

- K. Whenever the piping work is to be suspended, the completed section of pipe line shall be protected against entry of foreign matters.
- 1.6 Miscellaneous Piping Materials
- A. Hangers and fixing items:
Hangers and fixing items shall be of steel in conformity to JIS G3101 the shape, dimensions, etc. conforming to JIS G3191, 3192, 3193 and 3194. Inserts shall be other of cast iron or malleable cast iron.
- B. Pipe escutcheon:
Pipe escutcheon shall be either of chrome plated brass, stainless steel or P.V.C. made and shall be instructed by Supervisor.
- C. Pipe sleeves:
Pipe sleeves shall be made of steel pipe, cast iron or steel plate more than 0.7 mm thick. Sleeves to be used in water-proof portion shall be free from affecting the water proof.
- 1.7 Painting
- A. General
- 1) All equipment and components shall be painted with the exception of metal, wood and fibre surfaces.
 - a) Those to be buried underground (except anti-corrosive coating)
 - b) Finished surfaces other than galvanized surfaces.
 - c) Non-exposed portion of galvanized surface.
 - d) Specially treated finished surface of specific decorative design.
 - e) Surfaces not deemed necessary.
 - 2) All surfaces that need to be tested or inspected shall be painted after the completion of test or inspection. If for any reason painting must be performed prior to test or inspection, approval of Supervisor shall be obtained.
 - 3) If painting is to be performed prior to delivery to the site, prior approval of the Supervisor shall be obtained.
 - 4) Color and gloss of paints shall be approved by the Supervisor with painted sample, prior to application. Such samples shall be coated under the conditions similar to the field application.

5) Pipe line at pump room or machine room shall be color corded in accordance with the zoning and flow. Direction of flow and mark of zoning shall be shown on the pipe. Color and position of mark shall be approved by the Supervisor.

B. Paints and Diluents:

Painting materials and diluents to be used shall be as specified in Table 1.7-a

C. Anti-corrosive paint:

Anti-corrosive paint shall be asphalt lineage paint or coaltar lineage paint to protect the surface of metal pipe from corrosion.

The entire surface of iron casting shall be enamelled with the refined tar mixture containing more than 2% of linseed oil or drying oil, conforming to JIS K2473 (refined tar)

D. Surface preparation:

Preparation of surface to be painted shall be in accordance with Table 1.7-b

E. Painting:

- 1) Painting shall conform to the general specification Part 2 Architectural Specification Section of Painting
- 2) Where color conditioning is required by using stiff mix paint or color-in-oil, the material to be used shall be of the same manufacture. Where special color conditioning is required and the area to be painted is large or dissimilar color may occur the Contractor shall use the paint conditioned by manufacturer.
- 3) Where paint is applied with brush, brushing shall be carefully performed so as to obtain good finish at corners, edges, and with out omissions, excess, run, bubbles, and in a manner to obtain uniform finish. Spray coating shall use spray guns and compressed air shall not contain any oil, water or dirt. Spraying distance shall generally be 300 mm away from the surface being sprayed. Spraying shall be done in a manner to overlap 1/3 width of the preceding coat. Direction of spray shall be at right angles to the preceding spray.
- 4) Coat surface shall be properly protected until completion of the work, in a manner not to damage and contaminate the surface.

Table 1-7-a Paint and Diluents

Item	JIS No.	JIS Name	Type by codes	Diluent	location	Use (for reference only
Ready Mixed Ready-mixed oil paint	JISK 5511	Ready-mixed white zinc oil paint		Boiled oil and thinner for oil paint	Outdoor	2nd and finish coats
	JISK 5512	Ready-mixed titanium white oil paint				
	JISK 5513	Ready-mixed white zinc light tint oil paint				
	JISK 5514	Ready-mixed titanium white light tint oil paint				
	JISK 5515	Ready-mixed tint oil paint				
Ready-mixed synthetic resin paint	JISK 5516	Ready-mixed synthetic resin paint		Thinner for oil paint	Indoor	
	JISK 5517	Ready-mixed synthetic resin light tint paint				
	JISK 5518	Ready-mixed synthetic resin tint paint				
Ready-mixed primer for wood surface	JISK 5506	Ready-mixed primer for wood surface	1	Boiled oil and thinner for oil paint	Outdoor	Prime and second coats
			2	Thinner for oil paint	Indoor	
Stiff mix paint	JISK 5451	Stiff mix white zinc paint		Boiled oil and thinner for oil paint		For color condi- tioning and tinting
	JISK 5452	Stiff mix white lead paint				
	JISK 5453	Stiff mix tint paint				

Item	JIS No.	JIS name	Type by codes	Diluent	Location	Use (for reference only)
Color-in-oil	JISK 5672	Color-in-oil		Boiled oil and thinner for oil paint		For color conditioning and tinting
	a JISK 5621	General anti-corrosive paint	1 2		Outdoor Indoor	Galvanized ferrous surfaces
	b JISK 5622	Red lead anti-corrosive paint	1		Outdoor Indoor	
	c JISK 5623	Lead suboxide anti-corrosive paint	1 2		Outdoor Indoor	
	d JISK 5626	Zinc dust anti-corrosive paint	1 2		Outdoor Indoor	
	e	Zinc chromate anti-corrosive paint	1			
	f JISK 5628	Red lead zinc chromate anti-corrosive paint				Ferrous surface
	g JISK 5591	Oil primer				Primer to receive lacquer enamel, etc.
Primer for Pretreatment	JISK 5633	Etching primer		Primer based on alcohol or ketone as designated by manufacturer		Chemical treatment for metal surface
Boiled oil	JISK 5421	Boiled oil	boiled linseed oil Outside Inside			Diluent
Thinner for oil paint	JISK 2201 for mineral spirit No.4 called for by the JIS for industrial gasoline					Diluent

Item	JIS No.	JIS Name	Type by codes	Diluent	Location	Use (for reference only
Aluminum Paint	JISK 5492	Aluminum paint	3			Second and finish coats
Oil surfacer	JISK 5593	Oil surfacer		Thinner oil paint		Second coat
Enamel	Lacquer enamel	JISK 5532	Lacquer enamel		Lacquer thinner	Finish coat
	Synthetic resin enamel	JISK 5582	Vinyl chloride resin enamel	1	Vinyl chloride resin thinner	Wood
				2		Metal surface
3				resistant material		
Thinner	Lacquer thinner	JISK 5538	Lacquer thinner			Diluent
	Thinner for vinyl chloride resin paint	JISK 5586	Thinner for vinyl chloride resin paint		To be sprayed To be brushed	Diluent
Vinyl chloride	JISK 5583	Vinyl chloride primer		Vinyl chloride thinner		Primer for synthetic resin enamel
Synthetic resin emulsion paint	JISK 5663	Synthetic resin emulsion paint		Water		Prime, second and finish coats
Vinyl chloride varnish	JISK 5581	Vinyl chloride varnish		Vinyl chloride thinner		
Liquid Drier	JISK 5691	Liquid drier	1 A B			To accelerate drying
			2 A B			
Stop putty	JISK 5592 (Oil putty) or standard of Architectural Institute of Japan (Hard Oil Putty). Mixed with proper quantity of well dried sawdust or approved equal.			Boiled oil, thinner for oil paint		For filling holes

Item	JIS No.	JIS Name	Type by codes	Dilluent	Location	Use (for reference only)
Unsaturated polyester putty	Standard of architectural institute of Japan	Unsaturated polyester putty				For filling holes
Putty for putting		Zinc putty		Boiled oil, and thinner for oil paint		For puttying
Putty for ground	JISK 5592	Oil putty		Thinner for oil paint		For sealing ground putty for primer putty
Putty for, light metal ground	Standard of architectural institute of Japan	Putty for light ground		Thinner for oil paint		For puttying light metal ground
Sealer	Sealer passing through 250 μ sieve specified by JIS Z8801 (standard sieve) such as live gypsum powder, pumice, quartz powder, heavy spar, marble powder					For sealing surfaces
Creosote oil	JISK 2470	Creosote oil				

Table 1-7b Preparation of Surfaces

Surfaces	Working sequence	Paint, etc.	Treatment of Surface	Drying time(hr)	
Wooden surfaces (I)	1	Removal of stain and coatings	Stain and other foreign matters shall be removed in a manner not to damage Surfaces, and oil and grease cleaned with volatile oil.		
	2	Removal of resin	Scrape off exuded resin. The portion where resin is likely to exude shall be heated by electric iron to force out the resin, and clean with volatile oil. Repeat this procedure according to the condition of resin exulation.		
	3	Sanding	Benzine planer marks, bristered grain, shag shall be sanded with #120 240 sandpaper.		
	4	Knot stopping	Shellac varnish	Two coats shall be coating applied to and around a knot.	1 hour before subsequent coat
	5	Filling holes	Putty for puttying	Puttying one or two times at split, check, hole, crack, pit	24 hours before subsequent coat

Surfaces	Working sequence	Paint etc.	Treatment of Surface	Drying time(hr)		
Ferrous surfaces (II)	Class A	1	Removal of stain and Foreign Matters	Removed by scraper and/or Wire-brush		
		2	Removal of Oil and Grease	Cleaned by Volatile Oil, or Soap Water, or treated by heated weak alkali liquid and washed by water		
		3	Removal of Rust	Acid-treated, and washed by neutralized hot water or removed by Sand-blasting.		
		4	Chemical Treatment	Phosphate-treatment Chromic-Acid treatment	Treated by dipping in phosphate solution, washed by hot water, then dried. Further treated by dipping in Chromic-acid solution.	
		5	Finish coating		Lightly rubbed by steel-wool, wire buff, sandpaper and/or rags	Immediately followed by subsequent process
Class B	1	Removal of stain and foreign matters	Removed by scraper or wire brush			
	2	Removal of Oil and Grease	Cleaned by volatile oil			
	3	Removal of Rust	Removed by scraper, wire brush or emery cloth #180			

Surface		Working sequence	Paint, etc.	Treatment of Surface	Drying time(hr)
Galvanized ferrous surfaces (III)	1	Removal of stain and foreign matters		Removed by scraper or wire brush	
	2	Removal of Oil and Grease		Cleaned by volatile Oil, and washed by water or treated by heated weak alkali-liquid and washed by water	
	3	Chemical treatment	Primer for metal sur- face treat- ment	One (1) coat by brush	3 hours
Cotton cloth clad Insulated surfaces (IV)	1	Drying		Left standing for drying	
	2	Removal of stain and foreign matters		Removed in a manner not to damage surface	

Note: Where the surface is coated with anti-corrosive paint such as synthetic resin, such coating shall be removed by caustic soda and the like.

