



Mitsui water and hot water supply piping system



Mitsui fire extinguishing piping system



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piping system for general
building

2019.7

Trust and Security

Elmex is a product conforming to the JIS standard.

JIS K 6769 : 2004 : Cross-linked polyethylene pipe JIS K 6787: 2004: Cross-linked polyethylene pipe for water supply JIS K 6770: 2004: Cross-linked polyethylene fitting JIS K 6788: 2004: Cross-linked polyethylene fitting for water supply

The certification numbers of the JIS certificated factories are CECN 10001, It is CECN 10002, JQ 0607015, JQ 0607017.

Elmex complies with the structure and material standards of the water supply equipment specified in Article 5 of the Enforcement Ordinance of the Water Law pursuant to the provisions of Article 16 of the Water Supply Law.

(We issue "conformity certificate" at our company. Please contact us for details.)

Elmex pipes and fittings are manufactured under the quality management system accredited by the international standard ISO 9001: 2017 / JIS Q 9001: 2017 for quality assurance. Registration number: KHK 96QR · 020

[Database of water supply equipment of Ministry of Health, Labor and Welfare)

It is a database established by the Ministry of Health, Labor and Welfare on the Internet in order to smoothly disseminate the new system and to provide information on compliance with performance standards for each product to consumers, contractors, water suppliers, etc.

Elmex[®] is listed in the water supply equipment database of the Ministry of Health, Labor and Welfare.

http://kyuusuidb.mhlw.go.jp/tec/kyusuidb/index.action



Crosslinked polyethylene pipe for hot water supply

Design and manufacture of cross-linked polyethylene fitting for hot water supply

Features and Performance

Excellent heat and cold resistance

It can be used in a wide temperature range from high temperature (95°C) to low temperature (minus 70°C). It is also excellent in frost durability (hard to crack even if frozen).

Outstanding safety and durability

The excellent performance is also maintained compared with the other material to chloric water. It also ensures safe and hygienic water quality without corrosive attack by oxidation and electrolytic corrosion of the pipes, or generation of red water and blue water. In addition, because it uses EF fittings, there is no worry of water leakage.

High flow characteristics

Since water scales and calcium compounds hardly adhere to the inside of pipes, clogging does not occur and high water runoff can be maintained.

Characteristics of Elmex pipe and EF fitting **EF=electro fusion

Excellent durability and corrosion resistance(Fig. 1)

Fig. 2

Elmex pipe is made from "crosslinked polyethylene" which has extremely excellent properties such as durability, corrosion resistance, electrolytic corrosion resistance, chemical resistance and the like. Crosslinked polyethylene is a thermoplastic chain structured polyethylene molecule bonded to make it a three-dimensional network structure like thermosetting plastic to enhance heat resistance.



Structure of EF fitting(Fig. 3)JIS K 6770 · JIS K 6788

In the EF fitting, the outer layer and the stiffener are made of heat-resistant crosslinked polyethylene and are completely integrated with the inner layer polyethylene incorporating the heating wire. Just by inserting the pipe into the fitting and switching on the heating wire, the inner layer of the fitting and the polyethylene part of the outer layer of the pipe dissolve and join together.

(Fig. 4)JIS K 6770 · JIS K 6788 Metal EF fitting is a product integrally molded of crosslinked polyethylene and copper metal fittings. The metal part and the crosslinked polyethylene part are firmly bonded physically and chemically. It is a breakthrough product Mitsui Chemicals has commercialized for the first time in the world.



Excellent heat insulation performance

The thermal conductivity is very small and very excellent in a heat insulation effect with 1/1200 of the copper pipe.

Easy workability

It is 1/5 lighter than the coated copper pipe, and it is rich in flexibility and bending piping is possible.



Double layer structure of pipe and fitting by which electroal fusion is made possible.

Structure of pipe (Fig. 2) JIS K 6769 · JIS K 6787

Thermal fusion boding is possible on the outer polyethylene layer. The inner crosslinked polyethylene layer is a high heat resistant layer. Since the pipe is an integrally molded structure of a polyethylene layer and a crosslinked polyethylene layer, it does not turn outward or peel.



