TCVN **VIETNAM STANDARD**

TCVN 4513 : 1988

INTERNAL WATER SUPPLY – DESIGN STANDARD

(this English version is for reference only)

HA NOI – 1988

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Internal water supply – design standard

This standard replaces TCXD 18 – 64 “Internal water supply – Design standard”.

This standard is used for design of internal water supply systems in houses, public buildings, production sites, additional construction buildings of industrial enterprises which are newly constructed or reconstructed.

Note: When designing an internal water supply system, not only the requirements of this standard shall be fulfilled but also the requirements of the other related existing standards.

1. General

1.1 Internal water supply system is designed to supply water directly to consumption places.

An internal water supply system (water supply systems used for households, production and fire fighting) includes:

Water line, water meter, main, branch, distribution water pipe network with sanitary equipments, production, fire-fighting equipment.

Depending on the flow of the pressure in the external water supply network, the function and process technology of the internal water supply network include: pump, pressure contain, pressure gas contain, reservoir located into or near building.

1.2 The drinking and household water supply (abbreviate as household water supply) must be designed to ensure the quality of water supply should be in accordance with nation regulations for potable water.

NOTES:

1) In the inhabitants area and enterprises which have water supply quality rating isn’t enough to ensure all water demand, so allow nonstandard water to supply urinal basins, water-waste provender, lavatory basin, urinal channel, floor faucet or another sanitary equipments.

2) In the case that insufficient potable quality water and there are hot spring sources in the construction area, after sanitary and epidemiologic of province or city allow to use the hot spring sources for household water supply.

1.3 The industrial water supply network must be designed to ensure technology requirements, not corrode pipes and fittings, sediments and not increase substance stick…inside pipelines.

1.4 The internal household water supply which from city water lines, must not connected with household water supply lines from local sources.

***NOTE**: Allow to connect local water supply networks in the special case when there was agreement with water supply network management of these city or local agentives.*

1.5 Must be designed the indoor fire-fighting water supply pipelines with the following:

a) Inside working house excluded the definitions in clause 1.6 of this standard.

b) Inside domestic house from the four floor and higher, school from the third floor and higher.

c) Inside the executive organ from the six floor and higher, school from the third floor and higher.

d) Inside railway-station, storage, another public areas, industrial construction supporter with building volume from 5000 m^3 and larger.

e) Inside theaters, cinemas, meeting halls, clubs has the seat number bigger than 300.

***NOTE 1:** If in the case of (b), (c) with different floors, should be designed the fire-fighting water supply pipeline for the part which specified in above.*

***NOTE 2:** In the working house have fire resistant level I and II, D and E produces, so the fire-fighting water supply network only placed in the part of house where stored combustible material.*

***NOTE 3:** In the special case, not carry out the definition in the clause 1.5 so must have the agreement of Fire Department – Home Office.*

1.6 Do not design the internal water supply network with the following:

a) Inside public bath, laundry house.

b) Inside working house where stores or maintains substances when touch water will fire and propagation.

c) Inside working house have fire resistant level I and II, accessories made from incombustible materials, where handling, transport, maintain semi-finished product and product are incombustibles.

d) Inside working house level E and D, has fire resistant level III, IV, V with volume not over 1000 m^3.

e) Inside incombustible store house with incombustible cargo.

f) Inside pump house or waste-water purification plant.

g) Inside working house and industrial enterprise supporter without working or household water supply pipelines and the external fire-fighting water supply from river, lake, pond or reservoir.

1.7 Install internal automatic fire-fighting equipment satisfy the technology requirement.

1.8 When design the internal fire-fighting water supply network, beside complying the definition in this standard, must also comply with the definition in the standard about “Fire prevention and protection for buildings and structures. TCVN 2622:1978”.

1.9 Pipeline, accessories, add-on, spare parts and material that install the internal water supply network, must comply with designed requirement of this standard and the current related technical condition standards.

2. Internal water supply network

2.1. In domestic house and public works, allow the water supply network designs:

a) Combination household fire-fighting water supply network.

b) Either household or fire-fighting water supply network.

Inside working house, allow the network designs:

- The household water supply network combine with the work and fire-fighting water supply network, or it combines with only the work water supply network.
- The fire-fighting water supply network combine with the household water supply network, or the work water supply network.

Distinct water supply networks.

2.2. The selection of the internal water supply network must be based on the economic technology substantiation, sanitary and fire protection requirements, combined with technology parameters of the external water supply network and the requirements on production technology.

2.3. Inside working house and industrial enterprise supporter, can design the circulation water supply network, the reuse network, the cold water supply systems, the distilled water system, water softener system ...

The determination of the design, must be based on the requirements of production technology and must comply with the regulations on the design of the building sector.

Need to design circulation and reuse water supply network.

2.4 For high domestic building, the administration building, hotel, nursing house, rest house, working house, support house, necessary to study the design of the partition water supply network.

The height of pressure water supply partitions is determined by calculating the static water pressure allow the highest in the fire tap, household taps or in the tap made in accordance with Clause 3.9 of this standard.

2.5 The water supply in each region can use pressure pumps, water pressure or compressed gas tanks and can take direct water from the external water supply network.

Water pressure of the external water supply network, must be used to water supply for the lower floor of the building.

3. Water use and free pressure water standard

3.1 The calculation standard on the biggest used water volume for keep feed in household, public house, working house and support house in accordance with the service house, the level of sanitary equipments, climatic conditions and another local conditions, according to Table 1.

NOTE *The standard of once used water or a sanitary equipment in the domestic house, public house, working house, support house defined in Annex 1 of this standard*.

3.2 A periodic water use parameters in accordance with the standard “Urban water supply, design standard”.

Water use place	**Unit**	**Daily water use standard about the maximum on 1/day**
1	*2*	*3*
Building with each flat has a shared tap of all daily living requirement.	1 person	From 80 to 100
Building has sanitary equipment: shower, washing tap, toilet in sift contained flat.	1 person	From 100 to 150
Building has sanitary equipment: Perfume shower, washing, toilet, shower special.	1 person	From 150 to 200
Building with each flat has bathroom, local water supply.	1 person	From 350 to 400
Hostel with each floor has toilet, urinal, bath – wash tap, kitchen.	1 person	From 75 to 100
Hostel with each room has toilet, urinal, bath – wash tap, kitchen.	1 person	From 100 to 120
Hotel – Level III	1 person	From 100 to 120
- Level II	1 person	From 150 to 200
-Level I	1 person	From 200 to 250
- Special level	1 person	From 250 to 300
Hospital, nursing house, rest house (with public bath and shower)	1 bed	From 250 to 300
Nursing , rest house with bath in all rooms	1 bed	From 300 to 400
Clinics, polyclinics	1 patients	15
Public bathrooms have shower	1 person	From 125 to 150
Hand washing house	1 kg laundry	40
Machine washing house	1 kg laundry	From 60 to 90
Food companies, food outlets		
a) Food spot	1 dish	12
b) Food to take home	1 dish	10
Collective kitchen	1 person / 1 meal	From 18 to 25
Daily swimming pool		
a) Additional flooding	% volume of pool	10

Water use place	Unit	Daily water use standard about the maximum on 1/day
b) Athletes (including shower)	1 person	50
c) Audience	1 seat	3
Kindergarten		
a) Day	1 kid	75
b) Night	1 kid	100
Administrative offices	1 person	From 10 to 15
Cinemas	1 seat	From 3 to 5
Clubs	1 seat or 1 person	10
Theater		
a) Audience	1 seat	10
b) Actors	1 person	40
School, High School	1 person	From 15 to 20
Stadium, sports stadium		
a) Athletes (including shower)	1 person	50
b) Audience	1 seat	3
Water		
a) Water for sport stadium, playing park, building for outdoor sports, greens, roads inside the stadium area	1 m^2	1.5
b) water grass football ground	1 m^2	3
services of public buildings	1 person /1 shift	25

NOTE:

1. For domestic building, daily used water get in public tap of street, primary zone, so the average standard of water for a person from 40 to 60 l / day.

