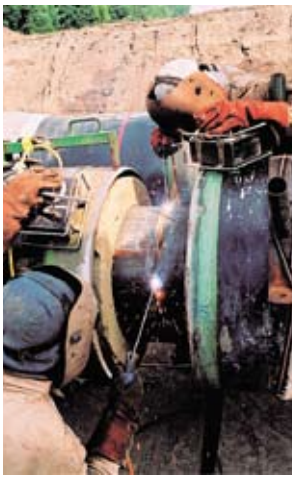
FERNWÄRME-TECHNIK GmbH

Solutions for the safe conveyance of hot or environmentally hazardous media

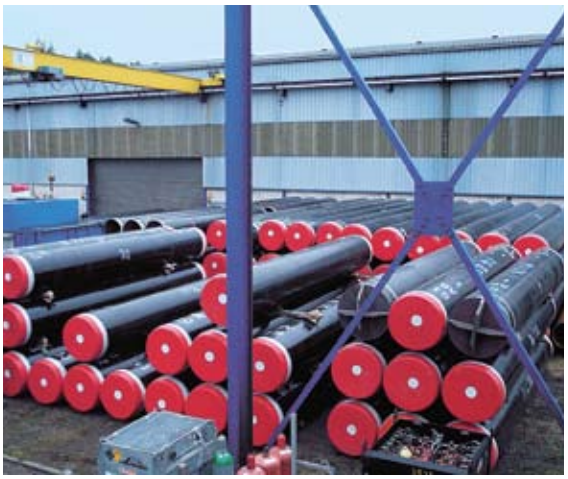
FW-FERNWÄRME-TECHNIK GmbH

History:
1980 Establishment of FW-FERNWÄRME-TECHNIK GmbH in Isernhagen, near Hanover, Germany
1991 Opening of factory in Celle, Germany
1992 Opening of factory in Tschernitz, Germany
2002 First developments of cooling lines with quick-couplings
2007 Start development and trials of LNG transport lines with vacuum
2009 New Headquarter on own premises next to factory in Celle, Germany

FW steel inspection chamber ready for connection of pipes (model)



Construction units being welded together



The Celle factory

Our range of products and services:

- The planning, design and prefabrication of all-steel pipe-in-pipe systems for the safe conveyance of hot water, steam, condensate, thermal oil, cooling water and potentially polluting fluids, at any pressure that occurs and at temperatures of up to 400° C
- Specific planning and implementation of the type of installation, including stress calculations relating to the pipes
- The provision of optimised compensation for the expansion and contraction of the inner pipe
- Calculations of heat and pressure losses, determination of insulation thicknesses and of the diameter of the encasing pipe
- Documentation relating to FW STEEL-CASED PIPE-IN-PIPE or FW SAFETY PIPING supplied
- Quality management, determination of testing programmes for prefabrication and on-site work, jointly with planners, contractors and clients
- Prefabrication at the factory of FW STEEL INSPECTION CHAMBERS, insulated and completely equipped with all the necessary valves and fittings in diameters of up to 4.2 metres
- Vacuum-tight housings for valves installed underground
- FW STEEL-CASED PIPE-IN-PIPE as self supporting pipe bridges
- Design and supply of leakage monitoring systems specially designed for FW SAFETY PIPING
- Design and supply of heat tracing systems to pipelines
- Design and supply of vacuum equipment (pumps, bulkhead seals, monitoring and safety equipment) to evacuate interstitial space
- Evacuation work with mobile vacuum pumps on site after the completion of assembly or subsequently as a service
- Design and implementation of thermal prestressing systems for medium pipes without compensators in pipelines carrying hot media (also for plastic-cased pipelines)
- Location of damage to underground district heating pipelines
- Repair and renewal of district heating networks
- Radiographic testing of welds
- Design and installation of cathodic corrosion protection for the encasing pipe
- Manufacture of FW/Dr Schnabel isolation flanges for cathodic corrosion protection equipment at terminations
- Concrete sealing of underground district heating inspection chambers (by our sister company BAWAX GmbH)
- Exploration of the subsoil with ground radar

All these tasks are handled by experienced design engineers, additionally trained as welding engineers, together with a team of master craftsmen, fitters and welders. FW has staff whose experience with the installation of steel-cased pipe-in-pipe systems in some cases goes back to the year 1968.
FW-FERNWÄRME-TECHNIK GmbH - sound technology and professional service.

The Product

It is said to have been in the year 1906 that a Frenchman pushed two steel pipes inside each other, with a view to conveying warm media through the inner pipe. The pipe-in-pipe system had been invented!

Over the past 50 years, about 85 different pipeline systems for transporting district heating, and just as many techniques of installation, have been created and “tried out” in practice: about 80 of them were failures.

In a survey of pipeline operators on the subject of corrosion damage to underground district heating pipelines, carried out by the Frankfurt-based district heating trade association AGFW, those questioned stated that 97% of damage was found to have originated from outside, and only 3% from inside. This result is as unambiguous as it is alarming.
Corrosion damage to a district heating pipeline originating from the exterior is an indication of faulty design and/or installation.

Nowadays, plastic-cased pipe-in-pipe systems predominate where temperatures of up to 130° C occur, while steel-cased pipe-in-pipe systems are considered to be safe for district heating pipelines with temperatures of up to 400° C. The polyethylene casing and composite insulation of plastic-cased pipe-in-pipe systems and the steel casing with vacuum insulation of steel-cased systems prevent any corrosion of the inner pipe originating from the exterior.