Structure of metal EF fitting



Pre-fabrication system

Features of pre-fabrication system

In the pre-fabrication system, pipes, fittings and connection fittings are integrally connected and processed within the processing manufacturer's factory and are transported to the site as "unit piping". It is a highly complete construction method that only installs "unit piping", supports the terminal at the end, and connects the equipment after the wall and floor are completed at the site.

Patent No. 2606808

• We have established a prefabricated certification system for prefabricated processing manufacturers.

Total cost is reduced by saving labor and shortening construction period.

Improvement of reliability of joining part and prevention of leakage becomes 2 possible by factory processing

Material loading becomes simple, and (3) industrial waste is reduced due to the simple packaging materials.

Example of construction process of pre-fabrication system



Electro Fusion fitting

Connection procedure

For joining pipes and fittings, use a dedicated controller (electro fusing machine). When the connector terminal is connected to the fitting terminal pin, the welding time requirement is automatically set and can be joined. Compared with the conventional construction method, piping without water leakage becomes possible as well as improvement of workability.



Caution on electro fusion bonding

Please be careful about the following points because attention is necessary to oil and dirt when doing electro fusing.

- · Do not work under dusty environment.
- Be sure to plane the surface.
- · Do not plane more than once.
- Do not touch the part where you have planed.
- Do not put the pipes on the floor after you have planed.
- · Take a fitting out from the bag just before fusing.

* If the fusion surface is dirty, the fusion strength will decrease and leakage may occur.

Basic system of Elmex branch piping

Construction example of underfloor piping

Elmex branch piping system responds to the needs of the water service industry besides the sheath pipe header method. It is a compact piping system based on the branching method similar to conventional piping (VLP piping, HIVP pipe, copper pipe). It has greatly improved the reliability of the joint part.

Special design is unnecessary!

General branch piping design drawings such as lining steel pipes, PVC pipes, coated steel pipes etc. can be diverted and the piping becomes compact.

Member cost is reduced!

Unlike the sheathing pipe header method, special members such as headers, faucet boxes, and sheath pipes are not used, and the number of fittings can be reduced, so it is possible to reduce the material cost. (Compared to our company)

2 **Joining work** is easy!

4

Since the joining work of Elmex® is done by electro fusing method, it does not require expertise such as thread cutting and brazing. Joining can be completed only by "welding for 20 seconds to 60 seconds" + "cooling for 3 minutes."

The total cost is reduced by perfect prefabrication!

By adopting the "pre-fabrication system" in which the piping units assembled in the factory beforehand are put together at the construction site, the reliability of the fitting part improves and the "reduction of the total cost" becomes possible due to the short construction term.

Basic physical properties

test method

JIS K 6922-2

JIS K 6769 JIS K 6787

JIS K 6769 JIS K 6787

JIS K 6769(110℃)

ASTM D 256 charpy

ASTM D 2240 shore D

ASTM C 177

ASTM D 696

JIS K 7206 vicat

JIS K 6922-2

Basic physical properties (Table 1)

density

gel fraction

tensile yield streng

tensile elonga at break

tensile modulus

not internal press

mpact strength

thermal conductivity

oftening temperature

coefficient of thermal expansion

hardness

rate

ô

unit

g/cm³

%

MPa

MPa

%

%

MPa

MPa

h

kJ/m²

_

 $W/(m \cdot K)$

10⁻⁴/°C

°C

°C

MPa

MPa

23℃

80°C

23℃

80°C

23℃

80°C

23℃

60°C

80°C

en characteristi

hysical property value

0.94

65 or more

18.6

8.6 342

348

512

98

8760or more

not destroyed

60

0.337

1.45

123

-70

5.5

2.9

2.1

6 G tial stress (circumfer

Hoop

MPa Property values are representative values and not standard values.

