4,514	0,242	4,389	0,240	4,282	0,284	8,226	0,282	7,999	0,280	7,776	0,329	14,913	0,327	14,486	0,325	14,132	0,384	27,571	0,381	26,851	0,379	26,142	0,448	51,959	0,446	50,608	0,443	49,278	0,518	93,891	0,515	91,328	0,512	89,009
0,8	0,199	1,678	0,219	2,416	0,218	2,361	0,261	4,837	0,259	4,703	0,258	4,588	0,304	8,811	0,302	8,568	0,300	8,330	0,353	15,970	0,350	15,513	0,348	15,134	0,411	29,519	0,408	28,748	0,405	27,989	0,480	55,619	0,477	54,173	0,474	52,751	0,555	100,490	0,551	97,747	0,548	95,266
0,9	0,212	1,784	0,233	2,568	0,231	2,510	0,278	5,140	0,276	4,998	0,274	4,875	0,323	9,361	0,321	9,103	0,318	8,850	0,375	16,963	0,372	16,478	0,370	16,075	0,436	31,349	0,433	30,531	0,430	29,725	0,510	59,058	0,506	57,523	0,503	56,013	0,589	106,688	0,585	103,777	0,581	101,143
1	0,224	1,885	0,246	2,712	0,244	2,651	0,293	5,426	0,291	5,276	0,289	5,147	0,341	9,881	0,338	9,609	0,336	9,342	0,395	17,902	0,392	17,391	0,390	16,966	0,460	33,080	0,457	32,217	0,454	31,367	0,538	62,310	0,534	60,691	0,531	59,098	0,621	112,551	0,617	109,481	0,613	106,702
1,1	0,235	1,980	0,258	2,849	0,256	2,785	0,308	5,699	0,306	5,542	0,304	5,406	0,358	10,376	0,355	10,090	0,353	9,810	0,415	18,796	0,412	18,259	0,409	17,813	0,483	34,727	0,480	33,821	0,477	32,929	0,564	65,404	0,561	63,705	0,557	62,033	0,652	118,128	0,648	114,906	0,644	111,990
1,2	0,246	2,071	0,270	2,980	0,268	2,913	0,322	5,960	0,320	5,795	0,318	5,653	0,374	10,849	0,372	10,550	0,369	10,257	0,434	19,650	0,431	19,089	0,428	18,622	0,505	36,301	0,502	35,353	0,498	34,421	0,590	68,361	0,586	66,585	0,582	64,838	0,681	123,457	0,677	120,090	0,673	117,043
1,3	0,256	2,159	0,281	3,105	0,280	3,035	0,335	6,210	0,333	6,038	0,331	5,891	0,390	11,303	0,387	10,991	0,384	10,686	0,452	20,469	0,449	19,885	0,446	19,399	0,526	37,810	0,523	36,824	0,519	35,853	0,614	71,197	0,610	69,347	0,607	67,528	0,710	128,568	0,705	125,063	0,701	121,890
1,4	0,266	2,243	0,292	3,226	0,290	3,153	0,348	6,450	0,346	6,272	0,344	6,119	0,405	11,739	0,402	11,416	0,399	11,099	0,469	21,258	0,466	20,651	0,463	20,146	0,546	39,263	0,543	38,239	0,539	37,231	0,638	73,926	0,634	72,006	0,630	70,117	0,737	133,487	0,732	129,848	0,727	126,554
1,5	0,276	2,324	0,303	3,343	0,301	3,267	0,361	6,683	0,358	6,498	0,356	6,339	0,419	12,160	0,416	11,826	0,414	11,497	0,486	22,019	0,483	21,390	0,480	20,868	0,566	40,665	0,562	39,604	0,558	38,560	0,661	76,559	0,656	74,571	0,652	72,615	0,763	138,233	0,758	134,465	0,753	131,055
1,6	0,285	2,403	0,313	3,455	0,311	3,378	0,373	6,907	0,370	6,717	0,368	6,552	0,433	12,568	0,430	12,222	0,427	11,882	0,502	22,755	0,499	22,105	0,496	21,565	0,585	42,021	0,581	40,924	0,577	39,846	0,683	79,106	0,678	77,052	0,674	75,031	0,788	142,824	0,783	138,931	0,778	135,408
1,7	0,294	2,479	0,323	3,565	0,321	3,485	0,385	7,125	0,382	6,928	0,380	6,759	0,447	12,963	0,444	12,606	0,441	12,256	0,518	23,468	0,514	22,798	0,511	22,241	0,603	43,335	0,599	42,204	0,595	41,092	0,704	81,575	0,699	79,457	0,695	77,373	0,813	147,273	0,807	143,259	0,802	139,627
1,8	0,303	2,553	0,332	3,671	0,331	3,588	0,396	7,336	0,393	7,134	0,391	6,960	0,460	13,346	0,457	12,979	0,454	12,619	0,533	24,160	0,530	23,471	0,526	22,898	0,621	44,611	0,617	43,447	0,613	42,303	0,725	83,972	0,720	81,792	0,715	79,647	0,837	151,594	0,831	147,462	0,826	143,723
1,9	0,312	2,625	0,342	3,774	0,340	3,689	0,407	7,542	0,404	7,334	0,402	7,155	0,473	13,719	0,470	13,342	0,467	12,972	0,548	24,834	0,544	24,126	0,541	23,536	0,638	45,852	0,634	44,656	0,630	43,480	0,745	86,303	0,740	84,063	0,735	81,859	0,860	155,796	0,854	151,550	0,849	147,708
2	0,320	2,695	0,351	3,875	0,349	3,788	0,418	7,742	0,415	7,529	0,413	7,345	0,486	14,083	0,482	13,696	0,479	13,315	0,563	25,490	0,559	24,763	0,555	24,159	0,655	47,061	0,650	45,834	0,646	44,626	0,764	88,574	0,760	86,275	0,755	84,013	0,883	159,889	0,877	155,532	0,871	151,589
2,1	0,328	2,764	0,360	3,973	0,358	3,884	0,429	7,938	0,426	7,719	0,423	7,530	0,498	14,437	0,494	14,040	0,491	13,650	0,577	26,130	0,573	25,385	0,569	24,765	0,671	48,240	0,667	46,982	0,662	45,745	0,784	90,789	0,779	88,433	0,773	86,115	0,905	163,881	0,899	159,415	0,893	155,374
2,2	0,336	2,831	0,368	4,069	0,366	3,977	0,439	8,129	0,436	7,904	0,433	7,711	0,510	14,783	0,506	14,377	0,503	13,978	0,591	26,755	0,587	25,993	0,583	25,358	0,687	49,391	0,683	48,104	0,678	46,837	0,802	92,952	0,797	90,540	0,792	88,166	0,926	167,779	0,920	163,208	0,914	159,071
2,3	0,344	2,896	0,377	4,162	0,375	4,069	0,449	8,315	0,446	8,086	0,443	7,888	0,521	15,122	0,518	14,706	0,514	14,298	0,604	27,366	0,600	26,586	0,596	25,937	0,703	50,517	0,698	49,200	0,694	47,904	0,820	95,067	0,815	92,599	0,810	90,172	0,947	171,590	0,941	166,915	0,935	162,684
2,4	0,351	2,960	0,385	4,254	0,383	4,159	0,459	8,498	0,456	8,263	0,453	8,062	0,533	15,453	0,529	15,028	0,525	14,611	0,617	27,964	0,613	27,167	0,609	26,504	0,718	51,618	0,713	50,273	0,709	48,949	0,838	97,135	0,833	94,615	0,828	92,135	0,968	175,319	0,961	170,542	0,955	166,219
2,5	0,359	3,022	0,393	4,344	0,391	4,246	0,468	8,676	0,465	8,437	0,462	8,231	0,544	15,777	0,540	15,344	0,537	14,918	0,630	28,550	0,626	27,736	0,622	27,059	0,733	52,697	0,728	51,323	0,724	49,972	0,856	99,162	0,850	96,588	0,845	94,057	0,988	178,970	0,981	174,095	0,975	169,682
2,6	0,366	3,084	0,401	4,432	0,399	4,333	0,478	8,852	0,475	8,608	0,472	8,397	0,555	16,095	0,551	15,653	0,547	15,218	0,643	29,124	0,638	28,294	0,635	27,603	0,748	53,754	0,743	52,353	0,738	50,975	0,873	101,148	0,867	98,523	0,862	95,941	1,008	182,550	1,001	177,577	0,995	173,076
2,7	0,373	3,144	0,409	4,518	0,407	4,417	0,487	9,024	0,484	8,775	0,481	8,561	0,566	16,407	0,562	15,956	0,558	15,513	0,655	29,687	0,651	28,841	0,647	28,136	0,762	54,791	0,757	53,363	0,752	51,958	0,890	103,096	0,884	100,421	0,878	97,789	1,027	186,061	1,020	180,993	1,014	176,406
2,8	0,380	3,203	0,417	4,603	0,414	4,500	0,496	9,192	0,493	8,939	0,490	8,721	0,576	16,713	0,572	16,254	0,568	15,803	0,668	30,239	0,663	29,378	0,659	28,660	0,776	55,810	0,771	54,355	0,766	52,924	0,906	105,009	0,900	102,284	0,895	99,604	1,046	189,508	1,039	184,346	1,033	179,674
2,9	0,387	3,261	0,424	4,686	0,422	4,581	0,505	9,358	0,502	9,100	0,499	8,878	0,587	17,014	0,583	16,546	0,579	16,087	0,680	30,782	0,675	29,905	0,671	29,175	0,790	56,810	0,785	55,329	0,780	53,873	0,922	106,887	0,917	104,114	0,911	101,386	1,065	192,894	1,058	187,640	1,051	182,885
3	0,394	3,318	0,432	4,768	0,429	4,661	0,514	9,521	0,510	9,259	0,507	9,033	0,597	17,309	0,593	16,834	0,589	16,366	0,691	31,316	0,687	30,424	0,682	29,681	0,804	57,793	0,799	56,287	0,794	54,805	0,938	108,734	0,932	105,913	0,926	103,138	1,083	196,223	1,076	190,878	1,069	186,041
3,1	0,400	3,374	0,439	4,849	0,437	4,740	0,523	9,681	0,519	9,414	0,516	9,185	0,607	17,600	0,603	17,116	0,599	16,641	0,703	31,841	0,698	30,934	0,694	30,178	0,817	58,760	0,812	57,228	0,807	55,722	0,954	110,550	0,948	107,682	0,942	104,861	1,101	199,496	1,094	194,062	1,087	189,145
3,2	0,407	3,430	0,446	4,928	0,444	4,817	0,531	9,839	0,528	9,568	0,524	9,334	0,617	17,886	0,613	17,395	0,608	16,912	0,714	32,357	0,709	31,435	0,705	30,668	0,831	59,711	0,825	58,155	0,820	56,624	0,969	112,337	0,963	109,423	0,957	106,556	1,119	202,717	1,111	197,195	1,105	192,199
3,3	0,414	3,484	0,453	5,006	0,451	4,894	0,540	9,994	0,536	9,719	0,533	9,482	0,626	18,168	0,622	17,669	0,618	17,178	0,726	32,866	0,720	31,929	0,716	31,150	0,844	60,648	0,838	59,067	0,833	57,513	0,985	114,097	0,978	111,137	0,972	108,225	1,136	205,887	1,129	200,280	1,122	195,205
3,4	0,420	3,537	0,460	5,083	0,458	4,969	0,548	10,147	0,544	9,868	0,541	9,627	0,636	18,445	0,632	17,938	0,627	17,440	0,737	33,367	0,731	32,416	0,727	31,625	0,857	61,570	0,851	59,966	0,845	58,388	1,000	115,830	0,993	112,825	0,987	109,869	1,154	209,011	1,146	203,318	1,139	198,167
3,5	0,426	3,590	0,467	5,159	0,465	5,043	0,556	10,298	0,552	10,014	0,549	9,770	0,645	18,718	0,641	18,204	0,637	17,699	0,748	33,860	0,742	32,895	0,738	32,093	0,869	62,479	0,864	60,852	0,858	59,250	1,014	117,537	1,008	114,489	1,001	111,489	1,171	212,088	1,163	206,312	1,156	201,085
3,6	0,432	3,642	0,474	5,233	0,471	5,116	0,564	10,447	0,560	10,159	0,557	9,911	0,655	18,988	0,650	18,466	0,646	17,954	0,758	34,347	0,753	33,368	0,748	32,554	0,882	63,376	0,876	61,724	0,870	60,100	1,029	119,221	1,022	116,129	1,016	113,086	1,187	215,122	1,180	209,264	1,172	203,962
3,7	0,438	3,694	0,481	5,307	0,478	5,188	0,572	10,593	0,568	10,301	0,564	10,050	0,664	19,253	0,659	18,725	0,655	18,205	0,769	34,827	0,763	33,834	0,759	33,009	0,894	64,260	0,888	62,585	0,882	60,938	1,043	120,881	1,037	117,746	1,030	114,661	1,204	218,115	1,196	212,175	1,189	206,799
3,8	0,444	3,744	0,487	5,379	0,484	5,259	0,580	10,738	0,576	10,442	0,572	10,187	0,673	19,516	0,668	18,980	0,664	18,453	0,779	35,300	0,774	34,294	0,769	33,457	0,906	65,132	0,900	63,435	0,894	61,766	1,057	122,519	1,051	119,341	1,044	116,215	1,220	221,067	1,212	215,046	1,205	209,598
3,9	0,450	3,794	0,494	5,451	0,491	5,329	0,587	10,880	0,583	10,580	0,580	10,322	0,682	19,774	0,677	19,231	0,672	18,698	0,790	35,767	0,784	34,748	0,779	33,900	0,918	65,992	0,912	64,273	0,906	62,582	1,071	124,136	1,064	120,916	1,058	117,749	1,236	223,980	1,228	217,881	1,220	212,361
4	0,456	3,844	0,500	5,522	0,497	5,398	0,595	11,021	0,591	10,717	0,587	10,456	0,691	20,030	0,686	19,480	0,681	18,939	0,800	36,228	0,794	35,196	0,789	34,338	0,930	66,842	0,924	65,101	0,918	63,388	1,085	125,732	1,078	122,471	1,071	119,263	1,252	226,856	1,244	220,679	1,236	215,088
4,1	0,462	3,892	0,506	5,592	0,504	5,466	0,603	11,160	0,598	10,853	0,595	10,588	0,699	20,282	0,695	19,725	0,690	19,178	0,810	36,684	0,804	35,639	0,799	34,769	0,942	67,681	0,936	65,918	0,929	64,184	1,099	127,308	1,092	124,006	1,085	120,758	1,268	229,697	1,259	223,442	1,252	217,782
4,2	0,468	3,940	0,513	5,661	0,510	5,534	0,610	11,298	0,606	10,986	0,602	10,718	0,708	20,531	0,703	19,968	0,698	19,414	0,820	37,134	0,814	36,076	0,809	35,196	0,953	68,510	0,947	66,725	0,941	64,970	1,112	128,865	1,105	125,523	1,098	122,235	1,283	232,503	1,275	226,172	1,267	220,443
4,3	0,473	3,988	0,519	5,729	0,516	5,601	0,617	11,434	0,613	11,119	0,609	10,847	0,717	20,778	0,712	20,207	0,707	19,647	0,830	37,579	0,824	36,508	0,819	35,618	0,965	69,329	0,958	67,523	0,952	65,747	1,125	130,404	1,118	127,022	1,111	123,695	1,299	235,276	1,290	228,870	1,282	223,072
4,4	0,479	4,035	0,525	5,796	0,522	5,667	0,625	11,568	0,620	11,249	0,616	10,975	0,725	21,021	0,720	20,444	0,715	19,877	0,839	38,018	0,833	36,935	0,828	36,034	0,976	70,139	0,969	68,312	0,963	66,515	1,139	131,925	1,131	128,504	1,124	125,138	1,314	238,017	1,305	231,536	1,297	225,671
4,5	0,484	4,082	0,531	5,863	0,528	5,732	0,632	11,700	0,627	11,378	0,623	11,101	0,733	21,262	0,728	20,678	0,723	20,105	0,849	38,453	0,843	37,358	0,838	36,446	0,987	70,940	0,981	69,092	0,974	67,274	1,152	133,429	1,144	129,968	1,137	126,564	1,329	240,727	1,320	234,173	1,312	228,241
4,6	0,490	4,127	0,537	5,929	0,534	5,796	0,639	11,832	0,634	11,506	0,630	11,225	0,741	21,500	0,736	20,910	0,731	20,330	0,858	38,883	0,852	37,775	0,847	36,854	0,998	71,731	0,992	69,863	0,985	68,025	1,164	134,916	1,157	131,417	1,149	127,975	1,344	243,407	1,335	236,780	1,326	230,782
4,7	0,495	4,173	0,543	5,994	0,540	5,860	0,646	11,962	0,641	11,632	0,637	11,348	0,750	21,735	0,744	21,139	0,739	20,552	0,868	39,308	0,862	38,188	0,856	37,257	1,009	72,514	1,002	70,626	0,996	68,768	1,177	136,387	1,170	132,850	1,162	129,371	1,358	246,058	1,349	239,359	1,341	233,296
4,8	0,501	4,218	0,549	6,059	0,546	5,923	0,653	12,090	0,648	11,757	0,644	11,470	0,758	21,968	0,752	21,365	0,747	20,773	0,877	39,728	0,871	38,597	0,866	37,655	1,020	73,289	1,013	71,380	1,006	69,503	1,190	137,842	1,182	134,268	1,174	130,751	1,373	248,682	1,364	241,911	1,355	235,784
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.5: roughness coefficient k=1,0 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,9	0,506	4,263	0,555	6,123	0,551	5,986	0,660	12,217	0,655	11,881	0,651	11,591	0,766	22,199	0,760	21,590	0,755	20,991	0,886	40,145	0,880	39,002	0,875	38,050	1,030	74,056	1,024	72,127	1,017	70,230	1,202	139,283	1,194	135,671	1,187	132,118	1,387	251,277	1,378	244,436	1,369	238,245
5	0,511	4,307	0,560	6,186	0,557	6,047	0,666	12,343	0,662	12,003	0,658	11,710	0,773	22,427	0,768	21,812	0,763	21,207	0,895	40,557	0,889	39,402	0,884	38,441	1,041	74,815	1,034	72,867	1,027	70,950	1,214	140,708	1,207	137,060	1,199	133,470	1,401	253,847	1,392	246,936	1,383	240,682
5,1	0,516	4,350	0,566	6,249	0,563	6,109	0,673	12,468	0,668	12,124	0,664	11,829	0,781	22,653	0,776	22,031	0,770	21,420	0,904	40,965	0,898	39,798	0,893	38,827	1,051	75,567	1,045	73,599	1,038	71,663	1,227	142,120	1,219	138,435	1,211	134,810	1,415	256,391	1,406	249,411	1,397	243,094
5,2	0,521	4,393	0,572	6,311	0,568	6,169	0,680	12,591	0,675	12,244	0,671	11,946	0,789	22,877	0,783	22,249	0,778	21,632	0,913	41,369	0,907	40,191	0,901	39,210	1,062	76,311	1,055	74,324	1,048	72,368	1,239	143,518	1,231	139,797	1,223	136,136	1,429	258,910	1,420	251,861	1,411	245,483
5,3	0,527	4,436	0,577	6,372	0,574	6,229	0,686	12,713	0,682	12,363	0,677	12,062	0,797	23,099	0,791	22,465	0,786	21,842	0,922	41,769	0,916	40,580	0,910	39,590	1,072	77,048	1,065	75,041	1,058	73,068	1,251	144,902	1,243	141,145	1,235	137,449	1,443	261,405	1,433	254,289	1,424	247,848
5,4	0,532	4,479	0,583	6,433	0,579	6,289	0,693	12,834	0,688	12,481	0,684	12,177	0,804	23,318	0,799	22,678	0,793	22,049	0,931	42,165	0,924	40,965	0,919	39,966	1,082	77,778	1,075	75,753	1,068	73,760	1,262	146,274	1,254	142,481	1,246	138,750	1,457	263,877	1,447	256,693	1,438	250,192
5,5	0,537	4,521	0,588	6,493	0,585	6,348	0,699	12,954	0,695	12,597	0,690	12,290	0,812	23,536	0,806	22,890	0,800	22,255	0,940	42,558	0,933	41,346	0,927	40,338	1,092	78,502	1,085	76,457	1,078	74,446	1,274	147,633	1,266	143,805	1,258	140,039	1,470	266,326	1,460	259,076	1,451	252,514
5,6	0,541	4,562	0,593	6,553	0,590	6,406	0,706	13,073	0,701	12,713	0,697	12,403	0,819	23,751	0,813	23,099	0,808	22,459	0,948	42,947	0,942	41,724	0,936	40,707	1,102	79,219	1,095	77,156	1,088	75,126	1,286	148,979	1,278	145,117	1,269	141,317	1,483	268,753	1,474	261,436	1,464	254,815
5,7	0,546	4,604	0,599	6,612	0,595	6,464	0,712	13,191	0,707	12,828	0,703	12,515	0,826	23,965	0,821	23,307	0,815	22,661	0,957	43,333	0,950	42,099	0,944	41,072	1,112	79,929	1,105	77,848	1,098	75,800	1,297	150,314	1,289	146,417	1,281	142,583	1,497	271,158	1,487	263,776	1,478	257,096
5,8	0,551	4,644	0,604	6,671	0,601	6,521	0,719	13,308	0,714	12,941	0,709	12,626	0,834	24,177	0,828	23,513	0,822	22,861	0,965	43,715	0,958	42,471	0,953	41,435	1,122	80,633	1,115	78,534	1,107	76,468	1,309	151,637	1,300	147,705	1,292	143,838	1,510	273,542	1,500	266,095	1,491	259,357
5,9	0,556	4,685	0,609	6,729	0,606	6,578	0,725	13,423	0,720	13,054	0,715	12,736	0,841	24,387	0,835	23,717	0,829	23,060	0,974	44,094	0,967	42,839	0,961	41,794	1,131	81,332	1,124	79,214	1,117	77,130	1,320	152,948	1,312	148,983	1,303	145,082	1,523	275,906	1,513	268,395	1,503	261,598
6	0,561	4,725	0,615	6,786	0,611	6,634	0,731	13,538	0,726	13,165	0,721	12,844	0,848	24,595	0,842	23,920	0,836	23,257	0,982	44,470	0,975	43,204	0,969	42,151	1,141	82,024	1,134	79,888	1,126	77,787	1,331	154,249	1,323	150,250	1,314	146,316	1,536	278,249	1,526	270,675	1,516	263,820
6,1	0,566	4,765	0,620	6,844	0,616	6,690	0,737	13,652	0,732	13,276	0,728	12,953	0,855	24,801	0,849	24,121	0,843	23,452	0,990	44,843	0,983	43,566	0,977	42,504	1,151	82,711	1,143	80,557	1,136	78,438	1,342	155,539	1,334	151,506	1,325	147,539	1,549	280,574	1,538	272,936	1,529	266,024
6,2	0,570	4,805	0,625	6,900	0,621	6,746	0,743	13,765	0,738	13,386	0,734	13,060	0,862	25,006	0,856	24,320	0,850	23,646	0,998	45,213	0,991	43,926	0,985	42,854	1,160	83,392	1,153	81,220	1,145	79,084	1,353	156,818	1,345	152,752	1,336	148,753	1,561	282,879	1,551	275,179	1,541	268,210
6,3	0,575	4,844	0,630	6,957	0,626	6,801	0,749	13,877	0,744	13,495	0,739	13,166	0,869	25,209	0,863	24,518	0,857	23,838	1,006	45,580	0,999	44,282	0,993	43,202	1,170	84,067	1,162	81,878	1,154	79,725	1,364	158,087	1,356	153,988	1,347	149,956	1,574	285,166	1,564	277,403	1,554	270,379
6,4	0,580	4,883	0,635	7,012	0,631	6,855	0,755	13,988	0,750	13,603	0,745	13,271	0,876	25,411	0,870	24,714	0,864	24,028	1,014	45,943	1,007	44,636	1,001	43,547	1,179	84,738	1,171	82,531	1,164	80,361	1,375	159,346	1,366	155,215	1,358	151,151	1,587	287,435	1,576	279,611	1,566	272,530
6,5	0,584	4,922	0,640	7,068	0,636	6,910	0,761	14,098	0,756	13,710	0,751	13,376	0,883	25,611	0,877	24,908	0,871	24,217	1,022	46,304	1,015	44,986	1,009	43,889	1,188	85,403	1,180	83,179	1,173	80,991	1,386	160,595	1,377	156,432	1,368	152,336	1,599	289,686	1,588	281,801	1,579	274,665
6,6	0,589	4,960	0,645	7,123	0,641	6,963	0,767	14,208	0,762	13,817	0,757	13,480	0,890	25,809	0,884	25,101	0,878	24,405	1,030	46,663	1,023	45,334	1,017	44,229	1,197	86,063	1,190	83,822	1,182	81,617	1,397	161,834	1,388	157,639	1,379	153,512	1,611	291,920	1,601	283,974	1,591	276,783
6,7	0,593	4,998	0,650	7,177	0,646	7,017	0,773	14,316	0,768	13,922	0,763	13,583	0,897	26,006	0,891	25,293	0,884	24,591	1,038	47,018	1,031	45,680	1,025	44,566	1,206	86,717	1,199	84,460	1,191	82,239	1,407	163,065	1,398	158,837	1,389	154,679	1,624	294,137	1,613	286,130	1,603	278,885
6,8	0,598	5,036	0,655	7,232	0,651	7,070	0,779	14,424	0,773	14,027	0,769	13,685	0,904	26,202	0,897	25,483	0,891	24,776	1,046	47,371	1,039	46,023	1,032	44,901	1,215	87,368	1,208	85,093	1,200	82,855	1,418	164,286	1,409	160,027	1,400	155,837	1,636	296,337	1,625	288,271	1,615	280,972
6,9	0,602	5,073	0,660	7,285	0,656	7,122	0,785	14,531	0,779	14,131	0,774	13,787	0,910	26,396	0,904	25,671	0,898	24,960	1,054	47,722	1,046	46,363	1,040	45,233	1,224	88,013	1,217	85,721	1,209	83,467	1,428	165,498	1,419	161,208	1,410	156,987	1,648	298,522	1,637	290,396	1,627	283,043
7	0,607	5,110	0,665	7,339	0,661	7,174	0,790	14,637	0,785	14,234	0,780	13,888	0,917	26,588	0,911	25,859	0,904	25,142	1,061	48,069	1,054	46,701	1,047	45,562	1,233	88,654	1,225	86,345	1,217	84,075	1,439	166,701	1,429	162,380	1,420	158,128	1,660	300,690	1,649	292,506	1,639	285,099
7,1	0,611	5,147	0,669	7,392	0,666	7,226	0,796	14,743	0,790	14,337	0,786	13,988	0,923	26,780	0,917	26,045	0,911	25,323	1,069	48,415	1,061	47,037	1,055	45,890	1,242	89,290	1,234	86,965	1,226	84,678	1,449	167,896	1,440	163,544	1,430	159,262	1,672	302,843	1,661	294,601	1,650	287,141
7,2	0,615	5,184	0,674	7,444	0,670	7,278	0,802	14,848	0,796	14,439	0,791	14,087	0,930	26,969	0,924	26,230	0,917	25,502	1,077	48,758	1,069	47,370	1,062	46,215	1,251	89,921	1,243	87,580	1,235	85,277	1,459	169,082	1,450	164,699	1,441	160,387	1,683	304,982	1,672	296,681	1,662	289,168
7,3	0,620	5,220	0,679	7,497	0,675	7,329	0,807	14,952	0,802	14,540	0,797	14,186	0,937	27,158	0,930	26,413	0,924	25,681	1,084	49,098	1,076	47,701	1,070	46,538	1,260	90,549	1,252	88,191	1,243	85,872	1,469	170,260	1,460	165,847	1,451	161,505	1,695	307,105	1,684	298,746	1,673	291,182
7,4	0,624	5,257	0,684	7,548	0,680	7,379	0,813	15,055	0,807	14,640	0,802	14,284	0,943	27,345	0,937	26,595	0,930	25,858	1,092	49,436	1,084	48,029	1,077	46,858	1,268	91,172	1,260	88,798	1,252	86,463	1,479	171,431	1,470	166,987	1,461	162,615	1,707	309,214	1,695	300,798	1,685	293,181
7,5	0,628	5,293	0,688	7,600	0,684	7,430	0,818	15,157	0,813	14,740	0,808	14,381	0,949	27,532	0,943	26,776	0,936	26,034	1,099	49,772	1,091	48,356	1,085	47,177	1,277	91,790	1,269	89,401	1,261	87,050	1,489	172,593	1,480	168,119	1,471	163,718	1,718	311,308	1,707	302,835	1,696	295,167
7,6	0,632	5,328	0,693	7,651	0,689	7,480	0,824	15,259	0,818	14,839	0,813	14,478	0,956	27,716	0,949	26,956	0,943	26,209	1,106	50,106	1,098	48,680	1,092	47,493	1,286	92,405	1,277	89,999	1,269	87,633	1,499	173,748	1,490	169,244	1,480	164,813	1,730	313,389	1,718	304,860	1,708	297,140
7,7	0,637	5,364	0,698	7,702	0,694	7,530	0,829	15,361	0,824	14,938	0,819	14,574	0,962	27,900	0,956	27,135	0,949	26,382	1,114	50,438	1,106	49,002	1,099	47,807	1,294	93,016	1,286	90,594	1,277	88,212	1,509	174,895	1,500	170,361	1,490	165,901	1,741	315,456	1,730	306,870	1,719	299,101
7,8	0,641	5,399	0,702	7,753	0,698	7,579	0,835	15,461	0,829	15,036	0,824	14,669	0,968	28,082	0,962	27,312	0,955	26,555	1,121	50,767	1,113	49,322	1,106	48,120	1,302	93,622	1,294	91,185	1,286	88,788	1,519	176,034	1,510	171,471	1,500	166,982	1,753	317,510	1,741	308,868	1,730	301,048
7,9	0,645	5,434	0,707	7,803	0,703	7,628	0,840	15,561	0,834	15,133	0,829	14,764	0,975	28,264	0,968	27,488	0,961	26,726	1,128	51,094	1,120	49,640	1,113	48,430	1,311	94,225	1,302	91,772	1,294	89,359	1,529	177,166	1,519	172,574	1,509	168,056	1,764	319,550	1,752	310,853	1,741	302,983
8	0,649	5,469	0,711	7,853	0,707	7,677	0,846	15,661	0,840	15,229	0,835	14,858	0,981	28,444	0,974	27,664	0,967	26,897	1,135	51,419	1,127	49,956	1,120	48,738	1,319	94,824	1,311	92,356	1,302	89,927	1,539	178,292	1,529	173,670	1,519	169,124	1,775	321,578	1,763	312,826	1,752	304,905
8,1	0,653	5,503	0,716	7,902	0,712	7,726	0,851	15,759	0,845	15,325	0,840	14,952	0,987	28,623	0,980	27,838	0,973	27,066	1,142	51,743	1,134	50,270	1,127	49,044	1,327	95,420	1,319	92,936	1,310	90,492	1,548	179,410	1,538	174,760	1,529	170,185	1,786	323,593	1,774	314,786	1,763	306,816
8,2	0,657	5,538	0,720	7,952	0,716	7,774	0,856	15,857	0,850	15,421	0,845	15,045	0,993	28,801	0,986	28,011	0,980	27,234	1,150	52,064	1,141	50,582	1,134	49,349	1,336	96,011	1,327	93,512	1,319	91,053	1,558	180,521	1,548	175,842	1,538	171,239	1,797	325,596	1,785	316,735	1,774	308,715
8,3	0,661	5,572	0,725	8,001	0,720	7,822	0,861	15,955	0,855	15,516	0,850	15,138	0,999	28,978	0,992	28,183	0,986	27,402	1,157	52,383	1,148	50,892	1,141	49,652	1,344	96,599	1,335	94,085	1,327	91,611	1,567	181,625	1,557	176,918	1,547	172,287	1,808	327,586	1,796	318,671	1,785	310,603
8,4	0,665	5,606	0,729	8,049	0,725	7,869	0,867	16,052	0,861	15,610	0,855	15,230	1,005	29,153	0,998	28,354	0,992	27,568	1,164	52,700	1,155	51,201	1,148	49,952	1,352	97,184	1,343	94,654	1,335	92,165	1,577	182,723	1,567	177,987	1,557	173,328	1,819	329,565	1,807	320,596	1,796	312,479
8,5	0,669	5,640	0,733	8,098	0,729	7,917	0,872	16,148	0,866	15,704	0,861	15,321	1,011	29,328	1,004	28,524	0,997	27,733	1,171	53,016	1,162	51,507	1,155	50,251	1,360	97,765	1,351	95,220	1,343	92,716	1,586	183,815	1,576	179,051	1,566	174,364	1,830	331,532	1,818	322,509	1,807	314,344
8,6	0,673	5,673	0,738	8,146	0,734	7,964	0,877	16,244	0,871	15,797	0,866	15,412	1,017	29,502	1,010	28,693	1,003	27,897	1,177	53,329	1,169	51,812	1,162	50,549	1,368	98,343	1,359	95,783	1,351	93,264	1,596	184,900	1,586	180,107	1,575	175,393	1,841	333,487	1,829	324,411	1,817	316,198
8,7	0,677	5,707	0,742	8,194	0,738	8,010	0,882	16,339	0,876	15,889	0,871	15,502	1,023	29,674	1,016	28,861	1,009	28,061	1,184	53,641	1,176	52,115	1,169	50,844	1,376	98,917	1,367	96,342	1,358	93,809	1,605	185,978	1,595	181,158	1,585	176,416	1,852	335,431	1,839	326,302	1,828	318,041
8,8	0,681	5,740	0,746	8,241	0,742	8,057	0,887	16,434	0,881	15,982	0,876	15,592	1,029	29,846	1,022	29,028	1,015	28,223	1,191	53,951	1,183	52,416	1,176	51,138	1,384	99,488	1,375	96,898	1,366	94,351	1,614	187,051	1,604	182,203	1,594	177,434	1,862	337,364	1,850	328,183	1,838	319,874
8,9	0,685	5,773	0,751	8,289	0,746	8,103	0,892	16,528	0,886	16,073	0,881	15,682	1,035	30,017	1,028	29,194	1,021	28,384	1,198	54,259	1,190	52,715	1,182	51,430	1,392	100,056	1,383	97,451	1,374	94,889	1,623	188,117	1,613	183,242	1,603	178,445	1,873	339,286	1,860	330,052	1,849	321,696
9	0,689	5,805	0,755	8,336	0,751	8,149	0,897	16,622	0,891	16,164	0,886	15,770	1,041	30,187	1,034	29,359	1,027	28,545	1,205	54,566	1,196	53,013	1,189	51,721	1,400	100,620	1,391	98,001	1,382	95,425	1,633	189,178	1,622	184,275	1,612	179,451	1,883	341,197	1,871	331,911	1,859	323,508
9,1	0,693	5,838	0,759	8,382	0,755	8,195	0,902	16,715	0,896	16,255	0,891	15,859	1,047	30,356	1,040	29,523	1,032	28,705	1,212	54,871	1,203	53,309	1,196	52,010	1,408	101,182	1,399	98,548	1,390	95,957	1,642	190,232	1,631	185,302	1,621	180,452	1,894	343,097	1,881	333,760	1,870	325,310
9,2	0,697	5,871	0,763	8,429	0,759	8,240	0,907	16,807	0,901	16,345	0,896	15,947	1,053	30,523	1,045	29,686	1,038	28,864	1,218	55,174	1,210	53,604	1,202	52,297	1,415	101,740	1,406	99,092	1,397	96,487	1,651	191,281	1,640	186,324	1,630	181,447	1,904	344,987	1,892	335,599	1,880	327,103
9,3	0,701	5,903	0,768	8,475	0,763	8,286	0,912	16,899	0,906	16,434	0,901	16,034	1,058	30,690	1,051	29,849	1,044	29,021	1,225	55,475	1,216	53,897	1,209	52,583	1,423	102,295	1,414	99,633	1,405	97,013	1,660	192,324	1,649	187,340	1,639	182,436	1,915	346,867	1,902	337,428	1,890	328,885
9,4	0,704	5,935	0,772	8,521	0,767	8,331	0,917	16,991	0,911	16,523	0,905	16,121	1,064	30,857	1,057	30,010	1,049	29,179	1,231	55,775	1,223	54,188	1,215	52,867	1,431	102,848	1,422	100,171	1,412	97,537	1,669	193,362	1,658	188,351	1,647	183,420	1,925	348,737	1,912	339,247	1,900	330,658
9,5	0,708	5,967	0,776	8,567	0,771	8,375	0,922	17,082	0,916	16,612	0,910	16,207	1,070	31,022	1,062	30,171	1,055	29,335	1,238	56,074	1,229	54,478	1,222	53,150	1,438	103,397	1,429	100,706	1,420	98,058	1,678	194,394	1,667	189,356	1,656	184,399	1,935	350,597	1,922	341,056	1,910	332,422
9,6	0,712	5,999	0,780	8,613	0,776	8,420	0,927	17,173	0,921	16,700	0,915	16,293	1,075	31,186	1,068	30,331	1,061	29,490	1,245	56,370	1,236	54,766	1,228	53,431	1,446	103,944	1,437	101,238	1,427	98,577	1,686	195,420	1,676	190,356	1,665	185,373	1,945	352,447	1,933	342,856	1,921	334,176
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.5: roughness coefficient k=1,0 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,7	0,716	6,030	0,784	8,658	0,780	8,464	0,932	17,263	0,926	16,788	0,920	16,379	1,081	31,350	1,074	30,490	1,066	29,645	1,251	56,666	1,242	55,053	1,235	53,711	1,454	104,488	1,444	101,768	1,435	99,093	1,695	196,442	1,685	191,351	1,674	186,342	1,956	354,287	1,943	344,646	1,931	335,921
9,8	0,719	6,062	0,788	8,703	0,784	8,508	0,937	17,353	0,930	16,875	0,925	16,464	1,087	31,512	1,079	30,648	1,072	29,799	1,258	56,959	1,249	55,338	1,241	53,990	1,461	105,029	1,452	102,295	1,442	99,606	1,704	197,458	1,693	192,341	1,682	187,306	1,966	356,118	1,953	346,428	1,941	337,657
9,9	0,723	6,093	0,792	8,748	0,788	8,552	0,942	17,442	0,935	16,962	0,929	16,549	1,092	31,674	1,085	30,806	1,077	29,952	1,264	57,251	1,255	55,622	1,248	54,267	1,469	105,567	1,459	102,819	1,450	100,116	1,713	198,469	1,702	193,325	1,691	188,265	1,976	357,940	1,963	348,200	1,951	339,385
10	0,727	6,124	0,796	8,792	0,792	8,596	0,947	17,531	0,940	17,048	0,934	16,633	1,098	31,835	1,090	30,962	1,083	30,104	1,270	57,542	1,261	55,905	1,254	54,542	1,476	106,102	1,467	103,341	1,457	100,624	1,721	199,474	1,711	194,305	1,700	189,219	1,986	359,753	1,973	349,963	1,960	341,103
10,2	0,734	6,186	0,804	8,881	0,800	8,682	0,956	17,707	0,949	17,220	0,944	16,800	1,109	32,155	1,101	31,273	1,094	30,406	1,283	58,119	1,274	56,465	1,266	55,089	1,491	107,165	1,481	104,376	1,472	101,632	1,739	201,471	1,728	196,250	1,717	191,113	2,006	363,351	1,992	353,463	1,980	344,515
10,4	0,741	6,247	0,812	8,969	0,808	8,768	0,965	17,881	0,959	17,389	0,953	16,966	1,120	32,471	1,112	31,581	1,104	30,706	1,296	58,691	1,287	57,021	1,279	55,631	1,506	108,218	1,496	105,401	1,486	102,630	1,756	203,448	1,745	198,176	1,733	192,989	2,025	366,914	2,012	356,929	1,999	347,894
10,6	0,749	6,307	0,820	9,056	0,815	8,853	0,975	18,054	0,968	17,557	0,962	17,130	1,131	32,785	1,123	31,886	1,115	31,002	1,308	59,257	1,299	57,571	1,291	56,167	1,520	109,260	1,510	106,417	1,500	103,619	1,773	205,406	1,761	200,083	1,750	194,846	2,045	370,443	2,031	360,362	2,019	351,240
10,8	0,756	6,367	0,828	9,142	0,823	8,937	0,984	18,226	0,977	17,724	0,971	17,292	1,141	33,095	1,133	32,188	1,126	31,296	1,321	59,817	1,311	58,115	1,303	56,699	1,534	110,293	1,525	107,423	1,515	104,599	1,789	207,346	1,778	201,973	1,767	196,687	2,064	373,938	2,050	363,763	2,038	354,555
11	0,763	6,427	0,836	9,227	0,831	9,020	0,993	18,395	0,986	17,889	0,980	17,453	1,152	33,403	1,144	32,487	1,136	31,587	1,333	60,373	1,324	58,655	1,316	57,226	1,549	111,316	1,539	108,419	1,529	105,569	1,806	209,268	1,795	203,845	1,783	198,510	2,083	377,402	2,069	367,133	2,057	357,839
11,2	0,770	6,486	0,843	9,311	0,838	9,103	1,002	18,563	0,995	18,053	0,989	17,613	1,162	33,708	1,154	32,784	1,146	31,875	1,345	60,923	1,336	59,190	1,328	57,747	1,563	112,330	1,553	109,407	1,543	106,531	1,822	211,172	1,811	205,700	1,799	200,317	2,102	380,834	2,088	370,472	2,075	361,093
11,4	0,777	6,544	0,851	9,395	0,846	9,185	1,011	18,730	1,004	18,215	0,998	17,771	1,173	34,010	1,165	33,078	1,157	32,161	1,357	61,469	1,348	59,720	1,339	58,265	1,577	113,335	1,567	110,386	1,556	107,484	1,839	213,060	1,827	207,539	1,815	202,107	2,121	384,236	2,107	373,781	2,094	364,319
11,6	0,784	6,602	0,858	9,478	0,854	9,266	1,020	18,895	1,013	18,375	1,007	17,928	1,183	34,310	1,175	33,369	1,167	32,444	1,369	62,010	1,359	60,246	1,351	58,777	1,591	114,332	1,580	111,356	1,570	108,429	1,855	214,931	1,843	209,362	1,831	203,882	2,140	387,608	2,125	377,061	2,112	367,516
11,8	0,790	6,659	0,866	9,560	0,861	9,347	1,029	19,059	1,022	18,535	1,016	18,083	1,193	34,607	1,185	33,658	1,177	32,725	1,381	62,546	1,371	60,767	1,363	59,286	1,604	115,319	1,594	112,318	1,584	109,366	1,871	216,786	1,859	211,169	1,847	205,642	2,158	390,951	2,144	380,313	2,130	370,686
12	0,797	6,716	0,873	9,642	0,868	9,426	1,038	19,221	1,031	18,693	1,024	18,237	1,204	34,901	1,195	33,944	1,187	33,004	1,393	63,078	1,383	61,283	1,374	59,790	1,618	116,299	1,608	113,272	1,597	110,295	1,887	218,626	1,875	212,961	1,863	207,387	2,176	394,266	2,162	383,538	2,148	373,830
12,2	0,804	6,773	0,881	9,723	0,876	9,505	1,047	19,382	1,039	18,849	1,033	18,390	1,214	35,193	1,205	34,228	1,197	33,280	1,404	63,605	1,394	61,795	1,386	60,289	1,631	117,270	1,621	114,218	1,610	111,216	1,903	220,450	1,890	214,738	1,878	209,118	2,194	397,553	2,180	386,736	2,166	376,947
12,4	0,810	6,829	0,888	9,803	0,883	9,584	1,055	19,542	1,048	19,005	1,041	18,542	1,224	35,483	1,215	34,510	1,207	33,554	1,416	64,128	1,406	62,304	1,397	60,785	1,645	118,233	1,634	115,156	1,624	112,129	1,918	222,259	1,906	216,500	1,894	210,834	2,212	400,814	2,198	389,908	2,184	380,038
12,6	0,817	6,884	0,895	9,883	0,890	9,662	1,064	19,701	1,056	19,159	1,050	18,692	1,234	35,770	1,225	34,790	1,217	33,826	1,427	64,647	1,417	62,808	1,409	61,277	1,658	119,189	1,648	116,087	1,637	113,036	1,934	224,054	1,921	218,248	1,909	212,537	2,230	404,048	2,215	393,054	2,202	383,105
12,8	0,824	6,939	0,902	9,962	0,897	9,739	1,072	19,858	1,065	19,311	1,058	18,841	1,243	36,056	1,235	35,067	1,226	34,095	1,439	65,161	1,429	63,308	1,420	61,765	1,671	120,137	1,661	117,010	1,650	113,935	1,949	225,834	1,937	219,983	1,924	214,226	2,248	407,257	2,233	396,176	2,219	386,148
13	0,830	6,994	0,909	10,040	0,904	9,816	1,081	20,014	1,073	19,463	1,067	18,989	1,253	36,338	1,245	35,342	1,236	34,363	1,450	65,672	1,440	63,804	1,431	62,249	1,684	121,077	1,674	117,926	1,663	114,827	1,964	227,601	1,952	221,704	1,939	215,902	2,266	410,441	2,251	399,273	2,237	389,167
13,2	0,837	7,048	0,916	10,118	0,911	9,892	1,089	20,169	1,081	19,614	1,075	19,136	1,263	36,619	1,254	35,615	1,245	34,628	1,461	66,179	1,451	64,296	1,442	62,729	1,697	122,011	1,687	118,836	1,676	115,712	1,979	229,354	1,967	223,411	1,954	217,565	2,283	413,600	2,268	402,347	2,254	392,163
13,4	0,843	7,102	0,923	10,195	0,918	9,967	1,097	20,322	1,090	19,763	1,083	19,282	1,272	36,898	1,264	35,886	1,255	34,892	1,472	66,682	1,462	64,785	1,453	63,206	1,710	122,937	1,699	119,738	1,688	116,591	1,994	231,094	1,982	225,106	1,969	219,215	2,300	416,735	2,285	405,397	2,271	395,136
13,6	0,849	7,155	0,930	10,272	0,925	10,042	1,106	20,475	1,098	19,911	1,091	19,427	1,282	37,174	1,273	36,155	1,264	35,153	1,483	67,181	1,473	65,270	1,464	63,679	1,723	123,856	1,712	120,633	1,701	117,463	2,009	232,821	1,997	226,789	1,984	220,854	2,317	419,848	2,302	408,425	2,288	398,087
13,8	0,856	7,208	0,937	10,348	0,932	10,116	1,114	20,626	1,106	20,059	1,099	19,570	1,291	37,449	1,283	36,422	1,274	35,413	1,494	67,676	1,484	65,751	1,475	64,149	1,736	124,769	1,725	121,522	1,713	118,328	2,024	234,535	2,011	228,459	1,998	222,480	2,335	422,937	2,319	411,430	2,305	401,016
14	0,862	7,261	0,944	10,423	0,939	10,190	1,122	20,776	1,114	20,205	1,107	19,713	1,301	37,721	1,292	36,687	1,283	35,671	1,505	68,168	1,494	66,229	1,485	64,615	1,748	125,675	1,737	122,405	1,726	119,188	2,039	236,237	2,026	230,117	2,013	224,095	2,351	426,004	2,336	414,414	2,321	403,925
14,2	0,868	7,313	0,951	10,498	0,945	10,263	1,130	20,925	1,122	20,350	1,115	19,854	1,310	37,992	1,301	36,950	1,292	35,927	1,516	68,657	1,505	66,704	1,496	65,078	1,761	126,575	1,750	123,281	1,738	120,041	2,053	237,927	2,040	231,763	2,027	225,698	2,368	429,050	2,353	417,377	2,338	406,812
14,4	0,874	7,365	0,958	10,573	0,952	10,336	1,138	21,074	1,130	20,494	1,123	19,995	1,319	38,260	1,310	37,211	1,301	36,181	1,527	69,142	1,516	67,175	1,507	65,538	1,773	127,468	1,762	124,151	1,751	120,889	2,068	239,605	2,055	233,397	2,041	227,290	2,385	432,074	2,369	420,318	2,355	409,680
14,6	0,880	7,417	0,964	10,647	0,959	10,409	1,146	21,221	1,138	20,637	1,131	20,135	1,329	38,527	1,319	37,471	1,310	36,433	1,537	69,624	1,526	67,643	1,517	65,995	1,786	128,356	1,774	125,016	1,763	121,730	2,082	241,272	2,069	235,020	2,056	228,870	2,402	435,077	2,386	423,240	2,371	412,527
14,8	0,886	7,468	0,971	10,720	0,965	10,480	1,154	21,367	1,146	20,779	1,139	20,273	1,338	38,792	1,329	37,729	1,319	36,684	1,548	70,102	1,537	68,108	1,528	66,448	1,798	129,237	1,786	125,874	1,775	122,566	2,096	242,927	2,083	236,633	2,070	230,440	2,418	438,059	2,402	426,141	2,387	415,355
15	0,892	7,519	0,977	10,793	0,972	10,552	1,162	21,512	1,153	20,920	1,146	20,411	1,347	39,055	1,338	37,985	1,328	36,932	1,558	70,577	1,547	68,569	1,538	66,899	1,810	130,112	1,799	126,726	1,787	123,396	2,111	244,571	2,097	238,234	2,084	232,000	2,434	441,022	2,418	429,023	2,403	418,164
15,2	0,898	7,569	0,984	10,865	0,978	10,622	1,169	21,656	1,161	21,060	1,154	20,548	1,356	39,317	1,347	38,239	1,337	37,180	1,569	71,049	1,558	69,028	1,548	67,346	1,822	130,981	1,811	127,573	1,799	124,220	2,125	246,203	2,111	239,825	2,098	233,549	2,451	443,964	2,434	431,886	2,419	420,955
15,4	0,904	7,620	0,991	10,937	0,985	10,693	1,177	21,799	1,169	21,200	1,162	20,684	1,365	39,576	1,355	38,492	1,346	37,425	1,579	71,518	1,568	69,484	1,558	67,791	1,834	131,845	1,822	128,414	1,811	125,040	2,139	247,826	2,125	241,405	2,112	235,088	2,467	446,888	2,450	434,730	2,435	423,727
15,6	0,910	7,669	0,997	11,009	0,991	10,763	1,185	21,942	1,177	21,338	1,169	20,819	1,374	39,835	1,364	38,743	1,355	37,669	1,589	71,984	1,578	69,936	1,569	68,232	1,846	132,703	1,834	129,250	1,822	125,854	2,153	249,437	2,139	242,975	2,125	236,617	2,483	449,792	2,466	437,555	2,451	426,481
15,8	0,916	7,719	1,003	11,080	0,998	10,832	1,192	22,083	1,184	21,476	1,177	20,953	1,383	40,091	1,373	38,992	1,364	37,912	1,600	72,447	1,588	70,386	1,579	68,671	1,858	133,556	1,846	130,081	1,834	126,662	2,166	251,039	2,153	244,535	2,139	238,136	2,499	452,678	2,482	440,363	2,467	429,218
16	0,922	7,768	1,010	11,151	1,004	10,901	1,200	22,224	1,192	21,612	1,184	21,086	1,391	40,346	1,382	39,240	1,372	38,153	1,610	72,907	1,598	70,833	1,589	69,107	1,870	134,403	1,858	130,906	1,846	127,466	2,180	252,630	2,166	246,085	2,152	239,646	2,515	455,546	2,498	443,153	2,482	431,937
16,2	0,928	7,817	1,016	11,221	1,010	10,970	1,207	22,363	1,199	21,748	1,192	21,219	1,400	40,599	1,390	39,486	1,381	38,392	1,620	73,364	1,608	71,277	1,599	69,540	1,882	135,245	1,869	131,726	1,857	128,264	2,194	254,212	2,180	247,626	2,166	241,146	2,530	458,396	2,513	445,925	2,498	434,639
16,4	0,934	7,866	1,023	11,290	1,017	11,038	1,215	22,502	1,207	21,883	1,199	21,350	1,409	40,851	1,399	39,731	1,389	38,630	1,630	73,818	1,618	71,719	1,609	69,971	1,893	136,082	1,881	132,541	1,869	129,058	2,207	255,783	2,193	249,157	2,179	242,637	2,546	461,228	2,529	448,681	2,513	437,325
16,6	0,939	7,914	1,029	11,360	1,023	11,106	1,222	22,640	1,214	22,017	1,207	21,481	1,417	41,101	1,408	39,974	1,398	38,867	1,640	74,270	1,628	72,157	1,618	70,399	1,905	136,913	1,893	133,351	1,880	129,847	2,221	257,345	2,207	250,678	2,193	244,119	2,561	464,044	2,544	451,419	2,529	439,994
16,8	0,945	7,962	1,035	11,429	1,029	11,173	1,230	22,777	1,221	22,151	1,214	21,611	1,426	41,349	1,416	40,216	1,406	39,102	1,650	74,719	1,638	72,593	1,628	70,825	1,916	137,740	1,904	134,156	1,892	130,631	2,234	258,898	2,220	252,191	2,206	245,592	2,577	466,842	2,560	454,142	2,544	442,648
17	0,951	8,010	1,041	11,497	1,035	11,240	1,237	22,913	1,229	22,283	1,221	21,741	1,434	41,596	1,425	40,456	1,415	39,336	1,660	75,165	1,648	73,027	1,638	71,248	1,928	138,562	1,915	134,957	1,903	131,410	2,248	260,442	2,233	253,695	2,219	247,056	2,592	469,624	2,575	456,848	2,559	445,285
17,2	0,956	8,057	1,047	11,565	1,041	11,307	1,244	23,049	1,236	22,415	1,228	21,869	1,443	41,842	1,433	40,695	1,423	39,568	1,669	75,608	1,658	73,458	1,648	71,668	1,939	139,379	1,927	135,753	1,914	132,185	2,261	261,976	2,247	255,189	2,232	248,512	2,607	472,389	2,590	459,538	2,574	447,908
17,4	0,962	8,105	1,054	11,633	1,048	11,373	1,252	23,183	1,243	22,546	1,236	21,997	1,451	42,086	1,441	40,933	1,431	39,799	1,679	76,049	1,667	73,886	1,657	72,086	1,950	140,191	1,938	136,544	1,925	132,956	2,274	263,502	2,260	256,675	2,245	249,959	2,623	475,138	2,605	462,212	2,589	450,515
17,6	0,967	8,151	1,060	11,700	1,054	11,439	1,259	23,317	1,250	22,676	1,243	22,124	1,460	42,329	1,450	41,169	1,440	40,029	1,689	76,488	1,677	74,312	1,667	72,502	1,962	140,999	1,949	137,330	1,936	133,722	2,287	265,019	2,273	258,153	2,258	251,398	2,638	477,872	2,620	464,872	2,604	453,107
17,8	0,973	8,198	1,066	11,767	1,060	11,504	1,266	23,450	1,257	22,806	1,250	22,250	1,468	42,571	1,458	41,404	1,448	40,257	1,698	76,924	1,686	74,736	1,676	72,915	1,973	141,802	1,960	138,113	1,947	134,483	2,300	266,527	2,286	259,622	2,271	252,829	2,653	480,590	2,635	467,516	2,619	455,684
18	0,979	8,245	1,072	11,834	1,066	11,569	1,273	23,583	1,265	22,934	1,257	22,376	1,476	42,811	1,466	41,638	1,456	40,484	1,708	77,357	1,696	75,157	1,686	73,326	1,984	142,600	1,971	138,890	1,958	135,241	2,313	268,027	2,298	261,083	2,284	254,252	2,668	483,293	2,650	470,145	2,634	458,247
18,2	0,984	8,291	1,078	11,900	1,072	11,634	1,280	23,715	1,272	23,062	1,264	22,501	1,485	43,050	1,474	41,870	1,464	40,710	1,718	77,788	1,705	75,576	1,695	73,735	1,995	143,395	1,982	139,664	1,969	135,994	2,326	269,518	2,311	262,536	2,296	255,667	2,683	485,981	2,665	472,760	2,648	460,796
18,4	0,989	8,337	1,084	11,966	1,078	11,698	1,288	23,846	1,279	23,190	1,271	22,625	1,493	43,287	1,483	42,101	1,472	40,935	1,727	78,217	1,715	75,992	1,704	74,141	2,006	144,184	1,993	140,433	1,980	136,743	2,339	271,002	2,324	263,981	2,309	257,074	2,697	488,654	2,679	475,361	2,663	463,330
18,6	0,995	8,382	1,090	12,031	1,083	11,762	1,295	23,976	1,286	23,317	1,278	22,749	1,501	43,523	1,491	42,331	1,480	41,158	1,736	78,644	1,724	76,407	1,714	74,545	2,017	144,970	2,004	141,198	1,991	137,488	2,352	272,477	2,337	265,418	2,322	258,474	2,712	491,312	2,694	477,947	2,677	465,851
18,8	1,000	8,428	1,095	12,096	1,089	11,826	1,302	24,105	1,293	23,443	1,285	22,872	1,509	43,758	1,499	42,559	1,488	41,380	1,746	79,068	1,733	76,819	1,723	74,947	2,028	145,751	2,015	141,959	2,002	138,229	2,364	273,944	2,349	266,848	2,334	259,866	2,727	493,957	2,708	480,519	2,692	468,359
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.5: roughness coefficient k=1,0 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
19	1,006	8,473	1,101	12,161	1,095	11,889	1,309	24,234	1,299	23,568	1,292	22,994	1,517	43,992	1,507	42,786	1,496	41,601	1,755	79,490	1,743	77,229	1,732	75,347	2,039	146,528	2,025	142,716	2,012	138,966	2,377	275,404	2,362	268,269	2,347	261,250	2,741	496,587	2,723	483,078	2,706	470,853
19,2	1,011	8,518	1,107	12,225	1,101	11,952	1,315	24,362	1,306	23,693	1,298	23,116	1,525	44,225	1,515	43,012	1,504	41,821	1,764	79,909	1,752	77,637	1,741	75,745	2,049	147,301	2,036	143,469	2,023	139,699	2,389	276,856	2,374	269,684	2,359	262,628	2,756	499,204	2,737	485,624	2,720	473,334
19,4	1,016	8,562	1,113	12,289	1,107	12,015	1,322	24,490	1,313	23,817	1,305	23,237	1,533	44,456	1,523	43,237	1,512	42,040	1,774	80,327	1,761	78,042	1,750	76,141	2,060	148,070	2,047	144,218	2,033	140,428	2,402	278,300	2,387	271,091	2,371	263,998	2,770	501,807	2,752	488,156	2,735	475,802
19,6	1,022	8,607	1,119	12,353	1,112	12,077	1,329	24,617	1,320	23,940	1,312	23,357	1,541	44,686	1,530	43,461	1,520	42,257	1,783	80,742	1,770	78,446	1,759	76,535	2,071	148,835	2,057	144,963	2,044	141,154	2,414	279,737	2,399	272,491	2,383	265,361	2,784	504,396	2,766	490,675	2,749	478,258
19,8	1,027	8,651	1,125	12,417	1,118	12,139	1,336	24,743	1,327	24,063	1,319	23,477	1,549	44,915	1,538	43,684	1,528	42,474	1,792	81,155	1,779	78,847	1,768	76,927	2,081	149,596	2,068	145,705	2,054	141,876	2,426	281,167	2,411	273,883	2,396	266,718	2,798	506,973	2,780	493,182	2,763	480,701
20	1,032	8,695	1,130	12,480	1,124	12,201	1,343	24,869	1,333	24,185	1,325	23,596	1,557	45,143	1,546	43,905	1,535	42,689	1,801	81,567	1,788	79,247	1,777	77,316	2,092	150,354	2,078	146,442	2,065	142,594	2,439	282,589	2,423	275,269	2,408	268,067	2,813	509,536	2,794	495,675	2,777	483,131
20,2	1,037	8,739	1,136	12,543	1,129	12,262	1,350	24,994	1,340	24,306	1,332	23,715	1,565	45,369	1,554	44,126	1,543	42,904	1,810	81,976	1,797	79,644	1,786	77,704	2,102	151,107	2,089	147,176	2,075	143,309	2,451	284,005	2,435	276,648	2,420	269,410	2,827	512,087	2,808	498,157	2,791	485,550
20,4	1,042	8,782	1,142	12,605	1,135	12,323	1,356	25,118	1,347	24,427	1,339	23,833	1,572	45,595	1,562	44,345	1,551	43,117	1,819	82,383	1,806	80,040	1,795	78,090	2,113	151,857	2,099	147,907	2,086	144,020	2,463	285,413	2,448	278,020	2,432	270,746	2,841	514,625	2,822	500,626	2,804	487,957
20,6	1,048	8,826	1,147	12,667	1,141	12,384	1,363	25,242	1,353	24,548	1,345	23,950	1,580	45,819	1,569	44,563	1,558	43,329	1,828	82,788	1,815	80,434	1,804	78,474	2,123	152,603	2,109	148,633	2,096	144,728	2,475	286,815	2,460	279,385	2,444	272,075	2,855	517,150	2,836	503,083	2,818	490,352
20,8	1,053	8,869	1,153	12,729	1,146	12,445	1,370	25,365	1,360	24,667	1,352	24,067	1,588	46,042	1,577	44,781	1,566	43,540	1,837	83,191	1,824	80,825	1,813	78,856	2,133	153,346	2,120	149,357	2,106	145,432	2,487	288,209	2,471	280,743	2,456	273,398	2,868	519,664	2,849	505,528	2,832	492,735
21	1,058	8,912	1,158	12,791	1,152	12,505	1,376	25,487	1,367	24,787	1,358	24,183	1,595	46,265	1,584	44,997	1,574	43,751	1,846	83,592	1,833	81,215	1,822	79,237	2,144	154,085	2,130	150,076	2,116	146,133	2,499	289,597	2,483	282,096	2,467	274,715	2,882	522,165	2,863	507,961	2,845	495,107
21,2	1,063	8,955	1,164	12,852	1,157	12,565	1,383	25,609	1,373	24,905	1,365	24,299	1,603	46,486	1,592	45,212	1,581	43,960	1,854	83,992	1,841	81,603	1,830	79,615	2,154	154,820	2,140	150,793	2,126	146,831	2,511	290,979	2,495	283,441	2,479	276,026	2,896	524,655	2,877	510,383	2,859	497,467
21,4	1,068	8,997	1,169	12,913	1,163	12,624	1,389	25,731	1,380	25,023	1,371	24,414	1,611	46,706	1,600	45,426	1,589	44,168	1,863	84,389	1,850	81,989	1,839	79,992	2,164	155,552	2,150	151,506	2,136	147,525	2,523	292,354	2,507	284,781	2,491	277,330	2,910	527,133	2,890	512,794	2,873	499,817
21,6	1,073	9,039	1,175	12,974	1,168	12,684	1,396	25,852	1,386	25,141	1,378	24,529	1,618	46,925	1,607	45,639	1,596	44,375	1,872	84,785	1,859	82,373	1,848	80,367	2,174	156,281	2,160	152,216	2,146	148,216	2,535	293,722	2,519	286,114	2,503	278,628	2,923	529,599	2,904	515,193	2,886	502,155
21,8	1,078	9,082	1,180	13,034	1,174	12,743	1,402	25,972	1,393	25,258	1,384	24,643	1,626	47,143	1,615	45,851	1,603	44,581	1,881	85,178	1,867	82,756	1,856	80,740	2,184	157,006	2,170	152,922	2,156	148,904	2,547	295,084	2,530	287,441	2,514	279,920	2,937	532,054	2,917	517,581	2,899	504,483
22	1,083	9,124	1,186	13,094	1,179	12,802	1,409	26,092	1,399	25,374	1,391	24,757	1,633	47,360	1,622	46,062	1,611	44,787	1,889	85,570	1,876	83,137	1,865	81,112	2,194	157,728	2,180	153,625	2,166	149,589	2,558	296,440	2,542	288,762	2,526	281,207	2,950	534,497	2,931	519,958	2,913	506,800
22,2	1,088	9,165	1,191	13,154	1,185	12,860	1,415	26,211	1,405	25,490	1,397	24,870	1,641	47,576	1,629	46,273	1,618	44,991	1,898	85,960	1,885	83,516	1,873	81,482	2,204	158,447	2,190	154,325	2,176	150,270	2,570	297,790	2,554	290,076	2,537	282,487	2,964	536,930	2,944	522,324	2,926	509,107
22,4	1,093	9,207	1,197	13,214	1,190	12,918	1,422	26,329	1,412	25,606	1,403	24,982	1,648	47,792	1,637	46,482	1,625	45,195	1,907	86,349	1,893	83,893	1,882	81,850	2,214	159,162	2,200	155,022	2,186	150,949	2,582	299,134	2,565	291,385	2,549	283,762	2,977	539,351	2,957	524,680	2,939	511,403
22,6	1,098	9,248	1,202	13,273	1,195	12,976	1,428	26,448	1,418	25,720	1,409	25,094	1,655	48,006	1,644	46,690	1,633	45,397	1,915	86,736	1,902	84,269	1,890	82,216	2,224	159,875	2,210	155,716	2,196	151,624	2,593	300,472	2,577	292,689	2,560	285,031	2,990	541,762	2,971	527,025	2,952	513,689
22,8	1,103	9,289	1,207	13,332	1,201	13,034	1,434	26,565	1,424	25,835	1,416	25,206	1,663	48,219	1,651	46,898	1,640	45,599	1,924	87,121	1,910	84,643	1,898	82,581	2,234	160,584	2,220	156,406	2,205	152,297	2,605	301,804	2,588	293,986	2,571	286,295	3,004	544,162	2,984	529,360	2,965	515,965
23	1,107	9,330	1,213	13,391	1,206	13,092	1,441	26,682	1,431	25,949	1,422	25,317	1,670	48,431	1,659	47,104	1,647	45,800	1,932	87,504	1,918	85,016	1,907	82,945	2,244	161,290	2,229	157,094	2,215	152,967	2,616	303,130	2,599	295,278	2,583	287,553	3,017	546,552	2,997	531,685	2,978	518,231
23,2	1,112	9,371	1,218	13,450	1,211	13,149	1,447	26,799	1,437	26,062	1,428	25,428	1,677	48,643	1,666	47,310	1,654	46,000	1,940	87,886	1,927	85,386	1,915	83,306	2,254	161,993	2,239	157,779	2,225	153,633	2,627	304,450	2,611	296,564	2,594	288,805	3,030	548,931	3,010	534,000	2,991	520,487
23,4	1,117	9,412	1,223	13,508	1,216	13,206	1,453	26,915	1,443	26,175	1,434	25,538	1,685	48,853	1,673	47,514	1,662	46,199	1,949	88,266	1,935	85,756	1,923	83,667	2,263	162,693	2,249	158,460	2,234	154,297	2,639	305,765	2,622	297,844	2,605	290,052	3,043	551,300	3,023	536,304	3,004	522,733
23,6	1,122	9,453	1,229	13,566	1,222	13,263	1,459	27,030	1,449	26,287	1,441	25,648	1,692	49,063	1,680	47,718	1,669	46,397	1,957	88,644	1,943	86,123	1,932	84,025	2,273	163,390	2,259	159,139	2,244	154,958	2,650	307,074	2,633	299,119	2,616	291,294	3,056	553,659	3,036	538,599	3,017	524,970
23,8	1,127	9,493	1,234	13,624	1,227	13,319	1,466	27,146	1,456	26,399	1,447	25,757	1,699	49,271	1,687	47,921	1,676	46,594	1,966	89,021	1,952	86,489	1,940	84,382	2,283	164,084	2,268	159,815	2,253	155,616	2,661	308,377	2,644	300,389	2,627	292,531	3,069	556,008	3,049	540,884	3,030	527,197
24	1,131	9,533	1,239	13,681	1,232	13,376	1,472	27,260	1,462	26,511	1,453	25,866	1,706	49,479	1,695	48,123	1,683	46,791	1,974	89,396	1,960	86,854	1,948	84,738	2,292	164,775	2,278	160,488	2,263	156,272	2,673	309,675	2,656	301,654	2,639	293,762	3,082	558,347	3,062	543,160	3,043	529,415
24,2	1,136	9,573	1,244	13,739	1,237	13,432	1,478	27,374	1,468	26,622	1,459	25,974	1,713	49,686	1,702	48,325	1,690	46,987	1,982	89,769	1,968	87,217	1,956	85,092	2,302	165,463	2,287	161,159	2,272	156,924	2,684	310,968	2,667	302,913	2,650	294,988	3,095	560,677	3,074	545,426	3,055	531,624
24,4	1,141	9,613	1,249	13,796	1,242	13,488	1,484	27,488	1,474	26,732	1,465	26,082	1,721	49,892	1,709	48,525	1,697	47,181	1,990	90,142	1,976	87,578	1,964	85,445	2,311	166,148	2,297	161,826	2,282	157,575	2,695	312,255	2,678	304,167	2,661	296,209	3,108	562,996	3,087	547,683	3,068	533,824
24,6	1,146	9,652	1,255	13,853	1,247	13,543	1,490	27,601	1,480	26,842	1,471	26,189	1,728	50,098	1,716	48,725	1,704	47,376	1,998	90,512	1,984	87,938	1,972	85,796	2,321	166,831	2,306	162,491	2,291	158,222	2,706	313,537	2,689	305,415	2,671	297,426	3,120	565,307	3,100	549,930	3,081	536,015
24,8	1,150	9,692	1,260	13,909	1,253	13,599	1,496	27,714	1,486	26,952	1,477	26,296	1,735	50,302	1,723	48,924	1,711	47,569	2,007	90,881	1,992	88,297	1,980	86,146	2,330	167,511	2,315	163,153	2,300	158,867	2,717	314,814	2,700	306,659	2,682	298,637	3,133	567,608	3,112	552,169	3,093	538,196
25	1,155	9,731	1,265	13,966	1,258	13,654	1,502	27,826	1,492	27,061	1,483	26,403	1,742	50,506	1,730	49,122	1,718	47,762	2,015	91,249	2,000	88,654	1,988	86,495	2,340	168,188	2,325	163,813	2,310	159,509	2,728	316,085	2,711	307,898	2,693	299,843	3,146	569,899	3,125	554,398	3,106	540,369
25,2	1,160	9,771	1,270	14,022	1,263	13,709	1,508	27,938	1,498	27,170	1,489	26,509	1,749	50,709	1,737	49,319	1,725	47,953	2,023	91,615	2,009	89,010	1,996	86,842	2,349	168,862	2,334	164,469	2,319	160,148	2,739	317,352	2,721	309,132	2,704	301,045	3,158	572,182	3,137	556,619	3,118	542,534
25,4	1,164	9,810	1,275	14,078	1,268	13,763	1,515	28,049	1,504	27,278	1,495	26,614	1,756	50,911	1,744	49,515	1,732	48,144	2,031	91,980	2,017	89,364	2,004	87,187	2,359	169,534	2,343	165,124	2,328	160,785	2,750	318,613	2,732	310,361	2,715	302,242	3,171	574,455	3,150	558,830	3,130	544,689
25,6	1,169	9,848	1,280	14,134	1,273	13,818	1,520	28,160	1,510	27,386	1,501	26,720	1,763	51,112	1,751	49,711	1,738	48,335	2,039	92,343	2,024	89,717	2,012	87,532	2,368	170,203	2,353	165,775	2,337	161,420	2,761	319,870	2,743	311,585	2,725	303,434	3,183	576,720	3,162	561,033	3,143	546,837
25,8	1,173	9,887	1,285	14,189	1,278	13,872	1,526	28,271	1,516	27,494	1,507	26,825	1,769	51,312	1,757	49,906	1,745	48,524	2,047	92,705	2,032	90,069	2,020	87,875	2,377	170,869	2,362	166,424	2,347	162,052	2,771	321,122	2,754	312,804	2,736	304,621	3,196	578,976	3,175	563,228	3,155	548,976
26	1,178	9,926	1,290	14,245	1,283	13,926	1,532	28,381	1,522	27,601	1,513	26,929	1,776	51,512	1,764	50,100	1,752	48,713	2,055	93,065	2,040	90,419	2,028	88,216	2,386	171,533	2,371	167,071	2,356	162,682	2,782	322,369	2,764	314,019	2,747	305,804	3,208	581,223	3,187	565,414	3,167	551,106
26,2	1,183	9,964	1,295	14,300	1,288	13,980	1,538	28,491	1,528	27,707	1,518	27,033	1,783	51,711	1,771	50,294	1,759	48,901	2,063	93,424	2,048	90,768	2,036	88,557	2,396	172,194	2,380	167,715	2,365	163,309	2,793	323,611	2,775	315,229	2,757	306,982	3,221	583,461	3,199	567,591	3,180	553,229
26,4	1,187	10,002	1,300	14,355	1,293	14,034	1,544	28,600	1,534	27,814	1,524	27,137	1,790	51,909	1,778	50,486	1,766	49,088	2,071	93,782	2,056	91,115	2,044	88,896	2,405	172,853	2,389	168,357	2,374	163,934	2,803	324,848	2,786	316,434	2,768	308,156	3,233	585,691	3,211	569,760	3,192	555,343
26,6	1,192	10,041	1,305	14,409	1,298	14,087	1,550	28,709	1,539	27,919	1,530	27,240	1,797	52,106	1,785	50,678	1,772	49,275	2,078	94,138	2,064	91,461	2,051	89,234	2,414	173,509	2,398	168,996	2,383	164,556	2,814	326,081	2,796	317,635	2,778	309,325	3,245	587,912	3,224	571,921	3,204	557,450
26,8	1,196	10,079	1,310	14,464	1,303	14,141	1,556	28,817	1,545	28,025	1,536	27,343	1,804	52,303	1,791	50,870	1,779	49,461	2,086	94,493	2,072	91,806	2,059	89,570	2,423	174,163	2,407	169,633	2,392	165,176	2,825	327,309	2,807	318,831	2,789	310,490	3,257	590,125	3,236	574,074	3,216	559,548
27	1,201	10,116	1,315	14,518	1,307	14,194	1,562	28,925	1,551	28,130	1,542	27,445	1,810	52,499	1,798	51,060	1,786	49,646	2,094	94,847	2,079	92,150	2,067	89,905	2,432	174,815	2,416	170,267	2,401	165,794	2,835	328,532	2,817	320,023	2,799	311,651	3,270	592,330	3,248	576,219	3,228	561,639
27,2	1,205	10,154	1,320	14,572	1,312	14,247	1,568	29,033	1,557	28,235	1,547	27,548	1,817	52,694	1,805	51,250	1,792	49,831	2,102	95,199	2,087	92,492	2,074	90,239	2,441	175,464	2,425	170,900	2,410	166,410	2,846	329,751	2,828	321,210	2,810	312,808	3,282	594,527	3,260	578,356	3,240	563,722
27,4	1,210	10,192	1,325	14,626	1,317	14,299	1,573	29,140	1,563	28,339	1,553	27,649	1,824	52,888	1,811	51,439	1,799	50,015	2,110	95,550	2,095	92,833	2,082	90,572	2,450	176,110	2,434	171,529	2,419	167,023	2,856	330,966	2,838	322,393	2,820	313,960	3,294	596,716	3,272	580,485	3,252	565,797
27,6	1,214	10,229	1,329	14,680	1,322	14,352	1,579	29,247	1,568	28,443	1,559	27,751	1,831	53,082	1,818	51,628	1,805	50,198	2,117	95,900	2,102	93,173	2,090	90,904	2,459	176,755	2,443	172,157	2,427	167,634	2,867	332,176	2,849	323,572	2,830	315,108	3,306	598,896	3,284	582,607	3,264	567,865
27,8	1,219	10,266	1,334	14,733	1,327	14,404	1,585	29,353	1,574	28,546	1,564	27,852	1,837	53,275	1,825	51,815	1,812	50,381	2,125	96,248	2,110	93,512	2,097	91,234	2,468	177,396	2,452	172,782	2,436	168,243	2,877	333,382	2,859	324,747	2,841	316,251	3,318	601,069	3,296	584,721	3,275	569,925
28	1,223	10,304	1,339	14,787	1,332	14,456	1,591	29,459	1,580	28,650	1,570	27,952	1,844	53,467	1,831	52,002	1,819	50,563	2,133	96,596	2,118	93,849	2,105	91,563	2,477	178,036	2,461	173,405	2,445	168,850	2,887	334,583	2,869	325,917	2,851	317,391	3,330	603,234	3,308	586,827	3,287	571,978
28,2	1,227	10,341	1,344	14,840	1,336	14,508	1,596	29,565	1,585	28,752	1,576	28,053	1,850	53,659	1,838	52,189	1,825	50,744	2,140	96,942	2,125	94,185	2,112	91,891	2,486	178,673	2,470	174,026	2,454	169,454	2,898	335,780	2,879	327,083	2,861	318,527	3,342	605,391	3,319	588,925	3,299	574,024
28,4	1,232	10,378	1,349	14,893	1,341	14,560	1,602	29,670	1,591	28,855	1,581	28,153	1,857	53,850	1,844	52,375	1,832	50,924	2,148	97,287	2,133	94,520	2,120	92,218	2,495	179,309	2,479	174,645	2,463	170,056	2,908	336,973	2,890	328,245	2,871	319,658	3,354	607,541	3,331	591,017	3,311	576,062
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.5: roughness coefficient k=1,0 mm (5/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
28,6	1,236	10,414	1,354	14,945	1,346	14,611	1,608	29,775	1,597	28,957	1,587	28,252	1,864	54,040	1,851	52,560	1,838	51,104	2,156	97,630	2,140	94,854	2,127	92,544	2,503	179,941	2,487	175,261	2,471	170,657	2,918	338,161	2,900	329,403	2,881	320,786	3,365	609,683	3,343	593,100	3,322	578,093
28,8	1,240	10,451	1,358	14,998	1,351	14,663	1,613	29,880	1,602	29,059	1,592	28,352	1,870	54,230	1,857	52,744	1,844	51,284	2,163	97,973	2,148	95,187	2,135	92,868	2,512	180,572	2,496	175,875	2,480	171,255	2,929	339,346	2,910	330,557	2,891	321,910	3,377	611,818	3,355	595,177	3,334	580,117
29	1,245	10,487	1,363	15,050	1,355	14,714	1,619	29,984	1,608	29,160	1,598	28,450	1,877	54,419	1,864	52,928	1,851	51,463	2,171	98,314	2,155	95,518	2,142	93,192	2,521	181,201	2,505	176,487	2,489	171,851	2,939	340,526	2,920	331,707	2,901	323,029	3,389	613,945	3,366	597,246	3,346	582,134
29,2	1,249	10,524	1,368	15,103	1,360	14,765	1,625	30,088	1,613	29,261	1,604	28,549	1,883	54,607	1,870	53,111	1,857	51,641	2,178	98,654	2,163	95,849	2,150	93,514	2,530	181,827	2,513	177,097	2,497	172,445	2,949	341,703	2,930	332,852	2,911	324,145	3,401	616,065	3,378	599,309	3,357	584,144
29,4	1,253	10,560	1,372	15,155	1,365	14,816	1,630	30,192	1,619	29,362	1,609	28,647	1,890	54,795	1,877	53,294	1,864	51,818	2,186	98,993	2,170	96,178	2,157	93,835	2,538	182,451	2,522	177,705	2,506	173,037	2,959	342,875	2,940	333,994	2,921	325,257	3,412	618,177	3,390	601,364	3,369	586,148
29,6	1,258	10,596	1,377	15,206	1,369	14,867	1,636	30,295	1,624	29,462	1,615	28,745	1,896	54,982	1,883	53,476	1,870	51,995	2,193	99,330	2,178	96,506	2,165	94,156	2,547	183,073	2,531	178,311	2,514	173,627	2,969	344,043	2,950	335,133	2,931	326,366	3,424	620,283	3,401	603,412	3,380	588,144
29,8	1,262	10,632	1,382	15,258	1,374	14,917	1,641	30,398	1,630	29,562	1,620	28,843	1,902	55,169	1,889	53,657	1,876	52,171	2,201	99,667	2,185	96,833	2,172	94,475	2,556	183,693	2,539	178,915	2,523	174,215	2,979	345,208	2,960	336,267	2,941	327,470	3,435	622,381	3,413	605,453	3,392	590,134
30	1,266	10,668	1,387	15,310	1,379	14,967	1,647	30,500	1,635	29,662	1,625	28,940	1,909	55,354	1,896	53,838	1,883	52,347	2,208	100,002	2,192	97,159	2,179	94,793	2,564	184,311	2,548	179,517	2,531	174,801	2,989	346,368	2,970	337,397	2,951	328,571	3,447	624,472	3,424	607,488	3,403	592,117
30,5	1,277	10,757	1,398	15,437	1,390	15,092	1,661	30,755	1,649	29,909	1,639	29,182	1,925	55,816	1,912	54,287	1,898	52,784	2,226	100,836	2,211	97,969	2,197	95,583	2,586	185,847	2,569	181,013	2,552	176,257	3,014	349,253	2,995	340,207	2,976	331,308	3,476	629,670	3,453	612,545	3,431	597,046
31	1,287	10,846	1,410	15,564	1,402	15,217	1,674	31,007	1,663	30,155	1,652	29,421	1,941	56,274	1,927	54,733	1,914	53,217	2,245	101,663	2,229	98,773	2,215	96,367	2,607	187,370	2,590	182,496	2,573	177,702	3,039	352,113	3,020	342,994	3,000	334,022	3,504	634,826	3,481	617,560	3,459	601,934
31,5	1,298	10,934	1,421	15,690	1,413	15,340	1,688	31,258	1,676	30,399	1,666	29,659	1,956	56,729	1,943	55,175	1,929	53,647	2,263	102,483	2,247	99,570	2,233	97,145	2,628	188,881	2,611	183,968	2,594	179,135	3,063	354,951	3,044	345,758	3,024	336,714	3,532	639,940	3,509	622,535	3,487	606,784
32	1,308	11,021	1,432	15,815	1,424	15,462	1,701	31,506	1,689	30,640	1,679	29,895	1,972	57,180	1,958	55,613	1,945	54,073	2,281	103,297	2,265	100,360	2,251	97,916	2,649	190,380	2,632	185,428	2,615	180,557	3,088	357,767	3,068	348,501	3,048	339,385	3,560	645,014	3,537	627,471	3,515	611,595
32,5	1,318	11,107	1,444	15,939	1,435	15,583	1,714	31,753	1,703	30,880	1,692	30,129	1,987	57,627	1,974	56,048	1,960	54,496	2,299	104,105	2,282	101,145	2,269	98,682	2,669	191,867	2,652	186,877	2,635	181,968	3,112	360,560	3,092	351,222	3,072	342,035	3,588	650,048	3,564	632,368	3,542	616,368
33	1,328	11,193	1,455	16,062	1,446	15,703	1,728	31,998	1,716	31,118	1,705	30,361	2,003	58,071	1,989	56,480	1,975	54,916	2,316	104,906	2,300	101,923	2,286	99,441	2,690	193,343	2,673	188,314	2,655	183,367	3,136	363,333	3,116	353,922	3,096	344,665	3,616	655,044	3,592	637,228	3,570	621,105
33,5	1,339	11,278	1,466	16,184	1,457	15,823	1,741	32,241	1,729	31,355	1,718	30,592	2,018	58,511	2,004	56,908	1,990	55,333	2,334	105,701	2,317	102,696	2,303	100,195	2,710	194,808	2,693	189,741	2,675	184,757	3,159	366,084	3,139	356,603	3,119	347,275	3,643	660,002	3,619	642,052	3,597	625,807
34	1,349	11,363	1,477	16,305	1,468	15,941	1,754	32,482	1,742	31,589	1,731	30,821	2,033	58,949	2,019	57,334	2,005	55,746	2,351	106,491	2,335	103,463	2,321	100,943	2,730	196,262	2,713	191,157	2,695	186,136	3,183	368,814	3,163	359,263	3,142	349,865	3,670	664,923	3,646	646,839	3,623	630,473
34,5	1,359	11,447	1,488	16,426	1,479	16,059	1,767	32,721	1,755	31,822	1,744	31,048	2,048	59,383	2,034	57,756	2,020	56,157	2,369	107,274	2,352	104,224	2,338	101,686	2,750	197,705	2,733	192,563	2,715	187,505	3,206	371,525	3,186	361,903	3,166	352,437	3,697	669,808	3,673	651,591	3,650	635,105
35	1,368	11,530	1,498	16,545	1,490	16,175	1,780	32,959	1,767	32,053	1,757	31,273	2,063	59,813	2,049	58,175	2,034	56,564	2,386	108,052	2,369	104,980	2,355	102,424	2,770	199,138	2,753	193,959	2,735	188,864	3,230	374,216	3,209	364,525	3,188	354,990	3,724	674,658	3,699	656,309	3,677	639,704
35,5	1,378	11,612	1,509	16,664	1,501	16,291	1,792	33,195	1,780	32,282	1,769	31,497	2,077	60,241	2,063	58,591	2,049	56,969	2,403	108,825	2,386	105,731	2,371	103,156	2,790	200,561	2,772	195,344	2,754	190,213	3,253	376,888	3,232	367,128	3,211	357,525	3,751	679,473	3,726	660,994	3,703	644,270
36	1,388	11,695	1,520	16,781	1,511	16,406	1,805	33,429	1,793	32,510	1,782	31,719	2,092	60,666	2,078	59,004	2,063	57,371	2,420	109,592	2,403	106,476	2,388	103,883	2,810	201,973	2,792	196,720	2,774	191,553	3,275	379,542	3,255	369,712	3,234	360,042	3,777	684,255	3,752	665,645	3,729	648,804
