# DHF

## POLYETHYLENE LINED STEEL PIPE

DAI-ICHI HIGH FREQUENCY CO., LTD.

# Proprietary Technologies, and their Products

Quality is a key word in every industry. In order to create a value added superior product, it is necessary to maintain the high quality technology and equipment. In response to those requirements, DHF has been providing the most advanced products, derived from high frequency induction heating technology.

As a result, DHF was awarded The Okochi Memorial Technology Prize and The Okochi Memorial Production Prize.

We are proud of introducing the polyethylene lined steel products with revolutionary properties as fluid purity protection as well as corrosion resistance.

DHF is determined to develop a new product to meet the requirements of the Customer in quality, cost, and delivery. The development of proprietary technology is one of the operational targets that DHF is searching for.



C O N T E N T S

# DHF-COAT-PE

Polyethylene Lined Steel Pipe

## <Features>

1. **High Resistance to Chemicals** ····· Polyethylene is chemically stable against acid and alkaline, and can be used to various application.

2. **High Mechanical Properties** ····· High resistance to cracks and exfoliation of the lining due to high tensile strength, large elongation, high toughness, and high adhesion. In particular, highest resistance in stress corrosion cracking environment.

3. **Low Friction Coefficient** ····· High fluid transportation rate due to smooth surface and low friction coefficient of the lining.

4. **Less Contamination** ····· Less marine life and foreign particle stay on the lined surface due to non-polar character and low contact angle to water.

5. **High Electrical Insulation** ····· High insulation resistance is itself corrosion protective and effective in connection with cathodic protection.

6. **Stability at Low Temperature** ····· No degrading and cracks even at -40 C

7. **Uniform Quality** ····· Uniform coating without a pinhole on a complex shaped pipe joint and tank.

8. **No Dissolution** ····· No dissolvable material is contained like plasticizer and fluid purity is protected without dissolved contamination.

9. **No Metallic Contact to Fluid** ····· Lining is made in such a way that the fluid never contact a metallic surface in any type of connectors such as flange, mechanical joint, or victaulic joint.

10. **High Weathering Resistance** ····· Prevent the ultraviolet degradation under the sun due to special treatment against weathering.

### Application of DHF-COAT-PE (Polyethylene Lined Steel Pipe)

**DHF-COAT-PE is widely used in various industries as a dependable corrosion resistant steel pipe, as follows.**

DHF-COAT-PE-I &DHF-COAT-PE-D ····· Sea-water ( Intake pipe, Cooling water piping, Fire hydrant piping, ballast pipe, etc.) Pure water, Chemical solution (Chloric acid, Sulferic acid, Sodium hypochlorite, etc.) Drainpipe, Waste water pipe, Desulferizing piping, Farming water, Waterworks, Water supply

DHF-COAT-PE-E ····· Gas pipeline, Oil pipeline, Conduit pipe, Intake pipe, Farming water, Clear water, Valve stand ( buried or exposed )



# DHF-COAT-PE

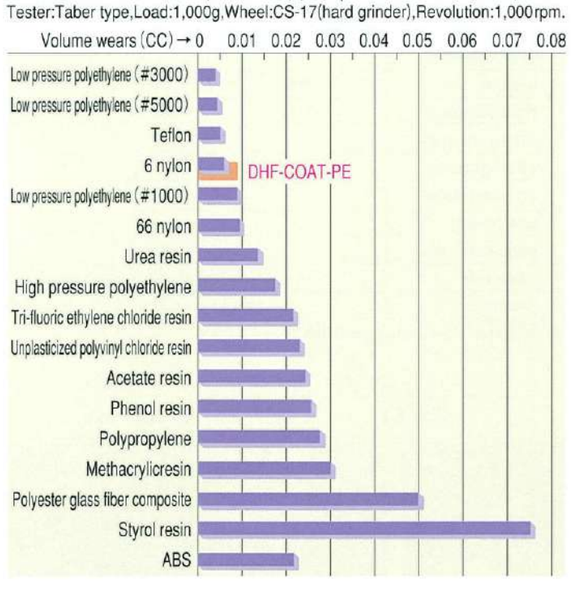
Polyethylene Lined Steel Pipe

## <Property>

| test item | | test method | criterion |
|---|---|---|---|
| pinhole test | | pinhole detector 10,000V | no pinhole |
| coating thickness test | | electromagnetic thickness meter | 1mm & over |
| adhesion test | | 10mm wide 180 peel test | 3kgf/cm & over ( 5-10kgf/cm ) |
| impact test | steel cone drop test | JWWA K132 spherical nose of 50R 6.3kgX1,000mm 20kgX1,850mm | no blow & no cracks |
| | Gardner impact | 5/8in.X3kgX1,200mm | |
| flattening test | | 2/3D | no cracks & no separation |
| stress corrosion cracking test | | Soak in 10% igebar at 50℃ after 2/3D flattening | no cracks in 1,000 hrs. |
| weathering test | | sunshine meter exposure 2,400 hrs | no property change |
| thermal cycle test | | 100 cycles between-10℃ & 90℃ | no blow & no cracks no property change |
| | | 100 cycles between-60℃ & 80℃ | |
| vacuum cycling test | | 300 cycles between vacuum &70℃ normal pressure | no blow & no floating |
| melting test | | JWWA K132 | acceptable |

### Comparison Table of other lining materials

Wear Resistance of Plastics (Taber wear) (cf. Japan Plastics vol.16, no11)
Tester:Taber type,Load:1,000g,Wheel:CS-17(hard grinder),Revolution:1,000rpm.