•1MPa=10.197kgf/cm²。 $1kJ/m^2=1.2kgf \cdot cm/cm^2$

Figure 3 Flow Diagram of Pipe

●W / (m•K) = 0.86kcl / (h•m•°C)。

Friction loss head (Figure 3) and equivalent pipe length of EF pipe (Figure 4)



Pipe diamet



5

Property values are representative values and not standard values.

hot internal pressure creep (Figure 2)

The method to estimate the life and strength of the Elmex pipe is the "hot inner pressure creep test" . This is to check the strength of the pipe in hot water at a certain temperature with the internal pressure added. As shown in the figure, the Elmex pipe shows stable characteristics over the long term from normal temperature to high temperature.



It has a larger inner diameter than a hard PVC-coated steel pipe (VLP pipe) for water supply of the same nominal diameter (A) and a fitting with the same core, so the friction loss head is small and a large flow is obtained.

Fitting ameter A	socket	elbow	reducer*	tees direct current (direct current in T-shaped pipe)	tees shunt (shunt in T-shaped pipe)
10	0.3	1.8	0.3	0.5	1.8
13	0.3	1.8	0.3	0.5	1.8
16	0.3	1.8	0.3	0.5	1.8
20	0.0	1.0	0.3	0.0	1.0
25	0.0	1.0	-	0.0	1.0

Table 4 Equivalent pipe length of Elmex pipe (m)

*It is expressed on the small caliber side

Operating temperature and maximum operating pressure (PN 15) (Table 5)

according to JIS K 6769							
g temperature	0~20	21~40	41~60	61~70	71~80	81~90	91~95
um working sure MPa	1.50	1.25	0.95	0.85	0.75	0.70	0.65

Mitsui fire extinguishing piping system "Elmex-SP"-Sign of Trust

Feature

Reliability

Three major features of Approved items that respond "Elmex-SP"

with trust and achievements

Manufactured under the Quality Management System certified under ISO9001. We have accumulated a lot of results as approved items based on the announcement by the Fire and Disaster Management Agency.

Authorization items based on the **Fire and Disaster Management Agency notification**

"Elmex-SP" pipes and fittings have been certified by Fire Equipment and Safety Center of Japan (General Incorporated Foundation) based on the notification No. 19 from the Fire and Disaster Management Agency in 2001.

Certification contents and range of application

model code	certification number	applicable fire extinguishing equipment	caliber	main application
Elmex-SP	PL-001-2	sprinkler system	16A,25A (Pipe / Fitting)	apartment building /
Elmex S-SP 30	PL-002-2	(wet type / dry type)	30*,40A (header)	group home
Elmex-SPT	PL-014-1	(wet type / dry type)	20A (Pipe / Fitting)	general building
Elmex S-SPT PL	PL-015-1		40,50A (header)	general building

* The flange of steel pipe connection part is 40A.

Conditions of use (excerpted and summarized from certificate appendix)

OUse pipes for the hidden part covered with the semi-incombustible materials prescribed in Article 1, 5 of the Building Standard Law Enforcement Order, or with materials with equivalent performance.

- OWhen installing pipes in "the part that has a risk of receiving heat in case of fire" such as openings etc., please take protective measures. (Example: Protect the piping effectively from flames and heat during the fire by covering with compartments, partitions, ceiling etc. made of semi-incombustible materials, or by wrapping rock wool with a thickness of 50 mm or more in piping etc.)
- When pipes are installed on the ceiling part under the wet pipe sprinkler system, pipes can be used without protective measures when "the part that may receive heat during fire" is within the effective range of automatic fire extinguishing equipment. (model code: Elmex SPT, Elmex S SPT only)

OMaximum operating pressure should be 1.0 MPa.

OThe minimum bending radius of the pipes is 8D (8 times the inner diameter), and when bending less than that is required, please use SP-elbow.

OAvoid exposing piping outdoors.

OTake appropriate measures for the penetrating part in the fire-resistant zone.