36,5	1,398	11,776	1,530	16,898	1,522	16,521	1,818	33,662	1,805	32,737	1,794	31,940	2,107	61,088	2,092	59,414	2,078	57,770	2,437	110,353	2,419	107,216	2,405	104,605	2,829	203,376	2,811	198,087	2,793	192,883	3,298	382,177	3,277	372,279	3,256	362,541	3,803	689,003	3,778	670,264	3,755	653,306
37	1,407	11,857	1,541	17,014	1,532	16,634	1,830	33,893	1,817	32,961	1,806	32,159	2,121	61,507	2,107	59,822	2,092	58,166	2,453	111,110	2,436	107,951	2,421	105,322	2,849	204,769	2,831	199,444	2,812	194,205	3,321	384,794	3,300	374,828	3,279	365,024	3,829	693,719	3,804	674,852	3,780	657,778
37,5	1,417	11,938	1,551	17,130	1,543	16,747	1,842	34,122	1,830	33,185	1,819	32,377	2,135	61,923	2,121	60,227	2,106	58,560	2,470	111,861	2,452	108,681	2,438	106,034	2,868	206,153	2,850	200,792	2,831	195,517	3,343	387,393	3,322	377,360	3,301	367,490	3,855	698,403	3,830	679,409	3,806	662,220
38	1,426	12,017	1,562	17,244	1,553	16,859	1,855	34,350	1,842	33,406	1,831	32,594	2,150	62,337	2,135	60,629	2,120	58,951	2,486	112,607	2,469	109,406	2,454	106,742	2,887	207,528	2,869	202,131	2,850	196,821	3,366	389,975	3,344	379,875	3,323	369,939	3,881	703,056	3,855	683,936	3,831	666,632
38,5	1,436	12,097	1,572	17,358	1,563	16,970	1,867	34,577	1,854	33,627	1,843	32,808	2,164	62,747	2,149	61,028	2,134	59,339	2,503	113,349	2,485	110,126	2,470	107,445	2,906	208,894	2,888	203,461	2,869	198,117	3,388	392,540	3,366	382,374	3,345	372,373	3,906	707,679	3,880	688,433	3,856	671,015
39	1,445	12,176	1,582	17,471	1,573	17,081	1,879	34,802	1,866	33,845	1,855	33,022	2,178	63,155	2,163	61,425	2,148	59,725	2,519	114,086	2,501	110,842	2,486	108,143	2,925	210,251	2,906	204,783	2,887	199,404	3,410	395,089	3,388	384,857	3,366	374,790	3,932	712,271	3,906	692,901	3,881	675,370
39,5	1,454	12,254	1,592	17,584	1,583	17,191	1,891	35,025	1,878	34,063	1,867	33,234	2,192	63,561	2,177	61,820	2,162	60,108	2,535	114,817	2,517	111,553	2,502	108,837	2,944	211,599	2,925	206,096	2,906	200,682	3,432	397,621	3,410	387,323	3,388	377,193	3,957	716,835	3,931	697,340	3,906	679,697
40	1,464	12,332	1,603	17,695	1,594	17,300	1,903	35,248	1,890	34,279	1,879	33,445	2,206	63,964	2,191	62,212	2,176	60,489	2,551	115,545	2,533	112,260	2,518	109,526	2,962	212,939	2,943	207,401	2,924	201,953	3,453	400,137	3,431	389,775	3,409	379,580	3,982	721,369	3,955	701,751	3,931	683,997
40,5	1,473	12,409	1,613	17,806	1,604	17,408	1,915	35,468	1,902	34,494	1,890	33,655	2,220	64,364	2,204	62,601	2,189	60,868	2,567	116,268	2,549	112,962	2,534	110,212	2,981	214,270	2,962	208,697	2,943	203,216	3,475	402,638	3,453	392,210	3,431	381,952	4,007	725,876	3,980	706,135	3,956	688,270
41	1,482	12,486	1,623	17,916	1,613	17,516	1,927	35,688	1,914	34,707	1,902	33,863	2,233	64,762	2,218	62,988	2,203	61,244	2,583	116,986	2,565	113,660	2,549	110,893	2,999	215,593	2,980	209,986	2,961	204,471	3,496	405,123	3,474	394,631	3,452	384,309	4,031	730,354	4,005	710,492	3,980	692,516
41,5	1,491	12,562	1,633	18,026	1,623	17,623	1,939	35,906	1,925	34,919	1,914	34,070	2,247	65,158	2,232	63,373	2,216	61,618	2,599	117,700	2,580	114,354	2,565	111,569	3,018	216,908	2,998	211,267	2,979	205,718	3,518	407,593	3,495	397,037	3,473	386,653	4,056	734,806	4,029	714,822	4,004	696,737
42	1,500	12,638	1,642	18,135	1,633	17,730	1,950	36,123	1,937	35,130	1,925	34,275	2,260	65,551	2,245	63,755	2,230	61,990	2,614	118,410	2,596	115,044	2,580	112,242	3,036	218,215	3,016	212,540	2,997	206,958	3,539	410,048	3,516	399,429	3,494	388,982	4,080	739,230	4,053	719,127	4,028	700,933
42,5	1,509	12,714	1,652	18,243	1,643	17,836	1,962	36,338	1,949	35,340	1,937	34,480	2,274	65,942	2,258	64,135	2,243	62,360	2,630	119,115	2,611	115,729	2,596	112,911	3,054	219,515	3,034	213,806	3,015	208,190	3,560	412,489	3,537	401,807	3,515	391,297	4,105	743,628	4,077	723,405	4,052	705,103
43	1,518	12,789	1,662	18,351	1,653	17,941	1,974	36,552	1,960	35,548	1,948	34,683	2,287	66,330	2,272	64,513	2,256	62,727	2,645	119,817	2,627	116,411	2,611	113,576	3,072	220,807	3,052	215,064	3,032	209,415	3,581	414,915	3,558	404,170	3,535	393,599	4,129	748,001	4,101	727,659	4,076	709,249
43,5	1,527	12,864	1,672	18,458	1,662	18,046	1,985	36,765	1,971	35,755	1,959	34,885	2,301	66,716	2,285	64,889	2,269	63,093	2,661	120,514	2,642	117,088	2,626	114,237	3,090	222,091	3,070	216,315	3,050	210,634	3,602	417,327	3,579	406,520	3,556	395,888	4,153	752,348	4,125	731,888	4,100	713,372
44	1,536	12,938	1,681	18,564	1,672	18,150	1,997	36,977	1,983	35,961	1,971	35,086	2,314	67,100	2,298	65,262	2,282	63,456	2,676	121,207	2,657	117,762	2,641	114,894	3,108	223,368	3,088	217,559	3,068	211,845	3,622	419,726	3,599	408,857	3,576	398,163	4,177	756,670	4,149	736,093	4,123	717,470
44,5	1,544	13,012	1,691	18,670	1,681	18,253	2,008	37,188	1,994	36,166	1,982	35,286	2,327	67,482	2,311	65,634	2,295	63,817	2,691	121,897	2,672	118,431	2,656	115,548	3,125	224,638	3,105	218,796	3,085	213,049	3,643	422,111	3,620	411,180	3,597	400,425	4,200	760,968	4,173	740,274	4,147	721,545
45	1,553	13,085	1,700	18,775	1,691	18,356	2,019	37,397	2,005	36,370	1,993	35,485	2,340	67,862	2,324	66,003	2,308	64,176	2,707	122,582	2,687	119,098	2,671	116,197	3,143	225,901	3,123	220,026	3,102	214,247	3,663	424,482	3,640	413,490	3,617	402,675	4,224	765,242	4,196	744,431	4,170	725,598
45,5	1,562	13,158	1,710	18,880	1,700	18,458	2,030	37,605	2,016	36,572	2,004	35,682	2,353	68,240	2,337	66,370	2,321	64,533	2,722	123,264	2,702	119,760	2,686	116,844	3,160	227,156	3,140	221,249	3,120	215,438	3,684	426,841	3,660	415,787	3,637	404,912	4,247	769,492	4,219	748,566	4,193	729,628
46	1,570	13,231	1,719	18,984	1,710	18,560	2,042	37,813	2,028	36,773	2,015	35,879	2,366	68,615	2,350	66,736	2,334	64,888	2,737	123,942	2,717	120,419	2,701	117,486	3,178	228,405	3,157	222,465	3,137	216,622	3,704	429,186	3,680	418,072	3,657	407,137	4,271	773,719	4,242	752,678	4,216	733,636
46,5	1,579	13,303	1,729	19,088	1,719	18,661	2,053	38,019	2,039	36,974	2,026	36,074	2,379	68,989	2,363	67,099	2,346	65,242	2,751	124,616	2,732	121,074	2,716	118,126	3,195	229,647	3,174	223,675	3,154	217,800	3,724	431,519	3,700	420,344	3,677	409,350	4,294	777,923	4,266	756,767	4,239	737,622
47	1,587	13,375	1,738	19,191	1,728	18,762	2,064	38,223	2,050	37,173	2,037	36,269	2,392	69,360	2,376	67,460	2,359	65,593	2,766	125,287	2,747	121,725	2,730	118,761	3,212	230,882	3,191	224,878	3,171	218,972	3,744	433,839	3,720	422,605	3,697	411,552	4,317	782,104	4,288	760,835	4,262	741,587
47,5	1,596	13,446	1,747	19,293	1,737	18,862	2,075	38,427	2,061	37,371	2,048	36,462	2,405	69,730	2,388	67,820	2,372	65,942	2,781	125,954	2,761	122,374	2,745	119,394	3,229	232,111	3,208	226,075	3,188	220,137	3,764	436,147	3,740	424,853	3,716	413,741	4,340	786,263	4,311	764,881	4,285	745,530
48	1,604	13,517	1,757	19,395	1,747	18,962	2,086	38,630	2,071	37,568	2,059	36,655	2,417	70,097	2,401	68,177	2,384	66,290	2,796	126,618	2,776	123,018	2,759	120,023	3,246	233,334	3,225	227,266	3,205	221,296	3,784	438,443	3,760	427,089	3,736	415,919	4,363	790,400	4,334	768,906	4,307	749,454
48,5	1,613	13,588	1,766	19,496	1,756	19,061	2,097	38,832	2,082	37,765	2,070	36,846	2,430	70,463	2,413	68,533	2,397	66,636	2,810	127,278	2,790	123,660	2,774	120,649	3,263	234,550	3,242	228,450	3,221	222,450	3,804	440,727	3,779	429,314	3,755	418,086	4,386	794,516	4,357	772,910	4,330	753,356
49	1,621	13,658	1,775	19,597	1,765	19,159	2,108	39,032	2,093	37,960	2,080	37,036	2,442	70,827	2,426	68,887	2,409	66,980	2,825	127,935	2,805	124,298	2,788	121,271	3,280	235,759	3,259	229,628	3,238	223,597	3,823	442,999	3,799	431,527	3,775	420,241	4,408	798,611	4,379	776,893	4,352	757,239
49,5	1,629	13,728	1,784	19,697	1,774	19,257	2,118	39,232	2,104	38,154	2,091	37,226	2,455	71,189	2,438	69,239	2,421	67,322	2,839	128,588	2,819	124,933	2,802	121,891	3,297	236,963	3,276	230,801	3,254	224,739	3,843	445,260	3,818	433,729	3,794	422,386	4,431	802,685	4,401	780,856	4,374	761,102
50	1,638	13,798	1,793	19,797	1,783	19,355	2,129	39,430	2,114	38,347	2,101	37,414	2,467	71,549	2,450	69,589	2,434	67,663	2,853	129,238	2,833	125,565	2,816	122,507	3,313	238,160	3,292	231,967	3,271	225,875	3,862	447,509	3,838	435,920	3,813	424,519	4,453	806,738	4,424	784,799	4,396	764,945
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.6: roughness coefficient k=1,25 mm (1/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,064	0,543	0,071	0,786	0,071	0,768	0,086	1,585	0,085	1,541	0,084	1,503	0,100	2,905	0,099	2,824	0,099	2,745	0,117	5,293	0,116	5,141	0,115	5,014	0,137	9,833	0,136	9,574	0,135	9,319	0,161	18,611	0,160	18,123	0,158	17,644	0,186	33,752	0,185	32,825	0,184	31,987
0,2	0,093	0,787	0,103	1,136	0,102	1,110	0,123	2,286	0,123	2,222	0,122	2,167	0,144	4,180	0,143	4,064	0,142	3,950	0,168	7,601	0,167	7,382	0,166	7,201	0,196	14,094	0,195	13,724	0,193	13,360	0,230	26,632	0,228	25,936	0,227	25,252	0,266	48,233	0,264	46,912	0,263	45,716
0,3	0,116	0,975	0,127	1,406	0,127	1,374	0,153	2,825	0,151	2,747	0,150	2,679	0,178	5,161	0,177	5,018	0,175	4,878	0,207	9,376	0,206	9,107	0,204	8,883	0,242	17,370	0,240	16,915	0,238	16,467	0,283	32,797	0,281	31,941	0,279	31,100	0,328	59,360	0,325	57,736	0,323	56,266
0,4	0,135	1,134	0,148	1,634	0,147	1,598	0,177	3,281	0,176	3,190	0,175	3,112	0,207	5,989	0,205	5,823	0,204	5,661	0,240	10,874	0,238	10,563	0,237	10,303	0,280	20,135	0,278	19,607	0,276	19,089	0,328	37,998	0,326	37,008	0,324	36,034	0,379	68,746	0,377	66,866	0,375	65,164
0,5	0,151	1,274	0,166	1,836	0,165	1,794	0,199	3,683	0,197	3,581	0,196	3,493	0,232	6,719	0,230	6,534	0,228	6,351	0,269	12,195	0,267	11,846	0,266	11,555	0,314	22,572	0,312	21,981	0,310	21,400	0,367	42,582	0,365	41,473	0,363	40,382	0,425	77,018	0,422	74,912	0,420	73,007
0,6	0,166	1,401	0,183	2,018	0,182	1,973	0,218	4,047	0,217	3,934	0,216	3,838	0,254	7,380	0,253	7,176	0,251	6,976	0,296	13,390	0,293	13,007	0,292	12,688	0,345	24,776	0,342	24,128	0,340	23,490	0,403	46,728	0,401	45,511	0,398	44,314	0,466	84,498	0,463	82,189	0,460	80,099
0,7	0,180	1,518	0,198	2,186	0,197	2,137	0,237	4,381	0,235	4,260	0,233	4,155	0,275	7,988	0,274	7,767	0,272	7,551	0,320	14,489	0,318	14,074	0,316	13,729	0,373	26,803	0,370	26,102	0,368	25,412	0,436	50,541	0,433	49,225	0,431	47,931	0,504	91,377	0,501	88,881	0,498	86,622
0,8	0,193	1,627	0,212	2,342	0,211	2,289	0,253	4,693	0,252	4,563	0,250	4,451	0,295	8,554	0,293	8,318	0,291	8,086	0,342	15,512	0,340	15,068	0,338	14,699	0,399	28,690	0,397	27,940	0,394	27,202	0,467	54,090	0,464	52,683	0,461	51,298	0,540	97,781	0,536	95,111	0,533	92,694
0,9	0,205	1,729	0,225	2,489	0,224	2,433	0,269	4,985	0,267	4,847	0,266	4,728	0,313	9,085	0,311	8,835	0,309	8,589	0,364	16,473	0,361	16,002	0,359	15,610	0,424	30,463	0,421	29,667	0,418	28,884	0,496	57,425	0,492	55,931	0,489	54,461	0,573	103,797	0,569	100,962	0,566	98,397
1	0,217	1,825	0,238	2,628	0,237	2,568	0,284	5,262	0,282	5,116	0,280	4,991	0,331	9,588	0,328	9,324	0,326	9,064	0,384	17,382	0,381	16,886	0,379	16,472	0,447	32,140	0,444	31,300	0,441	30,474	0,523	60,579	0,519	59,003	0,516	57,452	0,604	109,487	0,600	106,497	0,597	103,792
1,1	0,228	1,917	0,250	2,760	0,248	2,697	0,298	5,525	0,296	5,373	0,294	5,241	0,347	10,067	0,345	9,789	0,342	9,516	0,403	18,247	0,400	17,726	0,398	17,292	0,469	33,736	0,466	32,854	0,463	31,987	0,549	63,578	0,545	61,925	0,542	60,298	0,634	114,899	0,630	111,762	0,626	108,923
1,2	0,238	2,005	0,261	2,886	0,260	2,821	0,312	5,777	0,310	5,617	0,308	5,480	0,363	10,524	0,360	10,234	0,358	9,949	0,421	19,074	0,418	18,529	0,416	18,075	0,491	35,260	0,487	34,339	0,484	33,432	0,573	66,445	0,570	64,717	0,566	63,017	0,663	120,070	0,658	116,793	0,654	113,827
1,3	0,248	2,090	0,272	3,007	0,271	2,939	0,325	6,019	0,323	5,852	0,321	5,709	0,378	10,962	0,375	10,660	0,373	10,363	0,439	19,867	0,435	19,299	0,433	18,826	0,511	36,722	0,508	35,763	0,504	34,819	0,597	69,195	0,593	67,395	0,589	65,625	0,690	125,031	0,686	121,618	0,681	118,530
1,4	0,258	2,171	0,283	3,123	0,281	3,053	0,338	6,251	0,335	6,078	0,333	5,929	0,393	11,384	0,390	11,071	0,387	10,762	0,455	20,629	0,452	20,040	0,449	19,550	0,530	38,129	0,527	37,133	0,524	36,153	0,620	71,841	0,616	69,973	0,612	68,135	0,716	129,804	0,712	126,261	0,707	123,055
1,5	0,267	2,249	0,293	3,236	0,291	3,163	0,350	6,475	0,347	6,296	0,345	6,142	0,407	11,791	0,404	11,467	0,401	11,147	0,472	21,366	0,468	20,755	0,465	20,247	0,549	39,487	0,546	38,455	0,542	37,441	0,642	74,394	0,638	72,459	0,634	70,557	0,742	134,410	0,737	130,742	0,732	127,422
1,6	0,276	2,325	0,303	3,345	0,301	3,269	0,361	6,692	0,359	6,507	0,357	6,348	0,420	12,185	0,417	11,850	0,414	11,520	0,487	22,078	0,484	21,447	0,481	20,922	0,568	40,800	0,564	39,734	0,560	38,686	0,663	76,863	0,659	74,865	0,655	72,899	0,767	138,864	0,761	135,075	0,757	131,646
1,7	0,285	2,398	0,312	3,450	0,311	3,372	0,373	6,902	0,370	6,711	0,368	6,547	0,433	12,567	0,430	12,221	0,427	11,881	0,503	22,768	0,499	22,117	0,496	21,576	0,585	42,072	0,582	40,974	0,578	39,893	0,684	79,256	0,680	77,196	0,675	75,169	0,790	143,182	0,785	139,275	0,780	135,740
1,8	0,293	2,470	0,322	3,552	0,320	3,472	0,384	7,106	0,381	6,910	0,379	6,741	0,446	12,938	0,443	12,581	0,440	12,231	0,517	23,438	0,514	22,768	0,511	22,211	0,603	43,308	0,599	42,177	0,595	41,065	0,704	81,580	0,700	79,460	0,695	77,374	0,813	147,374	0,808	143,353	0,803	139,715
1,9	0,301	2,539	0,331	3,652	0,329	3,570	0,394	7,305	0,392	7,103	0,389	6,929	0,459	13,298	0,455	12,932	0,452	12,572	0,532	24,090	0,528	23,402	0,525	22,829	0,619	44,510	0,615	43,348	0,611	42,205	0,724	83,841	0,719	81,662	0,714	79,518	0,836	151,452	0,830	147,320	0,825	143,581
2	0,309	2,606	0,340	3,749	0,338	3,665	0,405	7,498	0,402	7,291	0,399	7,113	0,471	13,649	0,467	13,274	0,464	12,904	0,546	24,724	0,542	24,018	0,539	23,431	0,636	45,681	0,631	44,488	0,627	43,315	0,743	86,042	0,738	83,806	0,733	81,606	0,858	155,424	0,852	151,183	0,847	147,346
2,1	0,317	2,672	0,348	3,844	0,346	3,757	0,415	7,687	0,412	7,474	0,410	7,292	0,483	13,992	0,479	13,607	0,476	13,228	0,560	25,344	0,556	24,620	0,552	24,018	0,651	46,823	0,647	45,601	0,643	44,398	0,761	88,190	0,756	85,898	0,751	83,643	0,879	159,297	0,873	154,952	0,868	151,019
2,2	0,325	2,737	0,356	3,936	0,354	3,847	0,425	7,871	0,422	7,654	0,419	7,466	0,494	14,326	0,491	13,932	0,487	13,545	0,573	25,948	0,569	25,207	0,565	24,591	0,667	47,938	0,663	46,687	0,658	45,456	0,779	90,286	0,774	87,940	0,769	85,632	0,900	163,080	0,894	158,631	0,889	154,605
2,3	0,332	2,800	0,365	4,026	0,363	3,936	0,435	8,051	0,432	7,829	0,429	7,637	0,505	14,653	0,502	14,250	0,498	13,854	0,586	26,539	0,582	25,782	0,578	25,151	0,682	49,028	0,678	47,748	0,673	46,489	0,797	92,336	0,792	89,937	0,787	87,577	0,921	166,777	0,914	162,228	0,909	158,111
2,4	0,340	2,861	0,373	4,115	0,370	4,022	0,444	8,227	0,441	8,000	0,438	7,804	0,516	14,973	0,513	14,561	0,509	14,156	0,599	27,118	0,594	26,344	0,591	25,699	0,697	50,095	0,692	48,787	0,688	47,501	0,814	94,342	0,809	91,890	0,804	89,479	0,941	170,395	0,934	165,747	0,928	161,542
2,5	0,347	2,921	0,380	4,201	0,378	4,107	0,454	8,400	0,450	8,168	0,448	7,968	0,527	15,287	0,523	14,866	0,520	14,453	0,611	27,684	0,607	26,894	0,603	26,236	0,711	51,139	0,707	49,805	0,702	48,492	0,831	96,306	0,826	93,804	0,820	91,342	0,960	173,939	0,954	169,194	0,948	164,901
2,6	0,354	2,981	0,388	4,286	0,386	4,190	0,463	8,569	0,459	8,332	0,457	8,129	0,538	15,594	0,534	15,165	0,530	14,743	0,624	28,239	0,619	27,433	0,615	26,763	0,726	52,163	0,721	50,802	0,716	49,463	0,848	98,231	0,842	95,679	0,837	93,169	0,979	177,412	0,973	172,573	0,967	168,194
2,7	0,361	3,039	0,396	4,369	0,393	4,271	0,472	8,735	0,468	8,494	0,465	8,286	0,548	15,895	0,544	15,458	0,540	15,028	0,636	28,784	0,631	27,962	0,627	27,279	0,740	53,168	0,735	51,780	0,730	50,415	0,864	100,120	0,858	97,519	0,853	94,960	0,998	180,819	0,991	175,888	0,985	171,425
2,8	0,367	3,095	0,403	4,451	0,401	4,351	0,480	8,898	0,477	8,652	0,474	8,441	0,558	16,191	0,554	15,745	0,551	15,308	0,647	29,319	0,643	28,482	0,639	27,786	0,753	54,154	0,748	52,740	0,744	51,350	0,880	101,974	0,874	99,325	0,869	96,719	1,017	184,164	1,010	179,141	1,003	174,596
2,9	0,374	3,151	0,410	4,531	0,408	4,429	0,489	9,058	0,486	8,808	0,483	8,592	0,568	16,481	0,564	16,028	0,560	15,582	0,659	29,844	0,654	28,992	0,650	28,284	0,767	55,122	0,762	53,684	0,757	52,269	0,896	103,795	0,890	101,099	0,884	98,447	1,035	187,449	1,028	182,337	1,021	177,711
3	0,381	3,206	0,418	4,610	0,415	4,507	0,498	9,215	0,494	8,961	0,491	8,742	0,578	16,767	0,574	16,306	0,570	15,853	0,670	30,360	0,666	29,494	0,661	28,773	0,780	56,074	0,775	54,611	0,770	53,172	0,911	105,586	0,905	102,843	0,899	100,145	1,053	190,678	1,045	185,478	1,039	180,773
3,1	0,387	3,260	0,425	4,688	0,422	4,582	0,506	9,370	0,502	9,111	0,499	8,888	0,588	17,048	0,584	16,579	0,580	16,118	0,682	30,868	0,677	29,987	0,673	29,254	0,793	57,011	0,788	55,523	0,783	54,060	0,926	107,346	0,920	104,558	0,914	101,815	1,070	193,854	1,063	188,568	1,056	183,784
3,2	0,393	3,314	0,431	4,764	0,429	4,657	0,514	9,522	0,511	9,259	0,507	9,033	0,597	17,324	0,593	16,848	0,589	16,380	0,693	31,367	0,688	30,472	0,683	29,728	0,806	57,932	0,801	56,420	0,795	54,933	0,941	109,079	0,935	106,245	0,929	103,458	1,087	196,979	1,080	191,608	1,073	186,747
3,3	0,399	3,366	0,438	4,839	0,436	4,731	0,522	9,672	0,519	9,405	0,515	9,175	0,607	17,596	0,603	17,112	0,598	16,637	0,703	31,859	0,698	30,950	0,694	30,194	0,819	58,839	0,813	57,304	0,808	55,794	0,956	110,784	0,950	107,907	0,944	105,076	1,104	200,056	1,097	194,601	1,090	189,664
3,4	0,406	3,418	0,445	4,913	0,442	4,803	0,530	9,819	0,526	9,548	0,523	9,315	0,616	17,865	0,612	17,373	0,607	16,890	0,714	32,344	0,709	31,421	0,705	30,653	0,831	59,732	0,826	58,174	0,820	56,641	0,971	112,464	0,964	109,543	0,958	106,670	1,121	203,087	1,113	197,549	1,107	192,538
3,5	0,412	3,468	0,452	4,986	0,449	4,874	0,538	9,965	0,534	9,690	0,531	9,453	0,625	18,129	0,621	17,630	0,616	17,140	0,725	32,821	0,719	31,885	0,715	31,106	0,843	60,613	0,838	59,031	0,832	57,476	0,985	114,120	0,979	111,156	0,972	108,240	1,137	206,073	1,130	200,454	1,123	195,369
3,6	0,418	3,518	0,458	5,058	0,455	4,945	0,546	10,108	0,542	9,829	0,539	9,589	0,634	18,389	0,630	17,883	0,625	17,386	0,735	33,292	0,730	32,342	0,725	31,552	0,855	61,481	0,850	59,877	0,844	58,299	0,999	115,752	0,993	112,745	0,986	109,788	1,154	209,017	1,146	203,317	1,139	198,160
3,7	0,423	3,568	0,465	5,129	0,462	5,014	0,553	10,250	0,550	9,967	0,546	9,723	0,643	18,646	0,639	18,133	0,634	17,629	0,745	33,756	0,740	32,793	0,735	31,992	0,867	62,337	0,862	60,710	0,856	59,111	1,013	117,361	1,006	114,313	1,000	111,315	1,170	211,920	1,162	206,142	1,155	200,913
3,8	0,429	3,617	0,471	5,199	0,468	5,082	0,561	10,389	0,557	10,102	0,554	9,856	0,652	18,899	0,647	18,379	0,643	17,869	0,755	34,214	0,750	33,238	0,745	32,426	0,879	63,181	0,873	61,533	0,868	59,911	1,027	118,949	1,020	115,860	1,013	112,821	1,186	214,784	1,178	208,928	1,170	203,628
3,9	0,435	3,665	0,477	5,268	0,474	5,150	0,568	10,527	0,564	10,236	0,561	9,986	0,660	19,149	0,656	18,623	0,651	18,105	0,765	34,666	0,760	33,677	0,755	32,854	0,891	64,014	0,885	62,344	0,879	60,702	1,040	120,516	1,033	117,386	1,027	114,307	1,201	217,611	1,193	211,678	1,186	206,309
4	0,441	3,712	0,483	5,336	0,481	5,217	0,576	10,663	0,572	10,368	0,568	10,115	0,669	19,396	0,664	18,863	0,660	18,339	0,775	35,112	0,770	34,110	0,765	33,277	0,902	64,837	0,896	63,146	0,890	61,482	1,053	122,063	1,047	118,893	1,040	115,775	1,217	220,402	1,208	214,393	1,201	208,955
4,1	0,446	3,759	0,489	5,404	0,487	5,282	0,583	10,797	0,579	10,499	0,575	10,243	0,677	19,640	0,673	19,100	0,668	18,569	0,785	35,553	0,779	34,539	0,775	33,695	0,913	65,650	0,907	63,937	0,901	62,253	1,067	123,591	1,060	120,382	1,053	117,224	1,232	223,158	1,224	217,074	1,216	211,568
4,2	0,452	3,806	0,495	5,470	0,493	5,347	0,590	10,930	0,586	10,628	0,582	10,368	0,686	19,881	0,681	19,334	0,676	18,797	0,795	35,988	0,789	34,961	0,784	34,107	0,924	66,453	0,919	64,719	0,912	63,014	1,080	125,100	1,073	121,852	1,066	118,656	1,247	225,881	1,238	219,723	1,231	214,150
4,3	0,457	3,851	0,501	5,536	0,498	5,412	0,597	11,061	0,593	10,755	0,589	10,493	0,694	20,119	0,689	19,565	0,684	19,022	0,804	36,418	0,798	35,379	0,793	34,515	0,936	67,246	0,929	65,492	0,923	63,766	1,093	126,592	1,085	123,305	1,078	120,071	1,262	228,571	1,253	222,340	1,245	216,701
4,4	0,462	3,897	0,507	5,601	0,504	5,475	0,604	11,190	0,600	10,881	0,596	10,616	0,702	20,354	0,697	19,794	0,692	19,244	0,813	36,843	0,808	35,792	0,803	34,918	0,946	68,030	0,940	66,255	0,934	64,510	1,105	128,066	1,098	124,741	1,091	121,469	1,276	231,231	1,268	224,927	1,260	219,222
4,5	0,468	3,941	0,513	5,665	0,510	5,538	0,611	11,318	0,607	11,006	0,603	10,737	0,710	20,586	0,705	20,020	0,700	19,464	0,823	37,264	0,817	36,201	0,812	35,316	0,957	68,805	0,951	67,010	0,945	65,245	1,118	129,524	1,111	126,161	1,103	122,852	1,291	233,860	1,282	227,485	1,274	221,715
4,6	0,473	3,986	0,519	5,729	0,516	5,600	0,618	11,445	0,614	11,129	0,610	10,857	0,718	20,816	0,713	20,244	0,708	19,682	0,832	37,679	0,826	36,605	0,821	35,711	0,968	69,572	0,962	67,757	0,955	65,972	1,130	130,965	1,123	127,565	1,116	124,219	1,305	236,461	1,296	230,014	1,288	224,181
4,7	0,478	4,029	0,525	5,792	0,522	5,662	0,625	11,570	0,620	11,251	0,617	10,976	0,726	21,044	0,721	20,465	0,716	19,897	0,841	38,091	0,835	37,004	0,830	36,100	0,978	70,330	0,972	68,496	0,966	66,691	1,143	132,391	1,135	128,954	1,128	125,572	1,319	239,033	1,311	232,517	1,302	226,620
4,8	0,483	4,073	0,530	5,854	0,527	5,722	0,631	11,694	0,627	11,372	0,623	11,094	0,733	21,269	0,728	20,684	0,723	20,110	0,850	38,498	0,844	37,400	0,839	36,486	0,989	71,080	0,982	69,227	0,976	67,403	1,155	133,802	1,147	130,328	1,140	126,910	1,333	241,578	1,325	234,992	1,316	229,033
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.6: roughness coefficient k=1,25 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,9	0,488	4,116	0,536	5,915	0,533	5,783	0,638	11,817	0,634	11,491	0,630	11,210	0,741	21,492	0,736	20,901	0,731	20,320	0,859	38,900	0,853	37,791	0,848	36,868	0,999	71,823	0,993	69,950	0,986	68,107	1,167	135,199	1,159	131,688	1,152	128,235	1,347	244,097	1,338	237,443	1,330	231,421
5	0,494	4,158	0,541	5,976	0,538	5,842	0,645	11,938	0,640	11,609	0,636	11,326	0,749	21,712	0,744	21,116	0,738	20,529	0,868	39,299	0,861	38,178	0,856	37,246	1,009	72,558	1,003	70,666	0,996	68,804	1,179	136,581	1,171	133,035	1,164	129,546	1,361	246,590	1,352	239,868	1,344	233,785
5,1	0,499	4,200	0,547	6,037	0,544	5,901	0,651	12,059	0,647	11,726	0,643	11,440	0,756	21,931	0,751	21,328	0,746	20,735	0,876	39,694	0,870	38,562	0,865	37,620	1,020	73,286	1,013	71,375	1,006	69,494	1,191	137,949	1,183	134,367	1,175	130,844	1,375	249,058	1,366	242,269	1,357	236,125
5,2	0,503	4,242	0,552	6,096	0,549	5,960	0,658	12,178	0,653	11,842	0,649	11,553	0,764	22,147	0,758	21,538	0,753	20,940	0,885	40,084	0,879	38,941	0,873	37,990	1,030	74,006	1,023	72,076	1,016	70,178	1,202	139,304	1,195	135,687	1,187	132,129	1,388	251,502	1,379	244,647	1,370	238,443
5,3	0,508	4,283	0,557	6,156	0,554	6,017	0,664	12,296	0,659	11,956	0,655	11,664	0,771	22,361	0,766	21,746	0,760	21,142	0,894	40,471	0,887	39,317	0,882	38,357	1,040	74,720	1,033	72,772	1,026	70,855	1,214	140,646	1,206	136,995	1,198	133,402	1,402	253,923	1,392	247,002	1,384	240,738
5,4	0,513	4,324	0,563	6,214	0,560	6,075	0,670	12,412	0,666	12,070	0,661	11,775	0,778	22,573	0,773	21,953	0,768	21,343	0,902	40,855	0,896	39,690	0,890	38,720	1,049	75,427	1,043	73,460	1,036	71,525	1,225	141,976	1,217	138,290	1,210	134,663	1,415	256,321	1,405	249,334	1,397	243,012
5,5	0,518	4,364	0,568	6,272	0,565	6,131	0,676	12,528	0,672	12,183	0,668	11,885	0,786	22,783	0,780	22,157	0,775	21,542	0,910	41,235	0,904	40,059	0,898	39,080	1,059	76,128	1,052	74,142	1,045	72,190	1,237	143,293	1,229	139,573	1,221	135,913	1,428	258,697	1,418	251,646	1,410	245,264
5,6	0,523	4,404	0,573	6,330	0,570	6,188	0,683	12,643	0,678	12,294	0,674	11,994	0,793	22,992	0,787	22,360	0,782	21,739	0,919	41,611	0,912	40,425	0,907	39,437	1,069	76,822	1,062	74,819	1,055	72,848	1,248	144,598	1,240	140,844	1,232	137,151	1,441	261,052	1,431	253,936	1,422	247,497
5,7	0,527	4,444	0,578	6,387	0,575	6,244	0,689	12,757	0,684	12,405	0,680	12,102	0,800	23,198	0,794	22,560	0,789	21,934	0,927	41,984	0,920	40,787	0,915	39,791	1,078	77,510	1,071	75,489	1,064	73,500	1,259	145,892	1,251	142,104	1,243	138,378	1,454	263,385	1,444	256,206	1,435	249,709
5,8	0,532	4,483	0,584	6,443	0,580	6,299	0,695	12,869	0,690	12,514	0,686	12,209	0,807	23,403	0,801	22,759	0,796	22,127	0,935	42,354	0,928	41,146	0,923	40,141	1,088	78,192	1,081	76,153	1,074	74,147	1,270	147,174	1,262	143,353	1,254	139,595	1,467	265,699	1,457	258,457	1,448	251,903
5,9	0,537	4,522	0,589	6,499	0,585	6,354	0,701	12,981	0,696	12,623	0,692	12,315	0,814	23,606	0,808	22,957	0,803	22,319	0,943	42,721	0,937	41,503	0,931	40,489	1,097	78,868	1,090	76,811	1,083	74,788	1,281	148,445	1,273	144,592	1,265	140,801	1,479	267,992	1,469	260,687	1,460	254,077
6	0,541	4,561	0,594	6,555	0,590	6,408	0,707	13,092	0,702	12,731	0,698	12,420	0,821	23,807	0,815	23,152	0,810	22,509	0,951	43,084	0,944	41,856	0,939	40,834	1,107	79,539	1,099	77,464	1,092	75,424	1,292	149,706	1,284	145,820	1,275	141,996	1,492	270,266	1,482	262,900	1,473	256,233
6,1	0,546	4,600	0,599	6,610	0,595	6,462	0,713	13,202	0,708	12,838	0,703	12,524	0,828	24,006	0,822	23,346	0,816	22,698	0,959	43,445	0,952	42,206	0,947	41,175	1,116	80,203	1,109	78,112	1,101	76,055	1,303	150,956	1,294	147,037	1,286	143,182	1,504	272,521	1,494	265,093	1,485	258,371
6,2	0,550	4,638	0,604	6,665	0,600	6,515	0,719	13,311	0,714	12,944	0,709	12,628	0,835	24,204	0,829	23,539	0,823	22,885	0,967	43,802	0,960	42,554	0,954	41,514	1,125	80,863	1,118	78,754	1,110	76,680	1,313	152,196	1,305	148,245	1,297	144,358	1,517	274,758	1,506	267,269	1,497	260,492
6,3	0,555	4,675	0,609	6,719	0,605	6,568	0,725	13,419	0,719	13,049	0,715	12,730	0,841	24,400	0,836	23,730	0,830	23,071	0,975	44,157	0,968	42,898	0,962	41,851	1,134	81,517	1,127	79,392	1,119	77,301	1,324	153,426	1,316	149,443	1,307	145,525	1,529	276,977	1,519	269,428	1,509	262,596
6,4	0,559	4,713	0,613	6,773	0,610	6,621	0,730	13,526	0,725	13,153	0,721	12,832	0,848	24,595	0,842	23,919	0,836	23,255	0,983	44,509	0,976	43,240	0,970	42,184	1,143	82,166	1,136	80,024	1,128	77,916	1,335	154,647	1,326	150,632	1,317	146,683	1,541	279,178	1,531	271,569	1,521	264,683
6,5	0,564	4,750	0,618	6,826	0,615	6,673	0,736	13,632	0,731	13,256	0,726	12,933	0,855	24,788	0,849	24,107	0,843	23,438	0,990	44,858	0,983	43,579	0,977	42,515	1,152	82,810	1,145	80,651	1,137	78,527	1,345	155,857	1,336	151,812	1,328	147,831	1,553	281,362	1,543	273,694	1,533	266,754
6,6	0,568	4,787	0,623	6,879	0,619	6,725	0,742	13,738	0,737	13,359	0,732	13,033	0,861	24,980	0,855	24,293	0,849	23,619	0,998	45,205	0,991	43,916	0,985	42,844	1,161	83,449	1,153	81,273	1,146	79,133	1,355	157,059	1,347	152,982	1,338	148,971	1,565	283,529	1,555	275,802	1,545	268,809
6,7	0,573	4,824	0,628	6,932	0,624	6,776	0,747	13,843	0,742	13,461	0,738	13,132	0,868	25,170	0,862	24,479	0,856	23,799	1,006	45,549	0,999	44,250	0,992	43,170	1,170	84,083	1,162	81,891	1,155	79,734	1,366	158,251	1,357	154,144	1,348	150,102	1,577	285,681	1,566	277,894	1,557	270,848
6,8	0,577	4,860	0,632	6,984	0,629	6,827	0,753	13,947	0,748	13,562	0,743	13,231	0,874	25,359	0,868	24,662	0,862	23,977	1,013	45,890	1,006	44,582	1,000	43,493	1,179	84,713	1,171	82,504	1,163	80,331	1,376	159,435	1,367	155,296	1,358	151,225	1,589	287,816	1,578	279,971	1,568	272,873
6,9	0,581	4,896	0,637	7,036	0,634	6,878	0,759	14,050	0,753	13,663	0,749	13,329	0,881	25,547	0,875	24,845	0,869	24,155	1,021	46,229	1,013	44,911	1,007	43,814	1,187	85,338	1,180	83,113	1,172	80,924	1,386	160,610	1,377	156,441	1,368	152,339	1,600	289,935	1,590	282,033	1,580	274,882
7	0,585	4,932	0,642	7,087	0,638	6,928	0,764	14,152	0,759	13,762	0,754	13,426	0,887	25,733	0,881	25,026	0,875	24,331	1,028	46,565	1,021	45,238	1,015	44,133	1,196	85,958	1,188	83,717	1,180	81,512	1,396	161,776	1,387	157,577	1,378	153,446	1,612	292,039	1,601	284,080	1,591	276,877
7,1	0,590	4,967	0,646	7,138	0,643	6,978	0,770	14,254	0,764	13,861	0,760	13,523	0,894	25,917	0,888	25,205	0,881	24,505	1,036	46,900	1,028	45,563	1,022	44,450	1,204	86,574	1,197	84,317	1,189	82,096	1,406	162,935	1,397	158,705	1,388	154,545	1,624	294,128	1,613	286,112	1,603	278,858
7,2	0,594	5,003	0,651	7,189	0,647	7,028	0,775	14,355	0,770	13,959	0,765	13,619	0,900	26,101	0,894	25,384	0,888	24,679	1,043	47,231	1,035	45,885	1,029	44,764	1,213	87,186	1,205	84,912	1,197	82,676	1,416	164,085	1,407	159,826	1,398	155,635	1,635	296,203	1,624	288,130	1,614	280,825
7,3	0,598	5,038	0,656	7,239	0,652	7,077	0,781	14,456	0,775	14,057	0,770	13,714	0,906	26,283	0,900	25,561	0,894	24,851	1,050	47,561	1,043	46,205	1,036	45,076	1,221	87,793	1,213	85,504	1,206	83,252	1,426	165,227	1,417	160,938	1,408	156,719	1,646	298,263	1,635	290,134	1,625	282,778
7,4	0,602	5,073	0,660	7,289	0,656	7,126	0,786	14,555	0,780	14,154	0,776	13,809	0,913	26,464	0,906	25,737	0,900	25,022	1,057	47,888	1,050	46,523	1,043	45,387	1,230	88,396	1,222	86,092	1,214	83,824	1,436	166,361	1,427	162,043	1,417	157,795	1,658	300,309	1,647	292,125	1,636	284,718
7,5	0,606	5,107	0,665	7,339	0,661	7,174	0,791	14,654	0,786	14,250	0,781	13,902	0,919	26,644	0,912	25,912	0,906	25,192	1,064	48,213	1,057	46,838	1,050	45,695	1,238	88,995	1,230	86,675	1,222	84,393	1,445	167,488	1,436	163,140	1,427	158,863	1,669	302,341	1,658	294,101	1,647	286,645
7,6	0,610	5,142	0,669	7,388	0,665	7,223	0,797	14,753	0,791	14,346	0,786	13,996	0,925	26,823	0,919	26,086	0,912	25,361	1,072	48,535	1,064	47,152	1,057	46,001	1,246	89,591	1,238	87,255	1,230	84,957	1,455	168,607	1,446	164,230	1,436	159,925	1,680	304,360	1,669	296,065	1,658	288,559
7,7	0,614	5,176	0,674	7,437	0,670	7,270	0,802	14,850	0,796	14,441	0,791	14,089	0,931	27,000	0,925	26,258	0,918	25,529	1,079	48,856	1,071	47,463	1,064	46,304	1,255	90,182	1,247	87,831	1,238	85,518	1,465	169,719	1,455	165,313	1,446	160,980	1,691	306,365	1,680	298,016	1,669	290,461
7,8	0,618	5,210	0,678	7,486	0,674	7,318	0,807	14,948	0,801	14,535	0,796	14,181	0,937	27,176	0,931	26,430	0,924	25,696	1,086	49,175	1,078	47,773	1,071	46,606	1,263	90,769	1,255	88,403	1,246	86,075	1,474	170,823	1,465	166,389	1,455	162,028	1,702	308,358	1,691	299,955	1,680	292,350
7,9	0,622	5,243	0,682	7,534	0,678	7,365	0,812	15,044	0,807	14,629	0,802	14,272	0,943	27,351	0,937	26,600	0,930	25,861	1,093	49,491	1,085	48,080	1,078	46,906	1,271	91,353	1,263	88,971	1,254	86,629	1,484	171,921	1,474	167,459	1,465	163,069	1,713	310,338	1,702	301,881	1,691	294,227
8	0,626	5,277	0,687	7,582	0,683	7,412	0,817	15,140	0,812	14,722	0,807	14,363	0,949	27,525	0,943	26,769	0,936	26,026	1,100	49,806	1,092	48,386	1,085	47,205	1,279	91,933	1,271	89,536	1,262	87,179	1,493	173,011	1,484	168,521	1,474	164,103	1,724	312,305	1,712	303,794	1,702	296,092
8,1	0,630	5,310	0,691	7,630	0,687	7,459	0,823	15,235	0,817	14,815	0,812	14,453	0,955	27,698	0,949	26,937	0,942	26,189	1,107	50,118	1,099	48,690	1,092	47,501	1,287	92,510	1,279	90,098	1,270	87,725	1,502	174,095	1,493	169,577	1,483	165,131	1,735	314,260	1,723	305,696	1,712	297,946
8,2	0,634	5,343	0,695	7,678	0,691	7,506	0,828	15,330	0,822	14,907	0,817	14,543	0,961	27,870	0,954	27,105	0,948	26,352	1,113	50,429	1,106	48,992	1,099	47,795	1,295	93,082	1,287	90,656	1,278	88,269	1,512	175,172	1,502	170,626	1,492	166,153	1,745	316,203	1,734	307,586	1,723	299,788
8,3	0,638	5,376	0,700	7,725	0,696	7,552	0,833	15,424	0,827	14,999	0,822	14,633	0,967	28,041	0,960	27,271	0,954	26,514	1,120	50,738	1,112	49,292	1,105	48,088	1,303	93,652	1,294	91,210	1,286	88,809	1,521	176,243	1,511	171,669	1,501	167,169	1,756	318,135	1,744	309,465	1,733	301,619
8,4	0,642	5,409	0,704	7,772	0,700	7,598	0,838	15,517	0,832	15,090	0,827	14,721	0,973	28,211	0,966	27,436	0,959	26,674	1,127	51,045	1,119	49,590	1,112	48,379	1,311	94,218	1,302	91,762	1,294	89,345	1,530	177,307	1,520	172,705	1,511	168,178	1,767	320,054	1,755	311,332	1,744	303,440
8,5	0,646	5,441	0,708	7,819	0,704	7,643	0,843	15,610	0,837	15,180	0,832	14,810	0,979	28,380	0,972	27,600	0,965	26,834	1,134	51,350	1,126	49,886	1,119	48,668	1,319	94,780	1,310	92,310	1,302	89,879	1,539	178,365	1,529	173,736	1,520	169,182	1,777	321,962	1,765	313,189	1,754	305,249
8,6	0,650	5,474	0,712	7,865	0,708	7,689	0,848	15,703	0,842	15,270	0,837	14,897	0,984	28,548	0,978	27,763	0,971	26,992	1,140	51,653	1,132	50,181	1,125	48,956	1,326	95,340	1,318	92,854	1,309	90,410	1,548	179,417	1,538	174,760	1,529	170,179	1,788	323,860	1,776	315,034	1,765	307,048
8,7	0,653	5,506	0,716	7,911	0,712	7,734	0,853	15,795	0,847	15,359	0,842	14,984	0,990	28,714	0,983	27,926	0,976	27,150	1,147	51,955	1,139	50,474	1,132	49,242	1,334	95,896	1,325	93,396	1,317	90,937	1,557	180,463	1,547	175,779	1,537	171,171	1,798	325,746	1,786	316,869	1,775	308,836
8,8	0,657	5,538	0,721	7,957	0,716	7,778	0,858	15,886	0,852	15,448	0,846	15,071	0,996	28,880	0,989	28,087	0,982	27,307	1,154	52,255	1,146	50,765	1,139	49,526	1,342	96,449	1,333	93,935	1,324	91,461	1,566	181,502	1,556	176,791	1,546	172,157	1,808	327,621	1,796	318,693	1,785	310,614
8,9	0,661	5,570	0,725	8,002	0,721	7,823	0,863	15,977	0,857	15,536	0,851	15,157	1,002	29,045	0,995	28,247	0,988	27,463	1,160	52,553	1,152	51,055	1,145	49,808	1,349	96,999	1,341	94,470	1,332	91,983	1,575	182,536	1,565	177,798	1,555	173,138	1,819	329,485	1,807	320,507	1,795	312,382
9	0,665	5,601	0,729	8,048	0,725	7,867	0,868	16,067	0,861	15,624	0,856	15,243	1,007	29,209	1,000	28,407	0,993	27,618	1,167	52,849	1,159	51,343	1,151	50,089	1,357	97,545	1,348	95,002	1,339	92,501	1,584	183,564	1,574	178,800	1,564	174,113	1,829	331,340	1,817	322,311	1,805	314,140
9,1	0,669	5,633	0,733	8,093	0,729	7,911	0,872	16,157	0,866	15,712	0,861	15,328	1,013	29,372	1,006	28,565	0,999	27,772	1,173	53,144	1,165	51,629	1,158	50,369	1,365	98,089	1,356	95,532	1,347	93,017	1,593	184,586	1,583	179,795	1,573	175,082	1,839	333,184	1,827	324,104	1,815	315,888
9,2	0,672	5,664	0,737	8,138	0,733	7,955	0,877	16,246	0,871	15,799	0,866	15,413	1,018	29,535	1,011	28,723	1,004	27,926	1,180	53,437	1,171	51,914	1,164	50,647	1,372	98,630	1,363	96,059	1,354	93,529	1,602	185,603	1,592	180,786	1,581	176,047	1,849	335,017	1,837	325,888	1,825	317,627
9,3	0,676	5,695	0,741	8,182	0,737	7,999	0,882	16,335	0,876	15,885	0,870	15,497	1,024	29,696	1,017	28,880	1,010	28,078	1,186	53,729	1,178	52,198	1,171	50,923	1,380	99,167	1,371	96,582	1,362	94,039	1,610	186,614	1,600	181,771	1,590	177,006	1,859	336,841	1,847	327,663	1,835	319,356
9,4	0,680	5,726	0,745	8,227	0,741	8,042	0,887	16,424	0,881	15,971	0,875	15,581	1,030	29,856	1,022	29,036	1,015	28,230	1,193	54,019	1,184	52,479	1,177	51,198	1,387	99,702	1,378	97,103	1,369	94,547	1,619	187,619	1,609	182,750	1,598	177,960	1,869	338,655	1,857	329,427	1,845	321,076
9,5	0,683	5,756	0,749	8,271	0,745	8,085	0,892	16,512	0,885	16,056	0,880	15,665	1,035	30,016	1,028	29,192	1,021	28,381	1,199	54,307	1,191	52,760	1,183	51,472	1,394	100,234	1,385	97,621	1,376	95,051	1,628	188,620	1,617	183,725	1,607	178,909	1,879	340,460	1,867	331,183	1,855	322,787
9,6	0,687	5,787	0,753	8,315	0,749	8,128	0,896	16,599	0,890	16,141	0,884	15,748	1,041	30,175	1,033	29,346	1,026	28,531	1,205	54,594	1,197	53,039	1,190	51,744	1,402	100,763	1,393	98,137	1,384	95,553	1,636	189,615	1,626	184,694	1,615	179,853	1,889	342,255	1,877	332,929	1,865	324,489
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.6: roughness coefficient k=1,25 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,7	0,690	5,817	0,757	8,358	0,753	8,171	0,901	16,686	0,895	16,226	0,889	15,830	1,046	30,333	1,039	29,500	1,032	28,681	1,212	54,880	1,203	53,316	1,196	52,014	1,409	101,290	1,400	98,650	1,391	96,052	1,645	190,605	1,634	185,658	1,624	180,792	1,899	344,041	1,886	334,666	1,875	326,182
9,8	0,694	5,848	0,761	8,402	0,757	8,213	0,906	16,773	0,899	16,310	0,894	15,912	1,051	30,490	1,044	29,652	1,037	28,829	1,218	55,164	1,209	53,592	1,202	52,284	1,416	101,814	1,407	99,160	1,398	96,549	1,653	191,590	1,643	186,618	1,632	181,726	1,909	345,817	1,896	336,394	1,884	327,866
9,9	0,698	5,878	0,765	8,445	0,760	8,255	0,910	16,859	0,904	16,394	0,898	15,994	1,057	30,646	1,050	29,805	1,042	28,977	1,224	55,447	1,216	53,866	1,208	52,551	1,424	102,335	1,414	99,667	1,405	97,043	1,662	192,570	1,651	187,572	1,641	182,655	1,919	347,585	1,906	338,113	1,894	329,542
10	0,701	5,908	0,769	8,488	0,764	8,298	0,915	16,944	0,909	16,477	0,903	16,075	1,062	30,802	1,055	29,956	1,047	29,124	1,230	55,728	1,222	54,140	1,214	52,818	1,431	102,853	1,422	100,172	1,412	97,535	1,670	193,544	1,660	188,522	1,649	183,580	1,928	349,343	1,915	339,824	1,904	331,210
10,2	0,708	5,967	0,776	8,573	0,772	8,381	0,924	17,114	0,918	16,643	0,912	16,237	1,073	31,111	1,065	30,256	1,058	29,416	1,243	56,286	1,234	54,682	1,226	53,347	1,445	103,883	1,436	101,175	1,427	98,511	1,687	195,480	1,676	190,407	1,665	185,416	1,948	352,834	1,935	343,220	1,923	334,520
10,4	0,715	6,026	0,784	8,658	0,780	8,464	0,933	17,283	0,927	16,806	0,921	16,396	1,083	31,417	1,076	30,554	1,068	29,706	1,255	56,839	1,246	55,219	1,238	53,871	1,459	104,902	1,450	102,168	1,441	99,478	1,704	197,396	1,693	192,273	1,682	187,234	1,967	356,291	1,954	346,583	1,941	337,797
10,6	0,722	6,084	0,792	8,741	0,787	8,545	0,942	17,450	0,936	16,969	0,930	16,555	1,094	31,719	1,086	30,848	1,079	29,992	1,267	57,386	1,258	55,751	1,250	54,390	1,473	105,911	1,464	103,151	1,454	100,435	1,720	199,294	1,709	194,122	1,698	189,034	1,986	359,715	1,972	349,913	1,960	341,043
10,8	0,729	6,142	0,799	8,824	0,795	8,626	0,951	17,615	0,944	17,129	0,939	16,711	1,104	32,019	1,097	31,140	1,089	30,276	1,279	57,928	1,270	56,278	1,262	54,904	1,487	106,911	1,478	104,125	1,468	101,384	1,736	201,174	1,725	195,954	1,714	190,818	2,004	363,106	1,991	353,213	1,979	344,259
11	0,736	6,199	0,807	8,906	0,802	8,707	0,960	17,779	0,953	17,289	0,947	16,867	1,114	32,317	1,107	31,429	1,099	30,557	1,291	58,466	1,282	56,800	1,274	55,413	1,501	107,902	1,491	105,090	1,482	102,323	1,752	203,037	1,741	197,769	1,730	192,585	2,023	366,467	2,009	356,482	1,997	347,445
11,2	0,743	6,256	0,814	8,988	0,809	8,786	0,969	17,941	0,962	17,446	0,956	17,021	1,125	32,611	1,117	31,716	1,109	30,835	1,303	58,998	1,293	57,317	1,285	55,918	1,515	108,884	1,505	106,046	1,495	103,254	1,768	204,884	1,757	199,567	1,746	194,336	2,041	369,797	2,028	359,721	2,015	350,603
11,4	0,749	6,312	0,821	9,068	0,817	8,865	0,977	18,102	0,971	17,603	0,965	17,173	1,135	32,903	1,127	32,000	1,119	31,111	1,314	59,526	1,305	57,830	1,297	56,418	1,528	109,857	1,518	106,994	1,509	104,177	1,784	206,713	1,773	201,349	1,761	196,072	2,059	373,097	2,046	362,932	2,033	353,732
11,6	0,756	6,368	0,829	9,148	0,824	8,943	0,986	18,261	0,979	17,758	0,973	17,325	1,145	33,193	1,137	32,281	1,129	31,385	1,326	60,049	1,316	58,338	1,308	56,914	1,542	110,822	1,532	107,933	1,522	105,092	1,800	208,527	1,788	203,116	1,777	197,792	2,077	376,369	2,064	366,114	2,051	356,834
11,8	0,762	6,423	0,836	9,228	0,831	9,021	0,995	18,419	0,988	17,911	0,981	17,475	1,155	33,480	1,147	32,560	1,139	31,656	1,337	60,568	1,328	58,842	1,320	57,405	1,555	111,778	1,545	108,865	1,535	105,999	1,815	210,325	1,804	204,867	1,792	199,498	2,095	379,612	2,081	369,269	2,068	359,909
12	0,769	6,478	0,843	9,306	0,838	9,098	1,003	18,576	0,996	18,064	0,990	17,623	1,164	33,764	1,156	32,837	1,148	31,926	1,349	61,082	1,339	59,341	1,331	57,893	1,568	112,726	1,558	109,788	1,548	106,898	1,831	212,108	1,819	206,604	1,807	201,189	2,113	382,828	2,099	372,398	2,086	362,959
12,2	0,775	6,532	0,850	9,384	0,845	9,174	1,011	18,731	1,004	18,215	0,998	17,771	1,174	34,046	1,166	33,111	1,158	32,192	1,360	61,592	1,350	59,837	1,342	58,376	1,581	113,667	1,571	110,704	1,561	107,790	1,846	213,876	1,834	208,326	1,822	202,866	2,131	386,018	2,117	375,501	2,103	365,983
12,4	0,782	6,586	0,857	9,462	0,852	9,250	1,020	18,885	1,013	18,365	1,006	17,917	1,184	34,326	1,176	33,383	1,167	32,457	1,371	62,098	1,361	60,328	1,353	58,856	1,594	114,599	1,584	111,613	1,574	108,674	1,861	215,630	1,849	210,035	1,837	204,530	2,148	389,181	2,134	378,578	2,121	368,982
12,6	0,788	6,640	0,864	9,538	0,859	9,325	1,028	19,038	1,021	18,514	1,014	18,062	1,193	34,604	1,185	33,653	1,177	32,719	1,382	62,599	1,372	60,816	1,364	59,331	1,607	115,525	1,597	112,514	1,586	109,552	1,876	217,369	1,864	211,729	1,852	206,180	2,166	392,319	2,151	381,630	2,138	371,957
12,8	0,794	6,693	0,871	9,614	0,866	9,399	1,036	19,190	1,029	18,661	1,023	18,206	1,203	34,879	1,194	33,921	1,186	32,980	1,393	63,097	1,383	61,299	1,375	59,803	1,620	116,442	1,609	113,408	1,599	110,422	1,891	219,095	1,879	213,410	1,867	207,817	2,183	395,433	2,168	384,659	2,155	374,909
13	0,801	6,745	0,878	9,690	0,873	9,473	1,044	19,340	1,037	18,807	1,031	18,349	1,212	35,152	1,204	34,187	1,195	33,238	1,404	63,591	1,394	61,779	1,386	60,271	1,633	117,353	1,622	114,295	1,611	111,286	1,906	220,808	1,893	215,078	1,881	209,442	2,200	398,521	2,185	387,664	2,172	377,838
13,2	0,807	6,797	0,884	9,765	0,879	9,546	1,052	19,490	1,045	18,953	1,039	18,490	1,222	35,424	1,213	34,451	1,205	33,495	1,415	64,081	1,405	62,255	1,396	60,736	1,645	118,257	1,635	115,175	1,624	112,143	1,920	222,507	1,908	216,734	1,896	211,054	2,217	401,587	2,202	390,646	2,188	380,744
13,4	0,813	6,849	0,891	9,839	0,886	9,619	1,060	19,638	1,053	19,097	1,046	18,631	1,231	35,693	1,222	34,713	1,214	33,749	1,426	64,568	1,415	62,728	1,407	61,197	1,658	119,154	1,647	116,049	1,636	112,994	1,935	224,194	1,922	218,376	1,910	212,653	2,233	404,629	2,219	393,605	2,205	383,629
13,6	0,819	6,901	0,898	9,913	0,893	9,691	1,068	19,785	1,061	19,240	1,054	18,771	1,240	35,960	1,232	34,972	1,223	34,002	1,436	65,051	1,426	63,197	1,417	61,655	1,670	120,044	1,659	116,916	1,648	113,838	1,949	225,868	1,937	220,007	1,924	214,241	2,250	407,648	2,235	396,542	2,221	386,492
13,8	0,825	6,952	0,904	9,986	0,899	9,763	1,076	19,931	1,069	19,382	1,062	18,909	1,249	36,225	1,241	35,230	1,232	34,253	1,447	65,530	1,437	63,663	1,428	62,109	1,682	120,928	1,671	117,777	1,661	114,676	1,964	227,529	1,951	221,626	1,938	215,818	2,267	410,646	2,252	399,458	2,238	389,334
14	0,831	7,002	0,911	10,059	0,906	9,834	1,084	20,076	1,076	19,523	1,070	19,047	1,258	36,488	1,250	35,486	1,241	34,502	1,457	66,006	1,447	64,125	1,438	62,560	1,695	121,805	1,684	118,631	1,673	115,508	1,978	229,179	1,965	223,233	1,953	217,382	2,283	413,622	2,268	402,353	2,254	392,155
14,2	0,837	7,053	0,918	10,131	0,912	9,904	1,092	20,220	1,084	19,663	1,077	19,183	1,267	36,750	1,259	35,741	1,250	34,749	1,468	66,478	1,457	64,584	1,448	63,008	1,707	122,677	1,696	119,480	1,685	116,335	1,992	230,817	1,979	224,828	1,966	218,936	2,299	416,576	2,284	405,227	2,270	394,956
14,4	0,843	7,103	0,924	10,203	0,919	9,974	1,099	20,363	1,092	19,802	1,085	19,319	1,276	37,009	1,267	35,993	1,259	34,994	1,478	66,947	1,468	65,040	1,459	63,452	1,719	123,542	1,708	120,322	1,696	117,155	2,006	232,444	1,993	226,412	1,980	220,479	2,316	419,510	2,300	408,081	2,286	397,738
14,6	0,849	7,152	0,930	10,274	0,925	10,044	1,107	20,505	1,099	19,940	1,093	19,454	1,285	37,267	1,276	36,244	1,267	35,238	1,488	67,413	1,478	65,492	1,469	63,894	1,731	124,401	1,719	121,159	1,708	117,970	2,020	234,059	2,007	227,986	1,994	222,011	2,332	422,424	2,316	410,915	2,302	400,501
14,8	0,855	7,202	0,937	10,345	0,932	10,113	1,115	20,646	1,107	20,077	1,100	19,587	1,294	37,523	1,285	36,493	1,276	35,480	1,499	67,876	1,488	65,942	1,479	64,332	1,743	125,254	1,731	121,990	1,720	118,779	2,034	235,663	2,021	229,548	2,008	223,533	2,348	425,317	2,332	413,730	2,318	403,244
15	0,861	7,251	0,943	10,415	0,938	10,182	1,122	20,786	1,115	20,213	1,108	19,720	1,303	37,777	1,294	36,740	1,285	35,720	1,509	68,335	1,498	66,388	1,489	64,768	1,754	126,101	1,743	122,815	1,732	119,582	2,048	237,256	2,034	231,100	2,021	225,044	2,364	428,192	2,348	416,526	2,333	405,969
15,2	0,866	7,299	0,950	10,485	0,944	10,250	1,130	20,925	1,122	20,349	1,115	19,852	1,311	38,030	1,302	36,986	1,293	35,959	1,519	68,792	1,508	66,832	1,499	65,201	1,766	126,943	1,755	123,635	1,743	120,381	2,061	238,839	2,048	232,642	2,035	226,546	2,379	431,047	2,363	419,304	2,349	408,676
15,4	0,872	7,347	0,956	10,554	0,950	10,318	1,137	21,063	1,129	20,483	1,122	19,983	1,320	38,281	1,311	37,230	1,302	36,197	1,529	69,245	1,518	67,272	1,509	65,631	1,778	127,779	1,766	124,450	1,755	121,174	2,075	240,412	2,062	234,174	2,048	228,037	2,395	433,883	2,379	422,063	2,364	411,366
15,6	0,878	7,395	0,962	10,623	0,957	10,385	1,145	21,201	1,137	20,617	1,130	20,114	1,329	38,530	1,320	37,472	1,310	36,432	1,539	69,696	1,528	67,710	1,519	66,058	1,789	128,610	1,778	125,259	1,766	121,962	2,088	241,974	2,075	235,696	2,062	229,519	2,411	436,701	2,394	424,804	2,380	414,038
15,8	0,883	7,443	0,968	10,692	0,963	10,452	1,152	21,337	1,144	20,749	1,137	20,243	1,337	38,778	1,328	37,713	1,319	36,667	1,549	70,144	1,538	68,145	1,528	66,482	1,801	129,436	1,789	126,063	1,777	122,745	2,102	243,526	2,088	237,208	2,075	230,992	2,426	439,501	2,410	427,528	2,395	416,693
16	0,889	7,491	0,974	10,760	0,969	10,519	1,159	21,473	1,151	20,881	1,144	20,372	1,346	39,024	1,336	37,952	1,327	36,899	1,559	70,589	1,547	68,577	1,538	66,904	1,812	130,256	1,800	126,862	1,789	123,523	2,115	245,069	2,101	238,710	2,088	232,455	2,441	442,284	2,425	430,235	2,410	419,331
16,2	0,895	7,538	0,981	10,827	0,975	10,585	1,167	21,607	1,159	21,012	1,151	20,500	1,354	39,269	1,345	38,190	1,335	37,131	1,568	71,031	1,557	69,007	1,548	67,323	1,823	131,071	1,812	127,656	1,800	124,296	2,128	246,602	2,115	240,203	2,101	233,909	2,457	445,049	2,440	432,924	2,425	421,952
16,4	0,900	7,584	0,987	10,895	0,981	10,650	1,174	21,741	1,166	21,142	1,159	20,627	1,363	39,512	1,353	38,427	1,344	37,361	1,578	71,470	1,567	69,434	1,557	67,739	1,835	131,882	1,823	128,445	1,811	125,064	2,141	248,125	2,128	241,687	2,114	235,354	2,472	447,797	2,455	435,597	2,440	424,558
16,6	0,906	7,631	0,993	10,961	0,987	10,716	1,181	21,874	1,173	21,272	1,166	20,753	1,371	39,753	1,361	38,662	1,352	37,589	1,588	71,907	1,576	69,858	1,567	68,153	1,846	132,687	1,834	129,229	1,822	125,828	2,154	249,639	2,141	243,162	2,127	236,790	2,487	450,528	2,470	438,254	2,455	427,147
16,8	0,911	7,677	0,999	11,028	0,993	10,781	1,188	22,007	1,180	21,400	1,173	20,878	1,379	39,994	1,370	38,895	1,360	37,816	1,597	72,341	1,586	70,280	1,576	68,565	1,857	133,487	1,845	130,009	1,833	126,587	2,167	251,144	2,154	244,628	2,140	238,218	2,502	453,243	2,485	440,895	2,470	429,722
17	0,917	7,723	1,005	11,094	0,999	10,845	1,195	22,138	1,187	21,528	1,180	21,003	1,387	40,232	1,378	39,128	1,368	38,042	1,607	72,772	1,595	70,699	1,586	68,974	1,868	134,283	1,856	130,784	1,844	127,342	2,180	252,640	2,166	246,086	2,152	239,637	2,517	455,942	2,500	443,521	2,484	432,280
17,2	0,922	7,769	1,011	11,159	1,005	10,909	1,202	22,269	1,194	21,655	1,187	21,127	1,396	40,470	1,386	39,358	1,376	38,266	1,616	73,201	1,605	71,116	1,595	69,380	1,879	135,074	1,867	131,555	1,855	128,092	2,193	254,128	2,179	247,535	2,165	241,048	2,532	458,625	2,515	446,131	2,499	434,824
17,4	0,927	7,814	1,017	11,224	1,011	10,973	1,209	22,399	1,201	21,782	1,194	21,251	1,404	40,706	1,394	39,588	1,384	38,490	1,626	73,628	1,614	71,530	1,604	69,785	1,890	135,861	1,878	132,321	1,866	128,838	2,206	255,607	2,192	248,975	2,178	242,451	2,546	461,292	2,529	448,725	2,514	437,353
17,6	0,933	7,859	1,022	11,289	1,017	11,036	1,216	22,528	1,208	21,907	1,200	21,373	1,412	40,940	1,402	39,816	1,392	38,711	1,635	74,052	1,623	71,942	1,614	70,187	1,901	136,643	1,889	133,082	1,876	129,580	2,219	257,077	2,204	250,407	2,190	243,846	2,561	463,944	2,544	451,305	2,528	439,868
17,8	0,938	7,904	1,028	11,354	1,022	11,099	1,223	22,657	1,215	22,032	1,207	21,495	1,420	41,174	1,410	40,043	1,400	38,932	1,644	74,474	1,633	72,352	1,623	70,586	1,912	137,420	1,899	133,839	1,887	130,317	2,231	258,539	2,217	251,831	2,203	245,232	2,575	466,581	2,558	453,871	2,542	442,368
18	0,943	7,949	1,034	11,418	1,028	11,162	1,230	22,784	1,222	22,157	1,214	21,616	1,428	41,406	1,418	40,269	1,408	39,151	1,654	74,893	1,642	72,759	1,632	70,984	1,923	138,193	1,910	134,592	1,898	131,050	2,244	259,993	2,229	253,247	2,215	246,611	2,590	469,203	2,573	456,422	2,557	444,855
18,2	0,949	7,993	1,040	11,482	1,034	11,224	1,237	22,911	1,228	22,280	1,221	21,737	1,436	41,636	1,426	40,493	1,416	39,370	1,663	75,310	1,651	73,165	1,641	71,379	1,933	138,962	1,921	135,341	1,908	131,779	2,256	261,438	2,242	254,656	2,227	247,983	2,604	471,811	2,587	458,958	2,571	447,327
18,4	0,954	8,038	1,046	11,545	1,040	11,286	1,244	23,038	1,235	22,403	1,228	21,857	1,444	41,866	1,434	40,716	1,424	39,587	1,672	75,725	1,660	73,567	1,650	71,772	1,944	139,727	1,931	136,086	1,919	132,505	2,269	262,876	2,254	256,056	2,240	249,347	2,619	474,405	2,601	461,481	2,585	449,786
18,6	0,959	8,082	1,051	11,608	1,045	11,348	1,251	23,163	1,242	22,525	1,234	21,976	1,452	42,094	1,442	40,938	1,432	39,802	1,681	76,137	1,669	73,968	1,659	72,163	1,954	140,488	1,942	136,827	1,929	133,226	2,281	264,306	2,266	257,449	2,252	250,703	2,633	476,984	2,615	463,991	2,599	452,232
18,8	0,964	8,125	1,057	11,671	1,051	11,409	1,257	23,288	1,249	22,647	1,241	22,095	1,459	42,321	1,449	41,159	1,439	40,017	1,690	76,547	1,678	74,367	1,668	72,552	1,965	141,244	1,952	137,564	1,940	133,943	2,293	265,728	2,279	258,834	2,264	252,052	2,647	479,550	2,629	466,486	2,613	454,664
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.6: roughness coefficient k=1,25 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
19	0,970	8,169	1,063	11,733	1,057	11,470	1,264	23,413	1,255	22,768	1,248	22,213	1,467	42,547	1,457	41,379	1,447	40,231	1,699	76,955	1,687	74,763	1,677	72,939	1,975	141,996	1,963	138,297	1,950	134,657	2,305	267,143	2,291	260,213	2,276	253,394	2,661	482,102	2,643	468,969	2,627	457,084
19,2	0,975	8,212	1,068	11,795	1,062	11,531	1,271	23,537	1,262	22,888	1,254	22,330	1,475	42,771	1,465	41,597	1,455	40,443	1,708	77,361	1,696	75,158	1,686	73,323	1,986	142,745	1,973	139,026	1,960	135,367	2,318	268,551	2,303	261,583	2,288	254,729	2,675	484,640	2,657	471,438	2,641	459,491
19,4	0,980	8,255	1,074	11,857	1,068	11,591	1,277	23,660	1,269	23,008	1,261	22,447	1,483	42,995	1,472	41,814	1,462	40,654	1,717	77,765	1,705	75,550	1,694	73,706	1,996	143,490	1,983	139,751	1,970	136,073	2,330	269,951	2,315	262,947	2,300	256,057	2,689	487,166	2,671	473,895	2,655	461,886
19,6	0,985	8,298	1,079	11,918	1,073	11,651	1,284	23,782	1,275	23,127	1,267	22,563	1,490	43,217	1,480	42,030	1,470	40,864	1,726	78,167	1,714	75,940	1,703	74,087	2,007	144,230	1,994	140,472	1,981	136,775	2,342	271,343	2,327	264,304	2,312	257,379	2,703	489,678	2,685	476,339	2,668	464,268
19,8	0,990	8,340	1,085	11,980	1,079	11,711	1,291	23,904	1,282	23,245	1,274	22,678	1,498	43,438	1,488	42,246	1,477	41,073	1,735	78,567	1,722	76,328	1,712	74,466	2,017	144,967	2,004	141,190	1,991	137,474	2,354	272,729	2,339	265,654	2,324	258,693	2,717	492,178	2,699	478,771	2,682	466,638
20	0,995	8,383	1,090	12,040	1,084	11,771	1,297	24,025	1,288	23,363	1,280	22,793	1,506	43,658	1,495	42,460	1,485	41,282	1,743	78,964	1,731	76,715	1,721	74,843	2,027	145,701	2,014	141,904	2,001	138,170	2,366	274,108	2,350	266,997	2,335	260,001	2,730	494,665	2,712	481,190	2,695	468,996
20,2	1,000	8,425	1,096	12,101	1,090	11,830	1,304	24,146	1,295	23,480	1,287	22,908	1,513	43,877	1,503	42,672	1,492	41,489	1,752	79,360	1,740	77,099	1,729	75,218	2,037	146,430	2,024	142,615	2,011	138,862	2,377	275,480	2,362	268,333	2,347	261,302	2,744	497,140	2,726	483,597	2,709	471,342
20,4	1,005	8,467	1,101	12,161	1,095	11,889	1,310	24,266	1,301	23,597	1,293	23,022	1,521	44,095	1,510	42,884	1,500	41,695	1,761	79,754	1,748	77,482	1,738	75,591	2,047	147,156	2,034	143,322	2,021	139,550	2,389	276,845	2,374	269,663	2,359	262,597	2,758	499,602	2,739	485,993	2,722	473,677
20,6	1,010	8,509	1,107	12,221	1,100	11,947	1,317	24,385	1,307	23,713	1,299	23,135	1,528	44,312	1,518	43,095	1,507	41,900	1,770	80,145	1,757	77,862	1,746	75,963	2,057	147,879	2,044	144,026	2,031	140,236	2,401	278,204	2,386	270,986	2,370	263,886	2,771	502,053	2,753	488,377	2,736	476,000
20,8	1,015	8,550	1,112	12,281	1,106	12,005	1,323	24,504	1,314	23,829	1,306	23,248	1,536	44,527	1,525	43,305	1,514	42,104	1,778	80,535	1,766	78,241	1,755	76,332	2,067	148,598	2,054	144,726	2,041	140,917	2,413	279,555	2,397	272,303	2,382	265,168	2,785	504,491	2,766	490,749	2,749	478,312
21	1,020	8,591	1,118	12,340	1,111	12,063	1,329	24,622	1,320	23,944	1,312	23,360	1,543	44,742	1,532	43,514	1,522	42,307	1,787	80,923	1,774	78,618	1,763	76,700	2,077	149,313	2,064	145,423	2,050	141,596	2,424	280,901	2,409	273,614	2,393	266,444	2,798	506,918	2,779	493,110	2,762	480,613
21,2	1,025	8,633	1,123	12,399	1,117	12,121	1,336	24,740	1,326	24,058	1,318	23,472	1,550	44,956	1,540	43,722	1,529	42,509	1,795	81,310	1,782	78,994	1,772	77,066	2,087	150,026	2,074	146,117	2,060	142,271	2,436	282,240	2,420	274,918	2,405	267,715	2,811	509,333	2,793	495,459	2,775	482,903
21,4	1,029	8,673	1,128	12,458	1,122	12,179	1,342	24,857	1,333	24,172	1,325	23,583	1,558	45,168	1,547	43,928	1,536	42,710	1,804	81,694	1,791	79,367	1,780	77,430	2,097	150,734	2,083	146,807	2,070	142,944	2,447	283,573	2,432	276,216	2,416	268,979	2,825	511,737	2,806	497,798	2,788	485,183
21,6	1,034	8,714	1,134	12,516	1,127	12,236	1,348	24,973	1,339	24,285	1,331	23,693	1,565	45,380	1,554	44,134	1,543	42,910	1,812	82,077	1,799	79,739	1,788	77,793	2,107	151,440	2,093	147,494	2,080	143,613	2,459	284,899	2,443	277,508	2,427	270,237	2,838	514,130	2,819	500,125	2,801	487,451
21,8	1,039	8,755	1,139	12,574	1,132	12,293	1,355	25,089	1,345	24,398	1,337	23,803	1,572	45,591	1,561	44,339	1,550	43,109	1,821	82,457	1,808	80,109	1,797	78,154	2,117	152,142	2,103	148,178	2,089	144,279	2,470	286,219	2,454	278,794	2,439	271,490	2,851	516,512	2,832	502,442	2,814	489,710
22	1,044	8,795	1,144	12,632	1,138	12,349	1,361	25,205	1,351	24,511	1,343	23,913	1,579	45,801	1,569	44,543	1,558	43,308	1,829	82,837	1,816	80,477	1,805	78,513	2,126	152,841	2,113	148,859	2,099	144,942	2,481	287,534	2,466	280,075	2,450	272,736	2,864	518,882	2,845	504,748	2,827	491,957
22,2	1,049	8,835	1,149	12,690	1,143	12,406	1,367	25,320	1,358	24,623	1,349	24,022	1,587	46,009	1,576	44,746	1,565	43,505	1,837	83,214	1,824	80,844	1,813	78,871	2,136	153,537	2,122	149,537	2,108	145,601	2,493	288,842	2,477	281,349	2,461	273,977	2,877	521,243	2,858	507,044	2,840	494,195
22,4	1,053	8,875	1,154	12,748	1,148	12,462	1,373	25,434	1,364	24,734	1,355	24,131	1,594	46,217	1,583	44,948	1,572	43,702	1,846	83,590	1,832	81,209	1,821	79,227	2,146	154,230	2,132	150,211	2,118	146,258	2,504	290,145	2,488	282,618	2,472	275,213	2,890	523,592	2,871	509,330	2,853	496,423
22,6	1,058	8,915	1,160	12,805	1,153	12,518	1,379	25,548	1,370	24,845	1,361	24,239	1,601	46,424	1,590	45,150	1,579	43,897	1,854	83,964	1,841	81,572	1,829	79,582	2,155	154,919	2,141	150,883	2,127	146,912	2,515	291,441	2,499	283,881	2,483	276,443	2,903	525,931	2,884	511,605	2,866	498,640
22,8	1,063	8,955	1,165	12,862	1,158	12,574	1,386	25,662	1,376	24,955	1,367	24,347	1,608	46,630	1,597	45,350	1,586	44,092	1,862	84,336	1,849	81,934	1,838	79,934	2,165	155,606	2,151	151,552	2,137	147,564	2,526	292,732	2,510	285,138	2,494	277,667	2,916	528,260	2,896	513,870	2,878	500,848
23	1,068	8,994	1,170	12,918	1,163	12,629	1,392	25,775	1,382	25,065	1,373	24,454	1,615	46,835	1,604	45,550	1,593	44,286	1,870	84,707	1,857	82,294	1,846	80,286	2,174	156,290	2,160	152,217	2,146	148,212	2,537	294,018	2,521	286,390	2,505	278,887	2,929	530,578	2,909	516,126	2,891	503,046
23,2	1,072	9,034	1,175	12,975	1,168	12,684	1,398	25,887	1,388	25,174	1,379	24,560	1,622	47,040	1,611	45,748	1,600	44,479	1,878	85,076	1,865	82,652	1,854	80,636	2,184	156,970	2,170	152,880	2,156	148,857	2,548	295,297	2,532	287,637	2,516	280,101	2,941	532,886	2,922	518,371	2,904	505,235
23,4	1,077	9,073	1,180	13,031	1,173	12,739	1,404	25,999	1,394	25,283	1,385	24,667	1,629	47,243	1,618	45,946	1,607	44,671	1,887	85,443	1,873	83,010	1,862	80,984	2,193	157,648	2,179	153,540	2,165	149,500	2,559	296,571	2,543	288,878	2,527	281,309	2,954	535,185	2,934	520,607	2,916	507,414
23,6	1,081	9,112	1,185	13,087	1,178	12,794	1,410	26,111	1,400	25,392	1,391	24,773	1,636	47,445	1,625	46,143	1,614	44,863	1,895	85,809	1,881	83,365	1,870	81,331	2,203	158,323	2,188	154,198	2,174	150,140	2,570	297,840	2,554	290,114	2,538	282,513	2,967	537,474	2,947	522,833	2,929	509,584
23,8	1,086	9,151	1,190	13,143	1,183	12,848	1,416	26,222	1,406	25,500	1,397	24,878	1,643	47,647	1,632	46,339	1,620	45,054	1,903	86,174	1,889	83,719	1,878	81,676	2,212	158,995	2,198	154,852	2,183	150,777	2,581	299,104	2,565	291,345	2,548	283,711	2,979	539,753	2,959	525,050	2,941	511,745
24	1,091	9,189	1,195	13,198	1,188	12,902	1,422	26,332	1,412	25,607	1,403	24,983	1,650	47,848	1,639	46,534	1,627	45,243	1,911	86,537	1,897	84,072	1,886	82,020	2,221	159,664	2,207	155,504	2,193	151,412	2,592	300,362	2,576	292,570	2,559	284,905	2,992	542,022	2,972	527,258	2,953	513,897
24,2	1,095	9,228	1,200	13,253	1,193	12,956	1,428	26,443	1,418	25,714	1,409	25,087	1,657	48,048	1,645	46,729	1,634	45,432	1,919	86,898	1,905	84,423	1,893	82,363	2,231	160,330	2,216	156,153	2,202	152,044	2,603	301,615	2,586	293,791	2,570	286,093	3,004	544,282	2,984	529,456	2,966	516,040
24,4	1,100	9,266	1,205	13,308	1,198	13,010	1,434	26,552	1,424	25,821	1,415	25,191	1,664	48,247	1,652	46,922	1,641	45,621	1,927	87,258	1,913	84,772	1,901	82,704	2,240	160,994	2,225	156,799	2,211	152,673	2,614	302,862	2,597	295,006	2,580	287,277	3,017	546,533	2,997	531,646	2,978	518,174
24,6	1,104	9,304	1,210	13,363	1,203	13,064	1,440	26,661	1,430	25,927	1,421	25,295	1,671	48,445	1,659	47,115	1,648	45,808	1,935	87,616	1,921	85,121	1,909	83,044	2,249	161,655	2,234	157,443	2,220	153,300	2,624	304,105	2,608	296,216	2,591	288,456	3,029	548,774	3,009	533,826	2,990	520,299
24,8	1,109	9,342	1,215	13,418	1,208	13,117	1,445	26,770	1,435	26,033	1,427	25,398	1,677	48,643	1,666	47,307	1,654	45,995	1,942	87,973	1,929	85,467	1,917	83,382	2,258	162,313	2,244	158,084	2,229	153,924	2,635	305,343	2,618	297,422	2,601	289,630	3,041	551,006	3,021	535,998	3,002	522,416
25	1,113	9,380	1,220	13,472	1,213	13,170	1,451	26,879	1,441	26,138	1,432	25,501	1,684	48,839	1,673	47,499	1,661	46,181	1,950	88,329	1,936	85,813	1,925	83,719	2,267	162,968	2,253	158,722	2,238	154,546	2,646	306,575	2,629	298,623	2,612	290,799	3,054	553,230	3,033	538,161	3,015	524,524
25,2	1,118	9,418	1,225	13,526	1,218	13,223	1,457	26,986	1,447	26,243	1,438	25,603	1,691	49,035	1,679	47,689	1,668	46,366	1,958	88,683	1,944	86,157	1,932	84,055	2,276	163,621	2,262	159,358	2,247	155,165	2,656	307,803	2,639	299,818	2,622	291,963	3,066	555,444	3,046	540,315	3,027	526,623
25,4	1,122	9,456	1,230	13,580	1,223	13,276	1,463	27,094	1,453	26,348	1,444	25,705	1,698	49,230	1,686	47,879	1,674	46,551	1,966	89,035	1,952	86,499	1,940	84,389	2,285	164,272	2,271	159,992	2,256	155,782	2,667	309,026	2,650	301,010	2,633	293,123	3,078	557,650	3,058	542,461	3,039	528,715
25,6	1,127	9,493	1,235	13,634	1,228	13,329	1,469	27,201	1,458	26,452	1,449	25,807	1,704	49,425	1,693	48,068	1,681	46,735	1,974	89,387	1,960	86,841	1,948	84,722	2,294	164,919	2,280	160,623	2,265	156,396	2,677	310,244	2,660	302,196	2,643	294,279	3,090	559,847	3,070	544,598	3,051	530,798