2. The standard of water for a bed in hospital, nursing house, rest house and some places in residential colleges, include amount of water in the kitchen, laundry.

3. The standard of water for 1 person in administrative offices include amount of water for customers and kitchen.

4. The standard of water for machines in machine washing house, food companies, food outlets, and other restaurants in accordance with engineering design projects.

5. Water cooling plant of refrigeration system and condition air standards accorded with above and calculated separately.

6. When take directly hot water from heat supply network, as well as local boiler station, then

calculating pipelines, cold water flow must be calculated with coefficient 0.7.

7. The standard of street water in table 1, it's daily water depend on climate conditions.

8. Water flow of the technological equipment of the treatment is not mentioned in table 1, shall be taken in accordance with technology design.

3.3 The standard of water and unregulated coefficient for eating and working in the working house in accordance with table 1 and TCXD "Urban water supply. Design standard."

3.4 The standard of water to indoor car washing in accordance with:

a) 1 small vehicle. From 200 to 300 liter.

b) 1 big vehicle. From 300 to 500 liter.

NOTE :

1) For vehicles on roads, apply this standard for cars.

2) Continuous cleaning time is 10 minutes / vehicle.

3) Water standards with the case on hand washing soft tube.

3.5 Water flow in a second of sanitary equipment, pipe diameters and equivalents are given in Table 2.

Table 2

Sanitary equipment	Equivalent	Water flow (l/s)	Diameter (mm)
1	2	3	4
– Tap of pot waste water	1	0.2	From 10 to 15
– Tap of washbasin	0.33	0.07	From 10 to 15
– Tap of standing urinal	0.17	0.035	From 10 to 15
– 1 meter of washing urinal pipe	0.3	0.06	From 10 to 15
– Waste cock of toilet	From 6 to 7	From 1.2 to 1.4	From 25 to 32
– Waste cock of toilet	0.5	0.1	From 10 to 15
– Blender of public hot bath	1.5	0.3	15
– Blender of electronic bath	1	0.2	15
– 1 tap of washing pot	1	0.2	15
– Ladies toilet (bides and cock)	0.35	0.07	From 10 to 15
– 1 shower in sanitary equipments	1	0.2	15
– 1 shower in flat	0.67	0.14	15
– 1 shower in pool	1	0.2	15
– 1 hot tap	0.17	0.035	From 10 to 15
– 1 tap of waste water pot of labs.	0.5	0.1	From 10 to 15
– 1 tap of washing pot in room	1	0.2	15
– 1 tap for water	From 1.5 to 2.5	From 0.3 to 0.5	From 20 to 25

NOTE *If not have water tap, spare parts and galvanized steel pipe with a diameter D = 10mm, it is permitted to use pipe diameter D = 15 mm.*

3.6 The standard of water used for production requirement (technological lines, cooling, cleaning equipment and floor wash water ...) and the unregulated coefficient must be accorded with production technology requirements and building design own up to the industry.

3.7 The standard of fire-fighting water and the number of fire hydrant standpipe take in table 3.

Table 3

Type	Fire hydrant standpipe	Volume
1	2	3
State administration from 6 to 12 floor with the volume is 25.000m^3	1	2.5
Family houses from 4 floor and higher, hotel and dormitory, the public from 5 floor and higher with the volume is 25.000m^3	1	2.5
Hospitals, prevention agencies, nurseries and kindergartens, trade shops, railway stations, the support of industrial projects have the volume from 25.000m^3 to 5000m^3	1	2.5
Rooms under the stands of the stadium with volume of 5000 m^3 to 25,000 m^3 and the volume of space sports to 25,000 m^3	1	2.5
Nursing house, holiday house, museums, libraries, agencies can design volume of 7,500 m^3 to 25,000 m^3, exhibitors display area under 500m^2	1	2.5
Hall, the audience space is installed with fixed films equipments can accommodate from 300 to 800 seats	1	2.5
Building from 12 to 16 floors	2	2.5
State administration from 6 to 12 floor with the volume over 25,000 m3	2	2.5
The hotel, dormitory, nursing house, rest house, hospitals, exhibition, various shops, railway stations, schools, with the volume larger than 25,000m^3	2	2.5
Industrial construction supporter with the volume larger than 25.000m^3	2	2.5
Rooms under the stands of the stadium and sport apartment with the volume larger than 25.000m^3 and the hall has a flow of 800 seats or more.	2	2.5
Theatre, cinema state, clubs, cultural houses, circus, concert hall can seat over 800, scientific research institutes	2	2.5

Working house exclude the specified in clause 1.6	2	2.5
The warehouse has the volume is 5000m^3 or more with inflammable material or combustible materials stored in flammable packaging cover.	2	2.5

NOTE *When calculate to use fire-fighting equipment with following:*

1) If tornado canvas tube with 125m length and 66mm diameter, and nozzles of this pipe is 19mm so water flow is 5 l / s.

2) In the civil area or train substation, in special cases, the most disadvantageous position by water pressure can be down to 7m.

3.8 Free water pressure necessary of taps and sanitary equipments at least 1 m; discharge cock of toilet without basin at least 3 m; drinking water boiler and shower network at least 4 m.

3.9 Working water pressure of sanitary equipment in the household water supply network must not be larger than 60m. Where the pressure in the pipeline is too large, they must be designed the network partition.

3.10 Frequent pressure of fire board inside the house, to ensure full specialties spray water column with the height necessary specified in Table 4.

Table 4.

Properties of house and construction	**Necessary height of dense spray water column**
Public house, support house with fire resistant level I, II.	6
Domestic house, Public house, support house, working house with inflammable material.	Height may be necessary to spray up to a highest point and farthest of the house but not less than 6m.
NOTE: *1) When calculated water pressure in hexagonal head, must calculate pressure loss in tornado canvas pipeline 10 or 20 m length, hexagonal head's diameter is 13, 16, 19, 22 mm.* *2) For water flow is 2.5 l/s, tornado canvas pipeline has 50 mm diameter, and hexagonal head's diameter at least 13 mm. For water flow is 5 l/s, must use the tornado canvas pipeline with 65 mm diameter, and hexagonal head's diameter at least 16 mm.* 3) *For the building with external water pressure not enough for internal fire-fighting to water supply, so install pumps that increase pressure and have telex control system, install near fire standpipe.*	

3.11 Pressure in working equipment in accordance with characteristics of this device technology.

4. Internal water supply network and accessories

4.1 Internal household water supply network, fire-fighting water supply network, household combine fire-fighting water supply network and working water supply network which have the quality of potable water; should use galvanized steel pipe with 70 mm diameter, no galvanized steel pipe with a diameter bigger than 70 mm.

NOTE:

1) Separate household water supply pipe can use plastic.

2) Pipeline on separate fire-fighting water supply network, allows use ungalvanized steel pipe, but does not allow plastic pipe for internal fire-fighting water supply.

4.2 Working water supply network not has the quality of potable water, but has special requirements such as softening water, distilled water ... could use plastic pipe, galvanized steel pipe, steel pipe, glass pipe, plastic lined steel pipe.

The selected pipeline depend on the requirements on water quality, temperature, pressure and metal required savings.

4.3 Water pipelines should used in the following:

a) cast iron pipe, the pipe diameter larger than 50mm.

b) galvanized steel pipe, the diameter of 50 mm or less.