1.8 Special Anti-corrosive Painting

A. General

- 1) Treatment of each surface to be coated, and type and number of coats shall be in accordance with Section 1.7 Painting.
- 2) Coating shall be made within 4 hours in dry season and 2 hours in rainy season after the surface has been treated by blasting.
- 3) Anti-corrosive paint, hardner, additive shall be harmless for health and shall not affect for water quality.

B. Epoxy Resin Coating

- 1) The epoxy resin coating material shall consist of epichlorohydrin and bisphenol A, in the state of condensated liquefied epoxy resin, having two or more of epoxy bases with 175-290 equivalent of epoxy added with prescribed hardener and additive.
- 2) Coating shall be made after the surface has been treated by sand-blasting and shall conform to JIS G5903, 5904.
- 3) Treated surface shall be hardened completely by heat. The tank for drinking water shall conform to and pass the test required for the standard equipment and packing for foods and additives in accordance with the Food Sanitation Act.

Items	No. of Coats	Thickness of Coat
Water tank	Three (3) or more	0.4 mm or more
Hot Water tank	Seven (7) or more	0.8 mm or more One sheet of glass fiber to be laid in between

- 4) Test for epoxy resin coating shall apply to film thickness of coat and holiday. Thickness of coat shall be tested by magnetic thickness gauge and holiday by holiday tester using Tesla Coil.

C. Phenolic-resin coating:

Method to apply phenolic-resin coat shall conform to epoxy resin coating.

D. Zinc Sheradizing:

- 1) Zinc Wire used for zinc sheradizing shall be such wire as prepared for special zinc base metal in accordance with JIS H2107 (Zinc base metal).
- 2) Used for protective coating shall be clear for primer conforming to JIS K5633 (etching primer) and for finish coat, conforming to JIS K5581 (vinyl chloride resin varnish) or JIS K5582 (vinyl chloride resin varnish).
- 3) After completion of sand blasting or grit-blasting, the surface shall be sheradized with zinc to a thickness of 0.15 mm or more.
In case of water tank, additional three coat of zinc shall be applied; one primer and two finish coat.
- 4) Test for sheradized zinc coating shall be performed in accordance with JIS H8661 (test method of sheradized zinc products).

E. Aluminum Sheradizing:

- 1) Aluminum wire used for Aluminum sheradizing shall conform to JIS H2102.
- 2) Aluminum sheradizing shall conform to JIS H9301.
- 3) Used for protective coating shall be three coat of epoxy resin coating.
- 4) Test shall be performed in accordance with JIS H8663.

1.9 Insulation

A. Covering

- 1) Insulation material shall conform to JIS and shall be approved by the Supervisor.
- 2) Insulation Materials is in Table 1.9-a

Table 1-9-a Insulation, External Covering and Supplementary Materials

Materials by classification	Requirements
Rockwool	Heat Insulating Board, cylinder, band and blanket of rockwool shall be standard products conforming to JIS A9504 (rockwool heat insulating and mineral wool heat insulating materials). Heat insulating board shall be class 1 or 2, heat insulating band shall be class 2, but that used for circular air duct shall be class 2 material covered with glass fiber on one surface. Glass fiber shall be plain fiber woven with glass fiber threads (JIS R3413); single thread of 13 micron, 200 filament, and having fabric weight of 72 g per 1 m ² . Blanket shall be reinforced with metal lath sheath specified by JIS A5505 (metal lath). All the rockwool heat insulating materials shall be treated by waterproof agent, etc.
Glass wool	Heat insulating board, cylinder, band and blanket of glass wool shall comply with JIS A9505 (Glass wool heat insulating materials). Heat insulating board shall be class 2, d and e; heat insulating cylinder shall be class 2; blanket shall be class 1,b or 2,b which shall be reinforced with metal lath sheath specified by JIS A5505 (metal lath), heat insulating band to be used for circular air duct shall be prepared by heat insulating board class 2, d cut into the specific width, followed by laying lengthwise and finished with glass fiber attached as specified above. All the glass wool heat insulating materials shall be treated with waterproof agent, etc.
Foam polystyrene	Heat insulating board and cylinder of foam styrene shall conform to JIS A9511 and shall be class 3. Foam polystyrene flexible board shall be made flexible by compression treatment applied to foam polystyrene board class 3, and its thickness shall be 5mm

Materials by classification	Requirements
	or less. Joings and coverings shall be formed of the above-specified material and manufacturing process, with quality conforming to Foam polystyrene heat insulating cylinder Class 3.
Cow Fur Felt	Heat insulating cylinder class 3 shall be manufactured to JIS A9508 (cow fur felt) by wet process. Heat insulating cylinder shall have asphalt felt linings on both outside and inside surfaces and formed into halved cylinders longitudinally. The halved pieces shall bear JIS label.
Carbonized Cork	Carbonized cork board shall conform to JIS A9507 (Carbonized cork sheet, class 2)
Diatom-earth	Diatom-earth heat insulating material shall be the standard product in accordance with JIS A9503 (diatom-earth heat insulating material), mixed with diatom-earth and shall be class 1.
Cotton cloth	Cotton cloth shall be 115 g. per 1 m ² or more. When used on pipes and the like, the cloth shall be cut to form the tape of proper width.
Vinyl tape	Vinyl tape shall be the product conforming to JIS Z1901 (anti-corrosive vinyl tape) having 0.2 mm thickness, semi-glass non-adhesive quality.
Aluminum cloth	Aluminum cloth shall be of 0.02 mm thick aluminum foil laminated with incombustible cotton cloth of 55 g. per 1 m ² or more using polyethylene resin agent; film thickness after hardening shall be 0.006 mm or more. When used on pipes, the cloth shall be cut to form the tape of proper widths
Glass cloth	Glass cloth shall be plain fabric made of glass fiber thread of 9 micron, 200 filament single thread conforming to JIS R3413

Materials by classification		Requirements
		(Glass fiber thread) and flat thread of 9 micron, 200 filament sliver glass fiber thread, approximately 3 mm wide, runproof. Weight of cloth shall be 150 g. per 1 m ² or more. When used on circular air duct, the cloth shall be cut to form the tape of proper width.
	Galvanized iron sheet	Galvanized Iron sheet shall be flat sheet conforming to JIS G3302 (Galvanized iron sheet). Thickness of sheet shall be 0.3 mm when used on pipes having outer diameter to be insulated being 250 mm or less, and 0.4 mm on others.
	Aluminum sheet	Aluminum sheet shall conform to JIS H4101 (Aluminum sheet and disc sheet, having thickness 0.8 mm and more.)
	Waterproof hessian cloth	Waterproof hessian cloth shall be the product of hessian cloth No.7 conforming to JIS L3405 (hessian cloth), being applied to one side with blown asphalt conforming to JIS K2207 (petroleum asphalt). Blown asphalt shall be of penetration degree 10 - 20. When used on pipes, the cloth shall be cut to form the tape of proper width.
	Special asbestos board	Special asbestos board shall be the product approved to be semi-incombustible material specified by Building Standards Act. Its thickness shall be 6mm and more.
	Plaster	Plaster shall be mixed gypsum plaster conforming to JIS A6904 (Gypsum plaster).
Supplementary materials	Kraft Paper	Kraft paper shall be the molding paper specified by the manufacturing process of JIS A6006 (asphalt roofing), having weight of 370 g. per 1 m ² .

Materials by Classification	Requirements
Incombustible Kraft Paper	Incombustible kraft paper shall be vinyl paper using non-plastic vinyl chloride resin, having weight of 500 g. per 1 m ² and conforming to class 2 flame resistance, as specified by JIS A 1322 (Testing method for incombustibility of thin building papers)
Asphalt roofing	Asphalt roofing shall be the product manufactured by the manufacturing process of JIS A6006, having weight of 17 kg. per roll (21m ²) or more.
Asphalt felt	Asphalt felt shall be the product manufactured by the manufacturing process of JIS A6005 (Asphalt felt), having weight of 17 kg. per roll (42m ²) or more.
Adhesive tape	Adhesive tape shall be the product conforming to type 1 of JIS Z1525 (vinyl adhesive tape), having thickness of 0.2 mm or more.
Metal lath	Metal lath shall be the product conforming to plain lath No.1 or rib lath (A) No. 1 conforming to JIS A5505, (metal lath), being anti-corrosion treated.
Diamond-shaped wire fabric	Wire fabric shall conform to JIS G3554 (wire fabric), using the galvanized wire specified by JIS G3532 (iron wire), having 16 - 26 mm mesh and diameter of wire being 0.9mm or more.
Iron wire	Iron wire specified by JIS G3552, having diameter of 0.8 mm or more.
Tack rivet	Tack rivet shall consist of the nail, with length corresponding to the thickness of heat insulating material, studded to the galvanized steel-plate washer, or copper-plated nails for spot-welding purpose, having sufficient strength to hold heat insulating materials

Materials by classification	Requirements
Steel frame	In all cases, steel frame shall be fabricated of galvanized iron sheet, JIS G3302, with standard thickness of 0.4 mm or more. When using light-gauge pre-fabricated shape steel, such steel shall be anti-corrosion treated.
Solder	Solder shall conform to JIS H4341 (solder).
Wooden frame	Wooden frame shall be made of Japanese cedar (SUGI)
Toothed washer and band	Toothed washer and have shall conform to JIS H3201 (brass plate), or JIS G4305 (cold-rolled stainless steel plate), having thickness of 0.2mm or more. Those made of brass plate shall be chrome-plated. Width of hand shall be 20mm for heat insulating material of 150 mm or less in outside diameter and 25 mm for more than 150mm.
Mastic compound	Mastic compound shall be as approved by the Government Inspector.
Joiner and Corner bead	Joiner and head shall be of metal and approved by the Government Inspector.
Asbestos cement	Asbestos Cement shall be an admixture of 75% of asbestos powder, 22% of Portland Cement and 3% of asbestos piker, by weight.
Adhesive agent	Adhesive agent shall be adequate to adhesion required and approved by the Government Inspector.