### Hydro-flow Equation (Hazen Williams Equation)

| in case of Cylinder | |
|---|---|
| flow velocity | $v=0.35464 \cdot C \cdot D^{0.63} \cdot I^{0.54}$ |
| flow volume | $Q=0.27853 \cdot C \cdot D^{2.63} \cdot I^{0.54}$ |
| dynamic gradient | $I=10.666 \cdot C^{-1.85} \cdot D^{-4.87} \cdot Q^{1.85}$ |
| flow velocity coefficient | $C=3.5903 \cdot Q \cdot D^{-2.63} \cdot I^{-0.54}$ |
| | $v=4Q/\pi d^2$ |

$v$=average flow velocity (m/sec)
C=flow velocity coefficient
I=h/$\ell$=dynamic gradient
h=friction loss in length L
Q=flow volume ($m^3$/sec)
D=inside diameter (m)

Note: Under a given condition, if the flow coefficient is large, flow velocity and flow volume are large. DHF-COAT-PE has a larger flow coefficient than other piping.

### Comparison Table of Bonding Strength

| lining material | manufacturing process | bonding strength kg/cm² |
|---|---|---|
| mortar lining | centrifugal | 4 |
| coaltar enamel lining | coating | 4 |
| asphalt lining | coating | 4 |
| tar-epoxy lining | coating | 15 |
| epoxy lining | curing at room temperature | 20 |
| polyethylene lining | powder coating | 100 |
| natural rubber lining | vulcanizing | 53 |
| hard natural rubber lining | vulcanizing | 100 |
| neoprene rubber lining | vulcanizing | 45 |
| neoprene rubber lining | vulcanizing at room temperature | 40 |
| neoprene rubber coating | vulcanizing at room temperature | 30 |

### Flow velocity coefficient (C value) of various piping

| piping | C-value |
|---|---|
| steel pipe ( new ) | 120 |
| steel pipe ( 10 years old ) | 110 |
| steel pipe ( 20 years old ) | 100 |
| ductile cast pipe ( new ) | 130 |
| ductile cast pipe ( 20 years old ) | 100 |
| rusted pipe | 70 |
| mortar lined ductile cast pipe ( trowelled ) | 130 |
| mortar lined ductile cast pipe ( no trowel ) | 110 |
| rubber lined steel pipe | 130 |
| tar epoxy coated steel pipe | 130 |
| polyehtylene lined steel pipe | 140 |

# DHF-COAT-PE

Polyethylene Lined Steel Pipe

## <PROPERTIES>

### Polyethylene's Resistance to Chemicals

**( Inorganic Compound )**

| chemicals | concentration % | 20˚C | 60˚C |
|---|---|---|---|
| chloric acid | various concentration | ○ | ○ |
| sulfuric acid | 60&under | ○ | ○ |
| sulfuric acid | 70 | ○ | △ |
| sulfuric acid | 80 | ○ | × |
| sulfuric acid | 95&over | △ | × |
| nitric acid | 5&under | ○ | ○ |
| nitric acid | 5～25 | ○ | △ |
| nitric acid | 30～60 | △ | × |
| nitric acid | 70&over | × | × |
| phosphoric acid | 90&under | ○ | ○ |
| phosphoric acid | 95&over | △ | × |
| chromic acid | electrolyte | ○ | ○ |
| chromic acid | 10&under | ○ | △ |
| chromic acid | 10～25 | △ | × |
| chromic acid | 25～50 | × | × |
| hydrofluoric acid | 60&under | ○ | ○ |
| hydrofluoric acid | 75&over | ○ | △ |
| hydrobromic acid | various concentration | ○ | ○ |
| hypochlorous acid | 10 | ○ | ○ |
| ammonia | dry gas | ○ | ○ |
| ammonia | aqueous solution | ○ | ○ |
| oxygen | 100 | ○ | × |
| hydrogen | 100 | ○ | ○ |
| carbonic acid gas | 100 | ○ | ○ |
| carbon monoxide | | ○ | ○ |
| sulfur dioxide | dry | ○ | ○ |
| sulfur dioxide | wet gas | ○ | △ |
| sulfur | colloid | ○ | △ |
| chlorine water | 2 | ○ | ○ |
| chlorine water | saturated | ○ | △ |
| hydrogen peroxide | | ○ | ○ |
| sodium chloride | | ○ | ○ |

**( Organic Compound )**

| chemicals | concentration % | 20˚C | 60˚C |
|---|---|---|---|
| formic acid | 80&under | ○ | ○ |
| formic acid | 80～100 | △ | △ |
| acetic acid | 10&under | ○ | ○ |
| acetic acid | 10～60 | ○ | △ |
| acetic acid | 60～100 | △ | × |
| oxalic acid | various concentration | ○ | ○ |
| methyl alcohol | 50&under | ○ | ○ |
| methyl alcohol | 100 | △ | △ |
| ethyl alcohol | 96&under | ○ | ○ |
| ethyl alcohol | 100 | △ | △ |
| butanol | 100 | ○ | × |
| benzyl alcohol | | × | |
| cresol | | × | |
| phenol | | × | |
| benzene | 100 | × | × |
| toluene | 100 | × | × |
| xylene | 100 | × | × |
| formalin | 40 | ○ | ○ |
| acetaldehyde | 100 | △ | × |
| benzaldehyde | 100 | × | |
| acetone | 100 | △ | × |
| methyl-ethyle-ketone | 100 | △ | × |
| cyclohexanon | 100 | × | |
| aniline | 100 | △ | × |
| nitrobenzene | 100 | △ | × |
| methyl acetate | | × | × |
| ethyl acetate | | △ | × |
| amyl acetate | | × | |
| petroleum | | × | × |
| petroleum ether | | × | × |
| gasoline | | △ | × |
| paraffin | | △ | × |

○:usable △:usable under limited condition ×:unusable ※Please consult with us about " the limited condition"