NOTE

– *Allows use of plastic pipe in the building where not have internal fire-fighting water supply network and the pipeline diameter smaller than 50 mm.*

– *Outside surface of the metal pipe should have a protection layer to against rust, corrosion.*

4.4 Connected pipeline by welded, screwed or flanged.

4.5 The internal water supply network must design:

– Acyclic network, if not for continuous water supply;

– Loop or connected around the water pipes network when needed to ensure continuous water supply, then the loop network must be connected with a outside loop network with at least two pipes into the house;

4.6 Design at least two pipes into the house in the following cases:

a) More than 12 fire standpipes inside house;

b) There are automatic fire-fighting equipment;

c) Building have more than 16 floor.

4.7 Where the arrangement two pipelines and more into the house, so many networks are connected to external water supply house. The space is between the external pipelines network with internal network should be arranged a shut-off valve to ensure continuous water supply while the part pipe is one of the network is damaged.

4.8 When install two pipes into the house if necessary to install the tank with pump to increase pressure in these pipelines, the pipelines must be connected to a one-way valve pump.

Where each pipe go into a tank with separate pump does not need to connect the pipes together.

4.9 When the internal water supply network take water from the indoor water pressure tank; and when the pipes connected to the distribution network from this water pressure tanks as well as two pipes must be installed one-way valve.

4.10 The spare parts and equipment on the pipelines have installed in the place where more easy to check and repair.

4.11 The smallest distance as the horizontal surface of the pipelines into the house to the other pipelines that buried underground in accordance with definition in Table 5.

4.12 Internal underground water supply pipelines that with crossed drainage pipelines, so installed over the drainage pipelines. The distance between the outside surface of the adjacent two pipelines together is not less than 0.01 m.

Table 5

Pipe diameter (mm)	Smallest distance between the water pipes of the house (m) with		
	Drainage pipeline	Heat pipeline	Average pressure steam pipeline
Smaller than 200	1.5	1.5	1.5
Bigger than 200	3	1.5	1.5

4.13 Anywhere the water pipe of the house connecting the water supply of the city, residential areas or enterprise, must to design water valve wells. When diameter of water pipes of the house from 40 mm or less so install block valve and allow to not need build the valve well.

4.14 When the water pipe of the house made of cast iron and the outside pressure of pipeline greater than 50 m, so at the watershed of the water pipes of the house, must be installed a pillow tube.

4.15 Places where water pipes of the house through into the basement's wall or foundation wall must be placed in the available hole:

a) Where is dry land, the distance from the top pipe to the top hole is 0.15 m and the inside hole must be loaded with a waterproof material (oil soaked jute cord).

b) Where wet soil or more groundwater, the pipeline through the wall that must weld to prevent water or placed in cage made of steel or cast iron and also have other method to prevent water. Size of hole depends on the diameter of the pipeline through the wall.

4.16 In domestic house and public house, the internal distribution water supply network is installed in the basement, technical floor, underground grooves with hot water pipelines, steam supply box. If the building without basement, the internal distribution water supply network is allowed to install direct bellow ground with anti-rust pain pipes.

NOTE

1) If the water supply pipes with other pipes placed in the underground channel, so the steam, hot water pipes must be placed higher than cold water pipes.

2) Don't placed the main fire-fighting water supply pipeline along to metal columns.

3) Don't placed the water supply pipeline in the ventilation pipe, ventilation, smoke flue.

4.17 The main pipeline, branch pipelines, water distributor pipelines to the sanitary equipment are install slope from 0.002 to 0.005 on the stand-pipe or water points. At the lowest point of pipeline must be installed the discharge device.

4.18 Stand pipeline and branch of the internal water supply network should to place with other pipes inside panels, block, technical washing cabin in manufacturing plants. This type of structure must be able to replace and repair the pipeline.

Allow to stand pipe, branch pipes of the internal water supply network installed over the bulkhead plate in the toilet, washing and kitchen without the special arrange requirements.

4.19 In the room with furniture special arrange requirement so the water supply pipe shall be placed underground in channel walls, in boxes. Outside surface of the channel, box should plastered brick cover. The valves located in underground channels, the box must contain detected doors for ease of inspection and repair management. Door hole lid made of tole which have the same color as the wall.

4.20 The main pipe, branch pipe in working house have to install over... placed under frames, trusses, columns, walls and the ceiling. Where it can not install over, so allow install the water supply pipeline in the channel with the other pipelines, exclude the gases, flammable liquids or poisons pipelines.

4.21 Only allowed to install together household water supply pipelines with waste water pipeline in the dry channel.

Allow the water supply pipeline is installed in separate channel in the special cases and have a legitimate reason.

The water supply pipeline to the technical equipment stay away from the column wall may be install on or under floor.

4.22 Water supply pipelines in the concrete blocks channel, panels, toilets when install together with heat supply pipelines as well as placed in the room with high humidity, necessary to take measures to isolate the moisture.

4.23 The internal fire standpipes must be arranged next to the entrance, on landing joist, lobby, corridors and visible areas, easy to use.

4.24 Center of fire standpipes must be arranged at an elevation of 1,25 from the floor. Each fire standpipe must have a tornado 30 m length with full connector and a hexagonal water head is placed in the separate cabinets.

NOTE

1) Fire-fighting cabinet can be placed inside the wall, hanging on the wall or column but not affect the travel way and other activities in the house.

2) In the same house, forbidden to use various types of tornado pipe and hexagonal water head has many types or different diameters.

4.25 On the water supply pipelines of the house, should install the outside public water tap for monad high buildings. Pipe's diameter is 20mm or 25mm.

NOTE: *For the public water tap needs place after the water meter.*

4.26 The lock valve of the internal water supply network must be located in the following places:

a) On the water pipelines of the house;

b) On the closed ring branching network to ensure each part of pipeline can be repaired (no more than half) and the ring network of the working water supply as calculated to ensure water supply to the continuous operate devices from both sides;

c) On the bottom of the standing water supply pipeline with 5 fire standpipes or more, and in each of the fire-fighting;

d) On the bottom of the internal standing household or working water supply pipelines with the house have 3 floor or higher;

e) In the each branch pipeline have 5 or more taps;

f) In the each branch into each apartment, in the branch water pipelines to exhaust cock on the branch water pipe to showers and washing tubs;

g) Before public faucets, outside water taps;

h) Before the special equipment (production testing and treatment ...) in the necessity case;

i) On the ring household and fire-fighting water supply network, so 5 fire standpipes have 1 loc valve for 1 floor;

NOTE

1) When the standing pipeline closes ring with the vertical, lock valve must be located in the top or bottom of this stand pipe.

2) On the ring pipeline inside the house only allowed to place the water equipment in two directions.

3) Lock valves on water supply pipelines placed through the restaurant, public dining room and other room built in combine with house where can't detect at night, should be arranged outside the construction.

4.26 Pipe fittings, faucets, mixing faucets of household, fire-fighting water supply network must be charged with working pressure 60m. Fittings installed in the working water supply network have working pressures specified by the technological requirements.

4.27 Areas in the city's water supply network with residual pressure, in the many high building, to reduce a water pressure and avoid wasting water on water pipelines into or on the branch water pipelines to water point, on each floors need to install the following devices:

a) When flow is constant, set washer (hole barrier);

b) When flow is inconstant, set pressure adjustment equipment;

4.28 When designing the internal water supply network require noise and vibration immunity measures for pipeline and equipment with fittings.

5. Water meter

5.1. To measure water flow, on the water pipeline into the building, into each apartment, on the branch pipeline of the public water supply pipeline network or on the water supply pipeline to the other consumption place, need set a water meter

5.2. The selection of water meter (model propellers and turbines) to install the water pipeline into the working house should be based on the largest daily flow on selected according to Table 6.