25,8	1,131	9,530	1,240	13,687	1,233	13,381	1,474	27,308	1,464	26,556	1,455	25,908	1,711	49,618	1,699	48,256	1,687	46,918	1,981	89,737	1,967	87,181	1,955	85,054	2,303	165,565	2,288	161,251	2,274	157,008	2,688	311,457	2,671	303,378	2,654	295,430	3,102	562,036	3,082	546,727	3,063	532,873
26	1,136	9,567	1,244	13,741	1,237	13,433	1,480	27,414	1,470	26,659	1,461	26,009	1,718	49,811	1,706	48,444	1,694	47,100	1,989	90,085	1,975	87,519	1,963	85,384	2,312	166,208	2,297	161,877	2,282	157,618	2,698	312,666	2,681	304,555	2,664	296,576	3,114	564,216	3,094	548,848	3,074	534,940
26,2	1,140	9,604	1,249	13,794	1,242	13,485	1,486	27,520	1,476	26,762	1,466	26,109	1,724	50,003	1,712	48,631	1,701	47,282	1,997	90,433	1,982	87,857	1,970	85,713	2,321	166,848	2,306	162,501	2,291	158,225	2,709	313,870	2,691	305,728	2,674	297,718	3,126	566,387	3,106	550,960	3,086	536,999
26,4	1,144	9,641	1,254	13,847	1,247	13,537	1,492	27,625	1,481	26,864	1,472	26,209	1,731	50,195	1,719	48,817	1,707	47,463	2,004	90,779	1,990	88,193	1,978	86,041	2,330	167,486	2,315	163,122	2,300	158,830	2,719	315,069	2,702	306,896	2,684	298,856	3,138	568,551	3,117	553,065	3,098	539,050
26,6	1,149	9,678	1,259	13,899	1,252	13,588	1,497	27,730	1,487	26,966	1,478	26,309	1,738	50,385	1,726	49,002	1,714	47,643	2,012	91,123	1,998	88,528	1,985	86,368	2,339	168,121	2,324	163,741	2,309	159,433	2,729	316,264	2,712	308,060	2,694	299,989	3,150	570,706	3,129	555,161	3,110	541,094
26,8	1,153	9,714	1,264	13,952	1,256	13,639	1,503	27,835	1,492	27,068	1,483	26,408	1,744	50,575	1,732	49,187	1,720	47,823	2,020	91,466	2,005	88,861	1,993	86,693	2,348	168,754	2,333	164,358	2,317	160,033	2,740	317,454	2,722	309,219	2,705	301,118	3,162	572,853	3,141	557,250	3,121	543,130
27	1,157	9,751	1,268	14,004	1,261	13,691	1,509	27,939	1,498	27,170	1,489	26,507	1,751	50,765	1,739	49,371	1,726	48,002	2,027	91,809	2,013	89,194	2,000	87,017	2,357	169,385	2,341	164,972	2,326	160,631	2,750	318,640	2,732	310,375	2,715	302,243	3,174	574,992	3,153	559,331	3,133	545,158
27,2	1,162	9,787	1,273	14,056	1,266	13,741	1,514	28,043	1,504	27,271	1,494	26,606	1,757	50,953	1,745	49,555	1,733	48,180	2,035	92,149	2,020	89,525	2,008	87,341	2,365	170,013	2,350	165,584	2,335	161,227	2,760	319,822	2,742	311,526	2,725	303,364	3,186	577,124	3,164	561,404	3,145	547,179
27,4	1,166	9,823	1,278	14,108	1,270	13,792	1,520	28,146	1,509	27,371	1,500	26,704	1,764	51,141	1,751	49,737	1,739	48,358	2,042	92,489	2,028	89,855	2,015	87,662	2,374	170,640	2,359	166,194	2,343	161,821	2,770	320,999	2,753	312,672	2,735	304,481	3,197	579,247	3,176	563,470	3,156	549,192
27,6	1,170	9,859	1,282	14,160	1,275	13,843	1,525	28,249	1,515	27,471	1,505	26,802	1,770	51,328	1,758	49,919	1,746	48,535	2,050	92,827	2,035	90,183	2,023	87,983	2,383	171,263	2,367	166,802	2,352	162,412	2,780	322,172	2,763	313,815	2,745	305,593	3,209	581,363	3,188	565,528	3,168	551,198
27,8	1,174	9,895	1,287	14,211	1,280	13,893	1,531	28,352	1,520	27,571	1,511	26,899	1,776	51,515	1,764	50,101	1,752	48,711	2,057	93,164	2,042	90,511	2,030	88,303	2,391	171,885	2,376	167,407	2,360	163,002	2,790	323,340	2,773	314,953	2,755	306,702	3,221	583,471	3,199	567,579	3,179	553,197
28	1,179	9,931	1,292	14,263	1,284	13,943	1,536	28,454	1,526	27,671	1,516	26,996	1,783	51,701	1,771	50,281	1,758	48,887	2,064	93,500	2,050	90,837	2,037	88,621	2,400	172,504	2,384	168,010	2,369	163,589	2,801	324,505	2,783	316,087	2,765	307,806	3,232	585,571	3,211	569,622	3,191	555,188
28,2	1,183	9,967	1,296	14,314	1,289	13,993	1,542	28,556	1,531	27,770	1,522	27,093	1,789	51,886	1,777	50,462	1,765	49,062	2,072	93,835	2,057	91,162	2,045	88,938	2,408	173,121	2,393	168,611	2,377	164,174	2,811	325,665	2,793	317,218	2,775	308,907	3,244	587,664	3,222	571,658	3,202	557,173
28,4	1,187	10,002	1,301	14,365	1,294	14,043	1,547	28,658	1,537	27,869	1,527	27,189	1,796	52,070	1,783	50,641	1,771	49,236	2,079	94,168	2,064	91,486	2,052	89,254	2,417	173,736	2,401	169,210	2,386	164,758	2,820	326,821	2,803	318,344	2,784	310,004	3,255	589,750	3,234	573,687	3,214	559,150
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.6: roughness coefficient k=1,25 mm (5/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
28,6	1,191	10,038	1,306	14,416	1,298	14,093	1,553	28,759	1,542	27,967	1,533	27,285	1,802	52,254	1,790	50,820	1,777	49,410	2,087	94,501	2,072	91,809	2,059	89,569	2,426	174,349	2,410	169,807	2,394	165,339	2,830	327,974	2,812	319,466	2,794	311,097	3,267	591,828	3,245	575,708	3,225	561,120
28,8	1,196	10,073	1,310	14,466	1,303	14,142	1,558	28,860	1,547	28,065	1,538	27,381	1,808	52,437	1,796	50,998	1,783	49,583	2,094	94,832	2,079	92,131	2,066	89,883	2,434	174,960	2,418	170,402	2,403	165,918	2,840	329,122	2,822	320,584	2,804	312,186	3,278	593,899	3,256	577,723	3,236	563,084
29	1,200	10,108	1,315	14,517	1,307	14,192	1,564	28,961	1,553	28,163	1,543	27,477	1,815	52,620	1,802	51,176	1,790	49,756	2,101	95,162	2,086	92,451	2,073	90,196	2,443	175,568	2,427	170,994	2,411	166,495	2,850	330,266	2,832	321,699	2,814	313,271	3,290	595,963	3,268	579,731	3,247	565,041
29,2	1,204	10,143	1,319	14,567	1,312	14,241	1,569	29,061	1,558	28,261	1,549	27,572	1,821	52,802	1,808	51,353	1,796	49,928	2,108	95,491	2,093	92,771	2,081	90,508	2,451	176,175	2,435	171,585	2,419	167,070	2,860	331,406	2,842	322,810	2,823	314,353	3,301	598,020	3,279	581,731	3,259	566,991
29,4	1,208	10,178	1,324	14,617	1,316	14,290	1,575	29,161	1,564	28,358	1,554	27,666	1,827	52,983	1,815	51,529	1,802	50,100	2,116	95,818	2,101	93,089	2,088	90,818	2,459	176,779	2,444	172,174	2,428	167,643	2,870	332,542	2,852	323,916	2,833	315,430	3,312	600,069	3,290	583,725	3,270	568,934
29,6	1,212	10,213	1,328	14,667	1,321	14,339	1,580	29,260	1,569	28,455	1,559	27,761	1,833	53,164	1,821	51,705	1,808	50,271	2,123	96,145	2,108	93,407	2,095	91,128	2,468	177,381	2,452	172,760	2,436	168,214	2,880	333,675	2,861	325,020	2,843	316,505	3,324	602,112	3,301	585,712	3,281	570,871
29,8	1,216	10,248	1,333	14,717	1,325	14,387	1,585	29,360	1,574	28,551	1,565	27,855	1,840	53,344	1,827	51,880	1,814	50,441	2,130	96,470	2,115	93,723	2,102	91,436	2,476	177,981	2,460	173,345	2,444	168,784	2,889	334,803	2,871	326,119	2,852	317,575	3,335	604,148	3,313	587,693	3,292	572,801
30	1,220	10,282	1,337	14,767	1,330	14,436	1,591	29,459	1,580	28,647	1,570	27,949	1,846	53,524	1,833	52,054	1,820	50,611	2,137	96,795	2,122	94,038	2,109	91,744	2,484	178,580	2,468	173,927	2,452	169,351	2,899	335,928	2,881	327,215	2,862	318,642	3,346	606,177	3,324	589,666	3,303	574,725
30,5	1,231	10,368	1,348	14,890	1,341	14,556	1,604	29,704	1,593	28,886	1,583	28,182	1,861	53,970	1,848	52,488	1,835	51,033	2,155	97,601	2,140	94,822	2,127	92,508	2,505	180,067	2,489	175,376	2,473	170,761	2,923	338,724	2,905	329,938	2,886	321,294	3,374	611,220	3,351	594,572	3,331	579,507
31	1,241	10,453	1,360	15,012	1,352	14,676	1,617	29,948	1,606	29,123	1,596	28,413	1,876	54,412	1,863	52,919	1,850	51,451	2,173	98,401	2,157	95,599	2,144	93,266	2,526	181,541	2,509	176,812	2,493	172,160	2,947	341,497	2,928	332,639	2,909	323,925	3,401	616,222	3,379	599,438	3,358	584,249
31,5	1,251	10,538	1,371	15,133	1,363	14,795	1,630	30,190	1,619	29,358	1,609	28,643	1,892	54,851	1,878	53,346	1,865	51,866	2,190	99,194	2,175	96,369	2,161	94,018	2,546	183,004	2,530	178,237	2,513	173,547	2,971	344,248	2,952	335,318	2,933	326,534	3,429	621,184	3,406	604,265	3,385	588,954
32	1,261	10,622	1,381	15,254	1,374	14,912	1,643	30,430	1,632	29,592	1,622	28,870	1,907	55,287	1,893	53,769	1,880	52,278	2,208	99,982	2,192	97,134	2,179	94,764	2,566	184,456	2,550	179,651	2,533	174,924	2,994	346,977	2,975	337,977	2,956	329,123	3,456	626,106	3,433	609,053	3,412	593,621
32,5	1,271	10,705	1,392	15,373	1,384	15,029	1,656	30,668	1,644	29,823	1,634	29,096	1,921	55,719	1,908	54,190	1,895	52,687	2,225	100,763	2,209	97,893	2,196	95,505	2,586	185,896	2,570	181,053	2,553	176,289	3,018	349,684	2,999	340,614	2,979	331,691	3,483	630,990	3,460	613,805	3,438	598,252
33	1,280	10,787	1,403	15,492	1,395	15,145	1,669	30,904	1,657	30,053	1,647	29,320	1,936	56,148	1,923	54,607	1,910	53,092	2,242	101,538	2,226	98,646	2,212	96,239	2,606	187,325	2,589	182,445	2,572	177,645	3,041	352,371	3,022	343,232	3,002	334,240	3,510	635,837	3,486	618,519	3,465	602,847
33,5	1,290	10,869	1,414	15,609	1,406	15,260	1,681	31,138	1,670	30,281	1,659	29,543	1,951	56,573	1,937	55,021	1,924	53,495	2,259	102,307	2,243	99,393	2,229	96,968	2,626	188,743	2,609	183,827	2,592	178,990	3,064	355,038	3,044	345,829	3,025	336,770	3,536	640,647	3,513	623,199	3,491	607,408
34	1,300	10,951	1,424	15,726	1,416	15,374	1,694	31,371	1,682	30,507	1,672	29,763	1,965	56,996	1,952	55,431	1,938	53,894	2,276	103,070	2,260	100,135	2,246	97,692	2,645	190,151	2,628	185,198	2,611	180,325	3,087	357,685	3,067	348,407	3,047	339,280	3,563	645,422	3,539	627,843	3,517	611,935
34,5	1,309	11,031	1,435	15,842	1,427	15,487	1,706	31,602	1,694	30,732	1,684	29,982	1,980	57,415	1,966	55,839	1,953	54,290	2,292	103,828	2,276	100,871	2,262	98,410	2,665	191,549	2,648	186,559	2,630	181,650	3,110	360,313	3,090	350,967	3,070	341,773	3,589	650,161	3,565	632,454	3,543	616,429
35	1,319	11,111	1,445	15,957	1,437	15,600	1,719	31,831	1,707	30,954	1,696	30,200	1,994	57,831	1,981	56,244	1,967	54,684	2,309	104,580	2,293	101,602	2,279	99,124	2,684	192,936	2,667	187,910	2,649	182,966	3,132	362,921	3,112	353,508	3,092	344,247	3,615	654,867	3,591	637,031	3,568	620,890
35,5	1,328	11,191	1,455	16,071	1,447	15,711	1,731	32,059	1,719	31,176	1,708	30,416	2,009	58,245	1,995	56,646	1,981	55,075	2,326	105,327	2,309	102,328	2,295	99,832	2,703	194,313	2,686	189,252	2,668	184,272	3,154	365,511	3,134	356,031	3,114	346,704	3,641	659,538	3,616	641,576	3,594	625,320
36	1,338	11,270	1,466	16,185	1,457	15,822	1,743	32,285	1,731	31,396	1,720	30,630	2,023	58,655	2,009	57,045	1,995	55,463	2,342	106,069	2,325	103,049	2,311	100,535	2,722	195,681	2,705	190,584	2,687	185,569	3,177	368,083	3,156	358,536	3,136	349,143	3,666	664,177	3,642	646,088	3,619	629,718
36,5	1,347	11,348	1,476	16,297	1,468	15,932	1,755	32,509	1,743	31,614	1,732	30,843	2,037	59,063	2,023	57,442	2,009	55,848	2,358	106,806	2,341	103,764	2,327	101,233	2,741	197,039	2,724	191,907	2,706	186,858	3,199	370,637	3,178	361,024	3,158	351,566	3,692	668,784	3,667	650,570	3,644	634,086
37	1,356	11,426	1,486	16,409	1,478	16,042	1,767	32,732	1,755	31,831	1,744	31,055	2,051	59,467	2,037	57,835	2,022	56,231	2,374	107,538	2,357	104,475	2,343	101,926	2,760	198,389	2,742	193,221	2,724	188,137	3,221	373,173	3,200	363,494	3,179	353,972	3,717	673,360	3,692	655,021	3,669	638,424
37,5	1,365	11,504	1,496	16,520	1,488	16,150	1,779	32,954	1,767	32,046	1,756	31,265	2,065	59,869	2,050	58,226	2,036	56,611	2,390	108,264	2,373	105,181	2,359	102,615	2,779	199,729	2,761	194,526	2,743	189,408	3,242	375,693	3,222	365,949	3,201	356,362	3,742	677,904	3,717	659,442	3,694	642,733
38	1,375	11,581	1,506	16,631	1,498	16,258	1,791	33,174	1,779	32,260	1,768	31,474	2,078	60,269	2,064	58,615	2,050	56,989	2,406	108,986	2,389	105,882	2,375	103,300	2,797	201,060	2,779	195,822	2,761	190,670	3,264	378,196	3,243	368,386	3,222	358,736	3,767	682,419	3,742	663,833	3,719	647,014
38,5	1,384	11,657	1,516	16,740	1,507	16,365	1,803	33,392	1,790	32,473	1,779	31,681	2,092	60,666	2,078	59,001	2,063	57,364	2,422	109,703	2,405	106,579	2,390	103,979	2,816	202,382	2,797	197,110	2,779	191,924	3,285	380,682	3,264	370,808	3,243	361,095	3,792	686,904	3,766	668,196	3,743	651,266
39	1,393	11,733	1,526	16,849	1,517	16,472	1,815	33,609	1,802	32,684	1,791	31,887	2,106	61,060	2,091	59,384	2,077	57,737	2,438	110,416	2,421	107,271	2,406	104,655	2,834	203,696	2,816	198,390	2,797	193,170	3,307	383,152	3,286	373,214	3,264	363,438	3,816	691,359	3,791	672,530	3,767	655,491
39,5	1,402	11,808	1,536	16,957	1,527	16,578	1,826	33,825	1,814	32,894	1,802	32,092	2,119	61,451	2,105	59,765	2,090	58,108	2,454	111,124	2,436	107,959	2,421	105,326	2,852	205,001	2,834	199,661	2,815	194,408	3,328	385,607	3,307	375,605	3,285	365,766	3,841	695,787	3,815	676,837	3,791	659,688
40	1,410	11,883	1,545	17,065	1,537	16,683	1,838	34,039	1,825	33,102	1,814	32,295	2,133	61,841	2,118	60,144	2,103	58,476	2,469	111,827	2,452	108,643	2,437	105,992	2,870	206,298	2,852	200,925	2,833	195,638	3,349	388,046	3,328	377,981	3,306	368,080	3,865	700,186	3,839	681,117	3,815	663,860
40,5	1,419	11,958	1,555	17,172	1,546	16,787	1,849	34,252	1,837	33,309	1,825	32,497	2,146	62,228	2,131	60,520	2,116	58,841	2,484	112,526	2,467	109,322	2,452	106,655	2,888	207,587	2,869	202,180	2,851	196,861	3,370	390,469	3,348	380,342	3,327	370,379	3,889	704,558	3,863	685,370	3,839	668,005
41	1,428	12,032	1,565	17,278	1,556	16,891	1,861	34,464	1,848	33,515	1,837	32,698	2,159	62,612	2,144	60,894	2,129	59,205	2,500	113,221	2,482	109,997	2,467	107,314	2,906	208,869	2,887	203,428	2,868	198,076	3,391	392,878	3,369	382,688	3,347	372,664	3,913	708,903	3,887	689,597	3,863	672,125
41,5	1,437	12,105	1,574	17,384	1,565	16,994	1,872	34,675	1,859	33,720	1,848	32,898	2,172	62,994	2,157	61,265	2,142	59,566	2,515	113,912	2,497	110,668	2,482	107,968	2,924	210,142	2,905	204,668	2,886	199,283	3,411	395,272	3,389	385,021	3,368	374,935	3,937	713,222	3,911	693,798	3,886	676,219
42	1,445	12,179	1,584	17,489	1,575	17,097	1,884	34,884	1,870	33,923	1,859	33,096	2,185	63,374	2,170	61,635	2,155	59,925	2,530	114,598	2,512	111,335	2,497	108,619	2,941	211,408	2,922	205,901	2,903	200,484	3,432	397,652	3,410	387,339	3,388	377,192	3,961	717,515	3,934	697,974	3,910	680,290
42,5	1,454	12,251	1,593	17,593	1,584	17,199	1,895	35,092	1,882	34,125	1,870	33,294	2,198	63,751	2,183	62,002	2,168	60,282	2,545	115,280	2,527	111,998	2,512	109,266	2,959	212,666	2,940	207,126	2,920	201,677	3,452	400,018	3,430	389,643	3,408	379,436	3,984	721,782	3,958	702,125	3,933	684,336
43	1,463	12,323	1,603	17,697	1,594	17,300	1,906	35,298	1,893	34,326	1,881	33,490	2,211	64,127	2,196	62,367	2,181	60,637	2,560	115,959	2,542	112,657	2,527	109,909	2,976	213,917	2,957	208,345	2,938	202,863	3,472	402,370	3,450	391,934	3,428	381,667	4,008	726,024	3,981	706,251	3,956	688,358
43,5	1,471	12,395	1,612	17,800	1,603	17,401	1,917	35,504	1,904	34,526	1,892	33,685	2,224	64,500	2,209	62,730	2,194	60,990	2,575	116,633	2,557	113,312	2,541	110,548	2,993	215,160	2,974	209,556	2,955	204,043	3,493	404,708	3,470	394,211	3,448	383,885	4,031	730,242	4,004	710,354	3,979	692,357
44	1,480	12,467	1,621	17,902	1,612	17,501	1,928	35,708	1,915	34,725	1,903	33,879	2,237	64,871	2,222	63,091	2,206	61,341	2,590	117,304	2,572	113,963	2,556	111,183	3,011	216,397	2,991	210,760	2,972	205,215	3,513	407,033	3,490	396,476	3,468	386,090	4,054	734,435	4,027	714,434	4,002	696,333
44,5	1,488	12,538	1,631	18,004	1,621	17,601	1,939	35,911	1,926	34,923	1,914	34,071	2,250	65,240	2,234	63,449	2,219	61,690	2,605	117,970	2,586	114,611	2,571	111,815	3,028	217,626	3,008	211,957	2,989	206,381	3,533	409,344	3,510	398,728	3,488	388,283	4,077	738,605	4,050	718,490	4,025	700,286
45	1,496	12,608	1,640	18,106	1,630	17,700	1,950	36,113	1,936	35,119	1,924	34,263	2,262	65,607	2,247	63,806	2,231	62,037	2,619	118,633	2,601	115,255	2,585	112,444	3,045	218,849	3,025	213,148	3,005	207,541	3,553	411,643	3,530	400,967	3,507	390,464	4,100	742,751	4,073	722,523	4,047	704,218
45,5	1,505	12,679	1,649	18,206	1,639	17,799	1,961	36,314	1,947	35,314	1,935	34,454	2,275	65,971	2,259	64,161	2,244	62,382	2,634	119,293	2,615	115,896	2,599	113,069	3,062	220,064	3,042	214,332	3,022	208,694	3,572	413,929	3,549	403,194	3,527	392,632	4,123	746,875	4,095	726,534	4,070	708,127
46	1,513	12,748	1,658	18,307	1,649	17,897	1,972	36,514	1,958	35,509	1,946	34,643	2,287	66,334	2,272	64,514	2,256	62,725	2,648	119,948	2,630	116,533	2,614	113,690	3,078	221,274	3,059	215,510	3,039	209,840	3,592	416,202	3,569	405,408	3,546	394,789	4,145	750,976	4,118	730,524	4,092	712,015
46,5	1,521	12,818	1,667	18,406	1,657	17,994	1,982	36,713	1,969	35,702	1,956	34,832	2,300	66,695	2,284	64,865	2,268	63,066	2,663	120,601	2,644	117,166	2,628	114,308	3,095	222,476	3,075	216,681	3,055	210,981	3,611	418,464	3,588	407,610	3,565	396,933	4,168	755,054	4,140	734,491	4,114	715,882
47	1,530	12,887	1,676	18,506	1,666	18,091	1,993	36,911	1,979	35,894	1,967	35,020	2,312	67,054	2,296	65,214	2,280	63,405	2,677	121,249	2,658	117,797	2,642	114,923	3,112	223,672	3,092	217,846	3,072	212,115	3,631	420,712	3,608	409,801	3,584	399,067	4,190	759,111	4,162	738,437	4,136	719,729
47,5	1,538	12,956	1,685	18,604	1,675	18,188	2,004	37,107	1,990	36,086	1,977	35,206	2,325	67,411	2,309	65,561	2,293	63,743	2,691	121,894	2,672	118,424	2,656	115,535	3,128	224,862	3,108	219,005	3,088	213,243	3,650	422,950	3,627	411,980	3,603	401,189	4,212	763,146	4,184	742,363	4,158	723,555
48	1,546	13,024	1,694	18,702	1,684	18,284	2,014	37,303	2,000	36,276	1,988	35,392	2,337	67,766	2,321	65,906	2,305	64,079	2,706	122,536	2,686	119,047	2,670	116,143	3,145	226,046	3,125	220,158	3,104	214,366	3,669	425,175	3,646	414,148	3,622	403,300	4,235	767,160	4,206	746,267	4,180	727,360
48,5	1,554	13,092	1,703	18,800	1,693	18,379	2,025	37,497	2,011	36,465	1,998	35,576	2,349	68,119	2,333	66,250	2,317	64,413	2,720	123,175	2,700	119,667	2,684	116,749	3,161	227,223	3,141	221,304	3,120	215,482	3,688	427,389	3,665	416,304	3,641	405,399	4,257	771,153	4,228	750,152	4,202	731,146
49	1,562	13,160	1,711	18,897	1,702	18,474	2,035	37,691	2,021	36,653	2,009	35,760	2,361	68,471	2,345	66,592	2,329	64,745	2,734	123,810	2,714	120,285	2,698	117,351	3,177	228,394	3,157	222,445	3,136	216,593	3,707	429,591	3,684	418,449	3,660	407,489	4,279	775,126	4,250	754,016	4,224	734,913
49,5	1,570	13,227	1,720	18,994	1,710	18,569	2,045	37,884	2,031	36,841	2,019	35,943	2,373	68,820	2,357	66,932	2,341	65,076	2,748	124,442	2,728	120,899	2,712	117,950	3,194	229,560	3,173	223,580	3,152	217,698	3,726	431,782	3,703	420,584	3,679	409,567	4,300	779,078	4,272	757,861	4,245	738,661
50	1,578	13,294	1,729	19,090	1,719	18,663	2,056	38,075	2,042	37,027	2,029	36,124	2,385	69,168	2,369	67,270	2,352	65,405	2,761	125,071	2,742	121,510	2,725	118,546	3,210	230,719	3,189	224,710	3,168	218,798	3,745	433,962	3,721	422,707	3,697	411,635	4,322	783,011	4,293	761,687	4,267	742,389
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.7: roughness coefficient k=1,5 mm (1/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
0,1	0,063	0,532	0,070	0,769	0,069	0,751	0,084	1,551	0,083	1,508	0,083	1,471	0,098	2,844	0,097	2,765	0,097	2,687	0,114	5,183	0,114	5,034	0,113	4,909	0,134	9,630	0,133	9,376	0,132	9,127	0,157	18,230	0,156	17,753	0,155	17,283	0,183	33,069	0,181	32,161	0,180	31,340
0,2	0,091	0,768	0,100	1,109	0,100	1,084	0,121	2,233	0,120	2,171	0,119	2,117	0,141	4,084	0,140	3,971	0,139	3,860	0,164	7,430	0,163	7,217	0,162	7,039	0,192	13,782	0,190	13,420	0,189	13,064	0,225	26,052	0,223	25,372	0,222	24,702	0,261	47,200	0,259	45,906	0,257	44,735
0,3	0,113	0,951	0,124	1,372	0,123	1,341	0,149	2,757	0,148	2,681	0,147	2,615	0,174	5,039	0,173	4,899	0,171	4,762	0,202	9,158	0,201	8,895	0,199	8,676	0,236	16,973	0,235	16,528	0,233	16,090	0,277	32,062	0,275	31,225	0,273	30,402	0,320	58,053	0,318	56,464	0,316	55,025
0,4	0,131	1,105	0,144	1,593	0,143	1,557	0,173	3,200	0,172	3,111	0,170	3,035	0,202	5,844	0,200	5,682	0,199	5,523	0,234	10,616	0,233	10,312	0,231	10,058	0,274	19,666	0,272	19,150	0,270	18,643	0,320	37,131	0,318	36,163	0,316	35,210	0,371	67,208	0,368	65,368	0,366	63,704
0,5	0,147	1,241	0,162	1,789	0,161	1,748	0,194	3,590	0,192	3,491	0,191	3,405	0,226	6,554	0,224	6,373	0,223	6,195	0,263	11,901	0,261	11,560	0,259	11,276	0,307	22,039	0,305	21,461	0,303	20,894	0,359	41,598	0,357	40,514	0,354	39,447	0,416	75,275	0,413	73,215	0,410	71,352
0,6	0,162	1,364	0,178	1,965	0,177	1,921	0,213	3,943	0,211	3,834	0,210	3,740	0,248	7,196	0,246	6,997	0,245	6,802	0,288	13,063	0,286	12,689	0,285	12,378	0,336	24,185	0,334	23,551	0,332	22,928	0,394	45,638	0,391	44,449	0,389	43,279	0,456	82,569	0,453	80,311	0,450	78,267
0,7	0,175	1,477	0,193	2,128	0,192	2,080	0,230	4,268	0,229	4,150	0,227	4,048	0,269	7,787	0,267	7,572	0,265	7,360	0,312	14,132	0,310	13,728	0,308	13,391	0,364	26,158	0,362	25,474	0,359	24,800	0,426	49,354	0,423	48,068	0,420	46,803	0,493	89,277	0,489	86,836	0,486	84,627
0,8	0,188	1,582	0,206	2,279	0,205	2,228	0,247	4,571	0,245	4,444	0,243	4,335	0,287	8,337	0,285	8,106	0,283	7,880	0,334	15,128	0,332	14,694	0,330	14,334	0,389	27,996	0,387	27,263	0,384	26,542	0,456	52,812	0,453	51,437	0,450	50,083	0,527	95,522	0,524	92,911	0,520	90,548
0,9	0,200	1,681	0,219	2,422	0,218	2,367	0,262	4,855	0,260	4,720	0,259	4,604	0,305	8,853	0,303	8,609	0,301	8,369	0,355	16,062	0,352	15,603	0,350	15,220	0,413	29,722	0,411	28,944	0,408	28,179	0,484	56,061	0,481	54,601	0,478	53,165	0,560	101,388	0,556	98,616	0,552	96,109
1	0,211	1,775	0,232	2,556	0,230	2,499	0,277	5,124	0,275	4,982	0,273	4,859	0,322	9,342	0,320	9,084	0,318	8,831	0,374	16,947	0,371	16,462	0,369	16,058	0,436	31,354	0,433	30,534	0,430	29,727	0,510	59,134	0,507	57,594	0,504	56,079	0,590	106,936	0,586	104,013	0,583	101,369
1,1	0,221	1,864	0,243	2,684	0,242	2,624	0,290	5,379	0,288	5,230	0,287	5,102	0,338	9,807	0,336	9,536	0,333	9,270	0,393	17,788	0,390	17,279	0,387	16,855	0,458	32,907	0,455	32,046	0,452	31,199	0,536	62,057	0,532	60,441	0,529	58,852	0,619	112,213	0,615	109,147	0,611	106,372
1,2	0,231	1,949	0,254	2,807	0,253	2,743	0,304	5,624	0,301	5,468	0,300	5,334	0,353	10,251	0,351	9,968	0,349	9,690	0,410	18,592	0,408	18,060	0,405	17,617	0,478	34,391	0,475	33,491	0,472	32,607	0,560	64,849	0,556	63,161	0,552	61,501	0,647	117,255	0,643	114,052	0,639	111,152
1,3	0,241	2,031	0,265	2,924	0,263	2,858	0,316	5,858	0,314	5,696	0,312	5,556	0,368	10,677	0,366	10,382	0,363	10,093	0,428	19,363	0,424	18,809	0,422	18,348	0,498	35,814	0,495	34,877	0,492	33,956	0,583	67,528	0,579	65,771	0,575	64,042	0,674	122,092	0,669	118,756	0,665	115,738
1,4	0,250	2,110	0,275	3,037	0,273	2,969	0,328	6,083	0,326	5,915	0,324	5,770	0,382	11,087	0,380	10,781	0,377	10,481	0,444	20,104	0,441	19,529	0,438	19,051	0,517	37,184	0,514	36,211	0,511	35,255	0,605	70,106	0,601	68,281	0,597	66,487	0,700	126,746	0,695	123,283	0,691	120,150
1,5	0,259	2,186	0,285	3,146	0,283	3,075	0,340	6,301	0,338	6,127	0,336	5,976	0,396	11,483	0,393	11,166	0,390	10,855	0,460	20,820	0,456	20,225	0,454	19,729	0,536	38,505	0,532	37,498	0,529	36,508	0,626	72,593	0,622	70,704	0,618	68,846	0,724	131,236	0,720	127,651	0,715	124,407
1,6	0,268	2,259	0,294	3,251	0,293	3,178	0,352	6,511	0,349	6,331	0,347	6,176	0,409	11,865	0,406	11,538	0,403	11,217	0,475	21,513	0,472	20,898	0,469	20,386	0,553	39,783	0,550	38,743	0,546	37,720	0,647	74,999	0,643	73,047	0,639	71,128	0,748	135,580	0,743	131,876	0,739	128,525
1,7	0,277	2,330	0,304	3,354	0,302	3,278	0,363	6,715	0,360	6,530	0,358	6,370	0,422	12,236	0,419	11,899	0,416	11,567	0,490	22,184	0,486	21,550	0,483	21,022	0,571	41,022	0,567	39,950	0,563	38,895	0,667	77,331	0,663	75,319	0,659	73,339	0,772	139,789	0,766	135,971	0,762	132,516
1,8	0,285	2,399	0,313	3,453	0,311	3,375	0,373	6,914	0,371	6,722	0,368	6,558	0,434	12,596	0,431	12,249	0,428	11,908	0,504	22,835	0,501	22,183	0,497	21,639	0,587	42,225	0,584	41,121	0,580	40,035	0,687	79,595	0,682	77,524	0,678	75,487	0,794	143,877	0,789	139,947	0,784	136,391
1,9	0,293	2,466	0,321	3,549	0,320	3,470	0,384	7,106	0,381	6,910	0,379	6,740	0,446	12,946	0,443	12,590	0,440	12,239	0,518	23,469	0,514	22,798	0,511	22,240	0,604	43,395	0,600	42,261	0,596	41,145	0,706	81,797	0,701	79,669	0,697	77,575	0,816	147,852	0,811	143,814	0,806	140,161
2	0,300	2,532	0,330	3,643	0,328	3,561	0,394	7,294	0,391	7,092	0,389	6,918	0,458	13,288	0,455	12,921	0,452	12,562	0,532	24,087	0,528	23,398	0,525	22,825	0,620	44,535	0,616	43,370	0,611	42,226	0,724	83,942	0,720	81,758	0,715	79,610	0,837	151,725	0,832	147,581	0,827	143,832
2,1	0,308	2,596	0,338	3,735	0,336	3,651	0,404	7,477	0,401	7,270	0,398	7,092	0,470	13,620	0,466	13,245	0,463	12,876	0,545	24,689	0,541	23,983	0,538	23,396	0,635	45,646	0,631	44,453	0,627	43,279	0,742	86,034	0,738	83,796	0,733	81,594	0,858	155,501	0,853	151,255	0,847	147,412
2,2	0,315	2,658	0,346	3,825	0,344	3,739	0,413	7,656	0,410	7,444	0,408	7,262	0,481	13,945	0,478	13,561	0,474	13,183	0,558	25,277	0,554	24,554	0,551	23,953	0,650	46,731	0,646	45,510	0,642	44,309	0,760	88,076	0,755	85,785	0,750	83,531	0,879	159,189	0,873	154,842	0,867	150,909
2,3	0,323	2,719	0,354	3,912	0,352	3,824	0,423	7,830	0,420	7,614	0,417	7,427	0,492	14,263	0,488	13,870	0,485	13,484	0,571	25,851	0,567	25,113	0,563	24,498	0,665	47,792	0,661	46,543	0,656	45,315	0,777	90,073	0,772	87,730	0,767	85,425	0,899	162,794	0,893	158,349	0,887	154,326
2,4	0,330	2,779	0,362	3,998	0,360	3,908	0,432	8,001	0,429	7,780	0,426	7,590	0,503	14,574	0,499	14,172	0,496	13,778	0,583	26,414	0,579	25,659	0,575	25,031	0,679	48,830	0,675	47,554	0,670	46,299	0,794	92,027	0,789	89,633	0,784	87,279	0,918	166,322	0,912	161,780	0,906	157,671
2,5	0,337	2,837	0,370	4,082	0,368	3,990	0,441	8,169	0,438	7,943	0,435	7,749	0,513	14,878	0,509	14,468	0,506	14,066	0,595	26,965	0,591	26,194	0,587	25,553	0,693	49,847	0,689	48,545	0,684	47,263	0,811	93,941	0,805	91,497	0,800	89,094	0,937	169,776	0,931	165,141	0,925	160,946
2,6	0,344	2,894	0,377	4,164	0,375	4,070	0,450	8,333	0,447	8,103	0,444	7,904	0,523	15,177	0,520	14,759	0,516	14,348	0,607	27,505	0,603	26,719	0,599	26,065	0,707	50,844	0,703	49,515	0,698	48,208	0,827	95,816	0,822	93,324	0,816	90,873	0,956	173,163	0,949	168,435	0,943	164,157
2,7	0,350	2,950	0,384	4,245	0,382	4,149	0,459	8,494	0,455	8,259	0,453	8,057	0,533	15,469	0,530	15,043	0,526	14,624	0,619	28,034	0,615	27,233	0,611	26,567	0,721	51,821	0,716	50,467	0,712	49,135	0,843	97,656	0,837	95,116	0,832	92,618	0,974	176,485	0,968	171,666	0,962	167,306
2,8	0,357	3,005	0,392	4,324	0,389	4,227	0,467	8,652	0,464	8,413	0,461	8,207	0,543	15,757	0,540	15,323	0,536	14,896	0,630	28,554	0,626	27,738	0,622	27,059	0,734	52,781	0,730	51,402	0,725	50,045	0,858	99,462	0,853	96,876	0,847	94,331	0,992	179,745	0,985	174,838	0,979	170,397
2,9	0,363	3,060	0,399	4,402	0,396	4,303	0,476	8,807	0,472	8,564	0,469	8,354	0,553	16,039	0,549	15,597	0,545	15,163	0,642	29,065	0,637	28,234	0,633	27,543	0,747	53,724	0,743	52,320	0,738	50,939	0,874	101,237	0,868	98,604	0,862	96,014	1,010	182,949	1,003	177,954	0,997	173,434
3	0,369	3,113	0,406	4,478	0,403	4,377	0,484	8,960	0,480	8,712	0,477	8,499	0,563	16,316	0,559	15,867	0,555	15,425	0,653	29,567	0,648	28,722	0,644	28,019	0,760	54,650	0,755	53,223	0,750	51,818	0,889	102,981	0,883	100,303	0,877	97,668	1,027	186,097	1,020	181,017	1,014	176,419
3,1	0,376	3,165	0,412	4,553	0,410	4,451	0,492	9,110	0,488	8,858	0,485	8,641	0,572	16,589	0,568	16,132	0,564	15,683	0,664	30,060	0,659	29,202	0,655	28,487	0,773	55,562	0,768	54,110	0,763	52,682	0,904	104,696	0,898	101,973	0,892	99,295	1,044	189,193	1,037	184,029	1,031	179,355
3,2	0,382	3,217	0,419	4,627	0,417	4,523	0,500	9,258	0,496	9,002	0,493	8,782	0,581	16,858	0,577	16,393	0,573	15,937	0,674	30,546	0,670	29,674	0,665	28,947	0,785	56,458	0,780	54,983	0,775	53,533	0,918	106,383	0,912	103,617	0,906	100,896	1,061	192,240	1,054	186,992	1,047	182,243
3,3	0,388	3,267	0,426	4,700	0,423	4,594	0,508	9,403	0,504	9,143	0,501	8,920	0,590	17,122	0,586	16,651	0,582	16,187	0,685	31,025	0,680	30,138	0,676	29,401	0,798	57,341	0,793	55,843	0,787	54,370	0,932	108,045	0,926	105,235	0,920	102,472	1,078	195,240	1,070	189,910	1,064	185,087
3,4	0,394	3,317	0,432	4,772	0,430	4,665	0,515	9,547	0,512	9,283	0,509	9,055	0,599	17,382	0,595	16,904	0,591	16,433	0,695	31,496	0,690	30,596	0,686	29,847	0,810	58,211	0,805	56,690	0,799	55,194	0,947	109,682	0,940	106,830	0,934	104,024	1,094	198,194	1,087	192,784	1,080	187,888
3,5	0,400	3,367	0,439	4,843	0,436	4,734	0,523	9,688	0,519	9,420	0,516	9,189	0,608	17,639	0,604	17,153	0,600	16,676	0,706	31,960	0,701	31,047	0,696	30,287	0,822	59,067	0,816	57,525	0,811	56,007	0,960	111,294	0,954	108,400	0,948	105,554	1,110	201,106	1,103	195,616	1,096	190,649
3,6	0,405	3,415	0,445	4,912	0,442	4,802	0,531	9,827	0,527	9,555	0,524	9,321	0,617	17,892	0,613	17,399	0,608	16,915	0,716	32,417	0,711	31,491	0,706	30,721	0,834	59,912	0,828	58,347	0,823	56,808	0,974	112,884	0,968	109,949	0,962	107,061	1,126	203,976	1,118	198,408	1,111	193,370
3,7	0,411	3,463	0,451	4,981	0,449	4,869	0,538	9,964	0,534	9,689	0,531	9,452	0,626	18,141	0,621	17,642	0,617	17,151	0,726	32,869	0,721	31,930	0,716	31,149	0,845	60,745	0,840	59,159	0,834	57,598	0,988	114,452	0,981	111,476	0,975	108,549	1,142	206,806	1,134	201,161	1,127	196,053
3,8	0,417	3,510	0,457	5,049	0,455	4,935	0,545	10,099	0,541	9,820	0,538	9,580	0,634	18,388	0,630	17,881	0,625	17,384	0,736	33,314	0,730	32,362	0,726	31,571	0,857	61,567	0,851	59,959	0,845	58,377	1,001	115,999	0,995	112,983	0,988	110,016	1,157	209,599	1,149	203,878	1,142	198,701
3,9	0,422	3,557	0,463	5,116	0,461	5,001	0,553	10,233	0,549	9,950	0,545	9,707	0,642	18,630	0,638	18,117	0,633	17,613	0,745	33,753	0,740	32,789	0,735	31,987	0,868	62,378	0,862	60,749	0,856	59,146	1,014	117,525	1,008	114,470	1,001	111,464	1,172	212,355	1,164	206,559	1,157	201,314
4	0,428	3,603	0,469	5,182	0,467	5,065	0,560	10,365	0,556	10,078	0,552	9,832	0,651	18,870	0,646	18,351	0,642	17,840	0,755	34,187	0,749	33,211	0,745	32,398	0,879	63,179	0,873	61,529	0,867	59,906	1,027	119,032	1,021	115,938	1,014	112,893	1,187	215,076	1,179	209,205	1,172	203,893
4,1	0,433	3,648	0,475	5,247	0,472	5,129	0,567	10,495	0,563	10,205	0,559	9,955	0,659	19,107	0,654	18,581	0,650	18,064	0,764	34,616	0,759	33,627	0,754	32,804	0,890	63,970	0,884	62,299	0,878	60,656	1,040	120,521	1,033	117,387	1,027	114,305	1,202	217,763	1,194	211,819	1,186	206,441
4,2	0,438	3,693	0,481	5,312	0,478	5,192	0,574	10,624	0,570	10,330	0,566	10,078	0,667	19,341	0,662	18,808	0,658	18,285	0,774	35,039	0,768	34,038	0,763	33,206	0,901	64,751	0,895	63,060	0,889	61,397	1,053	121,991	1,046	118,820	1,039	115,700	1,217	220,417	1,208	214,401	1,201	208,957
4,3	0,444	3,737	0,487	5,375	0,484	5,255	0,580	10,751	0,576	10,454	0,573	10,198	0,675	19,572	0,670	19,033	0,666	18,504	0,783	35,457	0,777	34,445	0,772	33,602	0,912	65,523	0,906	63,812	0,900	62,129	1,065	123,444	1,058	120,235	1,052	117,078	1,231	223,041	1,223	216,953	1,215	211,444
4,4	0,449	3,781	0,493	5,438	0,490	5,316	0,587	10,877	0,583	10,576	0,580	10,318	0,683	19,801	0,678	19,255	0,673	18,720	0,792	35,871	0,786	34,846	0,781	33,994	0,922	66,286	0,916	64,555	0,910	62,852	1,078	124,880	1,071	121,634	1,064	118,440	1,245	225,633	1,237	219,475	1,229	213,903
4,5	0,454	3,825	0,498	5,501	0,495	5,377	0,594	11,001	0,590	10,697	0,586	10,435	0,691	20,027	0,686	19,475	0,681	18,933	0,801	36,279	0,795	35,243	0,790	34,381	0,933	67,041	0,927	65,290	0,921	63,568	1,090	126,300	1,083	123,017	1,076	119,787	1,260	228,197	1,251	221,969	1,243	216,333
4,6	0,459	3,867	0,504	5,562	0,501	5,437	0,601	11,124	0,596	10,817	0,593	10,552	0,698	20,250	0,693	19,692	0,689	19,145	0,810	36,684	0,804	35,636	0,799	34,764	0,943	67,787	0,937	66,017	0,931	64,275	1,102	127,705	1,095	124,385	1,088	121,119	1,274	230,732	1,265	224,435	1,257	218,737
4,7	0,464	3,910	0,509	5,623	0,506	5,497	0,607	11,246	0,603	10,935	0,599	10,667	0,706	20,471	0,701	19,907	0,696	19,354	0,819	37,084	0,813	36,025	0,808	35,143	0,953	68,525	0,947	66,736	0,941	64,975	1,114	129,094	1,107	125,738	1,100	122,437	1,287	233,240	1,279	226,874	1,271	221,114
4,8	0,469	3,952	0,515	5,683	0,512	5,556	0,614	11,366	0,609	11,052	0,606	10,782	0,713	20,690	0,708	20,120	0,704	19,560	0,828	37,479	0,822	36,409	0,817	35,518	0,963	69,255	0,957	67,447	0,951	65,668	1,126	130,468	1,119	127,077	1,111	123,740	1,301	235,721	1,292	229,288	1,284	223,467
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.7: roughness coefficient k=1,5 mm (2/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
4,9	0,474	3,993	0,520	5,743	0,517	5,614	0,620	11,485	0,616	11,168	0,612	10,894	0,721	20,906	0,716	20,331	0,711	19,765	0,836	37,871	0,830	36,789	0,825	35,889	0,974	69,978	0,967	68,151	0,961	66,353	1,138	131,828	1,130	128,401	1,123	125,030	1,315	238,177	1,306	231,677	1,298	225,795
5	0,479	4,034	0,525	5,802	0,522	5,672	0,626	11,603	0,622	11,282	0,618	11,006	0,728	21,120	0,723	20,539	0,718	19,968	0,845	38,258	0,839	37,166	0,834	36,257	0,983	70,693	0,977	68,847	0,971	67,031	1,149	133,175	1,142	129,713	1,134	126,307	1,328	240,607	1,319	234,041	1,311	228,099
5,1	0,484	4,075	0,531	5,861	0,528	5,729	0,633	11,719	0,628	11,396	0,624	11,117	0,736	21,332	0,731	20,745	0,725	20,168	0,853	38,642	0,847	37,539	0,842	36,620	0,993	71,402	0,987	69,537	0,980	67,703	1,161	134,508	1,153	131,011	1,146	127,572	1,341	243,014	1,332	236,382	1,324	230,380
5,2	0,488	4,115	0,536	5,918	0,533	5,785	0,639	11,835	0,635	11,508	0,631	11,227	0,743	21,542	0,738	20,949	0,733	20,367	0,862	39,022	0,855	37,908	0,850	36,981	1,003	72,103	0,997	70,220	0,990	68,368	1,172	135,828	1,165	132,297	1,157	128,824	1,355	245,397	1,345	238,700	1,337	232,640
5,3	0,493	4,155	0,541	5,976	0,538	5,842	0,645	11,949	0,641	11,619	0,637	11,335	0,750	21,750	0,745	21,152	0,740	20,563	0,870	39,398	0,864	38,273	0,858	37,337	1,013	72,798	1,006	70,897	1,000	69,027	1,183	137,135	1,176	133,570	1,168	130,064	1,368	247,757	1,358	240,996	1,350	234,877
5,4	0,498	4,195	0,546	6,033	0,543	5,897	0,651	12,063	0,647	11,730	0,643	11,443	0,757	21,956	0,752	21,352	0,747	20,758	0,878	39,771	0,872	38,636	0,866	37,691	1,022	73,486	1,016	71,567	1,009	69,679	1,195	138,430	1,187	134,832	1,179	131,292	1,380	250,095	1,371	243,270	1,363	237,094
5,5	0,503	4,234	0,551	6,089	0,548	5,952	0,657	12,175	0,653	11,839	0,649	11,549	0,764	22,161	0,759	21,551	0,754	20,951	0,886	40,141	0,880	38,994	0,875	38,041	1,032	74,168	1,025	72,231	1,018	70,326	1,206	139,713	1,198	136,082	1,190	132,509	1,393	252,411	1,384	245,523	1,375	239,290
5,6	0,507	4,273	0,556	6,145	0,553	6,007	0,663	12,286	0,659	11,947	0,655	11,655	0,771	22,363	0,766	21,747	0,760	21,142	0,894	40,507	0,888	39,350	0,882	38,388	1,041	74,843	1,034	72,889	1,028	70,967	1,217	140,985	1,209	137,320	1,201	133,715	1,406	254,707	1,396	247,756	1,388	241,466
5,7	0,512	4,311	0,561	6,200	0,558	6,061	0,669	12,397	0,665	12,054	0,660	11,759	0,778	22,563	0,773	21,942	0,767	21,332	0,902	40,869	0,896	39,702	0,890	38,731	1,051	75,513	1,044	73,541	1,037	71,602	1,228	142,245	1,220	138,548	1,212	134,910	1,418	256,982	1,409	249,969	1,400	243,623
5,8	0,516	4,350	0,566	6,255	0,563	6,114	0,675	12,506	0,670	12,161	0,666	11,863	0,785	22,762	0,779	22,136	0,774	21,520	0,910	41,229	0,904	40,052	0,898	39,072	1,060	76,177	1,053	74,188	1,046	72,231	1,238	143,494	1,230	139,764	1,222	136,095	1,431	259,237	1,421	252,163	1,412	245,761
5,9	0,521	4,387	0,571	6,309	0,568	6,167	0,681	12,614	0,676	12,266	0,672	11,966	0,792	22,959	0,786	22,327	0,781	21,706	0,918	41,585	0,912	40,398	0,906	39,410	1,069	76,835	1,062	74,828	1,055	72,855	1,249	144,733	1,241	140,971	1,233	137,270	1,443	261,473	1,434	254,338	1,425	247,881
6	0,525	4,425	0,576	6,363	0,573	6,220	0,687	12,722	0,682	12,371	0,678	12,068	0,798	23,155	0,793	22,517	0,787	21,891	0,926	41,939	0,919	40,742	0,914	39,745	1,078	77,487	1,071	75,464	1,064	73,474	1,260	145,961	1,252	142,167	1,243	138,435	1,456	263,690	1,446	256,495	1,437	249,983
6,1	0,530	4,462	0,581	6,416	0,578	6,272	0,693	12,829	0,688	12,474	0,684	12,169	0,805	23,348	0,800	22,706	0,794	22,074	0,934	42,290	0,927	41,082	0,921	40,077	1,087	78,134	1,080	76,094	1,073	74,087	1,270	147,179	1,262	143,353	1,254	139,590	1,468	265,889	1,458	258,633	1,449	252,068
6,2	0,534	4,499	0,586	6,469	0,583	6,324	0,698	12,934	0,693	12,577	0,689	12,269	0,812	23,541	0,806	22,893	0,800	22,256	0,941	42,637	0,935	41,420	0,929	40,407	1,096	78,776	1,089	76,719	1,082	74,696	1,281	148,387	1,272	144,530	1,264	140,736	1,480	268,069	1,470	260,754	1,461	254,135
6,3	0,538	4,535	0,591	6,522	0,587	6,375	0,704	13,039	0,699	12,679	0,695	12,369	0,818	23,731	0,813	23,078	0,807	22,436	0,949	42,982	0,942	41,755	0,936	40,734	1,105	79,413	1,098	77,339	1,090	75,300	1,291	149,585	1,283	145,697	1,274	141,872	1,492	270,232	1,482	262,859	1,472	256,186
6,4	0,543	4,572	0,595	6,574	0,592	6,426	0,710	13,143	0,705	12,780	0,700	12,468	0,825	23,920	0,819	23,262	0,813	22,615	0,957	43,324	0,950	42,088	0,944	41,058	1,114	80,044	1,106	77,954	1,099	75,899	1,301	150,773	1,293	146,855	1,284	143,000	1,503	272,378	1,493	264,946	1,484	258,220
6,5	0,547	4,608	0,600	6,626	0,597	6,477	0,715	13,246	0,710	12,881	0,706	12,566	0,831	24,108	0,826	23,445	0,820	22,793	0,964	43,664	0,957	42,417	0,951	41,380	1,122	80,671	1,115	78,565	1,108	76,493	1,311	151,953	1,303	148,004	1,294	144,119	1,515	274,508	1,505	267,018	1,496	260,239
6,6	0,551	4,644	0,605	6,677	0,601	6,527	0,721	13,349	0,716	12,980	0,711	12,663	0,838	24,294	0,832	23,626	0,826	22,969	0,972	44,001	0,965	42,745	0,959	41,699	1,131	81,293	1,124	79,171	1,116	77,083	1,321	153,123	1,313	149,144	1,304	145,229	1,527	276,621	1,517	269,073	1,507	262,243
6,7	0,555	4,679	0,609	6,728	0,606	6,577	0,726	13,451	0,721	13,079	0,717	12,759	0,844	24,479	0,838	23,805	0,832	23,143	0,979	44,335	0,972	43,070	0,966	42,016	1,140	81,910	1,132	79,772	1,125	77,668	1,331	154,285	1,323	150,275	1,314	146,331	1,538	278,718	1,528	271,113	1,519	264,231
6,8	0,560	4,714	0,614	6,778	0,610	6,626	0,732	13,552	0,727	13,177	0,722	12,855	0,850	24,662	0,845	23,984	0,839	23,317	0,986	44,667	0,979	43,392	0,973	42,331	1,148	82,523	1,141	80,368	1,133	78,249	1,341	155,438	1,333	151,398	1,324	147,424	1,550	280,799	1,540	273,138	1,530	266,204
6,9	0,564	4,749	0,618	6,829	0,615	6,675	0,737	13,652	0,732	13,275	0,727	12,950	0,857	24,845	0,851	24,161	0,845	23,489	0,993	44,997	0,986	43,712	0,980	42,643	1,157	83,131	1,149	80,961	1,141	78,826	1,351	156,583	1,343	152,513	1,334	148,510	1,561	282,866	1,551	275,148	1,541	268,163
7	0,568	4,784	0,623	6,879	0,619	6,724	0,742	13,751	0,737	13,371	0,733	13,044	0,863	25,025	0,857	24,337	0,851	23,660	1,001	45,324	0,994	44,030	0,987	42,953	1,165	83,735	1,157	81,549	1,150	79,398	1,361	157,719	1,352	153,620	1,344	149,588	1,573	284,917	1,562	277,143	1,552	270,108
7,1	0,572	4,818	0,627	6,928	0,624	6,772	0,748	13,850	0,743	13,467	0,738	13,138	0,869	25,205	0,863	24,511	0,857	23,830	1,008	45,649	1,001	44,345	0,995	43,261	1,173	84,334	1,166	82,132	1,158	79,967	1,371	158,847	1,362	154,719	1,353	150,658	1,584	286,954	1,573	279,124	1,563	272,039
7,2	0,576	4,852	0,632	6,977	0,628	6,820	0,753	13,948	0,748	13,563	0,743	13,231	0,875	25,383	0,869	24,685	0,863	23,998	1,015	45,971	1,008	44,659	1,002	43,567	1,182	84,929	1,174	82,712	1,166	80,531	1,381	159,967	1,372	155,810	1,363	151,720	1,595	288,976	1,584	281,092	1,574	273,956
7,3	0,580	4,886	0,636	7,026	0,633	6,868	0,758	14,045	0,753	13,657	0,748	13,324	0,881	25,560	0,875	24,857	0,869	24,166	1,022	46,291	1,015	44,970	1,009	43,870	1,190	85,521	1,182	83,288	1,174	81,092	1,390	161,080	1,381	156,894	1,372	152,775	1,606	290,985	1,595	283,045	1,585	275,861
7,4	0,584	4,920	0,641	7,074	0,637	6,915	0,764	14,142	0,758	13,752	0,753	13,415	0,887	25,736	0,881	25,028	0,875	24,332	1,029	46,609	1,022	45,279	1,015	44,172	1,198	86,108	1,190	83,860	1,182	81,649	1,400	162,185	1,391	157,970	1,382	153,823	1,617	292,979	1,606	284,986	1,596	277,752
7,5	0,588	4,954	0,645	7,123	0,641	6,963	0,769	14,238	0,763	13,845	0,759	13,507	0,894	25,911	0,887	25,198	0,881	24,497	1,036	46,925	1,029	45,586	1,022	44,471	1,206	86,691	1,198	84,428	1,190	82,202	1,409	163,282	1,400	159,039	1,391	154,864	1,628	294,961	1,617	286,913	1,607	279,630
7,6	0,592	4,987	0,649	7,170	0,646	7,009	0,774	14,334	0,768	13,938	0,764	13,597	0,899	26,084	0,893	25,366	0,887	24,661	1,043	47,239	1,036	45,891	1,029	44,769	1,214	87,270	1,206	84,992	1,198	82,751	1,419	164,373	1,409	160,101	1,400	155,899	1,639	296,929	1,628	288,827	1,618	281,496
7,7	0,596	5,020	0,654	7,218	0,650	7,056	0,779	14,428	0,774	14,030	0,769	13,687	0,905	26,256	0,899	25,534	0,893	24,824	1,050	47,551	1,042	46,194	1,036	45,064	1,222	87,846	1,214	85,552	1,206	83,297	1,428	165,456	1,419	161,156	1,409	156,926	1,650	298,884	1,639	290,729	1,628	283,350
7,8	0,600	5,053	0,658	7,265	0,654	7,102	0,784	14,523	0,779	14,122	0,774	13,776	0,911	26,428	0,905	25,700	0,899	24,986	1,057	47,861	1,049	46,495	1,043	45,358	1,230	88,417	1,222	86,109	1,214	83,839	1,437	166,532	1,428	162,204	1,419	157,946	1,661	300,827	1,649	292,619	1,639	285,192
7,9	0,604	5,086	0,662	7,312	0,658	7,148	0,789	14,616	0,784	14,213	0,779	13,865	0,917	26,598	0,911	25,866	0,904	25,147	1,064	48,168	1,056	46,794	1,049	45,649	1,238	88,985	1,230	86,662	1,222	84,377	1,446	167,601	1,437	163,245	1,428	158,961	1,671	302,757	1,660	294,497	1,650	287,021
8	0,607	5,118	0,666	7,359	0,663	7,193	0,794	14,709	0,789	14,303	0,784	13,953	0,923	26,767	0,917	26,030	0,910	25,307	1,070	48,474	1,063	47,091	1,056	45,939	1,246	89,550	1,238	87,212	1,230	84,913	1,456	168,663	1,446	164,280	1,437	159,968	1,682	304,675	1,670	296,362	1,660	288,840
8,1	0,611	5,150	0,671	7,405	0,667	7,239	0,799	14,802	0,794	14,393	0,789	14,041	0,929	26,935	0,922	26,194	0,916	25,465	1,077	48,778	1,069	47,386	1,063	46,227	1,254	90,111	1,245	87,759	1,237	85,445	1,465	169,719	1,455	165,309	1,446	160,970	1,692	306,581	1,681	298,216	1,670	290,647
8,2	0,615	5,182	0,675	7,451	0,671	7,284	0,804	14,893	0,799	14,482	0,794	14,128	0,935	27,102	0,928	26,356	0,922	25,623	1,084	49,080	1,076	47,679	1,069	46,514	1,261	90,668	1,253	88,302	1,245	85,974	1,474	170,768	1,464	166,331	1,455	161,965	1,703	308,475	1,691	300,059	1,681	292,443
8,3	0,619	5,214	0,679	7,497	0,675	7,328	0,809	14,985	0,803	14,571	0,798	14,215	0,940	27,268	0,934	26,517	0,927	25,780	1,090	49,381	1,082	47,971	1,076	46,798	1,269	91,223	1,261	88,841	1,253	86,499	1,483	171,811	1,473	167,346	1,464	162,954	1,713	310,358	1,702	301,891	1,691	294,228
8,4	0,623	5,246	0,683	7,542	0,679	7,373	0,814	15,075	0,808	14,659	0,803	14,301	0,946	27,433	0,939	26,678	0,933	25,936	1,097	49,679	1,089	48,261	1,082	47,081	1,277	91,773	1,268	89,378	1,260	87,021	1,492	172,848	1,482	168,356	1,472	163,937	1,723	312,230	1,712	303,711	1,701	296,002
8,5	0,626	5,277	0,687	7,587	0,683	7,417	0,819	15,166	0,813	14,747	0,808	14,386	0,952	27,597	0,945	26,837	0,938	26,091	1,103	49,976	1,096	48,549	1,089	47,362	1,284	92,321	1,276	89,911	1,268	87,541	1,501	173,878	1,491	169,360	1,481	164,915	1,734	314,090	1,722	305,521	1,711	297,766
8,6	0,630	5,308	0,691	7,632	0,687	7,461	0,824	15,255	0,818	14,834	0,813	14,472	0,957	27,760	0,951	26,996	0,944	26,245	1,110	50,271	1,102	48,836	1,095	47,642	1,292	92,865	1,284	90,441	1,275	88,057	1,509	174,903	1,500	170,358	1,490	165,887	1,744	315,939	1,732	307,320	1,721	299,520
8,7	0,634	5,340	0,695	7,677	0,691	7,504	0,829	15,345	0,823	14,921	0,818	14,556	0,963	27,922	0,956	27,153	0,949	26,398	1,116	50,564	1,108	49,121	1,102	47,920	1,299	93,407	1,291	90,968	1,283	88,570	1,518	175,921	1,508	171,350	1,499	166,853	1,754	317,778	1,742	309,108	1,731	301,263
8,8	0,637	5,371	0,699	7,721	0,695	7,548	0,833	15,433	0,827	15,007	0,822	14,640	0,968	28,083	0,962	27,310	0,955	26,551	1,123	50,855	1,115	49,404	1,108	48,196	1,307	93,945	1,298	91,492	1,290	89,080	1,527	176,934	1,517	172,336	1,507	167,813	1,764	319,606	1,752	310,887	1,741	302,996
8,9	0,641	5,401	0,703	7,765	0,699	7,591	0,838	15,521	0,832	15,093	0,827	14,724	0,974	28,243	0,967	27,466	0,960	26,702	1,129	51,145	1,121	49,685	1,114	48,471	1,314	94,480	1,306	92,014	1,297	89,588	1,536	177,941	1,526	173,317	1,516	168,768	1,774	321,424	1,762	312,655	1,751	304,720
9	0,645	5,432	0,707	7,809	0,703	7,634	0,843	15,609	0,837	15,178	0,832	14,807	0,979	28,402	0,973	27,621	0,966	26,853	1,136	51,433	1,127	49,965	1,121	48,744	1,322	95,012	1,313	92,532	1,305	90,092	1,544	178,942	1,534	174,293	1,524	169,718	1,784	323,232	1,772	314,414	1,761	306,433
9,1	0,648	5,462	0,711	7,853	0,707	7,677	0,848	15,696	0,842	15,263	0,836	14,890	0,985	28,561	0,978	27,775	0,971	27,003	1,142	51,720	1,134	50,244	1,127	49,015	1,329	95,541	1,320	93,047	1,312	90,594	1,553	179,938	1,543	175,262	1,533	170,663	1,794	325,030	1,782	316,162	1,771	308,138
9,2	0,652	5,492	0,715	7,896	0,711	7,719	0,852	15,783	0,846	15,347	0,841	14,972	0,990	28,718	0,983	27,928	0,977	27,152	1,148	52,005	1,140	50,521	1,133	49,286	1,336	96,067	1,328	93,560	1,319	91,093	1,561	180,929	1,551	176,227	1,541	171,602	1,804	326,817	1,792	317,901	1,781	309,833
9,3	0,655	5,523	0,719	7,940	0,715	7,761	0,857	15,869	0,851	15,431	0,846	15,054	0,996	28,875	0,989	28,081	0,982	27,300	1,154	52,289	1,146	50,796	1,139	49,554	1,344	96,590	1,335	94,069	1,326	91,589	1,570	181,914	1,560	177,186	1,550	172,536	1,814	328,596	1,802	319,631	1,790	311,519
9,4	0,659	5,552	0,723	7,983	0,719	7,803	0,861	15,955	0,855	15,514	0,850	15,135	1,001	29,031	0,994	28,232	0,987	27,447	1,161	52,571	1,152	51,070	1,145	49,822	1,351	97,111	1,342	94,576	1,333	92,083	1,578	182,893	1,568	178,141	1,558	173,465	1,824	330,364	1,811	321,351	1,800	313,195
9,5	0,663	5,582	0,727	8,025	0,723	7,845	0,866	16,040	0,860	15,597	0,855	15,216	1,006	29,186	0,999	28,383	0,992	27,594	1,167	52,851	1,159	51,343	1,151	50,088	1,358	97,629	1,349	95,080	1,341	92,574	1,587	183,868	1,577	179,090	1,566	174,390	1,833	332,123	1,821	323,063	1,810	314,863
9,6	0,666	5,612	0,731	8,068	0,726	7,887	0,871	16,125	0,865	15,680	0,859	15,297	1,012	29,340	1,005	28,533	0,998	27,740	1,173	53,130	1,165	51,614	1,158	50,352	1,365	98,144	1,357	95,582	1,348	93,062	1,595	184,837	1,585	180,034	1,575	175,309	1,843	333,873	1,831	324,765	1,819	316,522
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.7: roughness coefficient k=1,5 mm (3/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
9,7	0,670	5,641	0,735	8,110	0,730	7,928	0,875	16,209	0,869	15,762	0,864	15,377	1,017	29,494	1,010	28,682	1,003	27,885	1,179	53,408	1,171	51,884	1,164	50,615	1,373	98,656	1,364	96,081	1,355	93,548	1,603	185,801	1,593	180,973	1,583	176,224	1,853	335,614	1,840	326,458	1,829	318,173
9,8	0,673	5,671	0,738	8,152	0,734	7,969	0,880	16,293	0,874	15,844	0,868	15,456	1,022	29,646	1,015	28,831	1,008	28,029	1,185	53,684	1,177	52,152	1,170	50,877	1,380	99,166	1,371	96,578	1,362	94,032	1,612	186,761	1,601	181,908	1,591	177,134	1,862	337,346	1,850	328,143	1,838	319,815
9,9	0,676	5,700	0,742	8,194	0,738	8,010	0,884	16,377	0,878	15,925	0,873	15,536	1,028	29,798	1,020	28,978	1,013	28,173	1,191	53,959	1,183	52,419	1,176	51,137	1,387	99,673	1,378	97,072	1,369	94,512	1,620	187,715	1,610	182,838	1,599	178,039	1,872	339,069	1,859	329,819	1,847	321,448
10	0,680	5,729	0,746	8,236	0,742	8,051	0,889	16,460	0,883	16,006	0,877	15,614	1,033	29,949	1,026	29,125	1,018	28,316	1,197	54,232	1,189	52,684	1,182	51,396	1,394	100,178	1,385	97,563	1,376	94,991	1,628	188,665	1,618	183,763	1,607	178,940	1,881	340,784	1,868	331,487	1,857	323,074
10,2	0,687	5,786	0,753	8,318	0,749	8,132	0,898	16,625	0,891	16,166	0,886	15,771	1,043	30,249	1,036	29,417	1,029	28,599	1,209	54,775	1,201	53,212	1,193	51,911	1,408	101,179	1,398	98,539	1,389	95,941	1,644	190,550	1,634	185,599	1,623	180,728	1,900	344,187	1,887	334,798	1,875	326,301
10,4	0,694	5,843	0,761	8,400	0,756	8,212	0,906	16,789	0,900	16,325	0,895	15,926	1,053	30,546	1,046	29,706	1,039	28,880	1,221	55,312	1,213	53,734	1,205	52,420	1,421	102,171	1,412	99,505	1,403	96,882	1,661	192,417	1,650	187,417	1,639	182,499	1,918	347,557	1,906	338,076	1,894	329,496
10,6	0,700	5,900	0,768	8,481	0,764	8,291	0,915	16,950	0,909	16,482	0,903	16,080	1,064	30,841	1,056	29,992	1,049	29,158	1,233	55,845	1,224	54,251	1,217	52,925	1,435	103,154	1,426	100,462	1,416	97,813	1,677	194,266	1,666	189,218	1,655	184,253	1,937	350,895	1,924	341,323	1,912	332,660
10,8	0,707	5,956	0,775	8,562	0,771	8,370	0,924	17,111	0,917	16,638	0,912	16,232	1,074	31,132	1,066	30,276	1,059	29,434	1,245	56,372	1,236	54,763	1,228	53,424	1,449	104,127	1,439	101,409	1,430	98,736	1,692	196,098	1,681	191,002	1,671	185,990	1,955	354,202	1,942	344,539	1,930	335,795
11	0,713	6,011	0,783	8,641	0,778	8,447	0,932	17,270	0,926	16,793	0,920	16,382	1,084	31,421	1,076	30,556	1,068	29,707	1,256	56,894	1,247	55,271	1,240	53,920	1,462	105,091	1,453	102,348	1,443	99,650	1,708	197,912	1,697	192,770	1,686	187,711	1,973	357,478	1,960	347,726	1,948	338,901
11,2	0,720	6,066	0,790	8,720	0,785	8,524	0,941	17,427	0,934	16,946	0,929	16,532	1,093	31,707	1,086	30,835	1,078	29,978	1,268	57,412	1,259	55,774	1,251	54,410	1,475	106,047	1,466	103,279	1,456	100,557	1,724	199,711	1,712	194,522	1,701	189,417	1,991	360,724	1,978	350,884	1,965	341,979
11,4	0,726	6,120	0,797	8,798	0,792	8,601	0,949	17,583	0,943	17,098	0,937	16,680	1,103	31,990	1,096	31,110	1,088	30,246	1,279	57,925	1,270	56,272	1,262	54,896	1,489	106,994	1,479	104,201	1,469	101,455	1,739	201,493	1,728	196,258	1,717	191,107	2,009	363,942	1,995	354,014	1,983	345,030
11,6	0,733	6,174	0,804	8,876	0,799	8,677	0,958	17,738	0,951	17,248	0,945	16,827	1,113	32,272	1,105	31,384	1,097	30,512	1,290	58,434	1,281	56,766	1,273	55,379	1,502	107,933	1,492	105,116	1,482	102,345	1,754	203,260	1,743	197,978	1,732	192,783	2,026	367,132	2,013	357,116	2,000	348,054
11,8	0,739	6,228	0,811	8,953	0,806	8,752	0,966	17,891	0,959	17,397	0,953	16,972	1,122	32,550	1,115	31,655	1,107	30,775	1,301	58,938	1,292	57,256	1,284	55,856	1,515	108,863	1,505	106,022	1,495	103,227	1,769	205,011	1,758	199,685	1,746	194,444	2,044	370,294	2,030	360,192	2,018	351,051
12	0,745	6,281	0,818	9,029	0,813	8,826	0,974	18,043	0,967	17,545	0,961	17,116	1,132	32,827	1,124	31,924	1,116	31,036	1,312	59,438	1,303	57,742	1,295	56,330	1,527	109,786	1,517	106,921	1,507	104,103	1,784	206,748	1,773	201,376	1,761	196,092	2,061	373,429	2,047	363,242	2,035	354,024
12,2	0,752	6,333	0,825	9,105	0,820	8,900	0,982	18,194	0,975	17,692	0,969	17,259	1,141	33,101	1,134	32,190	1,126	31,295	1,323	59,934	1,314	58,224	1,306	56,800	1,540	110,701	1,530	107,812	1,520	104,970	1,799	208,470	1,788	203,054	1,776	197,726	2,078	376,538	2,064	366,267	2,052	356,972
12,4	0,758	6,386	0,831	9,179	0,827	8,973	0,990	18,343	0,983	17,837	0,977	17,401	1,151	33,372	1,143	32,455	1,135	31,553	1,334	60,426	1,325	58,701	1,316	57,266	1,553	111,609	1,543	108,696	1,533	105,831	1,814	210,179	1,802	204,718	1,791	199,346	2,095	379,623	2,081	369,267	2,068	359,896
12,6	0,764	6,437	0,838	9,254	0,833	9,046	0,998	18,492	0,991	17,981	0,985	17,542	1,160	33,642	1,152	32,717	1,144	31,807	1,345	60,913	1,335	59,175	1,327	57,729	1,565	112,510	1,555	109,573	1,545	106,685	1,828	211,873	1,817	206,369	1,805	200,953	2,112	382,682	2,098	372,243	2,085	362,796
12,8	0,770	6,489	0,845	9,328	0,840	9,118	1,006	18,639	0,999	18,124	0,993	17,682	1,169	33,910	1,161	32,977	1,153	32,060	1,356	61,397	1,346	59,645	1,338	58,187	1,578	113,403	1,567	110,443	1,557	107,532	1,843	213,555	1,831	208,006	1,819	202,548	2,129	385,717	2,115	375,195	2,102	365,674
13	0,776	6,540	0,851	9,401	0,846	9,190	1,014	18,785	1,007	18,266	1,001	17,820	1,179	34,175	1,170	33,235	1,162	32,311	1,366	61,878	1,356	60,112	1,348	58,643	1,590	114,289	1,580	111,307	1,569	108,373	1,857	215,223	1,845	209,631	1,833	204,130	2,146	388,728	2,131	378,125	2,118	368,529
13,2	0,782	6,590	0,858	9,473	0,853	9,261	1,022	18,930	1,015	18,407	1,009	17,958	1,188	34,438	1,179	33,491	1,171	32,560	1,377	62,354	1,367	60,575	1,359	59,094	1,602	115,169	1,592	112,163	1,581	109,207	1,872	216,878	1,860	211,243	1,848	205,700	2,162	391,717	2,148	381,032	2,134	371,362
13,4	0,788	6,640	0,864	9,545	0,860	9,331	1,030	19,074	1,023	18,547	1,016	18,094	1,197	34,700	1,188	33,746	1,180	32,808	1,387	62,827	1,377	61,034	1,369	59,542	1,614	116,042	1,604	113,013	1,593	110,035	1,886	218,521	1,874	212,844	1,862	207,259	2,179	394,683	2,164	383,917	2,150	374,174
13,6	0,794	6,690	0,871	9,617	0,866	9,401	1,038	19,216	1,030	18,686	1,024	18,229	1,206	34,959	1,197	33,998	1,189	33,053	1,398	63,297	1,388	61,490	1,379	59,987	1,626	116,908	1,616	113,857	1,605	110,856	1,900	220,152	1,888	214,432	1,875	208,805	2,195	397,626	2,180	386,780	2,166	376,965
13,8	0,800	6,740	0,877	9,688	0,872	9,470	1,045	19,358	1,038	18,824	1,031	18,364	1,214	35,217	1,206	34,248	1,198	33,296	1,408	63,762	1,398	61,943	1,389	60,429	1,638	117,768	1,628	114,695	1,617	111,672	1,914	221,770	1,902	216,009	1,889	210,341	2,211	400,549	2,196	389,623	2,182	379,735
14	0,806	6,789	0,884	9,758	0,879	9,539	1,053	19,499	1,045	18,961	1,039	18,497	1,223	35,473	1,215	34,497	1,206	33,538	1,418	64,225	1,408	62,393	1,399	60,868	1,650	118,622	1,640	115,527	1,629	112,482	1,928	223,377	1,915	217,574	1,903	211,865	2,227	403,450	2,212	392,445	2,198	382,486
14,2	0,812	6,837	0,890	9,828	0,885	9,608	1,060	19,638	1,053	19,096	1,046	18,630	1,232	35,727	1,223	34,744	1,215	33,778	1,428	64,684	1,418	62,839	1,409	61,303	1,662	119,470	1,651	116,352	1,640	113,286	1,942	224,973	1,929	219,128	1,917	213,378	2,243	406,330	2,228	395,247	2,214	385,217
14,4	0,817	6,886	0,896	9,898	0,891	9,676	1,068	19,777	1,060	19,231	1,054	18,761	1,241	35,979	1,232	34,989	1,223	34,017	1,438	65,141	1,428	63,282	1,419	61,735	1,674	120,312	1,663	117,172	1,652	114,084	1,955	226,557	1,943	220,671	1,930	214,881	2,259	409,190	2,244	398,029	2,230	387,929
14,6	0,823	6,934	0,903	9,967	0,897	9,743	1,075	19,915	1,068	19,365	1,061	18,892	1,249	36,229	1,241	35,233	1,232	34,253	1,448	65,594	1,438	63,722	1,429	62,164	1,685	121,148	1,674	117,986	1,663	114,877	1,969	228,131	1,956	222,204	1,943	216,373	2,274	412,031	2,259	400,792	2,245	390,622
14,8	0,829	6,981	0,909	10,035	0,904	9,810	1,083	20,052	1,075	19,498	1,068	19,022	1,258	36,478	1,249	35,474	1,240	34,489	1,458	66,043	1,448	64,159	1,439	62,591	1,697	121,978	1,686	118,795	1,675	115,664	1,982	229,693	1,970	223,726	1,957	217,856	2,290	414,852	2,275	403,536	2,260	393,296
15	0,834	7,029	0,915	10,103	0,910	9,877	1,090	20,188	1,082	19,630	1,076	19,151	1,266	36,725	1,258	35,715	1,249	34,722	1,468	66,490	1,458	64,593	1,449	63,014	1,708	122,803	1,697	119,598	1,686	116,446	1,996	231,245	1,983	225,238	1,970	219,328	2,305	417,654	2,290	406,262	2,276	395,953
15,2	0,840	7,076	0,921	10,171	0,916	9,943	1,097	20,323	1,090	19,762	1,083	19,279	1,275	36,970	1,266	35,953	1,257	34,954	1,478	66,934	1,467	65,024	1,458	63,435	1,720	123,622	1,709	120,396	1,697	117,223	2,009	232,787	1,996	226,740	1,983	220,790	2,321	420,438	2,305	408,970	2,291	398,592
15,4	0,845	7,123	0,927	10,238	0,922	10,008	1,105	20,457	1,097	19,892	1,090	19,406	1,283	37,214	1,274	36,190	1,265	35,184	1,488	67,375	1,477	65,453	1,468	63,853	1,731	124,436	1,720	121,189	1,709	117,995	2,022	234,319	2,009	228,232	1,996	222,243	2,336	423,203	2,320	411,659	2,306	401,213
15,6	0,851	7,169	0,933	10,305	0,928	10,074	1,112	20,590	1,104	20,022	1,097	19,533	1,292	37,456	1,283	36,426	1,274	35,413	1,497	67,813	1,487	65,878	1,477	64,268	1,742	125,245	1,731	121,976	1,720	118,762	2,035	235,841	2,022	229,714	2,009	223,687	2,351	425,950	2,335	414,332	2,321	403,818
15,8	0,856	7,215	0,939	10,371	0,934	10,139	1,119	20,722	1,111	20,150	1,104	19,658	1,300	37,696	1,291	36,660	1,282	35,641	1,507	68,248	1,496	66,301	1,487	64,681	1,754	126,048	1,742	122,759	1,731	119,524	2,048	237,353	2,035	231,187	2,022	225,121	2,366	428,680	2,350	416,987	2,336	406,406
16	0,862	7,261	0,945	10,437	0,940	10,203	1,126	20,854	1,118	20,278	1,111	19,783	1,308	37,936	1,299	36,892	1,290	35,867	1,516	68,681	1,506	66,721	1,496	65,091	1,765	126,847	1,753	123,537	1,742	120,281	2,061	238,856	2,048	232,650	2,035	226,546	2,381	431,392	2,365	419,626	2,350	408,978
16,2	0,867	7,307	0,951	10,503	0,946	10,267	1,133	20,985	1,125	20,405	1,118	19,907	1,316	38,173	1,307	37,123	1,298	36,092	1,526	69,111	1,515	67,139	1,506	65,498	1,776	127,640	1,764	124,309	1,753	121,033	2,074	240,349	2,061	234,105	2,048	227,962	2,396	434,088	2,380	422,248	2,365	411,533
16,4	0,873	7,352	0,957	10,568	0,952	10,331	1,140	21,114	1,132	20,532	1,125	20,030	1,325	38,409	1,315	37,353	1,306	36,315	1,535	69,538	1,524	67,554	1,515	65,903	1,787	128,428	1,775	125,077	1,763	121,781	2,087	241,833	2,074	235,550	2,060	229,370	2,411	436,767	2,395	424,854	2,380	414,073
16,6	0,878	7,397	0,963	10,633	0,957	10,394	1,147	21,244	1,139	20,657	1,132	20,153	1,333	38,644	1,323	37,581	1,314	36,537	1,545	69,963	1,534	67,967	1,524	66,305	1,798	129,212	1,786	125,841	1,774	122,524	2,100	243,308	2,086	236,987	2,073	230,769	2,426	439,430	2,409	427,444	2,394	416,598
16,8	0,883	7,442	0,969	10,697	0,963	10,457	1,154	21,372	1,146	20,782	1,139	20,274	1,341	38,877	1,331	37,808	1,322	36,757	1,554	70,385	1,543	68,377	1,533	66,706	1,808	129,991	1,797	126,599	1,785	123,263	2,112	244,774	2,099	238,415	2,085	232,160	2,440	442,077	2,424	430,019	2,409	419,107
17	0,889	7,487	0,975	10,761	0,969	10,519	1,161	21,499	1,153	20,906	1,146	20,395	1,349	39,109	1,339	38,034	1,330	36,977	1,563	70,804	1,552	68,784	1,543	67,103	1,819	130,766	1,807	127,353	1,796	123,997	2,125	246,231	2,111	239,835	2,098	233,542	2,455	444,708	2,438	432,578	2,423	421,602
17,2	0,894	7,531	0,980	10,824	0,975	10,581	1,168	21,626	1,160	21,030	1,152	20,516	1,357	39,340	1,347	38,258	1,338	37,195	1,573	71,221	1,561	69,189	1,552	67,498	1,830	131,536	1,818	128,103	1,806	124,727	2,138	247,680	2,124	241,246	2,110	234,916	2,469	447,323	2,453	435,122	2,437	424,081
17,4	0,899	7,575	0,986	10,888	0,980	10,643	1,175	21,752	1,166	21,152	1,159	20,635	1,365	39,569	1,355	38,481	1,346	37,411	1,582	71,636	1,570	69,592	1,561	67,892	1,841	132,301	1,829	128,849	1,817	125,453	2,150	249,121	2,136	242,649	2,122	236,283	2,483	449,924	2,467	437,652	2,451	426,547
17,6	0,904	7,618	0,992	10,950	0,986	10,705	1,181	21,878	1,173	21,274	1,166	20,754	1,372	39,797	1,363	38,702	1,353	37,627	1,591	72,048	1,579	69,993	1,570	68,282	1,851	133,062	1,839	129,590	1,827	126,175	2,162	250,553	2,148	244,044	2,134	237,641	2,498	452,509	2,481	440,167	2,466	428,998
17,8	0,909	7,662	0,997	11,013	0,992	10,766	1,188	22,002	1,180	21,395	1,172	20,873	1,380	40,023	1,371	38,923	1,361	37,841	1,600	72,458	1,588	70,391	1,579	68,671	1,862	133,819	1,850	130,327	1,837	126,892	2,175	251,977	2,161	245,431	2,147	238,992	2,512	455,080	2,495	442,668	2,480	431,436
18	0,915	7,705	1,003	11,075	0,997	10,826	1,195	22,126	1,186	21,516	1,179	20,990	1,388	40,249	1,378	39,142	1,369	38,054	1,609	72,866	1,597	70,787	1,588	69,057	1,872	134,571	1,860	131,060	1,848	127,606	2,187	253,393	2,173	246,811	2,159	240,335	2,526	457,637	2,509	445,155	2,493	433,859
18,2	0,920	7,748	1,009	11,137	1,003	10,887	1,201	22,250	1,193	21,636	1,186	21,107	1,396	40,473	1,386	39,360	1,376	38,266	1,618	73,271	1,606	71,181	1,596	69,441	1,883	135,319	1,870	131,789	1,858	128,315	2,199	254,801	2,185	248,182	2,171	241,671	2,540	460,179	2,523	447,628	2,507	436,270
18,4	0,925	7,791	1,014	11,198	1,008	10,947	1,208	22,372	1,200	21,755	1,192	21,224	1,403	40,696	1,394	39,577	1,384	38,477	1,627	73,675	1,615	71,573	1,605	69,824	1,893	136,064	1,881	132,513	1,868	129,021	2,211	256,202	2,197	249,547	2,183	242,999	2,554	462,708	2,537	450,087	2,521	438,667
18,6	0,930	7,834	1,020	11,259	1,014	11,007	1,215	22,494	1,206	21,874	1,199	21,339	1,411	40,917	1,401	39,792	1,391	38,686	1,636	74,076	1,624	71,962	1,614	70,204	1,903	136,804	1,891	133,234	1,878	129,723	2,223	257,595	2,209	250,903	2,194	244,320	2,568	465,222	2,551	452,534	2,535	441,051
18,8	0,935	7,876	1,025	11,320	1,019	11,066	1,221	22,616	1,213	21,992	1,205	21,454	1,419	41,138	1,409	40,007	1,399	38,895	1,644	74,475	1,633	72,350	1,623	70,582	1,913	137,540	1,901	133,951	1,889	130,421	2,235	258,980	2,221	252,253	2,206	245,635	2,582	467,724	2,564	454,967	2,548	443,422
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.7: roughness coefficient k=1,5 mm (4/5)