B. Installation work

- 1) Work shall be executed after completion of inspection and prime coat of all the equipment and piping has been finished. The joint clearance between heat insulating materials shall be minimized and longitudinal seams shall be staggered.
- 2) In all cases, wire tying shall be made spirally round the band material at 50 mm intervals or less.
- 3) Cylindrical material shall be tied at two position for each section. When affixed by adhesive tape all the seams and joints shall be sealed with the tape.
- 4) In all case, taping shall be done with a lap width of more than 15 mm and all other tying shall be done at a lap width of more than 30 mm. The material wrapped with water-proof hemp cloth shall be applied with two (2) coats of asphalt primer. Cotton cloth shall wrap the material with one-side salvage folded back.
- 5) Piping and air duct penetrating through floor shall be protected of their covering materials for the section at least up to 150 mm high, by means of galvanized iron sheet. When steam or hot-water piping penetrates through wall or floor, heat insulation shall not be applied up to approximately 25 mm from the wall or floor surfaces.
- 6) Wrapping by steel sheet shall be done as follows.
 - a. Pipe joint shall be ridge-seamed, bend shall be knee-cap seamed, and seam at peripheral portion shall be interlocked.
 - b. Rectangular air duct and square-shaped tank, seam shall be flat type, and joints shall be inter locked.
 - c. Circular tank, seam shall be interlocked end that on end plate shall be interlocked in aradial formation.
 - d. All seams, except for ridge-seams subject to much moisture both outdoor or indoor, shall be soldered.

- 7) Toothed-edge escatcheon shall be attached to the end of indoor insulated piping, and a band shall be attached to branched and curred point.
- 8) Where the pipings run through the fire wall or other fire protected part, rockwool insulation material shall be used for pipes insulation at the section of 1,000 mm from the face of those wall.
- 9) Indication Mark:
In all case, exposed pipings shall be marked the flow direction and type of flow in accordance with JIS Z 9102.
Valves shall be indicated by card showing the zoning and purpose.

2. Water Supply Work

2.1.1 Pipes and Fittings

Pipe	Standard	Description	Class
Cast iron	JWWA G 105	Centrifugal ductile cast iron pipe for water supply use.	Normal pressure pipe.
	JWWA G 106	Ductile cast iron pipe special for water supply use.	"
	JWWA G 109	Joint use cast iron pipe for water supply use.	"
Steel pipe	JIS G 3442	Galvanized steel pipe for water supply use.	White pipe
	JIS G 3452	Confirm thickness and diameter of pipe.	
	JIS B 2301	Threaded malleable cast iron pipe joint.	Galvanized
	JIS B 2302	Threaded steel pipe joint	"

Pipe	Standard	Description	Class
	JIS B 2211	Basic dimensions of 5 kg/cm ² Iron and Steel pipes flanges.	Galvanized
	JIS B 2212	Basic dimensions of 10 kg/cm ² Iron and steel pipes flanges.	"
Lead pipe	JIS H 4312	Lead pipe for water supply use.	Class 2
Brass pipe	JIS H 3631	Brass pipe	
	JIS G 3452	Conform to thickness and diameter of pipe.	
Joint	JIS B 2301	Joint	
Flange	JIS B 2211	Basic dimension of 5 kg/cm ² iron and steel pipe flanges.	
Flange	JIS B 2212	Basic dimension of 10 kg/cm ² iron and steel pipe flanges.	
Copper pipe	JIS H 3603	Quality of material shall conform to class 1 of said JIS and its dimensions, tolerance, shall be in accordance with ASTM B 88-M Type.	
P.V.C. pipe	JIS K 6742	Hard vinyl chloride pipe for water supply use.	
	JWWA K 105	- " -	
Joint	JIS K 6743	Hard vinyl chloride pipe joint for water supply use.	
	JWWA K 106	- " -	

Pipe	Standard	Description	Class
High impact P.V.C. pipe	JWWA K 118	High impact P.V.C. pipe for water supply use.	
	JWWA K 119	High impact P.V.C. pipe joint for water supply use.	
High temperature P.V.C. pipe	JIS K 6742	Hard vinyl chloride pipe for water supply use.	
joint	JIS K 6743	Hard vinyl chloride pipe joint for water supply use.	Cold formed joint.
Vinyl lining steel pipe	JWWA K 116	Pipe shall conform to said standard	
joint	JIS B 2301	Joint shall conform to said standard and P.V.C. or epoxy lining shall be applied with thickness of 0.2 mm more.	
flange	JIS B 2211 2212	Same as stated above.	
Anti-corro- sive steel pipe	JIS G 3452	Pipe shall be said standard and tar-epoxy pain shall be sprayed with high pressure.	
joint	JIS B 2301	Joint shall be said standard and treatment shall be same as above.	
Eternit pipe	JIS A 5301	Asbestos cement pipe for water supply use.	Class 1
joint	JIS A 5315 JIS A 5520	Asbestos cement pipe joint for water supply use.	

Table 2.1.2-a Valves and Cocks

7.5-25

2.1.2 Valves and Cocks

Name	Dimensional category	Standard		
		Number	Designation	Maximum working pressure (kg/cm ²)
Gate valve	Less than 50mm in nominal diameter	JIS B 2013	Threaded gate valve, Bronze, 5 kg/cm ²	14
		JIS B 2023	Threaded gate valve, Bronze, 10 kg/cm ²	
	More than 65mm in nominal diameter	JIS B 2031	Flanged cast iron gate valve, 5 kg/cm ² , male thread	7
		JIS B 2044	Flanged cast iron gate valve, 10 kg/cm ² , male thread	
Check valve	Less than 50mm in nominal diameter	JIS B 2025	Threaded swing check valve, Bronze, 10 kg/cm ²	14
	More than 65mm in nominal diameter	JIS B 2045	Flanged swing gate valve, cast iron, 10 kg/cm ²	14
Sluice valve	-	JIS B 2062	Sluice valve for water supply use.	7.5
Corporation cock	Shall be of bronze, conforming to the standards of the utility company.			7.5
Stop cock	Same as above			

Note: All gate valves and check valves, including valves ancillary to equipment, shall conform to JIS. Provided, however, that check valves ancillary to pumps shall be excluded.

2.2 Equipment

2.2.1 Lift Pump

Lift pump shall consist of a horizontal pump directly coupled with a motor by means of a shaft coupling, being mounted on a common base mad of cast iron. The pump casing shall conform to JIS G 5501 (gray casting) class 2, the impellor shall conform to class 2 of JIS H 5111 (bronze castings) and the main shaft shall conform to class 50 of JIS G 4303 (stainless steel rods), except that those using sleeve shall conform to S 30C of JIS G 4051 (carbon steel materials for mechanical machine).

The pump shall be of the structure free from noise during operation and fire from oil matters during water supply.

Pump coupled directly with a motor shall be installed level on the foundation together with the common base. Shaft center shall be precisely adjusted. Then, mortar shall be poured into bolt holes. After the mortar has sufficiently hardened, bolts shall be uniformly tightened.

Where suction pipe installed through the slab, manhole shall be provided for the easy lifting of foot valve.

The pump shall be furnished with the following accessories:

- A. Gate Valve (elevating tyre valve rod) 1 ea.
- B. Check Valve (with by-pass valve) 1 ea.
 Provided, however, that check valves of a nominal diameter of less than 50 mm shall have by-pass pipe installed on the lift pipes in the front and rear.
- C. Foot valve, (provided with strainer and capable of permitting on-the-ground handling). 1 set
- D. Manometer (with a cock) 1 set
- E. Priming funnel (with a cock) 1 set
- F. Mating flange (with bolts) 1 lot
- G. Drain cock 1 lot
- H. Anchor bolts, wrenches and other necessary accessories..... 1 lot

2.2.2. Deep well
Submerged
motor driven
pump.

This item shall refer to the particular specification and drawings.

2.3 Piping Installation

2.3.1 Burial Pipe

- A. For the burial pipe, cast iron pipe or steel pipe with diameter more than 65, and lead pipe, steel pipe, P.V.C. pipe or copper pipe with diameter less than 50 shall be used. Earth covering on underground pipes shall be at least 450 mm in the general ground, at least 750 mm where subject to vehicular traffic and at least 1,000 mm where subject to heavy vehicular traffic, provided that such covering shall not be less than the depth of frost penetration in cold district.
- B. Piping for interior, steel pipe, lead pipe, brass pipe, copper pipe or P.V.C. pipe shall be used.

2.3.2 Connecting Pipes

- A. Steel Pipes:
Joint threads shall be pipe taper male threadeds as specified in JIS B 0203 (Pipe Taper Thread). If so required in connecting pipes, either red lead paint dissolved in vegetable oil or a seal tape or sealant shall be applied on male threads with approval of the Supervisor. Use of stiff mix paint or jute shall not be permitted.

Pipe diameter	3/8" 10mm	1/2 15	3/4 20	1 25	1.1/4 32	1.1/2 40	2 50	2.1/2 65	3 80	3.1/2 90	4 100	5 125	6 150	8 200
Effective length of male thread	12	15	17	19	22	22	27	30	34	35	40	41	44	57

B. Cast Iron Pipe:

- 1) In case of mechanical joints, the spigot end of pipe shall be inserted into the bell until it has been completely brought into contact with the bell bottom. Then, a rubber ring previously fitted on the spigot near its end shall be forced into the gap between spigot and bell. Retaining ring shall be applied on the joint and clamped uniformly around the circumference with bolts and nuts to bring the rubber ring into tight contact with both pipes. The rubber ring shall be type 2 No.1 as specified in JIS K 6353 (rubber for water supply use).
- 2) In case of flanged joints, packings with a thickness of 3 mm or less and matching the flange size shall be placed so as to fit the pipe inside diameter, and bolts shall then be tightened uniformly. In any case, stiff mix paint or putty shall not be used on either face of the packing.