### Properties of Polyethylene Resin

| item | test method | unit | criterion |
|---|---|---|---|
| Specific gravity | JIS K6760 | g／$cm^3$ | 0.920 & over |
| Tensile strength | JIS K6760 | KN／$cm^2$ (kgf／$cm^2$) | 1.18 & over (120 & over) |
| Elongation | JIS K6760 | % | 500 & over |
| Hardness | JIS K7215 | HD D | 40～55 |
| Softening Point | JIS K7206 | ˚C | 85 & over |
| Volume Resistance | JIS K6911 | ohm-cm | $10^{14}$ |
| Embrittlement Temperature | JIS K7216 | ˚C | -50˚C & under |
| Environmental Stress Cracking with constant strain | JIS K6760 | hrs | 1000 & over |
| Impact | JIS G3469 appendix | — | no pinhole |
| Water Absorption | JIS K7209 | % | 0.01 & under |
| Insulation Threshold Voltage | JIS C2110 | KV | 30 & over |



# DHF-COAT-PE

Polyethylene Lined Steel Pipe

## <Manufacturing Shops of Polyethylene Lined Steel Pipe>

### ISO 9001 Certified

(Tokyo Branch, Chiba Works. Kansai Branch, Akashi Works)
Other branchs are in the process of certification.


DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

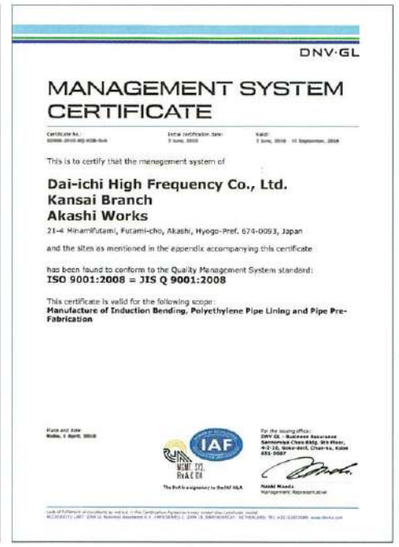
**Dai-ichi High Frequency Co., Ltd.**
**Tokyo Branch**
**Chiba Works**

8 Tsuruji, Kisarazu-City, Chiba-Pref. 292-0835, Japan

and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
**ISO 9001:2008 = JIS Q 9001:2008**

This certificate is valid for the following scope:
**Design and Manufacturing of Induction Bending, Polyethylene Pipe Lining and Pipe Pre-Fabrication**


DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

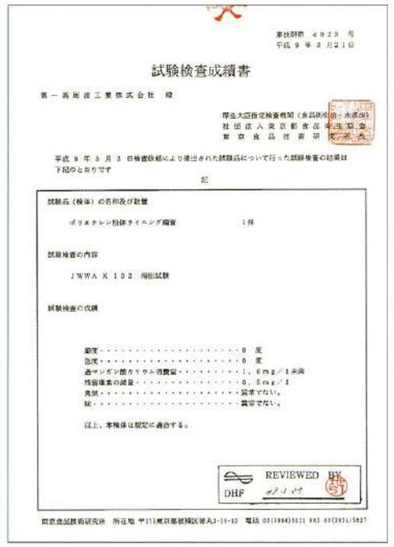
**Dai-ichi High Frequency Co., Ltd.**
**Kansai Branch**
**Akashi Works**

21-4 Minamifutami, Futami-cho, Akashi, Hyogo-Pref. 674-0093, Japan

and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
**ISO 9001:2008 = JIS Q 9001:2008**

This certificate is valid for the following scope:
**Manufacture of Induction Bending, Polyethylene Pipe Lining and Pipe Pre-Fabrication**


試験検査成績書

第一高周波工業株式会社 殿

厚生大臣指定検査機関（食品衛生法）承認(30)
社団法人兵庫県食品衛生協会
兵庫食品技術研究所

平成 9 年 3 月 3 日検査依頼により提出された試験品について行った試験検査の結果は下記のとおりです

記

試験品（検体）の名称及び数量

ポリエチレン粉体ライニング鋼管　1件

試験検査の内容

JWWA K 132　塗膜試験

試験検査の成績

鋭度・・・・・・・・・・・・・・・・・・・・・・0 度
強度・・・・・・・・・・・・・・・・・・・・・・0 度
過マンガン酸カリウム消費量・・・・・・・・・1．6mg／l 未満
残留塩素の減量・・・・・・・・・・・・・・・0．5mg／l
臭気・・・・・・・・・・・・・・・・・・・・異常でない。
味・・・・・・・・・・・・・・・・・・・・・異常でない。

以上、本検体は規定の適合する。

REVIEWED BY DHF

兵庫食品技術研究所　所在地 〒115 東京都北区浮間1-10-12　電話 03(3964)3111 FAX 03(3931)5827

### Chiba Works

No.A-119
Certified shop by JWWA
※ Japan Water Works Association(JWWA)