I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
19	0,940	7,918	1,031	11,380	1,025	11,125	1,228	22,736	1,219	22,109	1,211	21,569	1,426	41,357	1,416	40,220	1,406	39,102	1,653	74,871	1,641	72,735	1,631	70,958	1,924	138,272	1,911	134,664	1,899	131,115	2,247	260,359	2,232	253,595	2,218	246,942	2,595	470,211	2,578	457,387	2,562	445,781
19,2	0,945	7,960	1,036	11,441	1,030	11,184	1,234	22,856	1,225	22,226	1,218	21,683	1,434	41,575	1,424	40,432	1,414	39,309	1,662	75,266	1,650	73,119	1,640	71,332	1,934	139,001	1,921	135,374	1,909	131,806	2,259	261,730	2,244	254,931	2,230	248,242	2,609	472,686	2,592	459,794	2,575	448,128
19,4	0,950	8,001	1,042	11,500	1,036	11,242	1,241	22,976	1,232	22,342	1,224	21,796	1,441	41,792	1,431	40,643	1,421	39,514	1,670	75,659	1,659	73,500	1,648	71,704	1,944	139,725	1,931	136,080	1,919	132,493	2,271	263,093	2,256	256,259	2,241	249,536	2,623	475,148	2,605	462,189	2,589	450,462
19,6	0,955	8,043	1,047	11,560	1,041	11,301	1,247	23,094	1,238	22,457	1,231	21,909	1,449	42,008	1,439	40,853	1,428	39,718	1,679	76,049	1,667	73,880	1,657	72,074	1,954	140,446	1,941	136,782	1,928	133,177	2,282	264,450	2,268	257,581	2,253	250,823	2,636	477,598	2,619	464,572	2,602	452,784
19,8	0,959	8,084	1,052	11,619	1,046	11,358	1,253	23,213	1,245	22,572	1,237	22,021	1,456	42,223	1,446	41,062	1,436	39,921	1,688	76,438	1,676	74,257	1,665	72,442	1,964	141,164	1,951	137,480	1,938	133,857	2,294	265,800	2,279	258,895	2,264	252,103	2,650	480,035	2,632	466,942	2,616	455,094
20	0,964	8,125	1,058	11,678	1,052	11,416	1,260	23,330	1,251	22,686	1,243	22,132	1,463	42,437	1,453	41,270	1,443	40,123	1,696	76,824	1,684	74,633	1,674	72,809	1,974	141,877	1,961	138,175	1,948	134,534	2,305	267,143	2,291	260,204	2,276	253,377	2,663	482,459	2,645	469,301	2,629	457,393
20,2	0,969	8,166	1,063	11,737	1,057	11,473	1,266	23,447	1,257	22,800	1,249	22,243	1,471	42,649	1,461	41,477	1,450	40,324	1,705	77,209	1,693	75,006	1,682	73,174	1,984	142,587	1,971	138,867	1,958	135,207	2,317	268,480	2,302	261,505	2,287	254,645	2,676	484,872	2,658	471,648	2,642	459,681
20,4	0,974	8,207	1,068	11,795	1,062	11,530	1,272	23,564	1,263	22,913	1,256	22,354	1,478	42,861	1,468	41,682	1,457	40,524	1,713	77,592	1,701	75,378	1,691	73,536	1,994	143,294	1,981	139,555	1,968	135,877	2,328	269,809	2,314	262,801	2,299	255,906	2,690	487,273	2,672	473,983	2,655	461,957
20,6	0,979	8,247	1,073	11,853	1,067	11,587	1,279	23,679	1,270	23,026	1,262	22,464	1,485	43,071	1,475	41,887	1,465	40,723	1,722	77,973	1,709	75,748	1,699	73,897	2,003	143,997	1,990	140,240	1,977	136,544	2,340	271,133	2,325	264,090	2,310	257,161	2,703	489,662	2,685	476,307	2,668	464,221
20,8	0,984	8,287	1,079	11,911	1,073	11,644	1,285	23,795	1,276	23,138	1,268	22,573	1,493	43,281	1,482	42,091	1,472	40,921	1,730	78,352	1,718	76,117	1,707	74,257	2,013	144,697	2,000	140,921	1,987	137,208	2,351	272,449	2,336	265,372	2,321	258,410	2,716	492,039	2,698	478,619	2,681	466,475
21	0,988	8,327	1,084	11,968	1,078	11,700	1,291	23,909	1,282	23,250	1,274	22,682	1,500	43,490	1,489	42,294	1,479	41,119	1,738	78,729	1,726	76,483	1,715	74,614	2,023	145,393	2,010	141,600	1,996	137,868	2,363	273,760	2,347	266,649	2,332	259,653	2,729	494,405	2,711	480,921	2,694	468,718
21,2	0,993	8,367	1,089	12,026	1,083	11,756	1,297	24,024	1,288	23,361	1,280	22,790	1,507	43,697	1,496	42,496	1,486	41,315	1,747	79,105	1,734	76,848	1,723	74,970	2,032	146,086	2,019	142,275	2,006	138,525	2,374	275,064	2,359	267,919	2,343	260,890	2,742	496,760	2,724	483,211	2,707	470,951
21,4	0,998	8,407	1,094	12,082	1,088	11,811	1,303	24,137	1,294	23,471	1,286	22,898	1,514	43,904	1,503	42,696	1,493	41,510	1,755	79,478	1,742	77,211	1,732	75,324	2,042	146,776	2,029	142,946	2,015	139,179	2,385	276,363	2,370	269,184	2,354	262,122	2,755	499,103	2,736	485,491	2,719	473,173
21,6	1,002	8,446	1,099	12,139	1,093	11,867	1,309	24,250	1,300	23,581	1,292	23,005	1,521	44,109	1,511	42,896	1,500	41,705	1,763	79,850	1,750	77,573	1,740	75,677	2,052	147,463	2,038	143,615	2,025	139,831	2,396	277,655	2,381	270,442	2,365	263,347	2,768	501,436	2,749	487,760	2,732	475,384
21,8	1,007	8,485	1,104	12,196	1,098	11,922	1,315	24,363	1,306	23,691	1,298	23,112	1,528	44,314	1,518	43,095	1,507	41,898	1,771	80,221	1,759	77,932	1,748	76,028	2,061	148,146	2,048	144,281	2,034	140,479	2,407	278,941	2,392	271,695	2,376	264,567	2,781	503,758	2,762	490,019	2,745	477,586
22	1,012	8,524	1,110	12,252	1,103	11,977	1,322	24,475	1,312	23,800	1,304	23,218	1,535	44,518	1,525	43,294	1,514	42,091	1,779	80,589	1,767	78,290	1,756	76,377	2,070	148,826	2,057	144,943	2,044	141,124	2,418	280,221	2,403	272,942	2,387	265,782	2,793	506,069	2,775	492,267	2,757	479,777
22,2	1,016	8,563	1,115	12,308	1,108	12,031	1,328	24,587	1,318	23,908	1,310	23,324	1,542	44,720	1,531	43,491	1,521	42,282	1,787	80,956	1,775	78,647	1,764	76,725	2,080	149,504	2,066	145,603	2,053	141,766	2,429	281,496	2,414	274,184	2,398	266,990	2,806	508,370	2,787	494,505	2,770	481,958
22,4	1,021	8,602	1,120	12,363	1,113	12,086	1,334	24,698	1,324	24,016	1,316	23,430	1,549	44,922	1,538	43,687	1,528	42,473	1,796	81,321	1,783	79,002	1,772	77,071	2,089	150,178	2,076	146,259	2,062	142,405	2,440	282,764	2,425	275,420	2,409	268,194	2,819	510,660	2,800	496,733	2,782	484,130
22,6	1,026	8,641	1,125	12,419	1,118	12,140	1,340	24,808	1,330	24,124	1,322	23,535	1,556	45,123	1,545	43,883	1,534	42,663	1,804	81,685	1,791	79,355	1,780	77,416	2,099	150,849	2,085	146,913	2,071	143,042	2,451	284,028	2,435	276,650	2,420	269,392	2,831	512,941	2,812	498,951	2,795	486,292
22,8	1,030	8,679	1,130	12,474	1,123	12,194	1,345	24,918	1,336	24,231	1,328	23,639	1,563	45,323	1,552	44,077	1,541	42,853	1,812	82,047	1,799	79,707	1,788	77,759	2,108	151,517	2,094	147,564	2,081	143,675	2,462	285,285	2,446	277,875	2,430	270,585	2,844	515,211	2,825	501,160	2,807	488,444
23	1,035	8,717	1,135	12,529	1,128	12,248	1,351	25,028	1,342	24,337	1,334	23,743	1,570	45,523	1,559	44,271	1,548	43,041	1,819	82,408	1,806	80,057	1,795	78,101	2,117	152,182	2,103	148,212	2,090	144,306	2,473	286,537	2,457	279,094	2,441	271,772	2,856	517,471	2,837	503,358	2,820	490,587
23,2	1,039	8,755	1,140	12,583	1,133	12,301	1,357	25,137	1,348	24,444	1,339	23,847	1,577	45,721	1,566	44,464	1,555	43,229	1,827	82,766	1,814	80,405	1,803	78,441	2,126	152,845	2,113	148,857	2,099	144,934	2,484	287,784	2,468	280,309	2,452	272,955	2,869	519,722	2,850	505,547	2,832	492,721
23,4	1,044	8,793	1,145	12,638	1,138	12,354	1,363	25,246	1,354	24,549	1,345	23,950	1,583	45,918	1,572	44,656	1,561	43,415	1,835	83,124	1,822	80,753	1,811	78,779	2,136	153,504	2,122	149,499	2,108	145,560	2,494	289,025	2,478	281,518	2,462	274,132	2,881	521,962	2,862	507,727	2,844	494,845
23,6	1,048	8,831	1,149	12,692	1,143	12,407	1,369	25,354	1,359	24,654	1,351	24,052	1,590	46,115	1,579	44,847	1,568	43,601	1,843	83,480	1,830	81,098	1,819	79,117	2,145	154,161	2,131	150,139	2,117	146,182	2,505	290,261	2,489	282,721	2,473	275,304	2,893	524,194	2,874	509,897	2,856	496,960
23,8	1,053	8,869	1,154	12,746	1,148	12,460	1,375	25,462	1,365	24,759	1,357	24,155	1,597	46,311	1,586	45,038	1,575	43,786	1,851	83,834	1,838	81,442	1,827	79,452	2,154	154,815	2,140	150,776	2,126	146,803	2,516	291,492	2,499	283,920	2,483	276,472	2,906	526,415	2,886	512,059	2,868	499,067
24	1,057	8,906	1,159	12,800	1,153	12,513	1,381	25,569	1,371	24,864	1,362	24,256	1,604	46,506	1,593	45,227	1,581	43,971	1,859	84,187	1,845	81,785	1,834	79,787	2,163	155,466	2,149	151,410	2,135	147,420	2,526	292,717	2,510	285,114	2,494	277,634	2,918	528,628	2,898	514,211	2,880	501,164
24,2	1,061	8,943	1,164	12,853	1,157	12,565	1,386	25,676	1,377	24,967	1,368	24,358	1,610	46,700	1,599	45,416	1,588	44,154	1,867	84,538	1,853	82,127	1,842	80,120	2,172	156,115	2,158	152,042	2,144	148,035	2,537	293,938	2,520	286,303	2,504	278,792	2,930	530,831	2,910	516,354	2,892	503,253
24,4	1,066	8,980	1,169	12,907	1,162	12,617	1,392	25,782	1,382	25,071	1,374	24,459	1,617	46,894	1,606	45,604	1,595	44,337	1,874	84,888	1,861	82,466	1,849	80,451	2,181	156,760	2,167	152,671	2,153	148,647	2,547	295,153	2,531	287,487	2,514	279,945	2,942	533,025	2,922	518,488	2,904	505,334
24,6	1,070	9,017	1,174	12,960	1,167	12,669	1,398	25,888	1,388	25,174	1,379	24,559	1,624	47,086	1,612	45,792	1,601	44,519	1,882	85,236	1,869	82,805	1,857	80,782	2,190	157,404	2,176	153,297	2,161	149,257	2,558	296,364	2,541	288,666	2,525	281,093	2,954	535,211	2,934	520,614	2,916	507,405
24,8	1,075	9,054	1,178	13,013	1,172	12,721	1,404	25,994	1,394	25,277	1,385	24,659	1,630	47,278	1,619	45,978	1,608	44,701	1,890	85,583	1,876	83,142	1,865	81,111	2,199	158,044	2,184	153,921	2,170	149,865	2,568	297,569	2,552	289,840	2,535	282,236	2,966	537,387	2,946	522,731	2,928	509,469
25	1,079	9,091	1,183	13,065	1,176	12,772	1,409	26,099	1,399	25,379	1,391	24,759	1,637	47,469	1,626	46,164	1,614	44,881	1,897	85,929	1,884	83,478	1,872	81,438	2,208	158,682	2,193	154,542	2,179	150,470	2,578	298,770	2,562	291,009	2,545	283,375	2,978	539,554	2,958	524,840	2,940	511,524
25,2	1,083	9,127	1,188	13,118	1,181	12,824	1,415	26,204	1,405	25,481	1,396	24,858	1,644	47,659	1,632	46,349	1,621	45,061	1,905	86,273	1,891	83,812	1,880	81,764	2,216	159,318	2,202	155,161	2,188	151,072	2,589	299,966	2,572	292,174	2,555	284,509	2,990	541,713	2,970	526,940	2,952	513,571
25,4	1,088	9,164	1,193	13,170	1,186	12,875	1,420	26,308	1,411	25,582	1,402	24,957	1,650	47,849	1,639	46,533	1,627	45,241	1,912	86,616	1,899	84,146	1,887	82,090	2,225	159,951	2,211	155,778	2,196	151,673	2,599	301,157	2,582	293,335	2,566	285,639	3,002	543,864	2,982	529,032	2,963	515,609
25,6	1,092	9,200	1,197	13,222	1,191	12,925	1,426	26,412	1,416	25,683	1,407	25,056	1,657	48,038	1,645	46,717	1,634	45,419	1,920	86,958	1,906	84,477	1,895	82,413	2,234	160,581	2,220	156,392	2,205	152,270	2,609	302,343	2,593	294,490	2,576	286,765	3,014	546,006	2,994	531,115	2,975	517,640
25,8	1,096	9,236	1,202	13,274	1,195	12,976	1,432	26,515	1,422	25,784	1,413	25,154	1,663	48,226	1,652	46,900	1,640	45,597	1,927	87,298	1,914	84,808	1,902	82,736	2,243	161,209	2,228	157,003	2,214	152,866	2,619	303,525	2,603	295,641	2,586	287,886	3,026	548,139	3,005	533,191	2,987	519,663
26	1,100	9,272	1,207	13,326	1,200	13,027	1,437	26,618	1,427	25,884	1,418	25,252	1,670	48,413	1,658	47,082	1,646	45,774	1,935	87,637	1,921	85,137	1,909	83,057	2,251	161,835	2,237	157,612	2,222	153,459	2,630	304,703	2,613	296,788	2,596	289,002	3,037	550,265	3,017	535,258	2,998	521,678
26,2	1,105	9,308	1,211	13,377	1,205	13,077	1,443	26,721	1,433	25,984	1,424	25,349	1,676	48,600	1,664	47,264	1,653	45,950	1,942	87,975	1,929	85,465	1,917	83,377	2,260	162,458	2,245	158,219	2,231	154,050	2,640	305,875	2,623	297,930	2,606	290,115	3,049	552,382	3,029	537,317	3,010	523,685
26,4	1,109	9,344	1,216	13,428	1,209	13,127	1,448	26,823	1,438	26,083	1,429	25,446	1,682	48,786	1,671	47,444	1,659	46,126	1,950	88,311	1,936	85,792	1,924	83,696	2,269	163,078	2,254	158,824	2,239	154,639	2,650	307,044	2,633	299,068	2,616	291,223	3,061	554,491	3,040	539,369	3,021	525,685
26,6	1,113	9,379	1,221	13,479	1,214	13,177	1,454	26,925	1,444	26,182	1,435	25,543	1,689	48,971	1,677	47,625	1,665	46,301	1,957	88,646	1,943	86,117	1,931	84,013	2,277	163,697	2,263	159,426	2,248	155,225	2,660	308,208	2,643	300,202	2,626	292,327	3,072	556,592	3,052	541,413	3,033	527,677
26,8	1,117	9,415	1,225	13,530	1,218	13,227	1,459	27,027	1,449	26,281	1,440	25,639	1,695	49,155	1,683	47,804	1,672	46,476	1,965	88,980	1,951	86,442	1,939	84,330	2,286	164,313	2,271	160,026	2,256	155,810	2,670	309,367	2,653	301,332	2,636	293,427	3,084	558,685	3,063	543,449	3,044	529,661
27	1,122	9,450	1,230	13,581	1,223	13,276	1,465	27,128	1,454	26,379	1,445	25,735	1,701	49,339	1,690	47,983	1,678	46,650	1,972	89,312	1,958	86,765	1,946	84,645	2,294	164,927	2,280	160,624	2,265	156,392	2,680	310,522	2,663	302,457	2,645	294,522	3,095	560,771	3,075	545,478	3,055	531,638
27,2	1,126	9,485	1,235	13,631	1,227	13,326	1,470	27,229	1,460	26,477	1,451	25,831	1,708	49,522	1,696	48,161	1,684	46,823	1,979	89,644	1,965	87,087	1,953	84,959	2,303	165,538	2,288	161,220	2,273	156,972	2,690	311,673	2,673	303,578	2,655	295,614	3,107	562,849	3,086	547,499	3,067	533,608
27,4	1,130	9,520	1,239	13,682	1,232	13,375	1,476	27,329	1,465	26,575	1,456	25,926	1,714	49,705	1,702	48,338	1,690	46,995	1,987	89,974	1,972	87,407	1,960	85,272	2,311	166,148	2,296	161,813	2,281	157,549	2,700	312,820	2,682	304,695	2,665	296,702	3,118	564,919	3,097	549,513	3,078	535,571
27,6	1,134	9,555	1,244	13,732	1,236	13,424	1,481	27,429	1,471	26,672	1,462	26,021	1,720	49,887	1,708	48,515	1,696	47,167	1,994	90,303	1,980	87,727	1,967	85,583	2,320	166,755	2,305	162,404	2,290	158,125	2,710	313,962	2,692	305,808	2,675	297,785	3,130	566,981	3,109	551,519	3,089	537,526
27,8	1,138	9,590	1,248	13,782	1,241	13,473	1,486	27,529	1,476	26,769	1,467	26,115	1,727	50,068	1,715	48,691	1,703	47,339	2,001	90,631	1,987	88,045	1,975	85,894	2,328	167,360	2,313	162,994	2,298	158,699	2,719	315,101	2,702	306,916	2,684	298,865	3,141	569,036	3,120	553,518	3,100	539,475
28	1,142	9,624	1,253	13,832	1,245	13,521	1,492	27,628	1,481	26,866	1,472	26,210	1,733	50,248	1,721	48,867	1,709	47,509	2,008	90,957	1,994	88,363	1,982	86,204	2,337	167,962	2,322	163,581	2,306	159,270	2,729	316,235	2,712	308,021	2,694	299,941	3,152	571,084	3,131	555,510	3,112	541,416
28,2	1,146	9,659	1,257	13,881	1,250	13,570	1,497	27,727	1,487	26,962	1,477	26,303	1,739	50,428	1,727	49,042	1,715	47,679	2,015	91,282	2,001	88,679	1,989	86,512	2,345	168,563	2,330	164,165	2,315	159,840	2,739	317,365	2,721	309,122	2,704	301,013	3,164	573,125	3,142	557,495	3,123	543,351
28,4	1,150	9,693	1,262	13,930	1,254	13,618	1,502	27,825	1,492	27,058	1,483	26,397	1,745	50,607	1,733	49,216	1,721	47,849	2,023	91,607	2,008	88,994	1,996	86,819	2,353	169,161	2,338	164,748	2,323	160,407	2,749	318,492	2,731	310,219	2,713	302,081	3,175	575,158	3,153	559,473	3,134	545,278
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