C. Lead Pipe

- 1) Joint between lead pipes shall be soldered or plastan joint. Joint between lead pipes and accessories shall be soldered joint.
- 2) Amount of solder to be use for connection is as follows.

mm inner diameter	Line Soldering		Joint w/accessory
	Length	Amount of Solder	Amount of Solder
10	48	0.125	0.170
13	54	0.155	0.200
16	57	0.190	0.265
20	64	0.270	0.360
25	67	0.400	0.520
30	70	0.500	0.650

3) Amount of planstan to be used for connection

Planstan	Pipe nominal diameter							
	10	13	16	20	25	30	40	50
Planstan	1.30	1.80	2.20	3.00	3.50	4.10	5.70	6.90
Rod Planstan	6.70	9.50	13.00	23.00	37.30	47.50	81.30	130.00

D. Copper pipe:

- 1) Joint of copper pipes shall be done with bell and spigot joint. Where the removal of pipes is required, flared joints shall be used for pipes of a nominal diameter below 1.1/4 and flang joints shall be used for pipes of a nominal diameter not smaller than 1.1/4.
- 2) Bell and spigot joint shall be effected by inserting the pipe spigot end correctly into the joint bell after thorough cleaning of pipe exterior and joint bell interior. The joint so effected shall be heated to a proper temperature and soft solder alloy shall be poured into the joint clearance.

E. Asbestos cement pipes:

Asbestos cement pipes shall be connected by using the joints specified in JIS A 5315 or JIS A 5520.

2.3.4 Piping in
Common

- A. Main shall be provided with flanged joints at convenient positions to facilitate the removal of pipes, provided that conical unions may be used for the exposed-to-view piping of a nominal diameter of 25 A or less.
- B. For the branches from the main, tee shall be used in all cases. Use of cross-tee shall not be permitted. In no case shall tee be used in such a manner that it forms a hammer-like shape.
- C. Piping shall be done in the manner not to produce the air-pocket and air-relief-valves and blow-off valves shall be provided where indicated in the drawings. Where pipes have a nominal diameter not exceeding 25A, blow-off valves shall be of the same diameter as pipe. Where a nominal diameter of pipes exceeds 25A.
- D. Where pipes penetrate through the concrete water tank or where water-proof treated, G.I.P. Sleeves with water-proof brim shall be installed and clearance between sleeve and pipe shall be filled with caulking material.
- E. Where pipes penetrate through fire wall or fire partition, the entire clearance around the pipe shall be completely filled with rock wool or other suitable non-combustible material.
- F. Horizontal run of piping shall be installed up-grade in case of the upward water supply and shall be down-grade in case of downward water supply. In any case, the grade of such piping shall be 1/250.
- G. Where specified in the drawing, air cushion shall be provided. Where pipe air-cushion is used, 2 m for top of branch pipe, 70 cm for flush valve, 40 cm for other sanitary fixture, shall be applied.
- H. Level of water level ball tap shall be 300 mm below the cover slab and float switch for pump shall be 150 mm or more above the bottom slab.
- I. The valves and pipes around the pump shall be anchored firmly not to affect to the pump. Pipe diameter more than 65 shall be provided with flexible joint and vibration joint.

2.3.5 Spacing of Supports

A. Steel pipe:

Horizontal run of piping shall be supported normally at intervals specified Table 3-11.

Table 3-11 Maximum spacing of supports of water supply pipe.

Nominal Dia.	up to 20	25-40	50	65-75	90-100	125-150	200	200-
Space (m)	1.8	2.0	3.0	4.0	4.0	5.0	6.0	6.5

Bend and branch portions shall be supported as required. Vertical pipe shall be braced at one or more points in every story and shall be secured to the lowest story at less than every three floors.

- B. Supporting for cast iron pipes shall be done with the consideration of pipe weight and pipe size.
- C. Support spacing for P.V.C. pipe shall be specified in Table 3-12.

Table 3-12

Nominal Dia.	up to 40	more than 50
Space (m)	1.2	1.5

Vertical pipe shall be braced at more than two point in every story.

- D. Supporting space for copper pipe shall be specified in Table 3-13.

Table 3-13

Nominal Dia.	- 3/4"	1 - 1.1/2"	2"	2.1/2 - 3"	4"
Space (m)	1.0	1.5	2.0	2.5	3.0

- E. Horizontal run of lead piping shall be supported at intervals of 0.6 m. or less. Where the distance of a horizontal run of lead pipe exceeds 1.0 m. such lead pipe shall be placed on steel angle (L-25x25x3) or semi-circular galvanized iron sheet trough (at least 0.6 mm thick) and the trough shall be supported at interval of 2.0 m. Vertical run of lead pipe shall be provided with flanges for the supporting purpose with interval of 1.0 m.
- F. Unless otherwise specified, the supporting shall be as stated above and in case those method shall not applied, contractor shall follow the direction of the Supervisor.

2.3.6 Anti corrosive work

Where steel pipes are to be laid directly in the ground, two coats of coal tar shall be applied on the pipes. Where steel or lead pipes are to be laid in concrete, water-proof hemp cloth shall be used to wrap the pipes and two coat of asphalt primer shall be applied. Where anti-corrosive paint shall be applied. Those paint shall conform to the section of "piping in common" or shall be approved by the Supervisor.

2.3.7 Piping for high-rise building.

Piping for high-rise building shall be specified in the particular specification and drawings.

2.3.8 Test

Hydraulic test shall be made during execution of the piping work, or before concealing or backfilling of the piping, and before application of the pipe covering upon completion of the piping work.

Those test shall be made in the presence of the Supervisor. Piping connected directly with public water works shall be tested at pressure specified by the local water works agency, or 17.5 kg/cm² for 60 min. Other piping shall be tested at a pressure 1.5 times higher than the maximum working pressure but not below 10.0 kg/cm².

2.4 Painting Painting shall conform to the Table 3-14.

Table 3-14

Surface	Type	Type of Paint	No. of coats			Remarks
			Prime	2nd	Finish	
Cotton Cloth (Insulated Surface)	Exposed	Ready-Mixed Paint	1	1	1	Under coat shall be filling.
	Concealed	Sealer	1	0	1	
Galvanized Iron Sheet (Insulated Surface)	Exposed	Ready-Mixed Paint	1	1	1	Prime coat shall be wash primer or anti-corrosive paint type C (Metalat)
Metalic Pipe	Iron	Rust Proof Paint	1	0	1	Except G.I.P.
Non Metalic Pipe		-	0	0	0	
Support and Frames	Exposed	Ready-Mixed Paint	2	1	1	Prime shall be anti-corrosive paint
	Concealed	Rust Proof Paint	1	1	1	
Pumps		Ready-Mixed Paint	2	1	1	Prime coat shall be anti- corrosive paint
Tank	Exposed not insulated	Ready-Mixed Paint	2	1	1	Prime coat shall be anti- corrosive paint
Joints	Exposed	Ready-Mixed Paint	1	0	1	Same as Galvanized Iron Sheet

Where paint shall not be applied.

P.V.C. Pipe
 F.R.P. Water Tank.
 Pipe which embedded in the ground.
 Surface treated pipe.
 Where directed by the supervisor.

2.5 Insulation

2.5.1 Where to be insulated

- A. Exterior exposed water supply piping shall be insulated by wrapping asphalt jute and heat welded and wrapped with Galvanized Iron Sheet. Painting shall conform to Item 2.4.
- B. Interior Piping

Where to be applied	Insulation Work	Painting work
Exposed piping and piping in pump room	Kraft paper and cotton cloth type	
Sanitary fixture accessories		
Exposed piping under slab	Asphalt jute, heat welded.	
Concealed piping		
Piping in the pit		
Bath room and Kitchen		

2.5.2 Insulated
Thickness

Water supply pipe shall be insulated by glass wool or rock-wool with the thickness shown in Table 3-16.

Table 3-16

Nominal Dia. (A)	15-20	25	30-40	50-80	90-100	125-200	Valve	Flat part
Public water pipe	15	15	15	20	20	25	20	20
Well water pipe	25	25	25	25	30	30	25	30
Northern country	25	30	30	35	35	35	35	35

1. When the well water temperature is below 16°C above thickness of insulation shall be applied unless otherwise specified.
2. In case the piping material is P.V.C., the thickness of insulation may reduce 60% of insulation thickness mentioned in the table.
3. Anti-frozen insulation shall conform to the particular specification and drawings.

3. Drainage
Work

3.1 Piping
Materials

3.1.1 Cast iron
pipe

Cast iron pipe shall conform to the requirement of JIS G 5525 and painting shall conform to JIS G 5525.

3.1.2 Galvanized
Steel pipe
and joint

- A. Galvanized steel pipe shall conform to JIS G 3452.
- B. Joints for drainage pipe shall conform to JIS B 2303.
(threaded drainage pipe joint)

C. Joints for vent pipe shall conform to JIS B 2301.

D. Pipe and joint shall be zinc gilding treated.

3.1.3 Lead pipe

Lead pipe shall conform to JIS H 4311 or HASS-203
Thickness and weight of pipe shall be as table 3-17

Table 3-17

Nominal Dia. (m)	Weight kg/m	Well thickness
125	24.7	5.3
100	16.8	4.5
75	12.8	4.5
65	8.3	3.4
50	6.5	3.4
40	4.6	3.0
30	3.5	3.0
25	3.0	3.0
20	2.5	3.0
16	2.1	3.0
13	1.7	3.0

3.1.4 Centrifugal
Concrete pipe

Centrifugal concrete pipe shall conform to JIS A 5303 (A or B type)

3.1.5 Vitrified
Pipes

Vitrified pipe shall conform to JIS R 1201 and JIS R 1202.

3.1.6 P.V.C. pipe

P.V.C. pipe shall conform to JIS K 6741 and joint shall conform to JIS K 6739.