Flexibility

Fire fighting piping system for various buildings

We respond with flexible design to the needs of a wide range of fire extinguishing piping systems in condominiums, offices, group homes, shopping centers, etc.

Standards for pipes and pipe fittings made of synthetic resin (excerpted and summarized from the Fire and Disaster Management Agency Notification No. 19 in 2001)

test items	test contents	acceptability criteria
Air tightness test	Air pressure 1.5 times the maximum working pressure is added to the pipes etc. for 3 minutes.	No leakage should be caused.
Leak test	Water pressure of 0.1 MPa is added to the pipes etc. for 3 minutes.	No leakage should be caused.
Pressure test	Water pressure of 1.5 times the maximum working pressure is added for 3 minutes to the pipe etc. that passed the leak test.	No cracks, leaks or escape should be caused. The margin of the outer diameter dimension is less than 1%.
Destructive test	Increase the water pressure at a rate of pressurization that is four times the maximum working pressure in one minute until cracks, leaks or escape occur in pipes etc. that have passed the leak test and pressure resistance test.	The pressure where cracks, leaks or escape occur should exceed 4 times the maximum working pressure.
Water hammer pressure test	Pressure fluctuation from 0 to 3.5 times the maximum working pressure is added 100 times at a rate of once per second to a filled pipe or the like, and then a leak test and pressure resistance test is performed.	No cracks, leaks or escape should be caused.
Bending test	Apply maximum working pressure to the pipe, and apply specified weight for 1 minute.	Repetitive temperature test
Tensile strength test	A tensile load is added in the longitudinal direction of the pipe or the like until broken or yielding.	The tensile load at broken or yielding should be 1 kN or more.
Crush test	After adding a load of 1 kN for 5 minutes to a pipe or the like left at 2 $^\circ$ C for 24 hours, conduct leak test and pressure test.	No cracks, leaks or escape should be caused.
Impact test	After dropping a weight on the pipes etc. that have been left at -18 $^{\circ}$ C, 0 $^{\circ}$ C, 20 $^{\circ}$ C for 24 hours, conduct leak test and pressure resistance test.	No cracks, leaks or escape should be caused.
Long hydrostatic pressure test	After leaving the pipe at 50 $^\circ$ C for 1000 hours with maximum working pressure, conduct leak test and pressure resistance test, which need to be passed.	No cracks, leaks or escape should be caused.
Repetitive temperature test	After repeating 5 times the test of leaving a pipe etc. with the highest working water pressure for 24 hours at 2° C and 24 hours at 40° C, conduct leak test and pressure test, which need to be passed.	No cracks, leaks or escape should be caused.
Chemical Resistance Test	Leave the test piece (JIS K 7114) of a pipe etc. in a constant temperature unit at 23 ± 2 ° C for 7 days. The test solution should be an undiluted solution and an aqueous solution of a fire extinguishing agent used for fire extinguishing equipment using the pipe or the like. Stir the test solution every 24 hours to make the concentration uniform.	Mass change and constitutional change of the test piece should not increase or decrease by 0.5% or more, respectively, and discoloration should not occur or discoloration needs to be minor.
Light heat resistance test*	Place pipes or the like with water pressure of maximum working pressure exposed at the center of the four sprinkler heads arranged square on the ceiling of the test room and ignite the fire model placed directly under the pipes etc. After extinguishing fire model with sprinkler equipment, conduct leak test and pressure test.	No cracks, leaks or escape should be caused.

*Only Model code Elmex-SPT, Elmex S-SPT have been passed



Our high quality piping system is supported

by high-quality double layer cross-linked polyethylene pipe based on electro fusion technology and prefabrication method, the integral structure by electro fusion fittings, and prefabrication.

Flexibility to respond to various buildings

Point:2 Flexibility

"Elmex-SP" can be used in various buildings such as apartment houses, office buildings, commercial facilities, hospitals and hotels due to its excellent heat resistance and flexibility. In addition, since "Elmex-SP" also complies with the water supply laws, it can be used in water connection type sprinkler equipment for specific facilities such as group home. "Elmex-SP" enables smooth sprinkler equipment installation regardless of the type of building, new construction or renovation, and its scale

Apartment house

Smooth installation in narrow space is possible.