DN (mm)	110	125	125	160	160	160	200	200	200	250	250	250	315	315	315	400	400	400	500	500	500
Class of pipes	SN4,SN8	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8	SN2	SN4	SN8
s (mm)	3,2	3,2	3,7	3,2	4	4,7	3,9	4,9	5,9	4,9	6,2	7,3	6,2	7,7	9,2	7,9	9,8	11,7	9,8	12,3	14,6
d (mm)	103,6	118,6	117,6	153,6	152	150,6	192,2	190,2	188,2	240,2	237,6	235,4	302,6	299,6	296,6	384,2	380,4	376,6	480,4	475,4	470,8
d (m)	0,1036	0,1186	0,1176	0,1536	0,152	0,1506	0,1922	0,1902	0,1882	0,2402	0,2376	0,2354	0,3026	0,2996	0,2966	0,3842	0,3804	0,3766	0,4804	0,4754	0,4708
F (m²)	0,008425374	0,011041779	0,010856362	0,018520474	0,01813664	0,017804083	0,028998559	0,028398191	0,027804103	0,045291391	0,044316202	0,043499331	0,071879907	0,070461726	0,069057675	0,115873567	0,113592766	0,111334635	0,181165566	0,177414051	0,173997322

Hydraulic table 1.7: roughness coefficient k=1,5 mm (5/5)