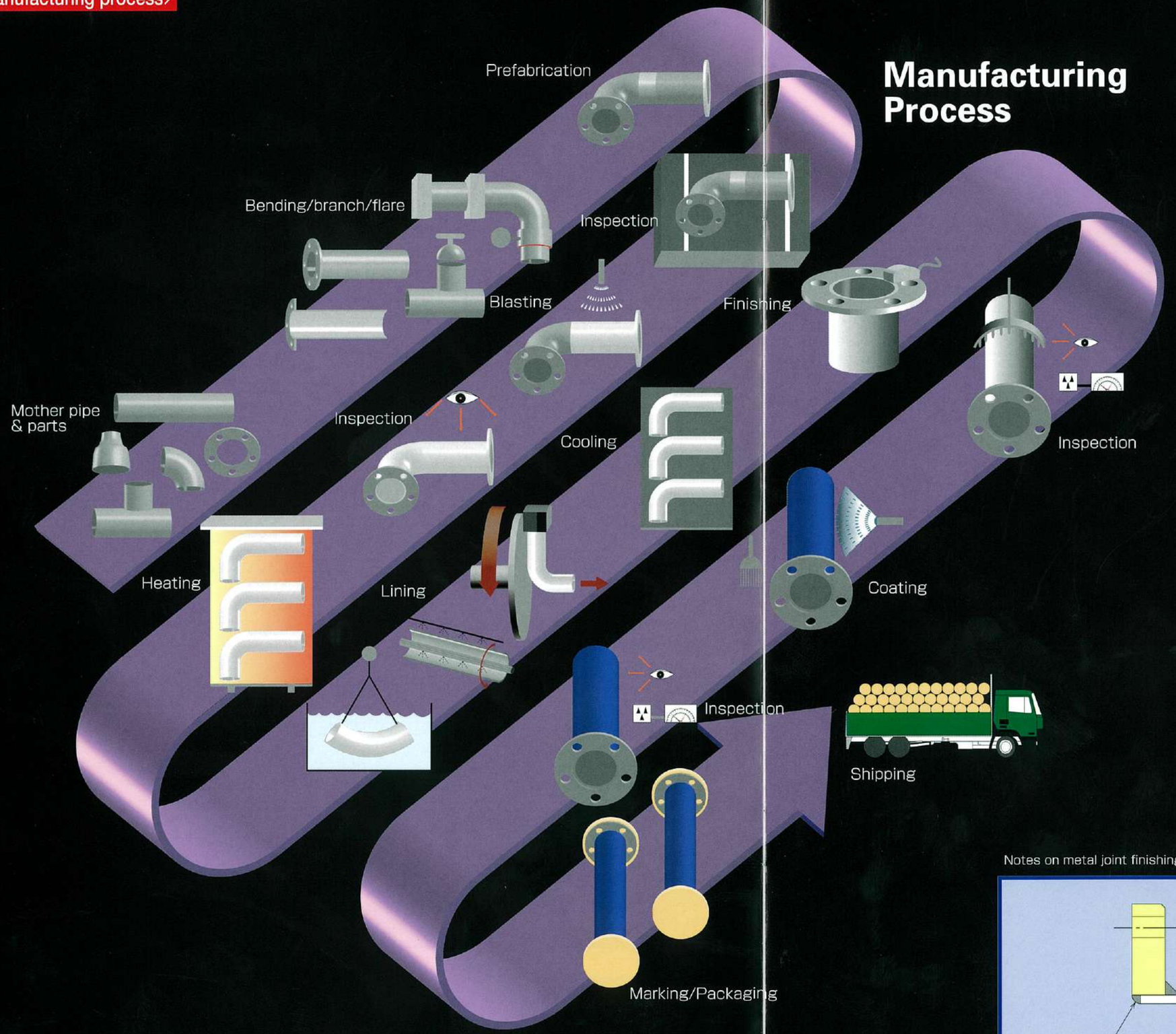
### Akashi Works

No.Q-93
Certified shop by JWWA
※ Japan Water Works Association(JWWA)

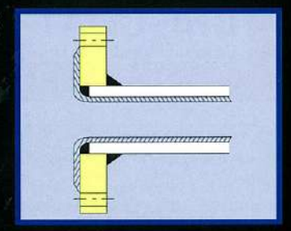
### Nagasaki Works

No.S-10
Certified shop by JWWA
※ Japan Water Works Association(JWWA)