Piping in an apartment building can be installed even in a narrow ceiling by compact integral joining of pipes and fittings. In addition, flexible pipes can bend to a minimum radius of about 130mm, so it is easy to engage with other equipment in a narrow ceiling.





It can be installed smoothly with preceding piping.



It is easy to install even in a narrow ceiling after ceiling foundation is constructed.

Sprinkler head mounting part



It is easy to engage with other facilities in a narrow place.



Flexible correspondence to various large facilities etc.

Pipes and fittings for general buildings* passed the light heat resistance test of the Fire and Disaster Management Agency Notification. It can be used in large space such as office building and shopping center even when there is an opening in the ceiling. In addition, when it is difficult to support and fix the pipe due to renovation work etc., the certification that "support and fixation are basically unnecessary at unwinding of 10m or less" is effective. Especially in the ceiling with narrow space and curved surface, the flexibility of the pipe widens the degree of freedom of design.

It also corresponds to the ceiling opening (wet type sprinkler).

Unwinding of 10 m or less

Basically no support fixation required











Narrow places can be easily constructed. After construction 3



Easy construction of curved surfaces. Sprinkler head



[Elmex-SP] fitting housing fire extinguishing piping system

Point:2 Flexibility

Model code: Elmex-SP, Elmex S-SP 30^{*}(for small section type heads)

Piping is completed by flanging the header of the prefabricated unit to the inlet pipe from the alarm valve and supporting the pipe and head fitting at the specified position.

*Elmex S-SP 30 can be used for the case of 4 small compartment head open at the same time. (Only SP-flange-attached header 40×16 can release 8 small section type heads at the same time.)



* The value of friction loss based on actual measurement is used for the calculation example on pages 6 and 8.

•When the pipe length is 10 m

②SP-socket 16 (SSK-16) 3SP-pipe 16(SNP-16S) (4)SP-head fitting 16 (SHF-16R1)

pipe fitting

(1) SP-header 30 with Flange 40 (12P)* ②SP-socket 16(SSK-16) ③SP-pipe 16 (SNP-16S) ④SP-head fitting 16 total

[™]In case of SP-Flange



④SP-head fitting 16(SHF-16R1)	50	1.35	2	2.7	
total				17.7	
(In case of SP-Flange 40 with header 30 (4P, 6P, 8P, 9P), the equivalent pipe length is 1 m (0.174 MPa)					
In case of SP-flanged header 40 $ imes$ 16 (8P), the equivalent pipe length is 1.4 m.					

10

1.35

50

13.5

[Elmex-SP] Fire extinguishing piping system for general building

Point:2 Flexibility

Model code: Elmex-SPT, Elmex S-SPT (light heat resistance test passed)

Replace all existing branch pipes and unwind pipes of metal pipes and flexible pipes with "Elmex-SP". Piping is completed by flanging prefabricated unit of Elmex-SP to the branch pipe from the horizontal main pipe, and by supporting the pipe and head fitting at the specified position. Due to its excellent heat resistance, it has the feature that piping can be done without avoiding the ceiling opening.

· When the pipe length is 10 m

pipe•fitting

total

① SP-flanged header 50 / 2 SP-Socket 20 3 SP-pipe 20(10m) ④ SP-head fitting 20



nominal diameter (A)	Elmex-SP	nominal diameter (A)	(reference)steel pipe
_	-	80	30or less
-	1	65	20or less
50	10 or less	50	10or less
40	5 or less	40	5or less
-	-	32	3or less
_	- (25	2or less
20	1	20	—



Elmex-SP Calculation example of pressure loss (general building)

 \cdot ① loss head from SP-flanged header 50 (10P) to ④SP-head fitting 20

①SP-flanged header 50 / 10P(SHD 5020 F 10) ② SP-Socket 20 (SSK-20)