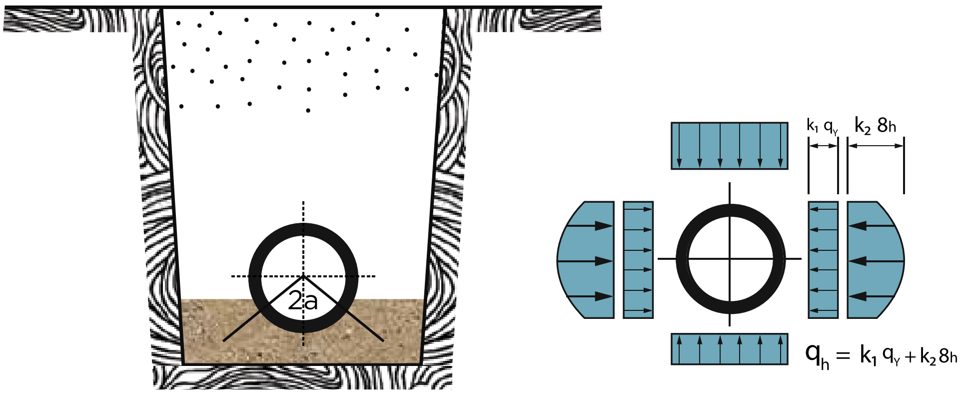
I (‰)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)	v(m/s)	Q (L/s)
28,6	1,155	9,727	1,266	13,980	1,259	13,666	1,508	27,924	1,497	27,153	1,488	26,490	1,751	50,786	1,739	49,390	1,727	48,018	2,030	91,930	2,015	89,308	2,003	87,126	2,362	169,758	2,346	165,329	2,331	160,973	2,758	319,614	2,741	311,312	2,723	303,146	3,186	577,184	3,165	561,443	3,145	547,199
28,8	1,159	9,762	1,271	14,029	1,263	13,714	1,513	28,022	1,502	27,249	1,493	26,583	1,757	50,964	1,745	49,563	1,733	48,186	2,037	92,252	2,022	89,620	2,010	87,431	2,370	170,352	2,355	165,908	2,339	161,536	2,768	320,732	2,750	312,402	2,732	304,207	3,197	579,203	3,176	563,407	3,156	549,113
29	1,163	9,796	1,275	14,078	1,268	13,762	1,518	28,119	1,508	27,343	1,498	26,676	1,764	51,141	1,751	49,735	1,739	48,354	2,044	92,573	2,029	89,932	2,017	87,735	2,378	170,944	2,363	166,485	2,347	162,098	2,778	321,847	2,760	313,487	2,742	305,264	3,208	581,215	3,187	565,365	3,167	551,021
29,2	1,167	9,830	1,279	14,126	1,272	13,809	1,524	28,216	1,513	27,438	1,503	26,768	1,770	51,318	1,757	49,907	1,745	48,521	2,051	92,892	2,036	90,243	2,024	88,038	2,386	171,534	2,371	167,059	2,355	162,657	2,787	322,958	2,769	314,569	2,751	306,317	3,219	583,220	3,198	567,315	3,178	552,922
29,4	1,171	9,863	1,284	14,175	1,276	13,857	1,529	28,313	1,518	27,532	1,509	26,860	1,776	51,494	1,763	50,078	1,751	48,687	2,058	93,211	2,043	90,552	2,031	88,340	2,395	172,123	2,379	167,632	2,363	163,215	2,797	324,064	2,779	315,647	2,761	307,367	3,230	585,218	3,209	569,259	3,189	554,816
29,6	1,175	9,897	1,288	14,223	1,281	13,904	1,534	28,410	1,523	27,626	1,514	26,952	1,782	51,670	1,769	50,249	1,757	48,853	2,065	93,529	2,050	90,861	2,038	88,641	2,403	172,709	2,387	168,203	2,372	163,771	2,806	325,168	2,788	316,722	2,770	308,413	3,241	587,210	3,220	571,196	3,200	556,705
29,8	1,179	9,931	1,293	14,272	1,285	13,951	1,539	28,506	1,528	27,720	1,519	27,043	1,788	51,845	1,775	50,419	1,763	49,019	2,072	93,845	2,057	91,168	2,045	88,941	2,411	173,293	2,395	168,772	2,380	164,325	2,816	326,267	2,798	317,793	2,780	309,456	3,252	589,194	3,230	573,127	3,210	558,586
30	1,183	9,964	1,297	14,320	1,289	13,998	1,544	28,602	1,534	27,813	1,524	27,134	1,794	52,019	1,781	50,589	1,769	49,183	2,079	94,160	2,064	91,475	2,052	89,240	2,419	173,875	2,403	169,339	2,388	164,877	2,825	327,363	2,807	318,860	2,789	310,496	3,263	591,173	3,241	575,051	3,221	560,462
30,5	1,192	10,047	1,308	14,439	1,300	14,115	1,557	28,840	1,546	28,045	1,537	27,360	1,809	52,452	1,796	51,010	1,784	49,593	2,096	94,945	2,081	92,236	2,069	89,983	2,439	175,322	2,423	170,748	2,407	166,249	2,849	330,086	2,830	321,513	2,812	313,079	3,290	596,089	3,268	579,833	3,248	565,123
31	1,202	10,130	1,318	14,558	1,311	14,231	1,570	29,077	1,559	28,275	1,549	27,584	1,824	52,882	1,811	51,428	1,798	50,000	2,113	95,722	2,098	92,992	2,086	90,720	2,459	176,758	2,443	172,146	2,427	167,610	2,872	332,787	2,854	324,144	2,835	315,641	3,317	600,965	3,295	584,577	3,274	569,746
31,5	1,212	10,212	1,329	14,675	1,321	14,346	1,583	29,312	1,572	28,503	1,562	27,807	1,838	53,308	1,826	51,843	1,813	50,403	2,131	96,494	2,115	93,741	2,102	91,451	2,479	178,181	2,463	173,533	2,447	168,961	2,895	335,467	2,877	326,754	2,858	318,182	3,344	605,803	3,322	589,282	3,301	574,332
32	1,222	10,293	1,340	14,792	1,332	14,460	1,595	29,544	1,584	28,729	1,574	28,028	1,853	53,731	1,840	52,254	1,827	50,803	2,147	97,259	2,132	94,485	2,119	92,176	2,499	179,594	2,482	174,909	2,466	170,300	2,918	338,125	2,899	329,343	2,881	320,704	3,370	610,602	3,348	593,950	3,327	578,882
32,5	1,231	10,373	1,350	14,907	1,342	14,573	1,608	29,775	1,596	28,954	1,587	28,247	1,867	54,151	1,854	52,663	1,841	51,200	2,164	98,018	2,149	95,222	2,136	92,896	2,518	180,995	2,502	176,274	2,485	171,629	2,941	340,763	2,922	331,912	2,903	323,206	3,397	615,363	3,374	598,582	3,353	583,396
33	1,241	10,453	1,360	15,022	1,353	14,685	1,620	30,004	1,609	29,177	1,599	28,464	1,882	54,568	1,869	53,068	1,856	51,593	2,181	98,772	2,165	95,954	2,152	93,610	2,537	182,386	2,521	177,628	2,504	172,948	2,963	343,380	2,944	334,462	2,925	325,688	3,423	620,089	3,400	603,179	3,379	587,876
33,5	1,250	10,533	1,371	15,136	1,363	14,797	1,632	30,232	1,621	29,398	1,611	28,680	1,896	54,981	1,883	53,470	1,870	51,984	2,197	99,519	2,182	96,681	2,168	94,319	2,557	183,766	2,540	178,972	2,523	174,257	2,986	345,978	2,967	336,992	2,947	328,152	3,449	624,778	3,426	607,740	3,404	592,322
34	1,259	10,611	1,381	15,249	1,373	14,907	1,645	30,457	1,633	29,617	1,623	28,894	1,910	55,391	1,897	53,869	1,884	52,372	2,214	100,262	2,198	97,402	2,184	95,022	2,576	185,136	2,559	180,307	2,542	175,556	3,008	348,556	2,989	339,503	2,969	330,598	3,474	629,433	3,451	612,268	3,430	596,735
34,5	1,269	10,689	1,391	15,362	1,383	15,017	1,657	30,681	1,645	29,835	1,635	29,107	1,924	55,799	1,911	54,265	1,897	52,757	2,230	100,999	2,214	98,118	2,201	95,721	2,595	186,496	2,578	181,631	2,561	176,846	3,030	351,116	3,011	341,996	2,991	333,025	3,500	634,053	3,476	616,763	3,455	601,116
35	1,278	10,767	1,401	15,473	1,393	15,126	1,669	30,904	1,657	30,051	1,647	29,318	1,938	56,203	1,925	54,658	1,911	53,140	2,246	101,730	2,230	98,829	2,216	96,414	2,613	187,847	2,596	182,946	2,579	178,126	3,052	353,657	3,033	344,471	3,013	335,435	3,525	638,640	3,502	621,225	3,480	605,465
35,5	1,287	10,844	1,411	15,584	1,403	15,234	1,681	31,125	1,669	30,266	1,658	29,527	1,952	56,604	1,938	55,048	1,925	53,519	2,262	102,456	2,246	99,534	2,232	97,102	2,632	189,187	2,615	184,252	2,598	179,397	3,074	356,180	3,054	346,929	3,034	337,828	3,550	643,195	3,527	625,655	3,505	609,783
36	1,296	10,921	1,421	15,694	1,413	15,342	1,692	31,344	1,681	30,480	1,670	29,735	1,966	57,003	1,952	55,436	1,938	53,896	2,278	103,178	2,262	100,235	2,248	97,786	2,651	190,518	2,633	185,548	2,616	180,660	3,095	358,685	3,076	349,369	3,056	340,205	3,575	647,717	3,551	630,054	3,529	614,070
36,5	1,305	10,997	1,431	15,803	1,423	15,448	1,704	31,562	1,692	30,691	1,682	29,942	1,979	57,399	1,966	55,821	1,952	54,270	2,294	103,894	2,278	100,931	2,264	98,465	2,669	191,840	2,652	186,836	2,634	181,913	3,117	361,173	3,097	351,792	3,077	342,564	3,600	652,209	3,576	634,423	3,554	618,329
37	1,314	11,072	1,441	15,911	1,433	15,554	1,716	31,778	1,704	30,902	1,693	30,147	1,993	57,792	1,979	56,203	1,965	54,642	2,310	104,605	2,293	101,622	2,279	99,139	2,687	193,153	2,670	188,114	2,652	183,158	3,138	363,643	3,118	354,199	3,098	344,908	3,625	656,669	3,600	638,762	3,578	622,558
37,5	1,323	11,147	1,451	16,019	1,442	15,659	1,727	31,993	1,715	31,111	1,705	30,351	2,006	58,182	1,992	56,583	1,979	55,011	2,325	105,312	2,309	102,308	2,294	99,809	2,705	194,457	2,688	189,385	2,670	184,395	3,159	366,098	3,139	356,590	3,119	347,236	3,649	661,100	3,625	643,072	3,602	626,758
38	1,332	11,221	1,460	16,126	1,452	15,764	1,739	32,207	1,727	31,318	1,716	30,553	2,020	58,570	2,006	56,960	1,992	55,378	2,341	106,013	2,324	102,990	2,310	100,474	2,723	195,753	2,706	190,646	2,688	185,623	3,180	368,536	3,160	358,964	3,140	349,548	3,673	665,501	3,649	647,353	3,626	630,931
38,5	1,341	11,295	1,470	16,232	1,462	15,868	1,750	32,419	1,738	31,524	1,727	30,755	2,033	58,956	2,019	57,335	2,005	55,743	2,356	106,711	2,339	103,667	2,325	101,135	2,741	197,039	2,723	191,900	2,706	186,844	3,201	370,958	3,181	361,323	3,160	351,845	3,698	669,873	3,673	651,606	3,650	635,076
39	1,349	11,369	1,480	16,338	1,471	15,971	1,762	32,629	1,749	31,729	1,739	30,955	2,046	59,339	2,032	57,708	2,018	56,105	2,371	107,403	2,354	104,340	2,340	101,791	2,759	198,318	2,741	193,145	2,723	188,056	3,222	373,364	3,201	363,667	3,181	354,128	3,722	674,217	3,697	655,832	3,674	639,194
39,5	1,358	11,442	1,489	16,442	1,481	16,074	1,773	32,839	1,761	31,933	1,750	31,153	2,059	59,719	2,045	58,078	2,031	56,464	2,387	108,092	2,370	105,009	2,355	102,444	2,777	199,588	2,759	194,382	2,741	189,261	3,243	375,755	3,222	365,996	3,201	356,396	3,745	678,533	3,720	660,031	3,697	643,286
40	1,367	11,514	1,499	16,547	1,490	16,175	1,784	33,047	1,772	32,135	1,761	31,350	2,072	60,097	2,058	58,445	2,044	56,822	2,402	108,776	2,385	105,673	2,370	103,092	2,794	200,851	2,776	195,612	2,758	190,458	3,263	378,131	3,242	368,310	3,221	358,649	3,769	682,822	3,744	664,203	3,720	647,353
40,5	1,375	11,587	1,508	16,650	1,499	16,277	1,795	33,253	1,783	32,336	1,772	31,547	2,085	60,473	2,071	58,811	2,056	57,177	2,417	109,455	2,399	106,334	2,385	103,736	2,812	202,105	2,793	196,833	2,775	191,647	3,284	380,492	3,263	370,610	3,241	360,889	3,793	687,085	3,767	668,349	3,744	651,394
41	1,384	11,658	1,517	16,753	1,509	16,377	1,807	33,459	1,794	32,536	1,783	31,741	2,098	60,846	2,084	59,174	2,069	57,530	2,432	110,131	2,414	106,990	2,399	104,376	2,829	203,352	2,811	198,048	2,792	192,830	3,304	382,838	3,283	372,895	3,261	363,114	3,816	691,321	3,790	672,469	3,767	655,410
41,5	1,392	11,729	1,527	16,855	1,518	16,477	1,818	33,663	1,805	32,734	1,794	31,935	2,111	61,217	2,096	59,535	2,082	57,881	2,446	110,802	2,429	107,642	2,414	105,013	2,846	204,591	2,828	199,255	2,809	194,005	3,324	385,170	3,303	375,167	3,281	365,326	3,839	695,531	3,813	676,565	3,790	659,401
42	1,401	11,800	1,536	16,957	1,527	16,577	1,829	33,866	1,816	32,932	1,805	32,128	2,124	61,586	2,109	59,893	2,094	58,230	2,461	111,470	2,444	108,291	2,429	105,645	2,863	205,823	2,845	200,454	2,826	195,173	3,344	387,488	3,323	377,425	3,301	367,525	3,862	699,716	3,836	680,636	3,813	663,369
42,5	1,409	11,871	1,545	17,058	1,536	16,676	1,839	34,068	1,827	33,128	1,815	32,319	2,136	61,953	2,122	60,250	2,107	58,577	2,476	112,133	2,458	108,935	2,443	106,274	2,880	207,048	2,862	201,647	2,843	196,334	3,364	389,793	3,342	379,670	3,321	369,711	3,885	703,876	3,859	684,682	3,835	667,313
43	1,417	11,941	1,554	17,159	1,545	16,774	1,850	34,268	1,837	33,323	1,826	32,509	2,149	62,317	2,134	60,605	2,119	58,921	2,490	112,793	2,473	109,576	2,457	106,899	2,897	208,265	2,879	202,832	2,860	197,489	3,384	392,084	3,362	381,901	3,340	371,884	3,908	708,012	3,882	688,705	3,858	671,234
43,5	1,425	12,010	1,563	17,259	1,554	16,871	1,861	34,467	1,848	33,517	1,837	32,699	2,161	62,680	2,147	60,957	2,131	59,264	2,505	113,448	2,487	110,213	2,472	107,520	2,914	209,475	2,895	204,011	2,876	198,636	3,403	394,361	3,382	384,120	3,360	374,044	3,931	712,124	3,904	692,705	3,880	675,133
44	1,434	12,079	1,572	17,358	1,563	16,969	1,872	34,666	1,859	33,710	1,847	32,887	2,174	63,040	2,159	61,308	2,144	59,605	2,519	114,100	2,501	110,846	2,486	108,138	2,931	210,679	2,912	205,183	2,893	199,777	3,423	396,626	3,401	386,325	3,379	376,192	3,953	716,212	3,927	696,682	3,902	679,008
44,5	1,442	12,148	1,581	17,457	1,572	17,065	1,882	34,863	1,869	33,901	1,858	33,074	2,186	63,399	2,171	61,656	2,156	59,943	2,534	114,748	2,515	111,476	2,500	108,753	2,948	211,875	2,929	206,348	2,909	200,912	3,442	398,878	3,420	388,519	3,398	378,328	3,976	720,277	3,949	700,636	3,925	682,862
45	1,450	12,216	1,590	17,555	1,581	17,161	1,893	35,059	1,880	34,092	1,868	33,260	2,199	63,755	2,183	62,002	2,168	60,280	2,548	115,393	2,530	112,102	2,514	109,364	2,964	213,065	2,945	207,507	2,926	202,040	3,462	401,117	3,439	390,700	3,417	380,452	3,998	724,319	3,971	704,568	3,947	686,695
45,5	1,458	12,284	1,599	17,653	1,590	17,257	1,904	35,254	1,890	34,282	1,878	33,445	2,211	64,109	2,195	62,347	2,180	60,615	2,562	116,034	2,544	112,725	2,528	109,971	2,981	214,248	2,961	208,659	2,942	203,162	3,481	403,344	3,459	392,869	3,436	382,564	4,020	728,339	3,993	708,479	3,968	690,506
46	1,466	12,352	1,608	17,750	1,598	17,352	1,914	35,448	1,901	34,470	1,889	33,628	2,223	64,462	2,208	62,690	2,192	60,949	2,576	116,672	2,558	113,344	2,542	110,575	2,997	215,425	2,978	209,805	2,958	204,278	3,500	405,558	3,478	395,026	3,455	384,664	4,042	732,337	4,015	712,367	3,990	694,296
46,5	1,474	12,419	1,616	17,846	1,607	17,446	1,924	35,641	1,911	34,658	1,899	33,811	2,235	64,812	2,220	63,031	2,204	61,280	2,590	117,306	2,572	113,960	2,556	111,176	3,013	216,595	2,994	210,945	2,974	205,388	3,519	407,761	3,496	397,171	3,474	386,754	4,064	736,313	4,037	716,235	4,012	698,066
47	1,482	12,486	1,625	17,942	1,616	17,540	1,935	35,832	1,921	34,844	1,909	33,993	2,247	65,161	2,231	63,370	2,216	61,610	2,604	117,936	2,585	114,573	2,570	111,774	3,029	217,759	3,010	212,079	2,990	206,492	3,538	409,951	3,515	399,305	3,492	388,831	4,086	740,268	4,059	720,082	4,033	701,816
47,5	1,490	12,553	1,634	18,038	1,624	17,633	1,945	36,023	1,931	35,030	1,919	34,174	2,259	65,507	2,243	63,707	2,228	61,937	2,618	118,564	2,599	115,183	2,583	112,369	3,046	218,917	3,026	213,207	3,006	207,590	3,557	412,131	3,534	401,428	3,511	390,898	4,108	744,202	4,080	723,909	4,055	705,545
48	1,498	12,619	1,642	18,133	1,633	17,726	1,955	36,213	1,942	35,214	1,930	34,354	2,271	65,852	2,255	64,042	2,239	62,264	2,632	119,188	2,613	115,789	2,597	112,960	3,062	220,069	3,042	214,328	3,022	208,682	3,575	414,298	3,553	403,539	3,529	392,954	4,129	748,115	4,102	727,716	4,076	709,255
48,5	1,506	12,685	1,651	18,228	1,641	17,819	1,965	36,402	1,952	35,398	1,940	34,534	2,283	66,195	2,267	64,376	2,251	62,588	2,645	119,809	2,626	116,392	2,610	113,549	3,078	221,215	3,058	215,444	3,038	209,768	3,594	416,455	3,571	405,639	3,548	395,000	4,151	752,008	4,123	731,502	4,097	712,946
49	1,513	12,750	1,659	18,322	1,650	17,911	1,976	36,589	1,962	35,580	1,950	34,712	2,294	66,537	2,279	64,708	2,263	62,911	2,659	120,426	2,640	116,992	2,624	114,134	3,093	222,355	3,073	216,555	3,053	210,849	3,613	418,600	3,589	407,729	3,566	397,035	4,172	755,881	4,144	735,270	4,119	716,618
49,5	1,521	12,816	1,668	18,415	1,658	18,002	1,986	36,776	1,972	35,762	1,960	34,889	2,306	66,877	2,290	65,038	2,274	63,232	2,672	121,041	2,653	117,589	2,637	114,716	3,109	223,489	3,089	217,659	3,069	211,925	3,631	420,734	3,608	409,808	3,584	399,059	4,194	759,734	4,165	739,018	4,140	720,271
50	1,529	12,880	1,676	18,509	1,667	18,094	1,996	36,962	1,982	35,943	1,970	35,065	2,318	67,214	2,302	65,367	2,286	63,551	2,686	121,652	2,667	118,183	2,651	115,296	3,125	224,617	3,105	218,758	3,084	212,995	3,649	422,858	3,626	411,877	3,602	401,073	4,215	763,568	4,187	742,747	4,160	723,906
50	1,992	16,787	2,174	24,010	2,163	23,478	2,567	47,541	2,550	46,245	2,535	45,130	2,960	85,849	2,941	83,516	2,921	81,223	3,408	154,356	3,385	150,002	3,365	146,377	3,939	283,153	3,915	275,843	3,890	268,650	4,571	529,657	4,543	516,036	4,515	502,633	5,249	950,978	5,215	925,289	5,184	902,036