3.1.7 Asbestos
Cement Pipe

Asbestos cement pipe shall conform to section 2.1.11 Water Supply Work.

- 3.1.8 Valves Valves shall conform to the section of Water supply work.
- 3.1.9 Sleeve Pipe sleeve made of galvanized iron sheet with thickness of 0.4 mm or more shall be used at where pipe penetrate through the wall and galvanized iron pipe with brim shall be used as sleeve where pipe penetrate through the water-proof wall.
- 3.1.10 Vent cap Vent pipe cap shall be provided at the wall face or top of vent pipe.
- 3.1.11 Drainage fittings
- A. General:
The sealed water depth of trap shall be more than 50 mm and the effective area of the drain hole of strainer shall be more than the sectional area of the drain pipe. The quality of material for iron and brass castings shall conform to class 2 of JIS G 5501 (gray iron castings) and class 2 of JIS H 5101 (brass castings).
 - B. Floor drain trap
Floor drain trap shall be made of cast iron and strainer or where exposed to view shall be chrome-plated copper alloy. Where the floor is water-proofed, trap shall conform to JIS A 4002 (floor drain trap).
 - C. Dram trap:
Dram trap shall be made of cast iron and strainer shall be made of brass. Where corrosive liquid is drained, trap shall be made of vitrified trap, and packing shall be anti-corrosive type.
Bolts to tighten the trap shall be brass bolts.
 - D. Sink trap:
Sink trap shall be made of cast iron or stainless.
 - E. Clean-out:
Clean out shall be chrome-plated brass alloy threaded type.
- 3.2 Equipment - Omitted -

3.3 Piping Work

3.3.1 Piping Material

Piping materials as follows:

Cast iron pipeDrainage pipe, Vent pipe
 Steel pipeDrainage pipe, Vent pipe
 Lead pipeDrainage pipe, Vent pipe
 Vitrified pipe and Centrifugal concrete pipe, drainage pipe

3.3.2 Connection

A. Steel pipes

Joint of steel pipe to threaded drain pipe joint fitting shall be done by cutting the taper male thread precisely on the pipe end portion and screwing this threaded pipe end tightly into the joint to such extent that a very slight clearance will be left between pipe end face and recess of joint. The taper male thread shall be cut on the pipe end portion in such manner that the distance from the pipe end face to the standard diameter point is at least equal to the length of the female thread portion and that the effective thread portion is 1.5 times longer than the length of the female thread portion.

B. Cast iron pipes:

The spigot end shall be inserted into the bell until it has been brought into contact with the socket bottom. Then the gap between spigot and bell shall be filled uniformly for a depth of about 25 mm from the bell end with yarn, and molten lead shall be poured into the gap, then caulked completely.

Amount of molten lead and yarn shall be as Table 3-18.

Table 3-18

Nominal dia.	For one joint (kg)	
	lead	yarn
50	0.70	0.08
65	0.90	0.10
75	1.00	0.12
100	1.25	0.18
125	1.50	0.21
150	1.75	0.25

C. Lead Pipes:

Joint between lead pipes shall be soldered or plastan joint. Where branch pipes are to be connected to the main, care shall be taken to avoid any protrusion of branch pipes beyond the inner wall of the main pipe.

Amount of solder shall be as Table 3-19.

Table 3-19

Nominal Dia. (A)	Amount of solder			Solder Weight (kg)	Remarks
	Joint dimension (mm)				
	Joint	Width	Thickness		
30	8	30	3.0	0.12	Amount of solder for 45° Y joint shall be increased 25% of this table.
40	10	30	3.0	0.15	
50	10	35	3.4	0.24	
65	12	35	3.4	0.30	
75	12	40	4.5	0.45	
100	12	40	4.5	0.57	

D. P.V.C. Pipe:

Joint shall be made by the cold-jointing method, and the pipe interior shall have no offset at the joint interfering with the flow. Joint adhesive shall be good quality and shall not be affected by heat and shock.

E. Concrete pipe:

In case of collar joints, ends of both pipes shall be brought into tight contact with each other at the center of the collar, and the pipes shall be properly positioned and secured to keep the even circumferential clearance between pipe and collar.

This clearance shall be filled with hard mortar in such manner that no mortar pours into the interior of pipes. If site conditions require that the collar should be first jointed to one end of pipe with mortar so as to form a bell, mortar shall be filled into the space between that pipe end and collar, but such space shall be left unfilled for about 10 mm from the pipe end face.

In case of joints using rubber rings, the spigot end of pipe shall be inserted into the bell end of pipe in such manner that the rubber ring can take its predetermined position.

F. Vitrified Pipes:

Spigot end of pipe shall be inserted into the bell end of pipe until the spigot end face has been brought into tight contact with the bell bottom. The pipes shall be properly secured to keep the even circumferential clearance between spigot and bell, and this clearance shall be thoroughly filled with hard mortar. Then mortar shall be placed on the joint with a taper of 45° from the outer circumference of the spigot end face.

G. Joint of different material pipe:

- 1) Where a cast iron pipe is to be jointed to the down-stream end of steel pipe, a GS joint shall be used. This GS joint shall be inserted into the cast iron pipe bell end, and the clearance between joint and bell shall be couked with yarn and lead.
- 2) In case lead drain pipe is to be connected to sanitary fixture or drainage fitting, the end of lead drain pipe to be connected shall be flared, and a lead pipe connecting Y-special or Y-branch capable of being tightly fitted to that flared end by means of a flange or screw shall be used.
- 3) Where a cast iron pipe is to be jointed to the down-stream end of lead pipe, the bell end of cast iron pipe shall be caulked with a brass caulking ferrule (collar). The lead pipe end shall be tightly fitted on the other end of cast iron pipe. The joint shall be soldered.
- 4) In case of steel pipe, a brass soldering nipple shall be used.
- 5) Where steel pipe is to be jointed to the down-stream end of brass pipe, threaded joint socket shall be used and brass soldering nipple shall be used.
- 6) Connection between brass pipe and lead pipe shall conform to the connection of lead pipe.
- 7) For the connection of vitrified pipe to cast iron pipe or steel pipe, where the diameter of vitrified pipe is equal to that of the cast iron pipe or steel pipe, the spigot end of cast iron pipe or steel pipe shall be inserted into the bell end of vitrified pipe and the clearance between spigot and bell shall be lightly packed with oakum. This clearance shall then be filled with hard mortar to complete the joint. Where the diameter of one pipe is smaller than that of

- 8) Where vitrified pipe is to be jointed to the down-stream end of lead pipe, the lead pipe end shall be inserted into the bell end of vitrified pipe and the joint shall be completed with oakum and putty or other suitable material.
- 9) Where vinyl pipe and steel pipe are to be jointed together, threaded drip pipe joint and valve joint (of vinyl) shall be used or alternatively, the vinyl pipe end shall be formed into a bell and the steel pipe end shall be inserted into such bell.
- 10) Where vinyl pipe and cast iron pipe are to be jointed together, a GS joint or brass caulking ferrule shall be used.
- 11) Where vinyl pipe and lead pipe are to be jointed, a brass collar shall be used.
- 12) Where vinyl pipe is to be jointed to vitrified pipe or concrete pipe, the joint shall be filled with oakum and finished with mortar.

3.3.3 Piping

- A. Where horizontal drain branch joints the main, such branch shall be connected to the main in a substantially horizontal position and at an acute angle of not more than 45° to the main in all cases.
- B. Where a lead pipe is to be bent, the bent shall be formed with the roundness of the pipe maintained, and no drain branch shall be connected to such bend.
- C. At the end part of drain pipe or where indicated in the drawings suitable size of clean out shall be provided.
- D. Any drainage from the following items shall not be connected directly to soil pipe or miscellaneous sewer pipe.
 - 1) Containers, appliances or equipment used for storage, cooking or handling of foods.
 - 2) Appliances or equipment using water as a cooling or heating medium.
 - 3) Water tanks, hot-water storage tank, heat exchangers and other similar tanks or reservoirs.

- 4) Pumping equipment for hot and cold-water supply and other similar equipment.
- 5) Drain pipes of fire hydrant system and sprinkler system.
- 6) Blow-off pipes and drain pipes of boilers, and drip pipes of steam lines.

- E. Indirect drainage pipe shall have a discharge opening space above the water receptacle or other overflow edge for a distance at least equal to the diameter of that pipe. If any trouble may occur due to provision of such spacing, adequate protective measures shall be taken.
- F. Vertical drain pipe shall be provided with a support block at the bottom end and shall be firmly secured to such block.

3.3.4 Vent Stack Piping

- A. Vent pipe shall be vertically branched out upward from a horizontal drain branch pipe or other appropriate point. Horizontal branching of the vent pipe shall not be permitted.
- B. Where vent pipes on each floor are to be connected to the vent stack all connections shall be made at least 150 mm above the respective overflow edges of fixture on that floor.
- C. The provision of the preceding item shall also apply to the connection of vent stack to stack vent pipe.
- D. Vent stack shall be connected to the waste stack or soil stack at the lowest part of stack pipe.
- E. Where vent pipe is to be connected to the horizontal drain pipe, such angle shall be more than 45° to upward.
- F. Vent stack shall be extended 600 mm from the top of the roof or lead to the wall and top of pipe shall be covered with vent cap.

3.3.5 Underground Piping

- A. Where water supply piping and drainage piping are to be buried parallel to each other, the actual horizontal distance between both lines shall be at least 500 mm,

and the water supply piping shall be buried above the drainage piping. This provision shall also apply where these lines cross each other.

- B. The distance between underground piping and building shall be more than 300 mm unless otherwise specified.
- C. Where concrete pipe or vitrified pipe are to be buried, gravel shall be laid on the ground at joint part then thoroughly compacted by a rammer. On this gravel layer, concrete bed shall be placed so as not to reverse the fall, and the pipes shall be laid on the concrete bed.
Backfill shall be thoroughly compacted so as not to leave voids under the bottom of pipe at any other part around the pipe.