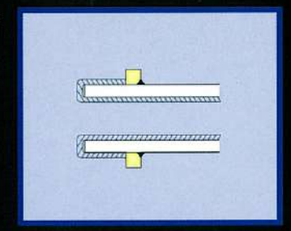
# Manufacturing Process



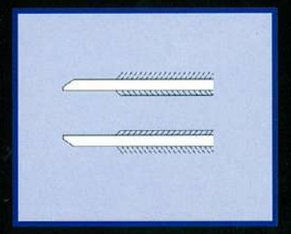

Flange



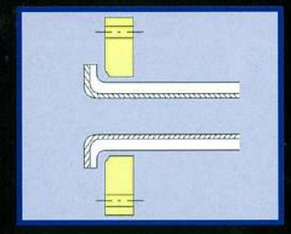
Joint



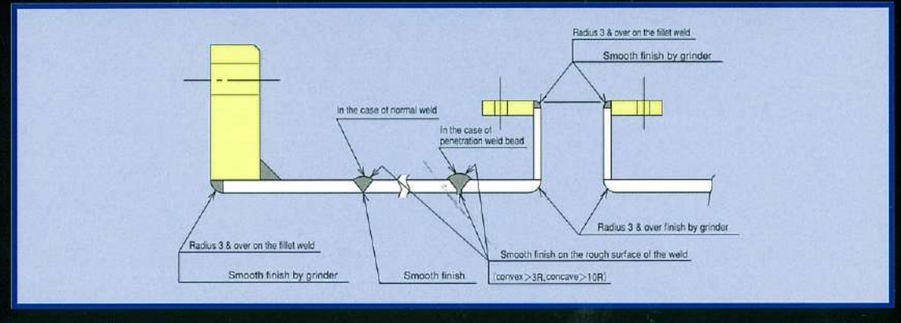
Flangeless



Flare/stubend



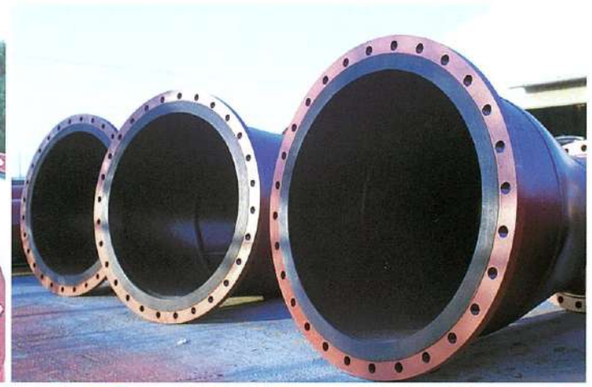
Notes on metal joint finishing



# DHF-COAT-PE-I WSP 039 SGP-FPA (External Primary Coating)／FPB (External Zinc Plating or Sprayed)

Internally Polyethylene Lined Steel Pipe

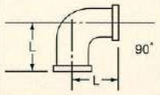
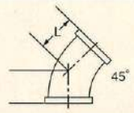
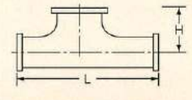
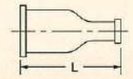
* Superior corrosion protective steel pipes widely used for more than 30 years experiences in Power Plant, Petroleum Plant, Chemical Plant, Shipyard, Building, Water Treatment Facilities, as the internal corrosion protection of fluid transporting piping against seawater, corrosive chemicals, and other corrosive elements.



# DHF-COAT-PE-I

Internally Polyethylene Lined Steel Pipe

## 〈Standard Dimensions〉

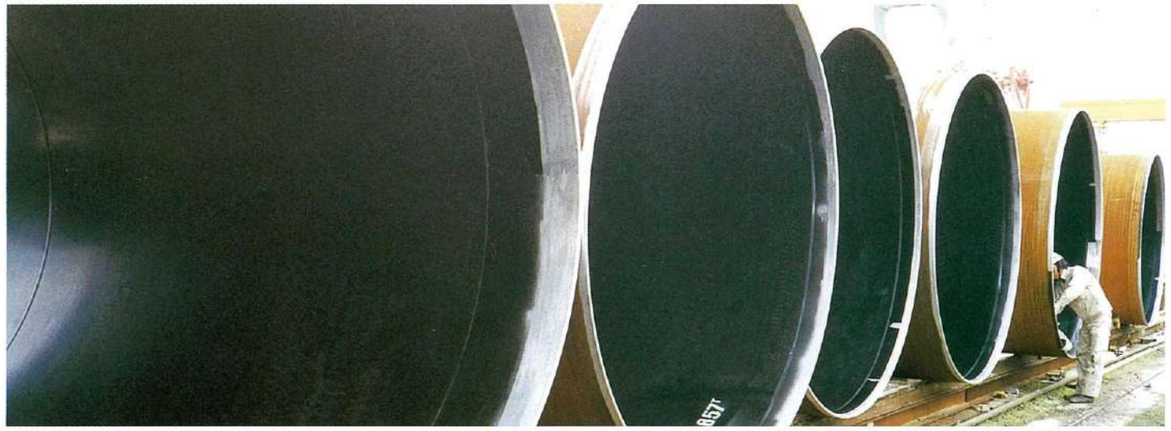
| SIZE | |  |  |  |  | |  |
|---|---|---|---|---|---|---|---|
| A | B | L | L | L | L | H | L |
| 20 | 3/4 | 2,750 | 80 | 52 | 150 | 75 | — |
| 25 | 1 | 4,000／5,500 | 97 | 57 | 170 | 85 | 82 |
| 32 | 1 1/4 | 4,000／5,500 | 112 | 62 | 190 | 95 | 83 |
| 40 | 1 1/2 | 4,000／5,500 | 95 | 63 | 200 | 100 | 94 |
| 50 | 2 | 4,000／5,500 | 97 | 65 | 220 | 110 | 84 |
| 65 | 2 1/2 | 4,000／5,500 | 118 | 72 | 240 | 120 | 98 |
| 80 | 3 | 4,000／5,500 | 137 | 75 | 300 | 150 | 98 |
| 100 | 4 | 4,000／5,500／11,000 | 158 | 85 | 320 | 160 | 111 |
| 125 | 5 | 4,000／5,500／11,000 | 196 | 102 | 340 | 170 | 137 |
| 150 | 6 | 4,000／5,500／11,000 | 235 | 123 | 380 | 190 | 151 |
| 200 | 8 | 5,500／11,000 | 311 | 133 | 368 | 230 | 164 |
| 250 | 10 | 5,500／11,000 | 389 | 165 | 446 | 270 | 191 |
| 300 | 12 | 5,500／11,000 | 465 | 197 | 522 | 320 | 218 |
| 350 | 14 | 5,500／11,000 | 544 | 230 | 576 | 350 | 347 |
| 400 | 16 | 5,500／11,000 | 620 | 263 | 630 | 370 | 372 |
| 450 | 18 | 5,500／11,000 | 695 | 290 | 700 | 410 | 400 |
| 500 | 20 | 5,500／11,000 | 770 | 325 | 782 | 450 | 525 |
| 550 | 22 | 6,000／12,000 | 845 | 355 | 858 | 490 | 525 |
| 600 | 24 | 6,000／12,000 | 925 | 385 | 884 | 500 | 525 |
| 650 | 26 | 6,000／12,000 | 1,000 | 420 | 1,010 | 505 | 628 |
| 700 | 28 | 6,000／12,000 | 1,080 | 452 | 1,040 | 520 | 628 |
| 750 | 30 | 6,000／12,000 | 1,153 | 483 | 1,140 | 570 | 628 |
| 800 | 32 | 6,000／12,000 | ※1 1,219 | ※1 505 | ※1 1,152 | ※1 576 | ※1 610 |
| 850 | 34 | MAX 12,000 or Metal weight no more than 5 tons | 1,296 | 537 | 1,270 | 635 | 610 |
| 900 | 36 | | 1,372 | 568 | 1,346 | 673 | 610 |
| 950 | 38 | | 1,448 | 600 | 1,422 | 711 | 610 |
| 1,000 | 40 | | 1,524 | 632 | 1,499 | 750 | 610 |
| 1,050 | 42 | | 1,600 | 663 | 1,524 | 711 | 610 |
| 1,100 | 44 | | 1,677 | 695 | 1,626 | 762 | 610 |
| 1,150 | 46 | | 1,753 | 726 | 1,702 | 800 | 711 |
| 1,200 | 48 | | 1,829 | 758 | 1,778 | 838 | 711 |
| 1,250 | 50 | | 1,905 | 789 | ※3 2,000 | 800 | ※3 1,300 |
| 1,300 | 52 | | 1,981 | 821 | ※3 2,000 | 800 | ※3 1,300 |
| 1,350 | 54 | | ※2 1,372 | 853 | 2,500 | 1,000 | ※3 1,300 |
| 1,400 | 56 | | 1,423 | 884 | 2,500 | 1,000 | ※3 1,300 |
| 1,450 | 58 | | 1,473 | 916 | 2,500 | 1,000 | ※3 1,300 |
| 1,500 | 60 | | 1,524 | 947 | 2,500 | 1,000 | ※3 1,300 |