Q/ Qpp	h/d	v/vpp	Q/ Qpp	h/d	v/ vpp	Q/Qpp	h/d	v/vpp	Q/ Qpp	h/d	v/vpp	Q/Qpp	h/d	v/vpp	Q/Qpp	h/d	v/vpp
0,001	0,023	0,17	0,045	0,141	0,52	0,21	0,309	0,80	0,51	0,506	1,00	0,805	0,701	1,08	0,955	0,856	1,05
0,002	0,032	0,21	0,05	0,149	0,54	0,22	0,316	0,81	0,52	0,512	1,01	0,81	0,705	1,08	0,960	0,865	1,04
0,003	0,038	0,24	0,055	0,156	0,55	0,23	0,324	0,82	0,53	0,519	1,01	0,815	0,709	1,08	0,965	0,874	1,04
0,004	0,044	0,26	0,06	0,163	0,57	0,24	0,331	0,83	0,54	0,525	1,02	0,82	0,713	1,08	0,970	0,883	1,04
0,005	0,049	0,28	0,065	0,170	0,58	0,25	0,339	0,84	0,55	0,531	1,02	0,825	0,717	1,08	0,975	0,894	1,03
0,006	0,053	0,29	0,07	0,176	0,59	0,26	0,346	0,85	0,56	0,537	1,02	0,83	0,721	1,08	0,980	0,905	1,03
0,007	0,057	0,30	0,075	0,182	0,60	0,27	0,353	0,86	0,57	0,543	1,03	0,835	0,725	1,08	0,985	0,919	1,02
0,008	0,061	0,32	0,08	0,188	0,61	0,28	0,360	0,86	0,58	0,550	1,03	0,84	0,729	1,07	0,990	0,935	1,02
0,009	0,065	0,33	0,085	0,194	0,62	0,29	0,367	0,87	0,59	0,556	1,03	0,845	0,734	1,07	0,995	0,956	1,01
0,01	0,068	0,34	0,09	0,200	0,63	0,3	0,374	0,88	0,6	0,562	1,04	0,85	0,738	1,07	1,000	1,000	1,00
0,011	0,071	0,35	0,095	0,205	0,64	0,31	0,381	0,89	0,61	0,568	1,04	0,855	0,742	1,07			
0,012	0,074	0,36	0,1	0,211	0,65	0,32	0,387	0,89	0,62	0,575	1,04	0,86	0,747	1,07			
0,013	0,077	0,36	0,105	0,216	0,66	0,33	0,394	0,90	0,63	0,581	1,05	0,865	0,751	1,07			
0,014	0,080	0,37	0,11	0,221	0,67	0,34	0,401	0,91	0,64	0,587	1,05	0,87	0,756	1,07			
0,015	0,083	0,38	0,115	0,226	0,68	0,35	0,407	0,92	0,65	0,594	1,05	0,875	0,761	1,07			
0,016	0,086	0,39	0,12	0,231	0,69	0,36	0,414	0,92	0,66	0,600	1,05	0,88	0,766	1,07			
0,017	0,088	0,39	0,125	0,236	0,69	0,37	0,420	0,93	0,67	0,607	1,06	0,885	0,770	1,07			
0,018	0,091	0,40	0,13	0,241	0,70	0,38	0,426	0,93	0,68	0,613	1,06	0,89	0,775	1,07			
0,019	0,093	0,41	0,135	0,245	0,71	0,39	0,433	0,94	0,69	0,620	1,06	0,895	0,781	1,07			
0,02	0,095	0,41	0,14	0,250	0,72	0,4	0,439	0,95	0,7	0,626	1,06	0,9	0,786	1,07			
0,022	0,100	0,42	0,145	0,255	0,72	0,41	0,445	0,95	0,71	0,633	1,06	0,905	0,791	1,07			
0,024	0,104	0,43	0,15	0,259	0,73	0,42	0,451	0,96	0,72	0,640	1,07	0,91	0,797	1,07			
0,026	0,108	0,45	0,155	0,263	0,74	0,43	0,458	0,96	0,73	0,646	1,07	0,915	0,803	1,06			
0,028	0,112	0,45	0,16	0,268	0,74	0,44	0,464	0,97	0,74	0,653	1,07	0,92	0,808	1,06			
0,03	0,116	0,46	0,165	0,272	0,75	0,45	0,470	0,97	0,75	0,660	1,07	0,925	0,814	1,06			
0,032	0,120	0,47	0,17	0,276	0,76	0,46	0,476	0,98	0,76	0,667	1,07	0,93	0,821	1,06			
0,034	0,123	0,48	0,175	0,281	0,76	0,47	0,482	0,99	0,77	0,675	1,07	0,935	0,827	1,06			
0,036	0,127	0,49	0,18	0,285	0,77	0,48	0,488	0,99	0,78	0,682	1,07	0,94	0,834	1,05			
0,038	0,130	0,50	0,19	0,293	0,78	0,49	0,494	1,00	0,79	0,689	1,07	0,945	0,841	1,05			
0,04	0,134	0,50	0,2	0,301	0,79	0,5	0,500	1,00	0,8	0,697	1,07	0,95	0,849	1,05			