Water meter installed on the water pipeline into the working house should be checked with the largest hourly flow.

NOTE *Where the water supply for automatic fire-fighting equipment as well as separate fire-fighting water supply network get water directly from water pipelines (not through the water meter).*

Table 6

Type	Size	Nominal flow	Safe Flow	
			Maximum flow/day (m^3/day)	Low limit (m^3/h)
Propeller	15	1	6	0.04
	20	1.6	10	0.06
	25	2.5	14	0.08
	32	4	20	0.105
	40	6.3	40	0.170
	50	10	60	0.220
Turbine	50	15	140	3
	80	45	500	6
	100	75	880	8
	150	160	2000	10
	200	165	3400	18
	250	410	5200	50

NOTE *If water has temperature higher than 30^oC ,should used a special meter.*

5.3. Pressure loss in propellers and turbine water meter, determined by the following formula:

$$h = S.q^2$$

Where :

h – pressure loss (m)

q – estimated flow (l/s)

S – resistance of meter as Table 7.

Table 7

Diameter (mm)	15	20	32	40	50	80	100	150	200
Resistance (m)	14.4	5.1	1.3	0.32	0.265	0.00207	0.00675	0.00013	0.0000453

NOTE *The pressure loss when water flow of household and working through propellers meter must not exceed 2.5 m, through turbine meter does not exceed 1 m and when a fire is 5 m and 2,5m respectively.*

5.4. Water meter must be installed in the outside cover wall of the house, where water pipeline into the house at the place where the easiest to check and repair.

NOTE

1) Do not install a meter in the bedroom.

2) Water meter must be placed on the water supply pipelines into the house, with a diameter equal to or less than a water supply pipe's diameter size 1.

3) Where no water meter can be install as above, allow to install outside but must be placed in separate holes with a lid.

5.5. When a single water pipe connected to the household and fire-fighting internal water supply network so set pipeline bypass to the front of the meter.

Water flow through meter and circle pipeline must be equal to the total largest household and fire-fighting water flow in the house.

NOTE *The cycle pipeline, must have a valve with lead sealing pliers from the local water supply management . Only open this valve when burning. Placement water meter must be easy to handle and have symbols or signs.*

5.6. Propeller meters must be placed horizontally; turbine meter can be placed oblique, horizontal or vertical direction when the water flow from bottom to top. Each side of the water meter must set a valve. Between the water meter and the second valve (the way water flows) set the discharge cock. Where the turbine water meter after valves set should be connected to 1 straight pipe have the length as 5 times diameter of water supply pipes.

6. Calculate the water supply network

6.1 Hydraulic calculation of the internal water supply network with the largest flow in one second.

6.2 Household and fire-fighting water supply networks used to fire fighting, must ensure the water flow for fire-fighting when the flow of household and working water is the largest in day.

NOTE *When determining the flow on second for the flow of fire-fighting in the working house and the support house without the water flow to shower, wash floors and watering.*

6.3 Household, working and fire-fighting water supply networks must be calculated to ensure the necessary pressure of the sanitary tools, equipment, fire hydrant placed the highest, the furthest thing from water pipeline into the house.

6.4 Diameter of the internal water supply pipe is calculated with the possibility of the maximum usable pressure on the external water supply pipe.

6.5 Speed of water flowing in the internal water supply steel pipeline does not exceed the following values:

- In the main and standing pipe: from 1,5 to 2 m / s;
- branch pipeline connected to the sanitary equipment 2.5 m / s;

Where water used to work requirements, the speed of water in the main and standing pipelines not exceed 1,2 m / s;

Where automatic fire fighting equipment not exceed 10 m / s;

6.6 When the total amount of the sanitary equipment from 20 or smaller, a diameter of the water supply pipeline allows to get in the Table 8.

Table 8.

Total amount of the sanitary equipment	1	3	6	12	30
Pipeline (mm)	10	15	20	25	32

6.7 Water flow in a second calculation for housing is determined by the following formula:

$$q = 0.2\sqrt{N + KN}$$

Where:

q – water flow in a second;

a – Value depends on the standard of using water for 1 person on 1 day from the Table 9.1;

K – Value depends on the amount taken in Table 10;

N – Total amount of the sanitary equipment in the house or calculated area (the section pipeline);

NOTE

1) Calculate water flow in the house determined by the formula (2) with the equivalent number of sanitary equipment to 5,000.

2) Water flow in the house determined in Annex II of this standard.

3) Water flow in the external water supply network install in subzone or street take as the current water supply standard.

4) Total equivalent of sanitary equipment see table 10.

Table 9

Standard using water for 1 person/day	100	125	150	200	250	300	350	400
Value a	2.2	2.16	2.15	2.14	2.05	2.00	1.90	1.85

Table 10

Equivalent	Upto 300	From 301 to 500	From 501 to 800	From 801 to 1200	Bigger than 1200
Value K	0.002	0.003	0.004	0.005	0.006

NOTE *The house supplies hot water with calculated concentration water flow (l / s) of hot and water supply network determined by the formula (2) multiplied by the coefficient 0.7.*

6.8 Where a group of domestic house include the public construction so the calculated water flow in a second should be determined in accordance with Clause 6.9 and 6.10 of this standard.

6.9 Calculate water flow in a second for the administrative office, motel, hotel, dormitory, dorm, kindergartens, schools, educational institutions, hospitals, public bathrooms, children's camp, determined by the following formula:

(3) $$q = \alpha 0.2\sqrt{N}$$

Where:

q – calculated flow (l/s);

N – total equivalent of the sanitary equipment in the house or the calculated pipeline;

α - accessories function coefficient of each type take in Table 11;

Table 11

Coefficient	**House Types**					
	Public bathroom, kindergarten	**Hospital, polytechnical department**	**administrative office, shop, design institute**	**School, and educational offices**	**Hospital, nursing, rest house, children camp**	**Hostel, motel, hotel, tenement**
α	12	1.4	1.5	1.8	2.0	2.5

NOTE

1) Water flow in a second for daily living requirement described in clause 6.9, determined in accordance with Annex 3.

$$q = \Sigma q_0.na'$$

2) Water flow in a public bathroom is determined by the following formula:

Where:

q – calculated water flow (l/s);

n – Number of the same type sanitary equipment;

a' – coefficient of simultaneous operation for sanitary equipment:

- *For bath: 50%;*
- *Shower: 100%;*
- *Low shower: 100%;*
- *Washing pot: 3%.*

q – water flow of the same sanitary equipment.

6.10 Water flow in a second for the daily living requirement in working house and relax rooms of industrial plants, defense, space, audience, work and sport, eating in public enterprises, identify by the formula:

$$q = \Sigma\, q_0 .n.\, a'$$

where:

q – calculated water flow (l/s);

q_0 – water flow of the same sanitary equipment (l/s);

n – number of the same sanitary equipment;

p – Coefficient simultaneous operation of sanitary equipment from table 12 and table 13.

6.11 Coefficient simultaneous operation of sanitary equipment in the working house and living rooms of industrial plants depend on the amount of sanitary tools from the table 12.

6.12 Coefficient simultaneous operation of the sanitary equipment in the room, space fans, the sport construction, public dining enterprises in accordance with Table 13.

6.13 Water flow in a second for working requirement must be determined by the technology of design include water consumption.