3.3.6 Grade

In all case, the interior horizontal run of drain piping shall have a grade of 1/50 for a nominal pipe diameter not exceeding 75 mm and of 1/100 for a nominal diameter exceeding 75 mm. For the pipe diameter exceeding 200 mm, grade shall be made in the manner to have flow speed 0.6 m/S or more. All vent pipes shall be installed upgrade toward the corresponding vent riser and shall have no downgrade or irregular portion.

3.3.7 Spacing of Support

Pipe hanger shall be made of steel and firmly secured to the structure with the spacing as follows:

- A. Cast iron pipe:
Horizontal and vertical run intervals of 1.6 m. or less
At the joint of branch pipes every branch joint
- B. Steel pipe:
Spacing shall conform to the section of water supply work item spacing.
- C. Lead pipe:
Horizontal and vertical run intervals of 1.0 m. or less
At the joint of branch pipe every branch joint.

Where the distance of a horizontal run of lead drain pipe exceeds 1.0 m, such lead pipe shall be placed in a semi-circular galvanized iron sheet trough (at least 0.6 mm thick) and each trough shall be supported at 2 position.

Vertical run of lead drain pipe shall be protected with a galvanized steel pipe up to the height of 1.5 m above the floor level.

- D. Vinyl pipe and copper pipe, spacing for pipe support shall conform to the section of water supply work item of spacing.

3.3.8 Piping for high-rise building

Piping for high-rise building shall be specified in the particular specification.

3.3.9 Pit

A. Sewage pit:

Concrete or brick shall be used for site made sewage pit and inside of pit shall be finished with water proof cement mortar with thickness of 25 mm. Bottom of pit shall be formed gutter shape and pit cover shall be made of cast iron air tight type. Where necessary, anti-thief chain shall be provided. Size of pit is as follows.

Width x Length	Depth to Pipe bottom	Wall thickness		Top Thickness m/m	Bottom Thickness m/m	Gravel bed	Cover diameter	Connected pipe
		mm Conc.	Brick					
450 x 450	450	100	half size	120	100	120	300	150
450 x 450	460 - 600	100	"	120	100	120	450	150
600 x 600	610 - 1,200	120		120	120	150	500	180
750 x 750	1,210 - 2,000	150		120	150	200	600	180
900 x 900	2,010 - 3,000	180		150	170	250	600	

B. Drain Pit:

Concrete or brick shall be used for site made drain pit and inside of pit shall be finished with water-proof cement mortar with thickness of 20 mm or more. Bottom of pit shall be 150 mm below jointed pipe bottom.

Pit cover shall be made of cast iron or concrete and air tight type or grating type. Size of pit is as follows unless otherwise specified.

Width x Length	Depth to pipe bottom	Wall thickness		Top Thickness	Bottom Thickness	Gravel Bed	Cover Diameter
		Concrete	Brick				
450 x 450	600	100		120	100	100	450
600 x 600	610 - 900	120		120	120	120	450
750 x 750	910 - 2,000	150		120	150	150	600
900 x 900	2,010 - 3,000	150		150	200	200	600

C. Pit shall be the structure to meet the local authorities requirement.

D. Pit with the depth of connected pipe bottom more than 1.2 m shall provide the starap made of galvanized iron and anchor wall shall be reinforced with 9 ϕ steel bar @ 200 mm crosswise.

E. The entire surface of cast iron pit cover shall be enamelled with the refined tar mixture.

3.3.10 Gasoline trap and Grease trap

Gasoline trap and grease trap shall be made of cast iron or anti-corrosive treated steel for interior use and made of concrete for large size exterior type. Detail shall be specified in the drawings and specifications.

3.3.11 Test Leak test by water filling shall be made after completion of piping work and before backfilling and/or application of pipe covering. All branch pipes, connections to sanitary fixtures and other openings in the tested section of piping shall be properly plugged, and such section shall be fully filled with water up to its highest point and shall be left standing for at least one hour. These tests shall be made in the presence of the Supervisor.

3.4 Painting Painting shall conform to the section of water supply work, item painting.

3.5 Insulation

3.5.1 Insulation work and Painting work. Drain piping shall be insulated and painted as follows unless otherwise specified.

A. Exterior Piping:

Applied place	Insulation work	Painting work
Underground piping	Anti-corrosive paint 2 coats	
Exposed piping		Wash primer 1 coat Ready-Mixed paint 2 coats
Blow Pipe	Asphalted jute heat welded up to blow off valve covered by galvanized iron sheet with thickness of 0.3 mm.	Wash primer 1 coat Ready-Mixed paint 2 coats

B. Interior Piping:

Insulation work and piping work for interior piping shall conform to section of water supply work and as follows.

Applied Place	Insulation work	Painting work
Piping on Slab	Asphalted jute heat welded	
Exposed Sewer Piping		Wash primer 1 coat Ready-Mixed paint 2 coats
Vent Piping		For steel pipe exposed to view. Wash primer 1 coat Ready-Mixed paint 2 coats.

3.5.2. Insulation Thickness

Insulation material for drain piping shall be glass wool or rockwool with the thickness as follows.

Insulation thickness:

Nominal Dia. (mm)	13-20	25	30-40	50-	Valve	Flat place
Normal area	15	15	15	20	20	20
Snow country	20	20	20	30	25	20

Note - (1) For the P.V.C. pipe, above insulation thickness may be reduce to 60% of its thickness.

(2) Special insulation work for snow country shall be specified in the particular specification or drawings.

4. Fixture Work
- 4.1 Sanitary Fixture
- A. Maker, class and color shall conform to drawings and particular specification or directed by the Supervisor.
 - B. W.C., Urinal, Lav. Wash basin, Slop sink, etc. shall conform to JIS A 5207.
 - C. Stool type urinal, cocking sink, slop sink and bath tub shall conform to JIS A 5207.
- 4.2 Accessories
- 4.2.1 Flush valves
- A. Flush valve for water closet shall conform to JIS A 5521 and be made of chrome-plated bronze with diameter of 25 mm and able to flash 15 ℓ of water within 10 second under 1.0 kg/cm² supply pressure. Joint diameter to flash pipe shall be 32 mm.
 - B. Flush valve for urinal shall conform to JIS A 5521 and shall be made of chrome-plated bronze with diameter of 13 mm and able to flash 5 ℓ of water within 6 second under 0.7 kg/cm² supply pressure.
 - C. Flush valve for high-tank shall made of chrome-plated bronze and shall conform to the requirement of item A.
 - D. When vacuum breaker is used, it shall be installed in the manner of sufficient function.
 - E. Expose in view flush pipe shall be chrome-plated brass pipe with thickness of 0.6 mm or more.
- 4.2.2 Faucet and Tap
- A. Faucet and tap shall be made of chrome-plated bronze and conform to JIS B 2061.
 - B. Flush valve and faucet shall pass the pressure test of 17.5 kg/cm².

4.2.3 Trap

Material of trap and seal depth is as follows:

Fixture	Material	Dia. (mm)	Seal depth	Remarks
Water closet	Vitrified, cast iron or lead trap	100	50 or more	
Urinal	Same as above	50	50 "	
Stool urinal	Bronze or cast iron trap	50	50 "	Strainer shall be made of bronze or stainless steel
Lavatory Wash Basin	Bronze trap	30	50 "	
Slop sink	Cast iron trap	65	50 "	
Kitchen sink	Cast iron, bronze or lead trap	40	50 "	
Laboratory sink	Vitrified or lead trap	40	50 "	

4.2.4 Miscellaneous

- A. Metal accessories which exposed in view shall be chrome-plated.
- B. Screw used to fix the fixture or accessories shall be brass made and shall be chrome-plated where exposed in view.

4.3 Installation of Sanitary Fixture

4.3.1 Installation Work

- A. Anchor bolts or expansion bolts shall be used where the fixture is to be installed on the concrete, block or brick wall, and wooden blocks, if used, shall be treated with preservative and firmly embedded in the wall.
- B. Where the fixture is to be installed on the lathed wall or veneered wall, a block of hard wood having the same dimension as the stud shall be attached between studs.

- C. In case wood block is provided for anchor purpose, such wood shall be treated with anti-corrosive paint.
- D. Where fixture is anchored to the slab, necessary anchor hole and pipe sleeve shall be provided at the construction of such slab.
- E. All exposed-to-view areas of accessories, flush valves, flush pipe, etc. for sanitary fixtures shall be chrome-plated and shall conform to class 2, Grade 2 of JIS H 8613.
- F. Where part of the porcelain fixture is to be embedded in concrete, the contact area between the concrete or mortar and the fixture shall be treated with asphalt to a thickness of 3 mm or more. Provided, however, that the bottom contact surface of stool urinal, etc. rest on sand layer.
- G. Clearance between the fixture and wall shall be filled with white cement or sealing compound.
- H. Where fixture is installed at the concrete wall or where metal accessories attached to vitrified fixture, elastic anti-corrosive type packing shall be used and firmly tightened.
- I. Position of faucet or tap shall be determined with due consideration given to convenience according to the surrounding situation, and securely installed in a workman-like manner.

4.3.2 Japanese style
Water closet

Installation of Japanese style water closet shall be specified in the particular specification and drawings.

4.3.3 Water
Closet

- A. The installation position shall be accurately oriented, then the fixture set and secured with its top edge being level. Specified flange (JIS A 5514) shall be used for the connection of the closet to the drainage lead pipe.
- B. Between the fixture set and drainage pipe, water-proof type sealer shall be used and flange and lead pipe shall be soldered.
- C. In case P.V.C. pipe is used for connection, between the joint shall be sealed with asbestos yarn or rubber packing shall be used.