3SP-pipe 20 (SNTP 20 ST 10) ④ SP-head fitting 20(SHF-20 R 1)

	flow rate (ℓ/min)	loss head of 1 meter pipe (mAq/m)	pipelength/equivalent pipelength (m)	loss of pipe fitting Head (mAq)
10P*	80	1.4	1.5	2.1
	80	1.4	0	0
	80	1.4	10	14
	80	1.4	5.1	7.1
				23.2

*In case of SP-Flanged Header 40 (5P), the equivalent pipe length is 1.3 meter (0.227 MPa)

Mitsui water and hot water supply piping system

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Precautions for safe use and design or construction

In using this product, please observe the following notices in addition to the contents described in the construction manual and related books.

1. Design

Double lav

- In case of using at 80 °C or higher (Eco Cute etc.), it is expected that the durability years will be lower than the water and hot water piping usually used in the dwelling unit, so please install it considering renewal.
- \odot Set up the safety device of the water heater so that the heat source stops at a water temperature of 95 ° C or higher. Also, please do not bring it close to 120 °C or more heat source.
- Please consult us when using it for special chemicals other than water and hot water supply.
- Avoid exposed piping outdoors. To prevent deterioration due to direct sunlight (ultraviolet rays), please install with outer covering material (light shielding material etc.) etc. attached.

2. Transportation and storage

- \bigcirc Keep in a place not exposed to direct sunlight.
- \bigcirc Please keep the unpacked pipe so that dust, solvent, paint etc. do not adhere.
- O When placing the pipe on the floor of concrete, please make sure that there are no nails, protrusions, steps, etc. on the floor, and lay on the clean cardboard, veneer and the like.
- O Since Pipe is soft and easily scratched, do not drag or drop it, please be sure to lift and transport.
- O Do not use a knife for unpacking. When cutting the binding band, please work with care so as not to damage the pipe.
- Do not open the fitting packaging until just before welding.
- Please do not throw the fitting or drop it from a height in case the terminal pin breaks.
- O Do not use fire near the storage location.
- Do not place solvents, paint, etc. near the storage location.

3.Construction

- O Do not spray or paint pipes directly, such as insecticide, antiseptic (creosote oil), white antiseptic, etc. with adequate protection.
- Use vinyl tape for "temporary fixation" and peel it off after construction. If contacting over a long period of time, it may have a bad influence on pipes or fittings.
- O Do dew condensation prevention measures on the ceiling piping etc., and take measures to prevent freezing in cold climates.
- Piping the bare pipe directly on the double wall, the ceiling board, the ceiling or the wall, etc. of the unit bath will cause water hammer sound, so wrap it with the cushioning materials and keep it away from direct contact with the wall and so on.
- If it is necessary to completely prevent water hammer noise, please consider installing a prevention device of water hamming.
- O During construction, please protect the pipe with a sheath tube etc. in a place where you may step on a pipe or give an external shock. If the pipe should be damaged, buckled or deformed, cut off and remove that part and replace it with a new one.
- O Please be careful not to bring the sparks such as electro welding, the torch lamp, gas burner etc. close to the fire. Please do not lay the pipes near the open fire such as gas stove.

4. Instruction guidance

O Please refer to the official manual for construction work. Also, be sure to take the construction guidance of our certified instructor and accept the certificate of attendance.

\rm Attention

For electro fusion splicing, please use Elmex for pipes and fittings. Please do not fuse because Elmex and other types of crosslinked polyethylene pipes and fittings (M type: single layer and E type: double layers) and other types of pipes and fittings such as polybutene cannot be properly fused and cause water leakage. The Elmex controller is exclusively for Elmex and Elmex-SP. Do not use this product because it will cause accidents, such as water leakage, ignition, burns, etc., if it is used for other companies' products etc.

Please make sure the Mitsui mark and "Elmex pipe" are printed on the Elmex pipe and stamp of Mitsui mark on Elmex® fittings.





head office |

Elmex Division.

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