NOTE When design manufacturing enterprise have high productivity, if the economic – technique reason in accordance with the requirements of technology, allowing safe flow multiply coefficients from 1.1 to 1.2

Table 12

Type	Number sanitary equipment								
	1	3	6	10	20	40	60	100	120
– Washing basin	1	1	1	1	1	1	1	1	1
– Cycle washing basin with sprinkler	1	1	1	1	1	1	1	1	1
– Shower	1	1	1	1	1	1	1	1	1
– Bowel urinal with automatic waste water	1	0.7	0.5	0.4	0.34	0.3	0.3	0.25	0.25
– Hanging bowel urinal	1	0.3	0.25	0.2	0.15	0.1	0.1	0.1	0.005
– Toilet with discharge cock	1	0.75	0.65	0.6	0.5	0.45	0.4	0.4	0.4
– Toilet with bowel waste preventer									

NOTE

1) When determining the water flow in a second excluding water flow on tap or fountain drinks bide.

2) Coefficient simultaneous operation of washing basin and other equipment not included in this table based on data in the technology of design.

3) An automatic wash bowel used to discharge for 3 to 4 small bowls.

6.14 Pressure loss due to friction inside the water steel pipe made of steel or cast iron, determined by hydraulic and spreadsheet formulas below:

$$i : A.q^2$$

Where

i – Pressure loss due to friction inside the pipe on 1 m;

A - resistance unit depends on the water supply pipe's diameter;

q – Calculated water flow (l/s)

Table 13

Sanitary equipment	Coefficient simultaneous operation		
	Cinema, hill, club, sport building	Theater, circus	Public food shop
– Washing basin	0.8	0.6	0.8
– Bowel waste preventer	0.7	0.5	0.6
– Hanging bowel urinal	1.0	0.8	0.5
– Shower	1.0	1.0	1.0
– Washing pot in canteen	1.0	1.0	
– Washing machine	-	-	-

6.15 Resistance unit A for steel pipes from Table 14 when the water speed inside the pipe is 1,2 m / s, and larger. But when speed is under 1,2 m/s, value A must be multiplied by a coefficient K. Coefficient K from Table 15.

Table 14

Diameter	A	Diameter	A
1	2	3	4
a) Flow by l/s			
10	32,95	50	0,001108
15	8,809	70	0,002993
20	1,643	80	0,001168
25	0,4367	100	0,000267
32	0,09386	125	0,00008623
40	0,04453	150	0,00003395
b) Flow by m^3/s			
175	18,96	300	0,9392
200	9,273	325	0,6088
225	4,822	350	0,4078
250	2,583	400	0,2062

Table 15

Speed (m/s)	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
K	1.41	1.28	1.2	1.15	1.115	1.085	1.06	1.04	1.035	1.015	1.0

6.16 When calculating the internal water supply network should calculated local pressure loss as percentage frictional pressure loss on pipe length:

- Household water supply network for domestic house and public building: 30%;
- Household combine fire-fighting water supply network for domestic house and public building, working water supply network: 20%;
- Working combine fire-fighting water supply network 15%;
- Fire-fighting water supply network: 10%;

6.17 Where the water supply network connected with many water pipelines, the calculations will include close one of them. Where there are two water pipelines, each pipe must be calculated with l00% water flow for fire fighting, if more than two pipes, each pipe must be calculated with 50% of water flow.

NOTE *The percentage ratio calculated on the amount of water for working requirements when closed one of the pipes based on the technical economic feasibility.*

6.18 Pressure of the water column depends on the diameter of hexagonal water spray head and operational radius of dense water column from Table 16.

NOTE:

1 Operational radius of the dense water spray column to obtain the height of the room from floor to roof or ceiling.

2 Where houses have more complex shapes, the height of the room, from floor to roof or ceiling is the highest.

3 Pressure in the fire standpipes were calculated for tornado canvas water pipes.

6.19 Pressure loss in tornado canvas pipes determined by the following formula:

$$H = K_p .q^2. l$$

Where

H – pressure loss in tornado canvas pipe (m);

q – Flow of fire-fighting water column (l/s);

K_p – Resistant coefficient of tornado canvas pipe;

l – The length of tornado canvas pipe (m);

Value of K take as:

Tornado canvas pipe's diameter 50mm – 0.012;

Tornado canvas pipe's diameter 66mm – 0.00385;

Table 16

The height of water sprayed along the height of the room	Diameter of the nozzle											
	13			16			19			22		
	Flow of a fire-fighting water column (l/s)	Pressure of nozzle (m) in case of long fire hose (m)		Flow of a fire-fighting water column (l/s)	Pressure of nozzle (m) in case of long fire hose (m)		Flow of a fire-fighting water column (l/s)	Pressure of nozzle (m) in case of long fire hose (m)		Flow of a fire-fighting water column (l/s)	Pressure of nozzle (m) in case of long fire hose (m)	
		10	20		10	20		10	20		10	20
1	2	3	4	5	6	7	8	9	10	11	12	13
a) Fire-fighting pipe d = 50 mm												
6	-	-	-	2.6	9.2	10.0	3.4	8.8	10.4	-	-	-
8	-	-	-	2.9	12.0	13.0	4.1	12.9	14.8	-	-	-
10	-	-	-	3.3	15.1	16.4	4.6	16.0	18.5	-	-	-
12	2.6	20.2	21.0	3.7	19.2	21.0	5.2	20.6	24.0	-	-	-
14	2.8	23.6	24.5	4.2	24.8	26.3	5.7	24.5	28.5	-	-	-
16	3.2	31.6	32.8	4.6	29.3	31.8	-	-	-	-	-	-
18	3.6	39.0	40.6	5.1	36.0	40.0	-	-	-	-	-	-
20	4.0	47.7	49.7	5.6	44.0	48.0	-	-	-	-	-	-
b) Fire-fighting pipe d = 66 mm												
6	-	-	-	2.6	8.8	9.0	3.4	7.8	8.3	4.5	7.8	8.6
8	-	-	-	2.9	11.0	11.4	4.1	11.4	12.4	5.4	11.3	12.4
10	-	-	-	3.3	14.0	14.4	4.6	14.3	15.2	6.1	14.4	15.8
12	2.6	19.8	20.2	3.7	16.0	18.6	5.2	18.2	19.9	6.8	18.0	19.8
14	2.8	23.0	23.3	4.2	23.0	23.5	5.7	21.8	23.0	7.4	21.4	32.5
16	3.2	31.0	31.5	4.6	27.6	28.4	6.3	26.6	28.0	8.3	27.0	29.7
18	3.6	38.0	38.5	5.1	33.8	34.6	7.0	32.9	34.8	9.0	32.7	34.8
20	4.0	46.4	47.0	5.6	41.2	42.4	7.5	37.2	39.7	8.7	36.7	40.6

NOTE *Pressure of fire-fighting pipe calculated with resistant inside tornado canvas pipe*

6.20 Hydraulic calculations for automatic fire-fighting equipments in accordance with recommendations for design of these equipments.

7. Water pump

7.1. In case the external water supply regularly or occasionally is insufficient of pressure needed to push water reach to the floors of the building, a booster pumping station shall be provided.

Note: *It is prohibited to connect directly an water pump to the pipeline. The pump shall take water up to the floors through a conditioning water container.*

7.2. Type and working mode of the pump must be determined based on comparing the economic and technical plans:

- Continuous pump;
- Occasionally operated pump;
- Firefighting water pump (only works in case of fire);

7.3. The pumps that supplying water for household consumption and fire-fighting are allow to be placed in an individual station or in other buildings, but the place shall be separated by fire-resistant wall and provided with an exit.

Note: *Pumping station located separately shall be made of material with fire-resistance class III.*

7.4. Pumps placed directly below apartments, rooms of the kindergarten, classes of school, hospital's treatment rooms, administrative office, the university lecture rooms and other similar rooms are not allowable.

7.5. Pump used in production site shall be located in the places that directly use water for production. In this case, the place where the pump is located shall be designed with closure.