※1. Flangeless dimensions are shown in the larger sizes above 750A. In the case of flange type, add the weld leg length (wall thickness of pipe).
※2. Short-elbow dimensions are shown in the larger sizes above 1,300A. ※3. JWWA dimensions are shown in the larger sizes above 1,200A.

# DHF-COAT-PE-LD (1600A～4000A)

Large Diameter Polyethylene Lined Steel Pipe

Large diameter corrosion protection pipes used for Seawater Intake Pipe, Seawater Circulation Pipe, Evaporator Pipe. DHF-COAT-PE-LD is almost free from sea life adhesion, and therefore very economical product.



※ Please consult with us about dimension and profile of 1,600A ～ 4,000A.



# DHF-COAT-PE

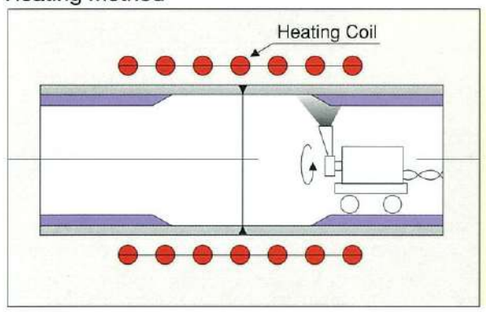
Polyethylene Lined Steel Pipe

## 〈Corrosion Coating Method of Field Welds〉

Flangeless type joint of DHF-COAT-PE is corrosion protected on the field welds in the following method.

### Internal Coating Method

Heating Method



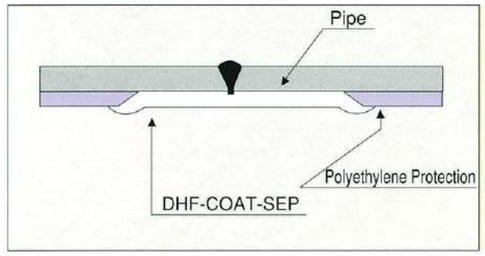

**Specification**

1. Resin
   Powdered polyethylene or special polyethylene sheet
2. Pipe size
   800A～4,000A
3. Coating thickness
   1 mm & over

**Manufacturing process**

Joint welding
↓
Surface preparation (grinder・sand paper)
↓
Heating (coil or gas burner)
↓
Lining (Powder or sheet)
↓
Cooling
↓
Inspection (Visual inspection,Coating thickness, Pinhole)

Heatless Method



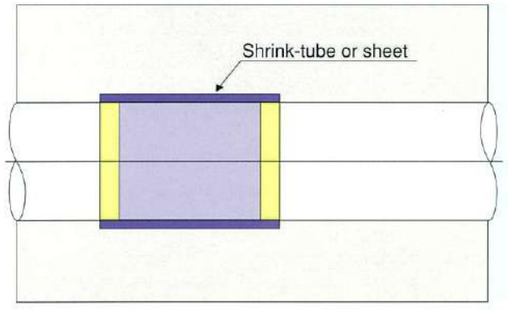

**Specification**

1. Resin
   Special modified polyethylene (DHF-COAT-SEP)
2. Pipe size
   800A～4,000A
3. Coating thickness
   1 mm & over

**Manufacturing process**

Joint welding
↓
Surface preparation (grinder・sand paper)
↓
Proprietary surface treatment
↓
Lining
↓
Inspection (Visual inspection,Coating thickness, Pinhole)

### External Coating Method




**Specification**

1. Resin
   Polyethylene shrink-tube or sheet
2. Pipe size
   25A～4,000A
3. Coating thickness
   1 mm & over

**Manufacturing process**

Joint welding
↓
Surface preparation (grinder・sand paper)
↓
Preheat
↓
Shrink treatment
↓
Inspection (Visual inspection,Coating thickness, Pinhole)

## 〈Field Inspection Technology on Lining〉

You can inspect lining damages and determine their locations on the existing piping.

**Features**

- Inspection can be performed on the piping as it is laid.
- Constant inspection monitoring can be established if the special electrodes are inserted upon fabrication.
- Damage loss can be minimized by an early detection.
- Repair of the piping or partial replacement of the piping can be limited only to a necessary part, and as a result drastic cost down can be expected.

**Scope of work**

Lining materials·····polyethylene, rubber, tar-epoxy, other plastic resins, glass
Pipe sizes·····600A and under
Connection type·····flange type ( please consult with us in case of mechanical or weld type connection.)
Fluid ·····seawater, clear water, waste water, various acid or alkaline solution.