- 4.3.4 Urinal
- A. The trap ped urinal and the wall-mounted stool urinal shall be correctly attached where indicated.
 - B. The ordinary type urinal shall be correctly attached where specified, and after wax or non-drying sealing compound has been applied to the inner circumference of the trap inlet to a proper thickness, the trap shall be inserted into the urinal drain outlet and further filled with sealing compound from outside, then inserted again perpendicularly without any offset. The method of connecting the trap with the lead pipe shall be in accordance with the preceding paragraph (C).
 - C. Prior to installation of stool urinal, the socket of drainage fitting shall be soldered complete to the lead pipe open to the floor surface. The urinal shall be correctly installed where indicated and sufficient wax or heat resisting non-drying sealing compound shall be filled in the clearance between the drainage fitting body and the urinal, then firmly tightened so as not to permit leak. However, the urinal shall not be connected to the drain pipe in a manner that the pipe end be flared and puttied to seal the joint.
- 4.3.5 Flush Pipe
- Flush pipes or water supply pipes, where the pipe is to be embedded, shall be galvanized steel pipe, lead pipe or P.V.C. pipe.
- 4.3.6 Wash Basin and Lavatory
- Firmly installed back hangers where indicated, secure so that the top plane of fixture will be level and not rickety. Sufficient wax or heat resisting non-drying sealing compound shall fill the clearance between the periphery of drain port and drain fitting of the fixture and then tightened in a manner not to permit leak.
- 4.3.7 Cistern
- The cistern shall be installed and secured firmly where indicated in a manner to level the top plane of the fixture. The flush pipe shall be installed in a workmanlike manner without leak.
- 4.3.8 Slop Sink
- The trap shall be correctly installed where indicated. Connection of the fixture to drain pipe shall conform to JIS A 5514. Installation of back hangers and connection of the drain port of the fixture with the drain fitting shall conform above 4.3.6.

4.4 Height of fixture installation Height of fixtures shall be as follows unless otherwise specified.

Fixture		Height	Remarks
Urinal	Floor finish to front top edge	530	
Lavatory	- ditto -	760	
Wash basin	- ditto -	Male Female	700 685
Mirror	Floor finish to top of mirror	Male Female	1,675 1,660
Shelf	Floor finish to top of shelf	Male Female	1,005 990
Faucet			
Sink	Sink floor to top of faucet	300	
Bath	Bath tub top to top of faucet	150	
Lav.	Lav. top to top of faucet	150	
Bath room	Floor finish to top of faucet	300	
Cristern	Floor finish to bottom of cristern		
	floor mounted Japanese type	500	
	Western type	550	
	High-tank Automatic	2,200	
	Manual	1,800	
Slop sink	Floor finish to front top edge	685	

Drinking fountain	Floor to front top edge	760
Flush valve for W.C.	Floor to center of valve	600
Flush valve for urinal	Flush top to center of flush valve	165
Paper holder	Floor to center of holder	
	Japanese type	400
	Western type	750

Above dimension may vary in accordance with tile layout and before commencement of work, installation drawing shall be provided.

- 4.5 Protection Necessary protection for fixture after installation shall be taken.
- 4.6 Test After completion of cleaning work hydraulic test and flushing test shall be made in the presence of the Supervisor.
- 4.7 Bath room unit Bath room unit shall conform to the particular specification and drawings.

5. Sewage
Treatment
System

5.1 Scope of
Work

Sewage treatment system includes all the necessary work to treat the sewage and discharge to the indicated place.
This system shall be met with the local code and any requirement of related authorities. Also this system shall be the structure to be passed the inspection of the government inspection or any other related inspection.
Detail of system shall conform to the particular specification and drawings.

6. Fire
Protection
System

6.1 Scope of
Work

Fire protection system shall be constructed in accordance with the requirement and code of fire department or other related authorities.

7. Hot Water Supply
Work

7.1 Piping material

- 7.1.1 Pipes
- A. Brass pipe and copper pipe shall conform to the section of water supply.
 - B. Steel pipe shall conform to JIS G 3452 (carbon steel pipe) and pipe joint shall conform to JIS B 2301 (threaded malleable cast iron pipe joint) and shall be zinc sheradized.
Pipe flange shall conform to JIS B 2211 (basic dimension of iron and steel pipe flanges of 5 to 10 kg/cm²) and JIS B 2212 and shall be zinc sheradized.
- 7.1.2 Valves
- Valves shall conform to the section of water supply work except butterfly valves shall not be used for water temperature above 90°C.
- 7.1.3 Expansion Joint
- A. Sleeve type expansion joint shall conform to HASS-003 (Slide expansion joint) and nominal diameter less than 50A shall be bronze made threaded type and nominal diameter more than 65 shall be cast iron made flange type.
 - B. Expansion joint shall conform to HASS-004 (expansion joint) and made of cast iron partially stainless steel or bronze made and joint shall conform to class 1 of SVS 304 or JIS H 3731.
- 7.1.4 Pipe sleeve
- Where pipe penetrate through the ceiling, floor or wall, galvanized iron sheet (0.4 mm thickness or more) pipe sleeve shall be provided and where penetrate through water-proof part, galvanized iron pipe sleeve shall be provided.
- 7.1.5 Expansion Tank
- The expansion tank shall be constructed of electro welded steel plate and interior surfaces shall be epoxy resin coating or Phenol resin coating. Exterior of tank shall be painted with rust rproof primer two coatings and color finish of 2 coatings. Steel plate cover and concrete or steel frame base shall be provided.

Accessories of tank is as follows:

Close type	Open type
Pressure gauge 1	Expansion pipe 1
Level gauge 1	Overflow pipe 1
Relief valve 1	Drain pipe 1
Expansion pipe 1	Vent pipe 1
Drain pipe 1	Water supply pipe 1
Inlet for air 1	Lift up pipe 1

7.2 Equipments

7.2.1 Hot water storage tank.

- A. The hot water storage tank shall be constructed of welded steel plate and its shape, dimensions, etc., conforming to the typical drawings.
- B. The heating tube shall conform to JIS H 3603 (deoxidized copper tubes) and heating device shall be of construction easy to remove.
- C. After construction of tank, tank and coil shall be tested.
- D. The tank shall be furnished with the following accessories.

i) Thermometer	v) Manhole
ii) Pressure gauge or level gauge	vi) Outlet or inlet for steam supply and return pipe Hot water supply and return pipe, water supply pipe and drain.
iii) Relief valve	
iv) Thermostat inlet	

7.2.2 Hot Water
Boiler and
tank

- E. Tank shall be installed on the channel steel base.
- A. All boilers shall be in accordance with the provision of the Boilers and Pressure vessels safety regulations, the boiler construction standards, the small-size boiler construction standards, the small-size pressure vessel construction standards and labor safety and sanitary regulations.
- B. Where cast iron or steel boiler is to be used as a hot-water boiler, it shall be constructed with steel specified in JIS G 3141, JIS G 3101.
- C. Shop drawing shall be submitted to the Supervisor in advance to the construction of tanks and shall be approved.

7.2.3 Oil furnace
hot water
boiler

- A. The boiler under this section shall be less than 10 head and 8 m² burner area. The boiler larger than this shall specified under Air-Conditioning Work.
- B. The boiler shall be made of steel plate, copper plate or cast iron and steel plate shall be electro-welded, copper plate shall be molded joint and in case steel plate made, both inside and outside surface shall be galvanized finish.
- C. Outlet or inlet for water supply, hot water supply, drain pipe, expansion pipe relief valve, thermometer shall be provided.
- D. Oil burner shall be automatic control by the hot water temperature.
- E. Boiler shall be tested under 2 kg/cm²,hydraulic pressure.
- F. In case outside wall is to be insulated, wall shall be doubled and mineral insulation material shall be filled in between.
- G. Following accessories shall be provided.

Thermometer
Level gauge
Relief valve
Oil burner

Cast iron door
Anti-explosion door
Cleaning tool

7.2.4 Gas burner
hot water
boiler

- A. Boiler shall be made of steel plate, copper plate or brass made.
- B. In case outside wall is to be insulated, wall shall be doubled and mineral insulation material shall be filled in between.
- C. For each boiler, following accessories shall be provided.
- Thermometer
Level gauge
Inlet or outlet for hot water supply, water supply, drain, overflow.
Gas burner
Cleaning tool
- D. Gas burner shall equip with pilot burner.
- E. Accessory metal shall be chrome-plated.
- F. Boiler shall be manual control type or automatic control type.
In case automatic control type, Automatic water supply equipment and automatic hot water temperature control equipment shall be provided.

7.2.5 Wall type
gas boiler

Small size wall type gas boiler shall conform to JIS S 2109, JIS S 2110.

7.2.6 Electric
hot water
boiler

- A. Electrical hot water boiler shall be specified in the particular specification and drawings.
- B. In case outside wall is to be insulated, wall shall be doubled and mineral insulation material shall be filled in between.
- C. For each boiler, following accessories shall be provided.

Thermometer	.....	1
Level gauge	.....	1
Inlet and outlet for water supply, hot water supply and overflow	.....	1
Indication Lamp	.....	1
Cleaning tool	.....	1 set

7.2.7 Smoke flue
and stack

- A. Smoke flue and stack shall be made of steel plate. Either a multiblade or an inclined J-type shall be attached on the stack top and a cleaning hole metal attached to the base. The damper shall be of the rotary type capable of permitting on the floor handling.
A packing 2.3 mm thick or more conforming to JIS R 3452 (asbestos thread packing) shall be firmly packed into the joint clearance of the flue, tightened uniformly so as to provide an air tight joint.
- B. When smoke stack is not set at the top of boiler, stack shall be anchored on the concrete slab by anchor bolt and shall be braced with steel wire of 2.5 mm at two different level, each 3 brace shall be provided.
- C. Expansion joints shall be provided at necessary points in the horizontal run of flue corresponding to the length of that flue.
- D. Clearance between the sliding part of expansion joint and flue shall be filled with asbestos thread packing wrapped in two layers or more, to provide an air tight joint.
- E. Smoke flue and stack for gas boiler and wall type gas boiler shall conform to the requirement of gas supplier and related code.

7.2.8 Hot water
Circulation
Pump

- A. Hot water circulation pump shall be either a centrifugal pump or propellar pump directly coupled with a motor. The material of the pump casing shall conform to class 2 of JIS G 5501, the impeller class 2 of JIS H 5111 and the main shaft class 50 of JIS G 4303, except that those using sleeves shall conform to S 35°C JIS G 4051. Bearing parts shall not be affected by hot-water temperature and shall be free from noise during operation.
- B. After completion of fabrication, pump shall be tested and result shall be reported to the Supervisor.
- C. Foundations for pump shall be of concrete and mortar shall be applied on the surface of each foundation. Holes for anchor bolts required to fix the equipment shall be accurately provided.
After installation of anchor bolts, those holes shall be filled with mortar. Drainage gutters on the perimeter of foundation top shall be provided and from which water shall be indirectly discharged into the nearest drainage system.