7.6. The pump supplying water for a group of buildings shall be put in an individual station as well as a large-sized pump is needed to be designed in accordance with requirements of design standard for a construction network.

7.7. Capacity of an water pump used for supplying water for household, production using a container shall be determined according to largest time flow. As for the pump without an water container, the capacitor of the pump shall be determined by second flow.

7.8. The pump can be operated by hand, by a remote control or an automatic control device. In case of a remote-controlled firefighting water pump, control button shall be located closely to firefighting nozzle where the pressure of external pipeline is not enough to extinguish a fire.

7.9. It is permitted to locate a firefighting pump only without a spare pump in the following cases:

a) Outbuilding of the warehouse do not have automatic fire fighting equipments but have a firefighting water column.

b) In factories classes D and E having refractory grades of I, II or when the external water flow for firefighting is not exceed 201/s.

7.10. Pump of water supply system used for in-house firefighting with classification of water supplying zone, special works, cinemas, clubs and cultural houses, meeting rooms, halls and works are equipped with automatic firefighting system, not only shall be automatically controlled or remote controlled but also controlled by hand.

NOTE: *When the pump is automatically operated, at the same time signals (light and sound) shall be indicated to the fire picket room or working places..*

7:11. Pumps with compressed air tanks must be designed as automatic controlled type.

7:12. Make sure the pump is perfectly operating, according to the following requirements:

a) Automatically operate the pump.

b) Automatically operate the spare pump if the working pump does not work due to technical mistake.

c.) Automatically operate the fire-fighting pump.

7:13. Water pump shaft need to be put lower than the lowest level of water source. In case the pump is put higher than lowest level of water source, it shall be provided with an water enticement device.

7:14. When the pump draws water from a container which has two pumps or more, the amount of drawing pipe shall be two at least. Each drawing pipe shall ensure to draw a maximum amount of water needed for fire fighting.

NOTE: *When there is not a spare pump, it is permitted to put one drawing pipe.*

7:15. It should be provided with an one-way valve and pressure meter on pushing pipe and a valve on the drawing pipe of each pump.

7:16. For pumps (used for firefighting, household water supplying and production) which are not allowed to stop water supply, it ensure that the pumps shall be continuously supplied with power by connecting with two independent power sources. If only one power source supplied, allowing to have a spare pump that run by internal combustion engines.

7:17. Pumps and electric motors must be on the same axis.

7:18. Pump must be placed on the pedestal higher than the basement floor of at least 0.2 m.

NOTE: *In each case, water pump for production can be put on a wooden frame or steel frame instead of a foundation.*

7:19. Minimum permissible distance between equipments installed in the pump room, shall be as the following provisions:

a) From the side of the foundation where the pump is put on and an electric engine to the wall and the distances between foundations is 70 mm;

b) From the edge of pump base where having a drawing pipe to the wall of opposite house is 1000 mm; from the edge of pump base where having an electric engine to the side walls shall not less than the distance needed to draw the rotor of the electric engine that no need to remove the engine out of the base

NOTE:

1. Pump with pushing pipe's diameter of 100mm or more is permitted to be put along the walls and partition without a need of path between the pump and the wall, but not less than 200mm from the foundation to the basel.

2. It is permitted to put two pumps on the same foundation without the need of arranging a path between two pumps, but a path of not less than 700mm shall be provided around the foundation.

7.20. The height of the pump room with lifting equipment required to ensure clearance from the bottom to the top of the equipments shall not less than 500mm.

Clearance height of pumping station without lifting equipment shall be at least 2.2 m.

7.21. Water pump for supporting household water shall be designed soundproofing. It need to put have sound structure for the water pump housing and living in public housing. Pumps need to be put on a soundproof base such as a pad made of rubber or soft wood. Drawing and pushing pipe shall be provided with anti-shaking buffet of at least 1 meter long.

7.22. Internal water pipeline system which increase pressure by using pump having pneumatic water tanks shall be designed in accordance with technology line and meet the codes of practice of State inspection body.

8. Pressure water tanks and water containers

8.1 Pressure tank must ensure to hold a reserve volume of water for adjustment of inharmonic water regimes and supply water for fire fighting. Requires separate distribution pipes to ensure the integrity of the fire and no water to use for other purposes.

NOTE

l. In case, each apartment of a high building have a separate reserve water, it does not need to put a generic pressure water tanks on the roof.

2. In any case, the volume of water pressure tanks shall not exceed 20 to 25m^3. If exceeding the above, each tank serving for a certain water supplying area shall be divided into smaller ones.

8.2. Harmonic capacity of the pressure tank or compressed air tanks of water pumps for household and production shall be determined in accordance with the following formula:

$$W = \frac{Q_b}{4.h}$$

(8)

Where:

W - Harmonic capacity of the water tank (m^3);

Q_b- Rated capacity of a pump or pump having largest capacity in a group of pumps with switches are opened (m^3/h);

n - Number of times the pump most open in an hour. n is taken as the following:

- Pump in open tank: n = 2 to 4;

- Pump with compressed air tanks: n = 6 to l0;

Bigger value is used for the pump having capacity of more than and equal to 10 KW.

8.3. Pressure water tanks and water tanks with pressure pumps used for fire fighting must reserve an amount of water as follows:

a) For industrial works: water reserved for fire fighting in calculation with time for extinguish the fire using inside fire fighting nozzle and automatic injection equipment is 10 minutes of occurrence of fire.

b) For civil works, the water reserves to ensure fire-fighting water supply within a 10-minute period, while still ensuring water for most activities.

NOTE: In case of automatically controlled pump, water amount reserved for fire fighting can be reduced to an amount needed for extinguishing time as 5 minutes.

8.4. Full capacity of compressed air tank shall be determined as the formula below:

$$V_K = W\frac{\beta}{1-\alpha} \qquad (9)$$

Full capacity of pressure tanks with automatic fire fighting shall be determined as the formula below:

$$V_A = \beta\,(w + w_l) \qquad (10)$$

Where:

V_K - Full capacity of compressed air tank (m^3);

V_A - Full capacity of pressurized tank (m^3);

W - Harmonizing capacity of compressed air or pressurized tank (m^3);

W_l - Capacity of water for fire fighting in the tank (m^3);

α - The ratio between absolute minimum pressure and maximum pressure

α value is taken from 0.7 to 0.8;

β - Reserving coefficient taken from 1.2 to 1.3

8.5. The height at which open pressurized tank is located and the minimum pressure of compressed air tank shall ensure pressure necessary for all units using water. Also in fire fighting water supply system or combined system it need to ensure the necessary pressure in the nozzle inside until the reserved water is over.

8.6. Pressurized and compressed air tanks containing water are made of steel sheets and covered both internally and externally. Paint used inside the tank must ensure hygiene standards be approved by health agencies before the use.

NOTE: *Open pressurized tank need to be designed with reinforced concrete.*

8.7. Pressurized tank shall be equipped with:

a) An water pipeline to the tank: With a locking valve and adjusting floating valve. Upper edge of the pipeline shall be far from the underside of the lid a distance from 100 to 150mm.
b) A distribution tube: Connected to tank wall and have a locking valve put at a position of 50mm far from wall.

c) An overflow pipe: Put in the highest water level of the tank. The diameter of overflow receiving funnel put horizontally shall be four times larger than the pipeline connected to the funnel. The diameter of overflow pipe shall be equal to or larger than the water pipeline to the tank.
d) An exhausting pipe: is connected to the tank at the bottom, it shall be fixed with an locking valve before used in combination with overflow pipe.

e) Measuring scale or water level indicator is connected to the pumping station.
NOTE:

1. An water pipeline can be connected to the tank in combination with distribution pipe but in this case, an one-way valve and valve lock shall be put on the distribution pipe.
2. If there is no water level indicator, a tube for indication of water level shall be provided. Upper end of the tube shall be put lower than the lower end of the overflow pipe a distance of 5 cm and the lower end of the tube shall be connected to pump control board.