5.2. Static calculation

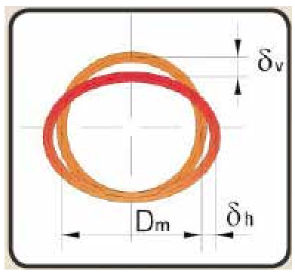
5.2.1. Deformation calculation

Static calculation refers to the budget deformation of flexible and ribbed (corrugated) plastic sewer pipes laid in the ground, that is, on the placenta (sand, gravel), with certain pipe angle, 2α [°], without influence of underground water, conducted in accordance with German guidance ATV - A guidelines 127.



Picture 27: *Scheme of load sharing on a sewer pipe laid in the ground*

Plastic pipes are a deformable structure, that is, they take over loads (stresses) without fracture phenomena. Vertical load on the tube causes its deformation (δv), hence its height decrease so that the round tube is elliptical, Picture 2.



Picture 28: *Elliptical shape of deformation of a round sewer pipe*

It is necessary to determine the size of the vertical deformation of the pipe which at the relevant load must not exceed the permissible value. In this case, except for the special cases caused by installation conditions and loads, it is required that the (relative) vertical deformation (δv), at the relevant load, no be greater than the permissible deformation δv.dop = 6.0 [%], i.e.

- $\delta_v \leq \delta_{v.dop} = 6\%$

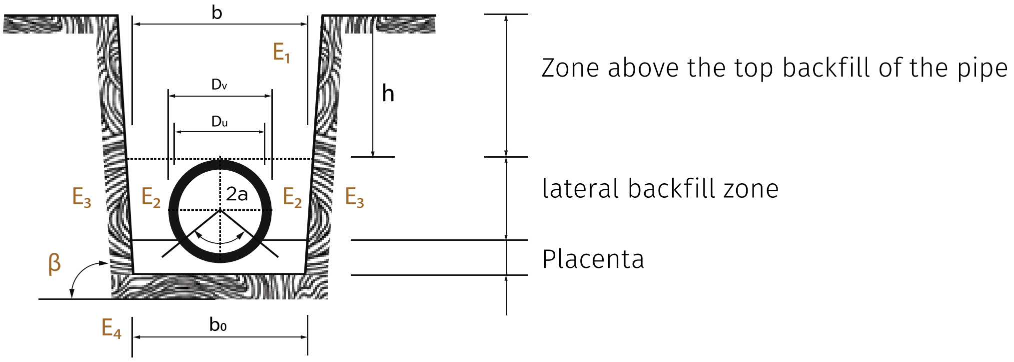
The magnitude of the relative vertical deformation of the pipe is given by the expression:

- $\delta_v = -\frac{100 \cdot c_v^*(q_v - q_n)}{8 \cdot SN}$

Where are:

SN (kN / m2) - ring (nominal, circumferential) pipe strength
cv * (1) - coefficient of total vertical deformation of pipe diameter
qv (kN / m2) - vertical pipe load
qn (kN / m2) - horizontal pipe load

5.2.2. Coefficient of vertical pipe deformation (cv*)



Picture 29: *Deformation yone*

Total vertical deformation coefficient of pipe (cv *) with the associated parameters is defined with following expressions:

- $E_2 = \frac{2}{3} \cdot \alpha_B \cdot E_{20}$
- $\zeta = \frac{1{,}44}{\Delta f + (1{,}44 - \Delta f)\frac{E_2}{E_3}}$
- $\Delta f = \frac{\frac{b}{D_v} - 1}{1{,}154 + 0{,}444(\frac{b}{D_v} - 1)} \leq 1{,}44$
- $S_{Bh} = 0{,}6 \cdot \zeta \cdot E_2$
- $V_{RB} = \frac{8 \cdot SN}{S_{Bh}}$
- $K^* = \frac{c_{h1}}{V_{RB} - c_{h2}}$
- $c_v^* = c_{v1} + c_{v2} \cdot K^*$

Whre are:

cv1, cv2 (1) - vertical deformation coefficients of the pipes (Table 1)
ch1, ch2 (1) - horizontal deformation coefficient of the pipes (Table 1)
K * (1) - pressure coefficient of substrate reaction
VRB (1) - coefficient of strength (strength ratio tubes and substrate strengths)
SBh (kN/m²) - horizontal strength of the substrate
z (1) - horizontal strength correction factor of the substrate
E1 (kN/m²) - modulus of elasticity of the material in the zone above the top-end filling of the pipe (Table 2)
E2 (kN/m²) - modulus of elasticity of the material in the lateral backfill zone
E3 (kN/m²) - modulus of soil elasticity along the trench. Usually taken E3 = E1 (Table 2)
E4 (kN/m²) - modulus of soil elasticity under the pipe. Usually E4 = 10E1 is taken
E20 (kN/m²) - module computational value elasticity, depending on soil type, conditions non-contact pipes on the placenta and its backfill (Table 2)
aB (1) - correction factor (impairment factor) modulus of elasticity E2
Df (1) - parameter
Dv (m) - outer diameter of the pipe
Du (m) - inner diameter of the pipe
b (m) - the width of the trench at the depth of pipe placement
h (m) - height of embankment above the top of the pipe
b (˚) - the slope angle of the side walls
aBi (1) - parameter dependent on the resting conditions tubes on the placenta, and usually, in accordance with manufacturer and the required method of nesting pipe recommends aBi = 2/3 or 1/3 5.2.2. Total vertical deformation coefficient of pipe (cv *) 2α [˚

2α[˚]	cv1[1]	cv2[1]	ch1[1]	ch2[1]
60	-0,1053	0,064	0,1026	-0,0658
90	-0,0966		0,0956	
120	-0,0893		0,0891	

Table No.8: *Value of the coefficient of vertical and horizontal deformation of the pipe as a function of the angle of installation (angle of installation) of the pipe (2a)*

The value of the coefficient of vertical and horizontal deformation of the pipe as a function of the angle of inclination (angle pipe fittings (2a))

Soil Groups	Drive roughness k (mm)
(in brackets are labels according to DIN)	E1, E20x10[kN/m²]
S1: Unbound soil (GE, GW, GI, SE, SW, SI)	6 - 23
S2: Weak soil (GU, GT, SU, ST)	3 - 11
S3: Bonded mixed floors (GU, GT, SU, ST, UL, UM)	2 - 5
S4: Hard soils (TL, TM, TA, OU, OT, OH, OK)	1,5 - 2

Table No.9: *Value of modulus of elasticity E1 and E20 for characteristic soil groupings*

The value of the modulus of elasticity E1 and E20 for characteristic soil groupings

LEGEND:

S1: gravelly, sandy soil;
S2: gravelly, sandy soil with clay binder;
S3: gravelly, sandy soil with clayey and organic binder;
S4: clayey, loamy soil. Under normal conditions pipe installation, the vertical load (qv) is higher from horizontal load (qh).
The load difference (qv - qh) causes a decrease vertical and increase the horizontal diameter pipes.

5.2.3. Vertical pipe load qv

Under normal pipe installation conditions, vertical load (qv) is greater than the horizontal loads (qh). Load difference (qv - qh) causes the vertical to decrease and increase horizontal pipe diameter. In the vertical load includes:

- the influence of the soil above the pipe tips
- additional load on the soil surface, such as
- building load, traffic load, etc.

Vertical pipe load (qv) due to load ground layer (pe) and vehicles (pv) with the associated parameters are defined by the following expressions:

- $q_v = \lambda_{RG} \cdot p_e + p_v$
- $\lambda_{RG} = \frac{\lambda_R - 1}{3} \frac{b}{D_v} + \frac{4 - \lambda_R}{3}$ za $1 \leq \frac{b}{D_v} \leq 4$
- $\lambda_R = \frac{\lambda_{max} \cdot V_s + \frac{E_1}{E_2} \cdot \frac{4 K_2}{3} \cdot \frac{\lambda_{max} - 1}{E_1/E_2 - 0,25}}{V_s + \frac{E_1}{E_2} \cdot \frac{3 + K_2}{3} \cdot \frac{\lambda_{max} - 1}{E_1/E_2 - 0,25}} \leq 4$
- $\lambda_{max} = 1 + \frac{\frac{h}{D_v}}{\frac{3,5}{\frac{E_1}{E_2}} + \frac{2,2}{\left(\frac{E_4}{E_2} - 0,25\right)} + \frac{h}{D_v}\left|\frac{0,62}{\frac{E_1}{E_2}} + \frac{1,6}{\frac{E_4}{E_2}\left(\frac{E_1}{E_2} - 0,25\right)}\right|}$
- $V_s = \frac{8 \cdot SN}{|c_v^*| \cdot E_2}$
- $p_e = \chi_\beta \cdot \gamma \cdot h$ za $\chi_\beta \leq 1$

- $p_v = \varphi' \cdot p_F \cdot a_F$
- $p_F = \frac{F_A}{r_A^2 \pi} \cdot \left\{1 - \left[\frac{1}{1 + (r_A/h)^2}\right]^{\frac{3}{2}}\right\} + \frac{3 F_E}{2 \pi h^2} \left[\frac{1}{1 + (r_E/h)^2}\right]^{\frac{5}{2}}$
- $a_F = 1 - \left[\frac{0,9}{0,9 + (4h^2 + h^6)/1,1 D_m^{2/3}}\right]$ za $h \geq 0,5m$ i $D_m \leq 5,0m$
- $D_m = \frac{D_v + D_u}{2}$
- $\chi_\beta = 1 - \frac{\beta}{90} + \frac{\beta}{90} \left[\frac{1 - e^{-2(h/b) K_1 \tan \delta}}{2(h/b) K_1 \tan \delta}\right]$

5.2.4. Horizontal pipe load qv

The horizontal load (qh) is defined by the expression:

- $q_h = K_2 \left(\lambda_B \cdot p_e + \gamma \cdot \frac{D_v}{2}\right)$

where lB [1] is the concentrated load factor in the ground next to the pipe defined by the expression:

- $\lambda_B = \frac{4 - \lambda_R}{3}$

5.2.5. Stress calculation

In this particular case it is required that the voltage of tension on the inner part of the pipe wall (σi) pri merodavnom opterećenju ne bude veći od dopuštenog napona zatezanja (σdop) tj.

- $\sigma_i < \sigma_{dop}$

The magnitude of the allowable tensile stresses is given by the expression:

- $\sigma_{dop} = 50 - 60\ MPa$

The tensile stress is given by:

- $\sigma_i = \frac{N}{A} + a_{ki}\frac{M}{W}$

where are:

σi (kN/m²) - Tension voltage at internal side of the pipe wall
σr (kN/m²) - computational (maximum) value pipe tensioning voltage
Fs (1) - coefficient value adopted safety where they are, expressed by the length of the meter tubes:

N (kN/m) - normal force
A (m²/m) - surface (longitudinal) cross section of the pipe
aki (1) - correction coefficient
M (kNm/m) - bending moment
W (m³/m) - resistance torque

The following are physical quantities with their corresponding parameters defined by the following expressions:

- $A = 1 \cdot s$
- $W = \frac{1 \cdot s^2}{6} = \frac{s^2}{6}$
- $a_{ki} = \frac{3D_u + 5s}{3D_u + 3s}$
- $N = \sum_{i=1}^{5} N_i$
- $N_{qv} = n_{qv} \cdot q_v \cdot r_m;\ N_{qh} = n_{qh} \cdot q_h \cdot r_m;\ N_{qh}^{*} = n_{qh}^{*} \cdot q_h^{*} \cdot r_m;$
  $\gamma_m \cdot s \cdot r_m = 13{,}8 n_g \cdot s \cdot r_m;\ N_w = n_w \cdot \gamma_w \cdot r_m^2$
- $M = \sum_{i=1}^{5} M_i$
- $M_{qv} = m_{qv} \cdot q_v \cdot r_m^2;\ M_{qh} = m_{qh} \cdot q_h \cdot r_m^2;\ M_{qh}^{*} = m_{qh}^{*} \cdot q_h^{*} \cdot r_m^2;$
  $r_m^2 = 13{,}8 m_g \cdot s \cdot r_m^2;\ M_w = m_w \cdot \gamma_w \cdot r_m^3 = 10 m_w \cdot r_m^3$
- $r_m = \frac{D_v + D_u}{4};\ q_h^{*} = (q_v - q_h) \cdot K^{*}$

where are:

ni, we (1) - coefficients of normal force and moments bending depending on the angle of contact of the pipe (2α) (Table 3.6)
rm (kN/m²) - mean pipe radius
γm (kN/m³) - volume weight of pipe material (usually taken γm = 13.8 kN/m³)
γw (kN/m³) - volume weight of water (rounded at γw = 10 kN/m³)
s (m) - thickness of pipe wall
qv (kN/m²) - vertical pipe load
qn (kN/m²) - horizontal pipe load
K * (1) - coefficient of reactive pressure of the substrate

Angle lying tubes, 2α (°)	Normal force coefficient					Coefficient of bending moment				
	nqv	nqh	nqh*	ng	nw	mqv	mqh	mqh*	mg	mw
60°	-0,080	-1,000	-0,577	-0,417	+1,292	+0,377	-0,250	-0,181	+0,840	+0,420
90°	-0,503	-1,000	-0,577	-0,333	+1,333	+0,314	-0,250	-0,181	+0,642	+0,321
120°	-0,027	-1,000	-0,577	-0,250	+1,375	+0,275	-0,250	-0,181	+0,520	+0,260

Table No.11: Values of the load coefficients of the bottom of the pipeline as a function of the angle of contact of the pipe 2α (°)

5.2.6. Symbols used in Eqs

pe (kN/m²) - soil load
pv (kN/m²) - traffic load
IR, IRG, Imax (1) - concentration factors loads above the pipe
Vs (1) - strength coefficient
K2 (1) - pressure ratio dependent on the coefficient strength of VRB and soil grouping
cβ (1) - correction factor (attenuation factor) ground loads
K1 (1) - horizontal and vertical pressure ratio the ground. Typically, K1 = 0.5 is taken
d (˚) - friction angle on trench walls. Usually d = 2/3j or d = 1/3j, depending on conditions pipe clogging
j (˚) - angle of internal friction of material
g (kN/m³) - volume weight of soil. It is usually taken g = 20 (kN/m³)
j '(1) - the carbon factor, depending on the type of vehicle
pF (kN/m²) - relevant load by means of transport
aF (1) - correction factor (impairment factor) traffic load
Dm (m) - calculated pipe diameter
FA, FE (kN) - influential load sizes by the relevant means of transport
rA, rE (m) - radii of influence of load by the relevant traffic load.

Group	K2[1]	
Tla	VRB>0,1	VRB≤0,1
S1	0,5	0,4
S2		0,3
S3		0,2
S4		0,1

A group of soils	ϕ[˚]
S1	35
S2	30
S3	25
S4	20

K2 values as a function of VRB and soil type *Internal friction angle as a function of soil type*

Traffic agent	FA [kN]	FE [kN]	rA [m]	rE [m]	ϕ' [1]
SLW 60	100	500	0,25	1,82	1,2
SLW 30	50	250	0,18	1,82	1,4
LKW 12	40	80	0,15	2,26	1,5

Table No.12 Traffic load parameter values

In the zone of over-filling the pipelines may be use all soil groups according to Table 2 while in the zone of the lateral backfill of the pipeline there can be used only loose and weakly bound soils, ie soil that can be compact (soil groups S1 and S2). More detailed module selection soil elasticities E1 and E20 within their area values according to Table 2 are related to the installation method pipes and with the degree of compaction achieved, NW [%], which ranges from 90-97 [%].

6 INTERFERENCE

INTERFERENCE REMOVAL

During operation, with each pipe system interference is possible. Interference with sewers divorces are possible in the form of clogging and pipeline leaks, and therefore during installation inspection openings should be provided for inspection piping and cleaning if needed.

7 MAINTENANCE

In terms of maintenance, we differentiate regularly and emergency maintenance. As already mentioned in Chapter 6, there should be anticipate situations in case of emergency maintenance happen, replacement of individual pipeline elements or cleaning pipeline when it gets clogged. Regular maintenance includes pipeline cleaning of deposited deposits on the pipe walls. Only pipeline cleaning and disinfection should be performed by an organization or institution certificated for that kind of works.

8 DISASSEMBLE

Disassembly and removal of the pipeline is performed as follows way or according to the following procedure:

- Drain water from the system
- Disassemble the pipeline by disassembling the joints
- Cut the dismantled pipeline as short as possible pieces, for easy manipulation

Disassemble and cut pipeline to transport vehicle and take to the dump provided for plastics so that the material can recycle.

9 POST USE

As mentioned earlier PVC masses can be recycled. PVC recycling does not lose its physicochemical properties so material that is recycled can be used for lining the motor housing, manufacture of laundry baskets and any items of plastic. Pestan for the production of its PVC production pipe and fitting programs exclusively use the original materials from renowned world manufacturers. Plastic masses are recycled by material code, so the code for PVC is:

10 SHORTCUTS

In the document it is used a metric metering system unit (SI), e.g. unit of force Newton (N) instead pounds (p) and power unit Watt (W) instead of kcal/h.

Conversion:

t (°C) = T - To = T - 273.15 K.
1 kp = 9.80665 N or 1 kp ≈ 10 N
1 Mp = 9806.65 N or 1 Mp ≈ 10 kN and 1 Mp/m = 10 kN/m
1 kp/cm² = 9.80665 N/cm² = 0.0980665 N/mm² = 0.0980665 Mpa or 1 kP/cm² ≈ 0.1 N/mm²
1 m water stubs = 0.0980665 bar or 1 m water column ≈ 0.1 bar
1 kcal/mh degrees = 1.16 W/mK (Thermal conductivity) or 1 kcal/mh degrees ≈ 1.2 W/mK

Thermal conductivity is given in W/mK. It's a stretch the same for K and °C since the difference is only at the beginning of the scale. In this sense, 1 W/m °C is identical to 1 W/mK. K (Kelvin) is the SI unit of temperature. Temperature in Celsius (t) is different from the temperature in Kelvinima (T) for 273.15 K.

t (°C) = T – To = T – 273.15 K.

In this document, 10 m / s was adopted for g, error of about 2% is ignored, the DN mark is nominal diameter, PN is the nominal pressure.

Dimensions and units

The dimensions are expressed in mm and / or inches and are specified as nominal and standard sizes.

d, d1, d2, d3, d4 Diameter
DN Nominal diameter
SC Size of hexagon screws
AL Number of screw holes
s Hexagon head screw width
g Weight in grams
SP Quantity in standard packaging
GP Quantity in large pack
e Pipe wall thickness
PN Nominal pressure
Rp Parallel inner pipe thread according to ISO 7-1
R Conical outer pipe thread to ISO 7-1
ppm Parts per million
1 bar = 0.1 N / mm2 = 0.1 Mpa (Megapascal) = 14.504 psi
C Design factor
S Tube series
SDR Standard dimension ratio

MFR Dissolved coefficient of flow according to ISO 4440
SDR Standard Dimension Ratio:
OD / SDR S
OD / S SDR
OD Outer diameter
S Wall thickness
Explaining of abbreviations
PB Polybitulene
PE Polyethylene
PE-X Cross-linked polyethylene
PP Polypropylene
PVC Polyvinyl chloride
PVC-C Chlorinated polyvinyl chloride (increased content chlorine)
PVC-U Unplasticized polyvinyl chloride
PVC-O Oriental polyvinyl chloride

11 CHEMICAL RESISTANCE

11.1 Introduction

The table in this document summarizes the data chemical resistance of PVC, and is in use in many countries, and was created as a result of the practical experience and test results.

Source: ISO/TR 10358

The table contains an estimate of the chemical resistance of a large the number of fluids rated as aggressive or inert according to PVC. Valuation is based on values obtained from the results of PVC immersion tests into the fluid sample at temperatures of 20, 60 and 100 °C and atmospheric pressure, following characteristics tensile strengths under given conditions. The classification will be determined taking into account a limited number of fluids considered to be more technically or commercially important, using equipment which allows pressure testing and determination of the chemical resistance coefficient separately for each fluid. That way, these tests will provide more complete information on the use of PVC pipes for transport of mentioned fluids including their own use under pressure.

11.2 Field of application

This document contains the chemical classification resistance of polypropylene for about 180 fluids. It is intended to provide general guidance on the possibilities of using polypropylene fluid transfer tubes:

- At temperatures of 20, 60 and 100 °C
- In the absence of internal pressure and external mechanical stress (for example: flexural stress, stresses due to thrust, twisting load, etc.)

11.3 Definitions and Symbols as Abbreviations

Criteria for classifications, definitions, symbols and the abbreviations used in this chapter are as follows:
S - satisfactory L - partial or restricted.

Chemical resistance of polypropylene exposed of fluid activity is classified as partial satisfactory when the test results are confirmed in most countries that participated in the testing. Also this classification (L) is used for resistances on the activity of chemical fluids in which u parameter dependencies can be used by both S and NS.

NS - not satisfying

Chemical resistance of polypropylene exposed fluid activity is classified as not satisfactory when the test results are confirmed in most countries that participated in the testing.

This classification (NS) includes materials that depending on the parameters they are labeled either NS or L. Saturated solution - saturated aqueous solution, prepared at 20 °C

Solution - unsaturated aqueous solution at a concentration higher than 10%

Mild solution - Mild aqueous solution at a concentration of 10% or less

Working solution - An aqueous solution with the usual concentration for industrial use

Dilution concentrations were recorded in the text expressed in mass percent. Aqueous dilutions poorly soluble chemicals are used, which are chemical activities according to polypropylene concerns, consider with saturated solutions. Generally, in this catalog common chemical names were used. This one the spreadsheet was created as a user guide polypropylene. Just in case some chemical compound is not in the table or due to uncertainty related to chemical resistance in some applications, please to contact Pestan for advice and suggestion for testing.

A chemical or product	Concentration	Temperature °C		
		20	60	100
Acetic acid	Up to 40%	S	S	-
Acetic acid	50%	S	S	L
Vinegar vinegar. glacial	>96%	S	L	NS
Acetic anhydride	100%	S	-	-
Acetone	100%	S	S	-
Acetophenone	100%	S	L	-
Acrylonitrile	100%	S	-	-
Air	-	S	S	S
Allyl alcohol	100%	S	S	-
Almond oil	-	S	-	-
Stips	Solution	S	S	-
Ammonia, aqueous solution	Saturated solution	S	S	-
Ammonia, dry gas	100%	S	-	-
Ammonia, liquid	100%	S	-	-
Ammonium acetate	Saturated solution	S	S	-
Ammonium chloride	Saturated solution	S	S	-
Ammonium fluoride	Up to 20%	S	S	-
Ammonium hydrogen carbonate	Saturated solution	S	S	-
Ammonium metaphosphate	Saturated solution	S	S	S
Ammonium nitrate	Saturated solution	S	S	S
Ammonium persulfate	Saturated solution	S	S	-
Ammonium phosphate	Saturated solution	S	-	-
Ammonium sulfate	Saturated solution	S	S	S
Ammonium sulfide	Saturated solution	S	S	-
Amyl acetate	100%	L	-	-
Amyl alcohol	100%	S	S	S
Aniline	100%	S	S	-
Apple juice	-	S	-	-
Imperial Water	HCl/HNOF3/1	NS	NS	NS
Barium bromide	Saturated solution	S	S	S
Barium carbonate	Saturated solution	S	S	S

A chemical or product	Concentration	Temperature °C		
		20	60	100
Barium chloride	Saturated solution	S	S	S
Barium hydroxide	Saturated solution	S	S	S
Barium sulfides	Saturated solution	S	S	S
Beer	-	S	S	-
Benzene	100%	L	NS	NS
Benzoic acid	Saturated solution	S	S	-
Benzyl alcohol	100%	S	L	-
Borax Solution	Solution	S	S	-
Boric acid	Saturated solution	S	-	-
Boron Trifluoride	Saturated solution	S	-	-
Bromine, gas	-	NS	NS	NS
Bromine, liquid	100%	NS	NS	NS
Bhutan, gas	100%	S	-	-
Butanol	100%	S	L	L
Butyl acetate	100%	L	NS	NS
Butyl glycol	100%	S	-	-
Butyl phenol	Saturated solution	S	-	-
Butyl phthalate	100%	S	L	L
Calcium carbonate	Saturated solution	S	S	S
Calcium chlorate	Saturated solution	S	S	-
Calcium chloride	Saturated solution	S	S	S
Calcium hydroxide	Saturated solution	S	S	S
Calcium hypochlorite	Solution	S	-	-
Calcium nitrate	Saturated solution	S	S	-
Camphor oil	-	NS	NS	NS
Carbon dioxide, dry gas	-	S	S	-
Carbon dioxide, wet gas	-	S	S	-
Carbon disulfide	100%	S	NS	NS
Oil monoxide, gas	-	S	S	-
Carbon tetrachloride	100%	NS	NS	NS
Castor Oil	100%	S	S	-
Caustic soda	Up to 50%	S	L	L
Chlorine, aqueous solution	Saturated solution	S	L	-
Chlorine, dry gas	100%	NS	NS	NS

A chemical or product	Concentration	Temperature °C		
		20	60	100
Chlorine, liquid	100%	NS	NS	NS
Chloroacetic acid	100%	S	-	-
Chlorine ethanol	100%	S	-	-
Chloroform	100%	L	NS	NS
Chlorosulphuric acid	100%	NS	NS	NS
Chromium alum	Solution	S	S	-
Chromic acid	Do 40%	S	L	NS
Citric acid	Saturated solution	S	S	S
Coconut oil	-	S	-	-
Copper (II) chloride	Saturated solution	S	S	-
Copper (II) nitrate	Saturated solution	S	S	S
Copper (II)	Saturated solution	S	S	-
Corn oil	-	S	L	-
Cotton seed oil	-	S	S	L
Cresol	Up to 90%	S	-	-
Cyclohexane	100%	S	-	-
Cyclohexanol	100%	S	L	-
Cyclohexanone	100%	L	NS	NS
Decalin (Decahydronaphthalene)	100%	NS	NS	NS
Dextrin	Solution	S	S	-
Dextrin Dextrose	Solution	S	S	S
Dibutyl phthalate	100%	S	L	NS
Dichloroacetic acid	100%	L	-	-
Dichlor ethylene (A i B)	100%	L	-	-
Diethanolamine	100%	S	-	-
Diethyl ether	100%	S	L	-
Diethylene glycol	100%	S	S	-
Diglycolic acid	100%	S	-	-
Diisooctyl	100%	S	L	-
Dimethylamine, gas	-	S	-	-
Dimethyl formamide	100%	S	S	-
Dimethyl phthalate	100%	L	L	-
Dioxane	100%	L	L	-
Distilled water	100%	S	S	S

A chemical or product	Concentration	Temperature °C		
		20	60	100
Etil alkohol	Up to 95%	S	S	S
Etil hlorid, gas	-	NS	NS	NS
Etilen hlorid (mono i di)	-	L	L	-
Etil etar	100%	S	L	-
Etilen glikol	100%	S	S	S
Etanol amin	100%	S	-	-
Etil acetat	100%	L	NS	NS
Gvožđe hlorid	Saturated solution	S	S	S
Gvožđe hlorid formaldehid	40%	S	-	-
Mravlja kiselina	10%	S	S	L
Mravlja kiselina	85%	S	NS	NS
Mravlja kiselina, anhidrid	100%	S	L	L
Fruktoza	Solution	S	S	S
Voćni sok	-	S	S	S
Benzin, alifatični ugljovodonici	-	NS	NS	NS
Želatin	-	S	S	-
Glukoza	20%	S	S	S
Glicerin	100%	S	S	S
Glikolna kiselina	30%	S	-	-
Heptan	100%	L	NS	NS
Heksan	100%	S	L	-
Bromovodonična kiselina	Up to 48%	S	L	NS
Hlorovodonična	Up to 20%	S	S	S
Hlorovodonična	30%	S	L	L
Hlorovodonična	From 35 to 36%	S	-	-
Fluorovodonična kiselina	Razblažen rastvor	S	-	-
Fluorovodonična kiselina	40%	S	-	-
Vodonik	100%	S	-	-
Hlorovodonik, suvi gas	100%	S	S	-
Vodonik peroksid (hidrogen)	Do 10%	S	-	-
Vodonik peroksid (hidrogen)	Do 30%	S	L	-
Vodonik sulfide, suvi gas	100%	S	S	-
Jod, u alkoholu	-	S	-	-

A chemical or product	Concentration	Temperature °C		
		20	60	100
Isooctane	100%	L	NS	-
Isopropyl alcohol	100%	S	S	S
Isopropyl ether	100%	L	-	-
Lactic acid	Do %	S	S	-
Lanolin	-	S	L	-
Linseed oil	-	S	S	S
Magnesium carbonate	Saturated solution	S	S	S
Magnesium chloride	Saturated solution	S	S	-
Magnesium hydroxide	Saturated solution	S	S	-
Magnesium sulfate	Saturated solution	S	S	-
Maleic acid	Saturated solution	S	S	-
Mercury (II) chloride	Saturated solution	S	S	-
Mercury (II) cyanide	Saturated solution	S	S	-
Mercury (I) nitrate	Solution	S	S	-
Mercury	100%	S	S	-
Methyl acetate	100%	S	S	-
Methyl alcohol	5%	S	L	-
Methyl amine	Up to 32%	S	-	-
Methyl bromide	100%	NS	NS	NS
Methyl ethyl ketone	100%	S	-	-
Methylene chloride	100%	L	NS	NS
Milk	-	S	S	S
Monochloric Acetic Acid	<85%	S	S	-
Oil	-	S	NS	NS
Nickel Chloride	Saturated solution	S	S	-
Nickel nitrate	Saturated solution	S	S	-
Nickel Sulphate	Saturated solution	S	S	-
Nitric acid	Up to 30%	S	NS	NS
Nitric acid	40 to 50%	L	NS	NS
Nitric acid, smokable (with nitrogen dioxide)	-	NS	NS	NS
Nitrobenzene	100%	S	L	-
Oleic acid	100%	S	L	-

A chemical or product	Concentration	Temperature °C		
		20	60	100
Oleum (sulfuric acid with 60% SO_3)	-	S	L	-
Olive oil	-	S	S	L
Oxalic acid	Saturated solution	S	L	NS
Oxygen, gas	-	S	-	-
Paraffin oil (FL65)	-	S	L	NS
Peanut oil	-	S	S	-
Peppermint oil	-	S	-	-
Perchloric acid	(2N) 20%	S	-	-
Petroller (light gasoline)	-	L	L	-
Phenol	5%	S	S	-
Phenol	90%	S	-	-
Phosphine, gas	-	S	S	-
Phosphoric acid	Up to 85%	S	S	S
Phosphorus oxychloride	100%	L	-	-
Picric acid	Saturated solution	S	-	-
Potassium bicarbonate	Saturated solution	S	S	S
Potassium borate	Saturated solution	S	S	-
Potassium bromate	Up to 10%	S	S	-
Potassium bromide	Saturated solution	S	S	-
Potassium carbonate	Saturated solution	S	S	-
Potassium chlorate	Saturated solution	S	S	-
Potassium chlorite	Saturated solution	S	S	-
Potassium Chromate	Solution	S	S	-
Potassium cyanide	Saturated solution	S	-	-
Potassium dichromate	Saturated solution	S	S	S
Potassium Iron Cyanide	Saturated solution	S	S	-
Potassium fluoride	Up to 50%	S	S	-
Potassium hydroxide	Saturated solution	S	S	S
Potassium iodide	Saturated solution	S	-	-
Potassium nitrate	10%	S	S	-
Potassium perchlorate	(2N) 30%	S	S	-
Potassium permanganate	Saturated solution	S	-	-
Potassium persulfate	Saturated solution	S	S	-

A chemical or product	Concentration	Temperature °C		
		20	60	100
Potassium sulphate	100%	S	S	-
Propane, gas	<50%	S	-	-
Propionic acid	-	S	-	-
Pyridine	100%	L	-	-
Seawater	-	S	S	S
Silicone oil	-	S	S	S
Silver nitrate	Saturated solution	S	S	L
Sodium acetate	Saturated solution	S	S	S
Sodium benzoate	35%	S	L	-
Sodium bicarbonate	Saturated solution	S	S	S
Sodium carbonate	Up to 50%	S	S	L
Sodium chlorate	Saturated solution	S	S	-
Sodium chloride	Saturated solution	S	S	-
Sodium chlorite	2%	S	L	NS
Sodium chlorite	20%	S	L	NS
Sodium dichromate	Saturated solution	S	S	S
Sodium hydrogen carbonate	Saturated solution	S	S	S
Sodium hydrogen sulfate	Saturated solution	S	S	-
Sodium hydrogen sulfite	Saturated solution	S	-	-
Sodium hydroxide	1%	S	S	S
Sodium hydroxide	10 to 60%	S	S	S
Sodium hypochlorite	5%	S	S	-
Sodium hypochlorite	10 to 15%	S	-	-
Sodium hypochlorite	20%	S	L	-
Sodium metaphosphate	Solution	S	-	-
Sodium nitrate	Saturated solution	S	S	-
Sodium perborate	Saturated solution	S	S	-
Sodium phosphate (neutral)	-	S	S	S
Sodium silicate	Solution	S	S	-
Sodium sulphate	Saturated solution	S	S	-
Sodium sulfide	Saturated solution	S	-	-
Sodium sulfite	40%	S	S	S
Sodium thiosulphate (hypo)	Saturated solution	S	-	-
Soybean oil	-	S	L	-

A chemical or product	Concentration	Temperature °C		
		20	60	100
Amber Acid	Saturated solution	S	S	-
Sulfuric acid	Up to 10%	S	S	S
Sulfur dioxide, dry or wet	100%	S	S	-
Sulfuric acid	10 to 30%	S	S	-
Sulfuric acid	50%	S	L	L
Sulfuric acid	96%	S	L	NS
Sulfuric acid	98%	L	NS	NS
Sulfuric acid	Up to 30%	S	-	-
Tartaric acid	Saturated solution	S	S	-
Tetrahydrofuran 1	100%	L	NS	NS
Tetralin	100%	NS	NS	NS
Thiophene	100%	S	L	-
Tin (IV) chloride	Solution	S	S	-
Tin (II) chloride	Saturated solution	S	S	-
Toluene	100%	L	NS	NS
Trichloroacetic acid	Up to 50%	S	S	-
Trichlorethylene	100%	NS	NS	NS
Triethanolamine	Solution	S	-	-
Turpentine		NS	NS	NS
Urea	Saturated solution	S	S	-
Vinegar	-	S	S	-
Salt water, mineral, drink	-	S	S	S
Whiskey		S	S	-
Wine		S	S	-
Xylene	100%	NS	NS	NS
Yeast	Solution	S	S	S
Zinc chloride	Saturated solution	S	S	-
Zinc sulphate	Saturated solution	S	S	-

Disclaimer

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12 CERTIFICATES

БЕЛНИИС – Belarus

KIWA-Netherlands

БЕЛНИИС – Belarus

VUPS- Czech Republic

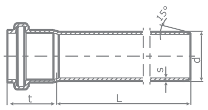
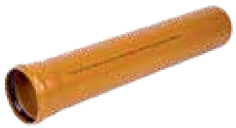
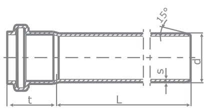
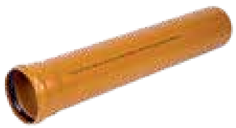
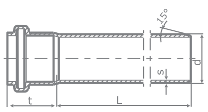
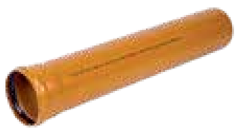
MPA – Germany

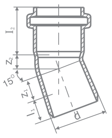
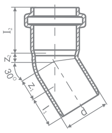
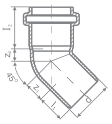
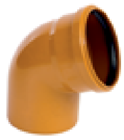
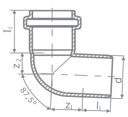
IGH Croatia

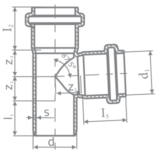
IMS Serbia

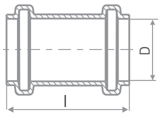
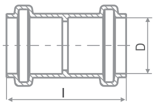
GOST R Russia

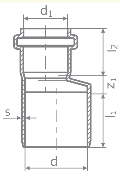
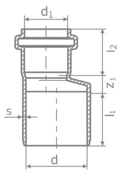
13 PRODUCT RANGE

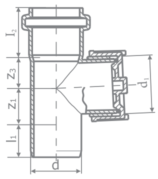
NAME	PICTURE	CODE	D	S	T
KG PIPE SDR51 SN2					
		10400044	160	3,2	86
		10400054	200	3,9	106
		10400074	250	4,9	128
		10400104	315	6,2	155
		10400144	400	7,9	183
		10400184	500	9,8	210
		10410560	630	12,3	188
KG PIPE SDR41 SN4					
		10400304	110	3,2	61
		10400324	125	3,2	72
		10400344	160	4,0	86
		10400364	200	4,9	106
		10400384	250	6,2	128
		10400404	315	7,7	155
		10400444	400	9,8	183
		10400484	500	12,3	210
		10410360	630	15,4	188
KG PIPE SDR34 SN8					
		10400604	110	3,2	61
		10400624	125	3,7	72
		10400644	160	4,7	86
		10400664	200	5,9	106
		10400684	250	7,3	128
		10400704	315	9,2	155
		10400744	400	11,7	183
		10400784	500	14,6	210
		10410160	630	18,4	188

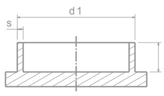
NAME	PICTURE	CODE	D	S	Z1	Z2	L1MIN	L2
KGB BEND 15°								
	 	10401362	110	3,2	6,1	20	61	49,1
		10401363	125	3,2	7,9	21	68	54,6
		10401360	160	4	10,1	26,2	81	86
		10401361	200	4,9	26	30	99	106
		*11500002	250	6,2	18	30	125	128
		*11500003	315					
		*11500005	400					
		*11500007	500					
KGB BEND 30°								
	 	10401020	110	3,2	14,7	27,1	61	49,6
		10401021	125	3,2	16,7	29,1	68	54,6
		10401022	160	4	24	30	81	86
		10401023	200	4,9	30	39	99	106
		*11500102	250	6,2	37	49	125	128
		*11500103	315					
		*11500105	400					
		*11500107	500					
KGB BEND 45°								
	 	10401120	110	3,3	22,9	34,7	61	49,1
		10401121	125	3,3	26	37,8	68	54,6
		10401102	160	4	36	44	81	86
		10401103	200	4,9	46	55	99	106
		10401104	250	6,2	57	69	125	128
		10401105	315	7,7	72	86	132	155
		10401106	400	9,8	83,3	117,9	150	119
		*11500205	500					
KGB BEND 87.5°								
	 	10401320	110	3,3	53,2	62,8	61	49,1
		10401321	125	3,3	60,4	70	68	54,6
		10401302	160	4	83	89	81	86
		10401303	200	4,9	105	114	99	106
		10401304	250	6,2	131	143	125	128
		10401305	315	7,7	165	180	132	155
		10401326	400	9,8	193,3	121,2	150	119
		*11500405	500					

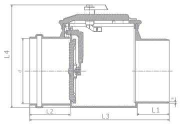
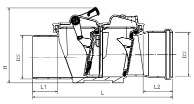
NAME	PICTURE	CODE	D/D1	S	Z1	Z2	Z3	L1MIN	L2	L3
KGEA BRANCH 87.5°										
	 	10401630	110/110	3,3	52,7	67,3	67,3	61	49,1	49,1
		10401631	125/110	3,3	52,4	67,6	67,6	68	54,6	49,1
		10401632	125/125	3,3	59,9	75,1	75,1	68	54,6	54,6
		10401603	160/110	4	58	86	64	81	86	61
		10401604	160/125	4	66	87	71	81	86	72
		10401605	160/160	4	83	89	89	81	86	86
		10401606	200/110	4,9	62	105	64	99	106	61
		10401607	200/125	4,9	69	75	101	75	106	72
		10401608	200/160	4,9	86	108	90	99	106	86
		10401609	200/200	4,9	106	111	111	99	106	106
		10401619	250/110	6,2	90	132	100	120	128	61
		10401620	250/125	6,2	90	132	100	120	128	72
		10401610	250/160	6,2	89	132	91	125	128	86
		10401611	250/200	6,2	108	134	111	125	128	106
		10401612	250/250	6,2	131	138	138	125	128	128
		10401618	315/110	7,7	93	162	104	134	155	61
		10401617	315/125	7,7	93	162	104	134	155	72
		10401613	315/160	7,7	93	164	104	134	155	86
		10401614	315/200	7,7	111	165	113	132	155	106
		10401615	315/250	7,7	134	169	139	132	155	128
		10401616	315/315	7,7	165	173	173	132	155	155
		10401621	400/110	9,8	106	206,5	131,8	150	124,2	51,3
		10401622	400/160	9,8	106	209,7	131,8	150	124,2	65
		10401623	400/200	9,8	106	214,5	131,8	150	124,2	77,5
		*11501232	400/110							
		*11501233	400/125							
		*11501234	400/160							
		*11501235	400/200							
		*11501236	400/250							
		*11501237	400/315							
		*11501239	400/400							
		*11501249	500/110							
		*11501250	500/125							
		*11501251	500/160							
		*11501252	500/200							
		*11501253	500/250							
		*11501254	500/315							
		*11501256	500/400							
		*11501258	500/500							
		*11501056	500/400							
		*11501058	500/500							

NAME	PICTURE	CODE	D(D/D1)	L1MIN
KGU KLIZNA SPOJKA				
	 	10402720	110	122,2
		10402721	125	131,2
		10402702	160	158
		10402703	200	158
		10402704	250	250
		10402705	315	293
		10402706	400	244
		*11502310	500	
KGU DOUBLE SOCKET				
	 	10402620	110	122,2
		10402621	125	131,2
		10402602	160	158
		10402604	250	250
		10402605	315	293
		10402626	400	244
		*11502410	500	

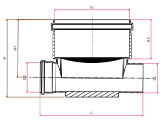
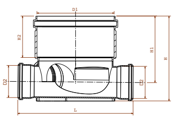
NAME	PICTURE	CODE	(D/D1)	S	Z1	L1MIN	L2
KGR EXCENTRIC REDUCER							
	 	10401730	125/110	3,3	23,3	67	49,1
		10401701	160/110	4	34	81	61
		10401702	160/125	4	27	81	72
		10401703	200/110	4,9	26	125	61
		10401705	200/160	4,9	32	99	86
		10401709	250/200	6,2	38	125	106
		10401714	315/250	7,7	46	132	128
KGR FLAT REDUCER							
	 	*10401750	110/200	4,9	5	61	59
		*10401800	110/250	6,1	7	61	90
		*10401810	110/315	7,7	40	61	93
		*10401820	110/400	6	40	61	95
		*10401751	125/200	4,9	5	72	59
		*10401801	125/250	6,1	7	72	90
		*10401811	125/315	7,7	40	72	93
		*10401821	125/400	9,8	40	72	95
		*10401802	160/250	6,1	8	86	90
		*10401812	160/315	7,7	7	86	93
		*10401822	160/400	9,8	50	86	95
		*10401813	200/315	7,7	7	106	93
		*10401823	200/400	9,8	50	106	95
		*10401824	250/400	9,8	50	128	95
		*11503027	315/400				
		*11503044	400/500				

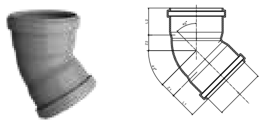
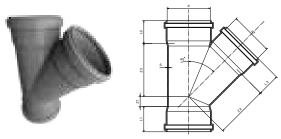
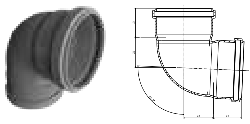
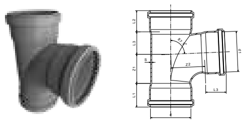
NAME	PICTURE	CODE	(D/D1)	S	Z1	Z2	L1MIN	L2
KGRE INSPECTION PIPE								
	 	10401920	110/110	3,3	51,7	52,68	67	49,1
		10401921	125/110	3,3	51,7	51	72	54,6
		10401902	160/160	4	83	89	81	86
		10401903	200/160	4,9	86	111	99	106
		10401904	250/160	6,2	89	91	125	128
		10401905	315/160	7,7	93	104	134	155
		*11502603	400/160					

NAME	PICTURE	CODE	D	S	L
KG END CAP					
	 	10402904	200	4,9	51,5
		10402900	250	6,2	90
		10402901	315	7,7	92,5
		10402902	400	9,8	95
		*11502504	500	12,3	120

NAME	PICTURE	CODE	D	S	L1	L2	L3	L4
KGRE NON RETURNABLE VALVE								
	 	10202502	110	4.0	64	64	320	189
		10202503	125	4.0	68	65	318	226
		10202504	160	4.0	68	103	350	248
		10402000	200	4,5	100	86	455	300
		10402001	250	6,2	144	104	566	365
		10402002	315	7,7	160	116	728	454
KGRE NON RETURNABLE VALVE WITH TWO CLAPS								
	 	10202505	110	4,0	62	62	355	190
			160					
			200					

NAME	PICTURE	CODE	(D/D1)
SAG K/K			
		10799210	250/160
		10799211	300/160
		10799212	400/160
		10799213	500/160
		10799214	600/160
		10799200	250/200
		10799201	300/200
		10799202	400/200
		10799203	500/200
		10799204	600/200
SAG K/SW			
		10799110	250/160
		10799111	300/160
		10799112	400/160
		10799113	500/160
		10799114	600/160
		10799100	250/200
		10799101	300/200
		10799102	400/200
		10799103	500/200
		10799104	600/200

NAME	PICTURE	CODE	(D/D1)	H	H1	H2	L
DRAIN MANHOLE STRAIGH THROUGH							
	 		315/160	384	281	190	479
		10799220	400/160	420	315	207	554
		10799221	400/200	470	340	207	586
DRAIN MANHOLE COLLECTIVE							
	 		315/160	395	309	185	490
		10799222	400/160	420	319	207	559
		10799223	400/200	470	344	207	584

NAME	PICTURE	D	D1	S	Z1	Z2	L1MIN	L2	L3
KGB BEND 110/45°		110		3.1	33.02	33.02	58.53	58.53	
KGB BEND 125/45°		125		3.6	36.92	36.92	64.46	64.46	
KGB BEND 160/45°		160		4.5	45.46	45.46	79.42	79.42	
KGB BEND 110/87.5°		110		3.1	61.15	61.15	58.53	58.53	
KGB BEND 125/87.5°		125		3.6	68.85	68.85	64.46	64.46	
KGB BEND 160/87.5°		160		4.5	86.35	86.35	79.42	79.42	
KGEA BRANCH 110/110-45°		110	110	3.1	24.94	133.47	58.53	58.53	58.53
KGEA BRANCH 125/110-45°		125	110	3.7	16.07	146.47	64.46	64.46	58.53
KGEA BRANCH 125/125-45°		125	125	3.7	26.07	152.53	64.46	64.46	64.46
KGEA BRANCH 160/110-45°		160	110	4.7	1.15	173.97	90	79.42	58.53
KGEA BRANCH 160/125-45°		160	125	4.7	11.15	178.53	88.85	79.42	64.46
KGEA BRANCH 160/160-45°		160	160	4.7	36.15	195.57	88.85	79.42	79.42
KGEA BRANCH 110/110-87.5°		110	110	3.2	79.94	91.47	65.06	58.53	58.53
KGEA BRANCH 125/110-87.5°		125	110	3.7	68.07	93.65	140	64.46	58.53
KGEA BRANCH 125/125-87.5°		125	125	3.7	83.07	95.61	71.93	64.46	64.45
KGEA BRANCH 160/110-87.5°		160	110	4.7	66.15	123.62	88.85	79.42	58.53
KGEA BRANCH 160/125-87.5°		160	125	4.7	69.15	111.65	88.85	79.42	64.45
KGEA BRANCH 160/160-87.5°		160	160	4.7	101.15	120.57	88.85	79.42	79.42

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