- D. Circulation pump which is provided between the pipe without foundation shall be installed in accordance with manufacture's standard.
- E. The pump shall be furnished with the following accessories.
- 1) Gate valve (elevating type valve rod) 1 ea.
 - 2) Check valve
 - 3) Pressure gauge or head gauge
 - 4) Drain cock
 - 5) Mating flange (with bolts)
 - 6) Wrenches and other necessary accessories
- 7.2.9 Motor and Electrical Work
- A. Mortar for pump shall conform to JIS C 4210 or JIS C 4203
 - B. Control panel shall be provided with necessary accessories and shall be operated by manual.
 - C. Electrical wiring work shall conform to the section of water supply work.
- 7.2.10 Installation of Hot water Boiler
- Foundation for small hot-water supply boilers shall be constructed of concrete, and the surface of foundation to receive the boiler shall be at least 50 mm above the floor level and shall be finished with mortar.
- Boiler shall be installed level on the foundation surface, and the clearance between boiler and foundation surface shall be thoroughly filled with mortar to prevent the ambient air from entering the fire box.
- The combustion chamber shall be lined with refractories or other materials as required.
- 7.3 Piping Work
- 7.3.1 Piping Material
- Pipe material for hot water supply work shall be made of steel pipe, brass pipe or copper pipe.

7.3.2 Pipe Joint

- A. Joint for steel pipe shall be threaded type or flange joint and shall conform to JIS B 0203.
- B. Joint for copper pipe shall be done with bell and spigot joint. Where the removal of pipes is required, flanged joint shall be used for pipes of nominal diameter below 30 mm, and flange joints shall be used for pipes of nominal diameter more than 30 mm. Bell and spigot joint shall be effected by inserting the pipe spigot end correctly into the joint bell after thorough cleaning of pipe exterior and joint bell interior. The joints so effected shall be heated to a proper temperature and soft solder alloy shall be poured into the joint clearance.
- C. For flange joint or union joint, rubber packing or super heat packing shall be used.

7.3.3 Piping

- A. Piping shall be installed with the grade to provide the gravity circulation and shall be circulated without the operation of circulation pump.
- B. Piping shall be installed in the manner not to produce in incorporated gravity circulation or possibility of occurrence of reverse circulation, short circuit condition or air packed condition.
- C. Piping shall be installed so as not to interfere with the expansion and contraction of pipes and in such manner that the grade of the piping can be kept uniform and even. Any piping with reverse grade, air pocket or other possible hindrance to circulation shall not be permitted.
- D. Piping shall be firmly secured in place by fixing hard wares at proper points taking account of the expansion and contraction of pipes. Piping with expansion joints shall be secured with fixing hard-wares at such points as may be considered effective as expansion starting points.
- E. Expansion pipe shall be vertically extended to the top of water supply tank at roof.
- F. Where pipe penetrate through the ceiling, floor or wall exposed in view, escatcheon shall be provided.
- G. Horizontal running pipe shall be installed not to produce any air pocket and where indicated in the drawing blow off valve provided.

- H. Where indicated in the drawing, air spring shall be provided.
 - I. After installation of pipe, pipe end shall be protected not to allow any sludge entering into pipe.
- 7.3.4. Spacing of Support
- A. Support material shall be made of steel and spacing of support shall be specified in the particular specification or drawings.
 - B. Any points of branch is to be made shall be supported and for vertical run of copper piping shall be braced at one point in every story.
 - C. For horizontal run of pipe, steel insert, cast iron insert, or anchor bolt shall be installed prior to the construction of concrete slab.
- 7.3.4 Piping for high-rise building
- A. Piping for highrise building shall be specified in the particular specification and drawings.
- 7.3.6 Grade
- In case of upward circulation, the hot-water supply piping shall be installed up-grade and the hot-water return piping shall be down-grade.
In case of downward circulation, both supply and return lines shall be installed down-grade. In all cases, the grade shall be 1/150 for the gravity circulation and 1/200 for the forced circulation.
- 7.3.7 Test
- Hydraulic test shall be made prior to the insulation work in the presence of the Supervisor.
Testing pressure shall be 10 kg/cm^2 and leave under such condition more than 60 min.
- 7.4 Painting
- A. Painting work shall conform to the section of water supply work item painting work.

- B. Hot water storage tank and pressure relief tank without insulation shall be painted with 2 coats of rust proof paint and 2 coats of finish coats.
- C. Boiler, smoke flue and stack shall be painted with two coats of rust proof paint and finished with two coat of anti-heat paint.

7.5 Insulation Work and Painting work

Hot water supply pipe, return pipe, storage tank and expansion tank shall be insulated and painted as follows:

A. Exterior Piping

Place	Insulation Work	Painting work
Exposed pipe	Glass wool insulation pipe Asphalt felt or roofing Galvanized iron sheet	Wash primer C 1 coat Ready-Mixed Paint.....2 coats
Blow and Overflow Pipe		Metal surface primer 1 coat Ready-Mixed Paint 2 coats

B. Interior Piping

- Refer to Table 7-5-B -

Table 7-5-B Insulation, External Covering and Supplementary Materials

Materials by classification	Requirements
Rockwool	<p>Heat Insulating Board, cylinder, band and blanket of rockwool shall be standard products conforming to JIS A9504 (rockwool heat insulating and mineral wool heat insulating materials). Heat insulating board shall be class 1 or 2, heat insulating band shall be class 2, but that used for circular air duct shall be class 2 material covered with glass fiber on one surface. Glass fiber shall be plain fiber woven with glass fiber threads (JIS R3413); single thread of 13 micron, 200 filament, and having fabric weight of 72 g per 1 m². Blanket shall be reinforced with metal lath sheath specified by JIS A5505 (metal lath). All the rockwool heat insulating materials shall be treated by waterproof agent, etc.</p>
Glass wool	<p>Heat insulating board, cylinder, band and blanket of glass wool shall comply with JIS A9505 (Glass wool heat insulating materials). Heat insulating board shall be class 2, d and e; heat insulating cylinder shall be class 2; blanket shall be class 1,b or 2,b which shall be reinforced with metal lath sheath specified by JIS A5505 (metal lath), heat insulating band to be used for circular air duct shall be prepared by heat insulating board class 2, d cut into the specific width, followed by laying lengthwise and finished with glass fiber attached as specified above. All the glass wool heat insulating materials shall be treated with waterproof agent, etc.</p>
Foam polystyrene	<p>Heat insulating board and cylinder of foam styrene shall conform to JIS A9511 and shall be class 3. Foam polystyrene flexible board shall be made flexible by compression treatment applied to foam polystyrene board class 3, and its thickness shall be 5mm</p>

Materials by classification	Requirements
	or less. Joings and coverings shall be formed of the above-specified material and manufacturing process, with quality conforming to Foam polystyrene heat insulating cylinder Class 3.
Cow Fur Felt	Heat insulating cylinder class 3 shall be manufactured to JIS A9508 (cow fur felt) by wet process. Heat insulating cylinder shall have asphalt felt linings on both outside and inside surfaces and formed into halved cylinders longitudinally. The halved pieces shall bear JIS label.
Carbonized Cork	Carbonized cork board shall conform to JIS A9507 (Carbonized cork sheet, class 2)
Diatom-earth	Diatom-earth heat insulating material shall be the standard product in accordance with JIS A9503 (diatom-earth heat insulating material), mixed with diatom-earth and shall be class 1.
Cotton cloth	Cotton cloth shall be 115 g. per 1 m ² or more. When used on pipes and the like, the cloth shall be cut to form the tape of proper width.
Vinyl tape	Vinyl tape shall be the product conforming to JIS Z1901 (anti-corrosive vinyl tape) having 0.2 mm thickness, semi-glass non-adhesive quality.
Aluminum cloth	Aluminum cloth shall be of 0.02 mm thick aluminum foil laminated with incombustible cotton cloth of 55 g. per 1 m ² or more using polyethylene resin agent; film thickness after hardening shall be 0.006 mm or more. When used on pipes, the cloth shall be cut to form the tape of proper widths
Glass cloth	Glass cloth shall be plain fabric made of glass fiber thread of 9 micron, 200 filament single thread conforming to JIS R3413

Materials by classification		Requirements
		(Glass fiber thread) and flat thread of 9 micron, 200 filament sliver glass fiber thread, approximately 3 mm wide, runproof. Weight of cloth shall be 150 g. per 1 m ² or more. When used on circular air duct, the cloth shall be cut to form the tape of proper width.
	Galvanized iron sheet	Galvanized Iron sheet shall be flat sheet conforming to JIS G3302 (Galvanized iron sheet). Thickness of sheet shall be 0.3 mm when used on pipes having outer diameter to be insulated being 250 mm or less, and 0.4 mm on others.
	Aluminum sheet	Aluminum sheet shall conform to JIS H4101 (Aluminum sheet and disc sheet, having thickness 0.8 mm and more.)
	Waterproof hessian cloth	Waterproof hessian cloth shall be the product of hessian cloth No.7 conforming to JIS L3405 (hessian cloth), being applied to one side with blown asphalt conforming to JIS K2207 (petroleum asphalt). Blown asphalt shall be of penetration degree 10 - 20. When used on pipes, the cloth shall be cut to form the tape of proper width.
	Special asbestos board	Special asbestos board shall be the product approved to be semi-incombustible material specified by Building Standards Act. Its thickness shall be 6mm and more.
	Plaster	Plaster shall be mixed gypsum plaster conforming to JIS A6904 (Gypsum plaster).
Supplementary materials	Kraft Paper	Kraft paper shall be the molding paper specified by the manufacturing process of JIS A6006 (asphalt roofing), having weight of 370 g. per 1 m ² .