8.8. When the building arranged several pressurized tanks, each tank shall be provided sufficiently with the equipments cited in 8.7. If the tanks is intercommunicated, the pipe of the same type at the bottom of the tanks can be can be connected to the same branch pipeline.

8.9. Water tank for fire fighting shall be equipped with water level indicator and the indicator shall be connected to the fire-fighter room, staff room or pump room.
8:10. The distance between pressurized tanks and the distance between tank wall and structure of the building shall not less than the distance specified in Table 17

Table 17

Shape of pressurized tank	The distance between tank body and the wall		The distance between pressurized tanks	The distance from the top of pressurized tank to upper floor
	Without a float	With a float		
Circle	0.3	0.8	0.7	0.6
Rectangle	0.7	1.0	0.7	0.6

8:11. Harmonizing capacity of water tank for household and pressure for the construction site shall be determined as the following formula:

$$W_{BC} = \frac{1.5Qday}{n} \qquad (11)$$

Where:

W_{BC} – Harmonizing capacity for household water amount of the tank (m^3);

Q_{day} - Water volume needed in a day for the construction site (m^3);

N – the times of pump opening and closing by hand during the day;

8.12. Full capacity of water tank serving pressure increasing pump that provides water for the building shall be determined as the following formula:

$$V_{BC} = W_{BC} + W_l \qquad (12)$$

Where

V_{BC} - Full capacity of water tank (m^3);

W_l- Capacity of water for fire fighting in the tank (m^3);

NOTE: *The drawing pipe of the Must be arranged by syringe pumps that ensure fire-fighting water in the tank not be used for other needs such u activities and production.*

8:13. Tanks can be built with reinforced concrete or brick, the material used is defined according to the capacity of the tank, the geological situation of construction, local materials... Bottom of the tank must have slope of not less than 1% toward the water collection pit.

8:14. Water tanks can be designed as circular, rectangular ... located overground or underground, inside or outside the buildings.

Tanks must be provided with an water supplying pipe, drawing or distributing pipes, overflow pipe, discharging pipe, water level indicator, ventilating holes, a ladder and an entrance door.

8:15. Compressed air tank shall be provided with an water supplying pipe connected to a distribution pipe, a safety discharging pipe, a pressure meter water, equipments for pumping water and adjusting air in the tank.

The distance from the top of tank to ceiling shall not less than 0.6 m and the distance between the tanks and from tanks to the wall shall not less than 0.7 m.

9. Requirements for internal water supply system, constructed in soft soil

9.1. The pipeline inside the house shall be put higher than the surface of first floor or ground floor, it must be put open and at a place easy to access to check and control

9.2. The pipeline connected to internal water supply system which constructed on an anti-subsidized area is permitted to designed as connected to internal water supply system constructed on normal area.

9.3. Do not allow to put the pipeline at the bottom of the foundation but through the foundation wall.

9.4. Before placing pipe in the basement walls or ground walls, it needs to leave holes in that position. Minimum hole size is 300 x 300 mm. Location for putting pipeline from the top of pipe to the top of hole shall not less than 0.15 m.

9.5. It is unallowable to fix the pipeline in the foundation wall. After placing the pipeline, insert he holes tightly with oiled jute rope.

9.6. The pipeline shall be made of steel or plastic. Cast iron pipes with rubber covered joints are allow to rectify the distortions appear.

9.7. When designing the pipe network, water supply inside the building in an earthquake, besides complying with the provisions in this standard must also comply with other standards specified for construction works in earthquakes region.

Annex 1

Water amount specified for one hand wash or clean of sanitary ware

Sanitary ware	Unit	Specified water amount (liter)
1	2	3
1. Accomodation Bathtube of 1,200 mm long with shower bath Bathtube (with shower bath) of 1,500 to 1,550 mm long	One time	250

Sanitary ware	Unit	Specified water amount (liter)
1	2	3
Bathtube (with shower bath) of 1,650 to 1,700 mm long	One time	275
Bathtube with out shower bath		
Shower bath with deep bath tray	One time	300
Shower bath with hollow bath tray	One time	200
Washing basin in toilet	One time	230
Sprinkler	One time	From 100 to 120
Washing basin in kitchen	One time	From 3 to 5
Shower bath in an apartment	One time	From 6 to 8
2. Public buildings	One time	From 8 to 10
- Bathroom with bath tube	One time	From 40 to 60
- Bathroom shower bath		
- Floor cleansing fluid, vapor bathrooms and sterilizing room	One customer ‘’	500 400
- Hand washing basin in haircut room	$1m^3$	3 to 5
- Washing basin in chaning room and toilet		
- Washing basin in doctor’s room	One hour	10
- Washing basin in a shop	“	100
- Washing basin in a pharmacy		
- Washing basin in public toilet	“	From 300 to 400
- Septic tank in public toilet in station	“	120

Sanitary ware	Unit	Specified water amount (liter)
1	2	3
- Tap or washing basin in a restaurant, cafeteria, refreshment bar, confectionary shop, canteen	1 day “ “ “	60 600 1000 250
3. Production site and supporting places		
- Separated shower bath in working rooms	1 time	From 40 to 60
- Shower bath in bathroom	45 minutes	500

Annex 2

Household water flow 1/s depends on the number of equivalent unit of sanitary ware

Equivalent number	Water flow 1/s in case water consumption limit is 1/person/day/unit						
	100	125	150	200	250	300	400
	In case of unequal consumption coefficient (m)						
	2.2	2.16	2.15	2.14	2.05	2	1.85
1	2	3	4	5	6	7	8
2	0.28	0.28	0.28	0.28	0.28	0.28	0.29
3	0.34	0.34	0.34	0.34	0.34	0.35	0.37
4	0.37	0.39	0.39	0.39	0.40	0.41	0.44
5	0.41	0.43	0.43	0.43	0.43	0.46	0.49
6	0.46	0.47	0.48	0.48	0.49	0.50	0.54
7	0.50	0.50	0.50	0.50	0.53	0.54	0.59
8	0.53	0.54	0.55	0.55	0.57	0.59	0.63
9	0.56	0.57	0.58	0.58	0.60	0.62	0.67
10	0.57	0.60	0.61	0.63	0.64	0.65	0.71
12	0.64	0.66	0.66	0.66	0.70	0.71	0.78

Equivalent number	Water flow 1/s in case water consumption limit is 1/person/day/unit						
	100	125	150	200	250	300	400
	In case of unequal consumption coefficient (m)						
	2.2	2.16	2.15	2.14	2.05	2	1.85
14	0.70	0.72	0.73	0.74	0.77	0.78	0.86
16	0.74	0.75	0.76	0.76	0.81	0.83	0.92
18	0.78	0.80	0.81	0.81	0.86	0.89	0.99
20	0.82	0.84	0.85	0.85	0.90	0.93	1.04
25	0.91	0.93	0.94	0.95	1.01	1.05	1.18
30	1.00	1.02	1.02	1.04	1.11	1.15	1.32
35	1.06	1.11	1.12	1.12	1.12	1.25	1.36
40	1.15	1.19	1.19	1.20	1.19	1.43	1.38
45	1.22	1.25	1.27	1.28	1.37	1.43	1.64
50	1.28	1.32	1.33	1.34	1.44	1.52	1.75
60	1.50	1.46	1.46	1.47	1.58	1.67	1.96
70	1.50	1.57	1.58	1.60	1.73	1.81	2.12
80	1.61	1.68	1.70	1.71	1.86	1.95	2.24
90	1.70	1.79	1.79	1.81	1.98	2.07	2.43
100	1.82	1.88	1.91	1.92	2.10	2.20	2.62
120	2.0	2.06	2.09	2.12	2.30	2.43	2.88
140	2.21	2.29	2.30	2.32	2.51	2.65	3.17
160	2.33	2.43	2.44	2.48	2.70	2.85	3.42
180	2.47	2.56	2.58	2.62	2.84	3.00	3.64
200	2.63	2.74	2.76	2.78	3.04	3.23	3.89
220	2.77	2.86	2.90	2.94	3.22	3.41	4.08
240	2.91	3.02	3.06	3.06	3.38	3.58	4.34
260	3.03	3.14	3.18	3.20	3.52	3.75	4.52
280	3.15	3.28	3.33	3.34	3.70	3.91	4.47
300	3.26	3.40	3.43	3.46	3.83	4.07	4.93
320	3.74	3.87	3.90	3.92	4.30	4.54	5.46
340	3.87	3.99	4.02	4.06	4.46	4.71	5.67
360	3.99	4.12	4.14	4.20	4.58	4.88	5.88