**〈Inspection Procedure〉**

**Piping line study**
↓ Consultation with layout drawing or field examination.
**Preparation**
↓ Electrodes and testers
**Field inspection**
↓ Electrodes insertion, and inspection on flowing.
**Summary of results**
↓
**Report**

# DHF-COAT-PE-E <JIS G3469 P1F>

External Polyethylene Lined Steel Pipe

DHF-COAT-PE-E has been widely used for more than 30 years as a long-term corrosion protection of pipeline to transport gas, oil, or water, even under the harsh environment in a cold district, a desert zone, and offshore. Colored polyethylene lining is also available upon request.

Buried trunk-line gas pipeline (high frequency induction bend + external F type)

## Dimension (maximum) and Lining Thickness

| TYPE | | I | II | | II | | II | | JISG3469 (P1F) Lining | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | L | C | H | C | H | L | H | Thickness | Permissible tolerance |
| 20 | 3/4 | 2,750 | 2,750 | 1,000 | 2,750 | 1,000 | 2,750 | 1,000 | 1.5 | +Not specified −0.3 |
| 25 ∫ 80 | 1 ∫ 3 | 5,500 | 5,500 | 1,500 | 5,500 | 1,500 | 5,500 | 1,000 | 1.5 | +Not specified −0.3 |
| 100 ∫ 150 | 4 ∫ 6 | ※1 12,000 | 5,500 | 1,500 | 5,500 | 1,500 | 5,500 | 1,000 | 2.0 | +Not specified −0.4 |
| 200 ∫ 850 | 8 ∫ 34 | ※1 12,000 | 5,500 | 1,500 | 5,500 | 1,500 | 5,500 | 1,000 | 2.5 | +Not specified −0.5 |
| 900 ∫ 1,000 | 36 ∫ 40 | ※1 12,000 or 5 tons & under | 4,000 | 1,500 | 4,000 | 1,500 | 4,000 | 1,000 | 2.5 | +Not specified −0.5 |
| 1,100 ∫ 1,500 | 44 ∫ 60 | ※1 12,000 or 5 tons & under | 3,000 | 1,500 | 3,000 | 1,500 | 3,000 | 1,000 | 3.0 | +Not specified −0.5 |

TYPE : I is manufactured by a straight pipe lining machine TYPE : II is manufactured by fluidized bed machine ※1:5,500mm max. in Akashi Works and Nagasaki Works



# DHF-COAT-PE-D <WSP 039 SGP-FPD>

External & Internal Polyethylene Lined Steel Pipe

DHF-COAT-PE-D is equipped with the internal corrosion protection property of DHF-COAT-PE-I, as well as the external weather resistance property of DHF-COAT-PE-E. It can be used under buried condition as well as normal piping on the floor. Also, coloured polyethylene coating can be applied upon request.

## Dimension (maximum) and Lining Thickness

| TYPE | | I | II | I | II | II | | II | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | B | L | | L | | H | C | L | branch location | H | nominal thickness |
| 25 ∫ 40 | 1 ∫ 1½ | NA | 1,100 | NA | 1,100 | 100 | 500 | 500 | anywhere | 150 | Internal1.0 External1.0 |
| 50 ∫ 80 | 2 ∫ 3 | NA (except 80A : 5,500) | 1,500 | NA (except 80A : 5,500) | 1,500 | 150 | 1,500 | 1,500 | anywhere | 150 | Internal1.0 External1.0 |
| 100 ∫ 350 | 4 ∫ 14 | ※1 12,000 | 1,600 | ※1 12,000 | 1,600 | 500 | 1,600 | 1,600 | anywhere | 200 | Internal1.0 External1.0 |
| 400 ∫ 750 | 16 ∫ 30 | ※1 12,000 | 1,500 | ※1 12,000 | 1,500 | 500 | 1,500 | 1,500 | anywhere | 400 | Internal1.0 External1.0 or 2.0 |
| 800 ∫ 900 | 32 ∫ 36 | ※1 12,000 | 1,500 | ※1 12,000 | 1,500 | 1,000 | 1,500 | 1,500 | anywhere | 400 | Internal1.0 External1.0 or 2.0 |
| 1,000 ∫ 1,500 | 40 ∫ 60 | 12,000 or 5 tons & under | 1,500 | 12,000 or 5 tons & under | 1,500 | 1,500 | 1,500 | 1,500 | anywhere | 400 | Internal1.0 External1.0 or 2.0 |

TYPE : I is manufactured by a straight pipe lining machine TYPE : II is manufactured by fluidized bed machine ※1:5,500mm max. in Akashi Works and Nagasaki Works

# DHF-COAT-PE-C

Colored Polyethylene Lined Steel Pipe

The resin type paint is coated over the lined polyethylene surface which is corrosion resistant and long-term weather resistant. The colored polyethylene can be utilized for the identification of the piping or the harmonizing with landscape.

## Specification

- Grade･･･DHF-COAT-PE-E, DHF-COAT-PE-D(External only)
- Sizes ･･･100A～1,500A The dimension is the same as each grade
- Color ･･･Blue, Red, White(Standard color) Consult with us about other colors
- Paint･･･Urethane resin paint(Standard paint) Consult with us about other paint

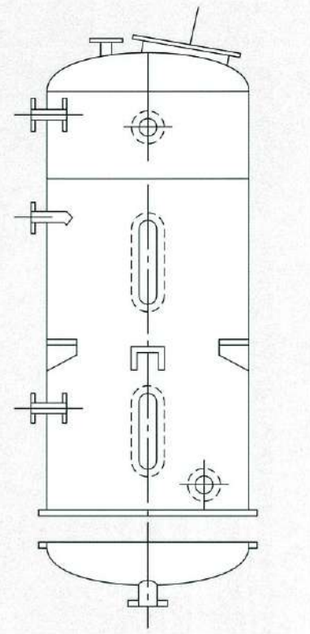


# DHF-COAT-PE-T

Internal Polyethylene Lined Tank

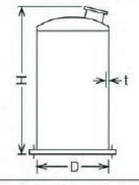
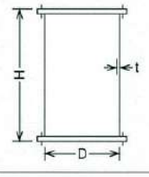
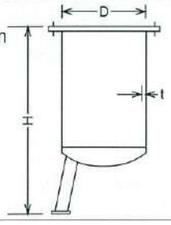
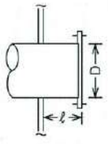
①No dissolved material from the coating. ②Thermomelting and bonding property makes no seam coating. ③Short time lining operation. ④High reliability and economical application.