Equivalent number	Water flow 1/s in case water consumption limit is 1/person/day/unit						
	100	125	150	200	250	300	400
	In case of unequal consumption coefficient (m)						
	2.2	2.16	2.15	2.14	2.05	2	1.85
380	4.12	4.28	4.32	4.32	4.72	5.04	6.07
400	4.25	4.42	4.44	4.48	4.94	5.20	6.40
430	4.63	4.77	4.80	4.88	5.31	5.59	6.73
500	4.93	5.06	5.06	5.16	5.51	5.17	7.14
550	5.73	5.92	5.94	6.02	6.32	6.89	8.25
600	6.08	6.26	6.30	6.34	6.90	7.30	8.68
650	6.46	6.60	6.67	6.70	7.30	7.70	9.22
700	6.76	7.00	7.03	7.06	7.70	8.09	9.69
750	7.07	7.33	7.36	7.40	8.08	8.48	10.10
800	7.40	7.63	7.71	7.80	8.36	8.86	10.56
850	8.58	8.81	8.87	8.96	9.63	10.08	11.85
900	8.93	9.19	9.22	9.30	9.99	10.50	12.28
950	9.25	9.55	9.63	9.65	10.34	10.91	12.86
1000	9.64	9.92	9.96	10.04	10.64	11.32	13.34
1100	10.20	10.46	10.68	10.78	11.56	12.14	14.83
1200	11.02	11.16	11.41	11.48	12.34	12.93	15.15
1300	13.00	13.32	13.40	13.46	14.36	15.01	17.38
1400	13.80	14.12	14.00	14.32	15.26	15.83	18.20
1500	14.54	14.90	14.98	15.08	16.02	16.74	19.10
1600	15.32	15.69	15.78	15.88	16.91	17.60	20.24
1700	16.08	16.46	16.57	16.66	17.73	18.45	21.34
1800	16.84	17.23	17.34	17.44	18.54	19.29	22.30
1900	17.58	18.00	18.10	18.21	19.35	20.12	23.24
2000	18.33	18.75	18.86	18.97	20.15	20.94	24.17
2200	19.81	20.21	20.37	20.49	21.74	22.58	26.01
2400	21.28	21.74	21.87	22.00	23.31	24.20	27.83
2600	22.73	23.22	23.35	23.48	24.86	25.80	29.62
2800	24.18	24.69	24.82	24.96	26.41	27.38	31.40

Equivalent number	Water flow 1/s in case water consumption limit is 1/person/day/unit						
	100	125	150	200	250	300	400
	In case of unequal consumption coefficient (m)						
	2.2	2.16	2.15	2.14	2.05	2	1.85
3000	25.61	26.14	26.28	26.43	27.94	28.95	33.15
3200	27.04	27.39	27.89	29.00	29.46	30.51	34.89
3400	28.46	29.03	29.18	29.34	30.96	32.06	36.62
3600	29.87	30.46	30.62	30.78	32.46	33.60	38.32
3800	31.28	31.86	32.05	32.22	33.95	35.13	40.02
4000	32.68	33.30	33.47	33.65	35.43	36.65	41.71
4200	34.07	34.72	34.09	35.06	36.90	38.16	43.38
4400	35.46	36.12	36.30	36.48	38.38	39.67	45.04
4600	36.83	37.53	37.71	37.89	39.84	41.16	47.70
4800	38.22	38.82	39.11	39.30	41.30	42.66	48.34
5000	39.60	40.32	40.51	40.70	42.75	44.14	49.97

Annex 3

Water flow 1/s for household consumption which depends on the number of equivalent unit of public buildings

Equivalent number	Public bathroom, nursery school	Polyclinical and outpatient departments	Administrative office, and shop	School	Sanatorium, rest house, children's camp	Hotel, dormitory, boarding-school, boarding-house
1	2	3	4	5	6	7
1	0.2	0.2	0.2	0.2	0.2	0.2
2	0.35	0.39	0.4	0.4	0.4	0.4
3	0.42	0.48	0.52	0.6	0.6	0.6
4	0.48	0.56	0.6	0.72	0.8	0.8
5	0.54	0.63	0.67	0.81	0.9	1.0
6	0.59	0.69	0.74	0.88	0.98	1.22
7	0.64	0.74	0.80	0.96	1.06	1.32
8	0.67	0.79	0.85	1.02	1.13	1.41

Equivalent number	Public bathroom, nursery school	Polyclinical and outpatient departments	Administrative office, and shop	School	Sanatorium, rest house, children's camp	Hotel, dormitory, boarding-school, boarding-house
1	2	3	4	5	6	7
9	0.72	0.84	0.9	1.08	1.20	1.50
10	0.76	0.88	0.95	1.13	1.26	1.58
12	0.83	0.97	1.04	1.24	1.38	1.73
14	0.9	1.05	1.12	1.34	1.50	1.87
16	0.96	1.02	1.2	1.44	1.60	2.0
18	1.02	1.19	1.27	1.52	1.69	2.12
20	1.07	1.35	1.34	1.61	1.79	2.23
25	1.2	1.4	1.5	1.8	2.0	2.50
30	1.31	1.53	1.64	1.97	2.2	2.74
35	1.42	1.66	1.78	2.14	2.37	2.96
40	1.52	1.77	1.90	2.28	2.53	3.16
45	1.61	1.88	2.01	2.42	2.68	3.35
50	1.70	1.98	2.12	2.54	2.83	3.54
55	-	2.08	2.22	2.67	2.97	3.71
60	-	2.17	2.32	2.79	3.1	3.38
65	-	2.26	2.42	2.90	3.22	4.03
70	-	2.34	2.51	3.02	3.3	4.18
75	-	2.42	2.60	3.12	3.46	4.33
80	-	2.5	2.68	3.22	3.58	4.47
85	-	2.58	2.77	3.32	3.69	4.61
90	-	2.66	2.84	3.42	3.80	4.75
95	-	2.73	2.93	3.51	3.9	4.88

Annex 3 – (finished)

1	2	3	4	5	6	7
100	-	2.8	3.00	3.60	4.00	5.00
120	-	-	3.00	3.94	4.38	5.48
140	-	-	3.56	4.26	4.73	5.91
160	-	-	3.8	4.55	5.06	6.33
180	-	-	4.03	4.82	5.36	6.71
200	-	-	4.24	5.08	5.65	7.07
220	-	-	4.45	5.34	5.93	7.42
240	-	-	4.61	5.57	6.20	7.74
260	-	-	4.84	5.81	6.45	8.06
280	-	-	5.02	6.02	6.69	8.36
300	-	-	5.20	6.24	6.93	8.66