## Application example

The complex configuration of the tank inside with nozzles and other parts can be polyethylene lined .

| Configuration | Dimension | Configuration | Dimension |
|---|---|---|---|
| 1.Tank top  | H≦3,500mm<br>D≦1,500mm<br>t≧6mm (D≦950) or<br>t≧9mm (D≧1,000) | 2.Tank middle  | H≦3,500mm<br>D≦1,500mm<br>t≧6mm (D≦950)<br>t≧9mm (D≧1,000) |
| 3.Tank bottom  | H≦3,300mm<br>D≦1,500mm<br>t≧6mm (D≦950)<br>t≧9mm (D≧1,000) | 4.Penetrated nozzle  | 100mm≦ℓ≦150mm<br>D≦500A |

| Configuration | Dimension |
|---|---|
| 5.Inside parts  | ℓ≦120mm<br>W1≦150mm<br>W2≦150mm<br>W1 and W2 dimensions are in accordance with Steel Shapes Std. |

# Handling Cautions on Lined Steel Pipes

## ● No Impact, No Dropping, No hammering

① No impact to flange surface and inside surface of pipe. No insertion of metal tools or rocks inside the pipe.

② No impact or no bending during pipe transportation.

③ Flange protector should be removed right before installation. Do not move the flanged pipe without a protector.

④ Do not step on the lined surface.

⑤ Use nylon sling or nylon rope to lift up the external lined pipe. Never use steel wire.

## ● No Heating

① No heating the polyethylene by gas burner, or no welding without sufficient cutback.

② Caution should be paid to avoid exposure of the lining to heating source like near-by welding since the lining may be melted or damaged by weld sputters. In case of question, place the wet cloth over the lining.

③ In case the lined pipe must be welded, be prepared to avoid weld sputter falling over the lining by covering the lining with wet cloth or other proper goods.

## ● Cautions on Pipe Installation

① Confirm no damages present on the lining before pipe installation.

② Use brackets or dunnages to prevent the lined pipe from excess concentrated load.

③ The packing material may be unremoved when the external lined pipe is installed under the ground. Be careful not to damage the lining by being exposed to rocks or stones or by their impact when refilling.

④ Be sure that no mechanical vibration is in direct contact with the piping.

⑤ Use the specified bolts, and tighten the bolts uniformly to the specified torque.

⑥ Be sure that no heat nor sputters should be in direct contact with the lined pipe when reworking by gas cutter or grinder.

# Associated Piping Parts

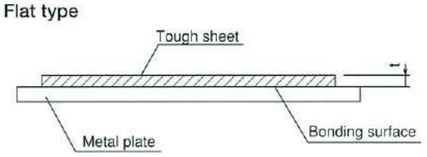
### Tough Slide Pad

This is a slideable supporting plate to allow the piping movement at the time of piping thermal expansion or contraction, in order to alleviate stress concentration on the supporting point.

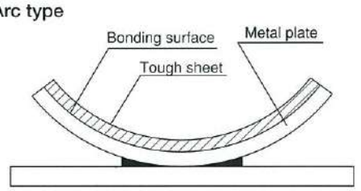
### <Structure / Shape>

Tough Slide Pad is made of an ultra high polymer (polyethylene) sheet and a metal plate (carbon steel or stainless steel).
The ultra high polyethylene resin is an engineering plastic bearing self-lubrication, wear resistance, impact resistance, resistance to various chemicals, and so on.

● Flat type




● Arc type

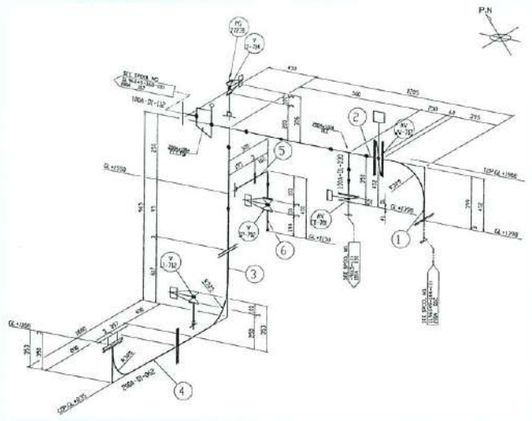





# Design Control CAD System

## ■Advanced Engineering Method : 3-dimensional CAD System

DHF provides piping design support of high quality and high efficiency in the area of piping plan, field measurement, detailed engineering drawing, and so forth, by the 3-dimensional CAD System. The total period and delivery time from piping design, pipe preparation, to installation, can be shortened by using DHF's proprietary 3-dimensional CAD System.



| | |
|---|---|
| Data Input | |
| 3-D CAD Simulation | ... Complex design result can be reviewed from different angle on the screen. |
| Piping Drawing | ... Output any necessary drawing as a plane, front, side, and cross-sectional views. |
| Total Isometric Drawing | ... Output a total isometric drawing to confirm the total integrity. |
| One-line Isom Drawing | ... Output a one-line isometric drawing to be utilized in the field. |
| Piping Piece Drawing | ... Output a devided piece drawing and also output a pipe list. |

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