FW STEEL-CASED PIPE-IN-PIPE and its properties:

- Suitable for use both underground and above ground
- Suitable for use in all types of soil
- Testable at any time
- Usable under whatever operating conditions may occur
- Safe in case of flooding
- Usable for any media, as the material of the inner pipe can be selected accordingly

FW STEEL-CASED PIPE-IN-PIPE for the Amstel duiker in the Netherlands

- A vacuum in the ring space
  - reduces heat losses by up to 50%
  - enables the integrity of both the inner and the encasing pipes to be permanently monitored
  - eliminates the possibility of corrosion on the inside of the encasing pipe or the outside of the medium pipe
- Equipped with cathodic corrosion protection (where the electrical ground resistance is ≤10,000 ohm cm)

Roller bearings

- Offers a high degree of prefabrication. All shapes such as elbows, anchors, watertight wall ducts, axial compensator end seals, T-junctions, reductions, pipe bearings, compensators etc. are installed in or on the 12 to 16 metre long construction units at the factory.
- Both the encasing and the inner pipe are welded so as to be pressure-resistant and vacuum-tight
- The pipe anchors used with FW STEEL-CASED PIPE-IN-PIPE do not need concrete thrust blocks
- The steel-cased pipe-in-pipe, firmly installed in the ground, absorbs soil and traffic loads; the inner pipe is free to expand when subjected to heating
- Inner pipes can be thermally prestressed against the encasing pipe; this enables longer stretches to be built without compensators

Our philosophy

Duiker in Duisburg

The FW-FERNWÄRME-TECHNIK company has constantly introduced further improvements to its FW STEEL-CASED PIPE-IN-PIPE system, in order to make it into what it is today: one of the safest pipeline systems for district heating. It has done this by carrying out its own programmes of practical experimentation, often in collaboration with specialised test institutes.

Properly installed and operated, FW STEEL-CASED PIPE-IN-PIPE offers trouble-free use for at least 50 years.

State-of-the-art practice today is to connect FW STEEL-CASED PIPE-IN-PIPE installations that are more than 500 metres in length to a stationary vacuum pump, so that a permanent vacuum creates a “thermos flask effect”, monitoring and securing the pipeline and insulating it in a particularly economic way against heat loss.

The high degree of prefabrication ensures low construction costs and short construction times, so that even customers whose heat consumption is quite low can be supplied efficiently.

In view of the high range of operational temperatures - up to 400° C at whatever pressure is required - FW STEEL-CASED PIPE-IN-PIPE and FW SAFETY PIPING systems are individually designed for each project, i.e. the thickness of the insulation is calculated in relation to the temperature of the medium and according to whether the pipeline is to be operated with or without a permanent vacuum in the ring space; and this also determines the nominal diameter of the encasing pipe. This preparatory design work is performed as a service in advance of the construction of a pipeline.

FW STEEL-CASED PIPE-IN-PIPE and FW SAFETY PIPING are in use all over the world, performing the tasks required of them in a trouble-free manner.

District heating conveyance and distribution pipelines are one-off investments that are not subject to wear or deterioration.

With the steel encasing pipe as the bearing element, FW STEEL-CASED PIPE-IN-PIPE can bridge roads, waterways etc. with a span of up to 30 metres.

In the nominal diameter range DN 500 - DN 1000 it is well worth considering steel-cased pipe-in-pipe systems during the costing phase, even for temperatures of less than 130° C.

We as FW-FERNWÄRME-TECHNIK GmbH do not sell pipes; we sell a system.

For steam up to 435° C

Transition from steel-cased to plastic-cased pipe without an inspection chamber

The Components

Standard straight lengths
are supplied in lengths of 12 or 16 metres, measured in terms of the inner pipe. The inner pipe is guided through the encasing pipe on bearings at regular intervals, and is 30 cm longer than the encasing pipe.

The inner pipe is heat-insulated throughout with shells of resinoid bonded mineral wool, or if preferred of glass wool or calcium silicate. The exterior of the encasing pipe is equipped with passive corrosion protection, consisting of polyethylene as per DIN 30670 N. Inner and encasing pipes are supplied with welding bevels as per DIN 2559. The inner pipe is secured to prevent it from sliding out of the encasing pipe during transportation: these securing elements are not removed until the construction unit is lying in its final position in the trench. The red transportation caps prevent dirt and water from entering the pipe. They remain the property of FW GmbH.

Goethe-Haus, Frankfurt

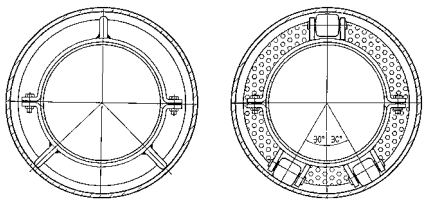
FW STEEL-CASED PIPE-IN-PIPE elbows
The inner pipe elbows are as per DIN 2605. The required wall thicknesses and construction type are calculated by FW.

The elbows of the encasing pipe are made out of cut segments on the basis of the straight lengths. Elbows and tees are fitted to straight lengths at the factory.

Pipe bearings
Inner pipes with diameters of up to DN 150 are secured by shoe supports, those of larger diameters by roller bearings. The spacing of the bearings depends on the nominal diameter of the inner pipe.

Inner pipe DN	25 to DN	65 four bearings	per 12-metre length
Inner pipe DN	80 to DN	150 three bearings	per 12-metre length
Inner pipe DN	200 to DN	1000 two bearings	per 12-metre or 16-metre length

FW will determine whether any further bearings - radial bearings for the axial and radial movement of the inner pipe within the encasing pipe, axial bearings for twin-pipe systems (only for nominal diameters of between DN 25 and DN 125), or roller-bearing cages for transmitting extreme forces to the encasing pipes - are required, and if so, will install them.



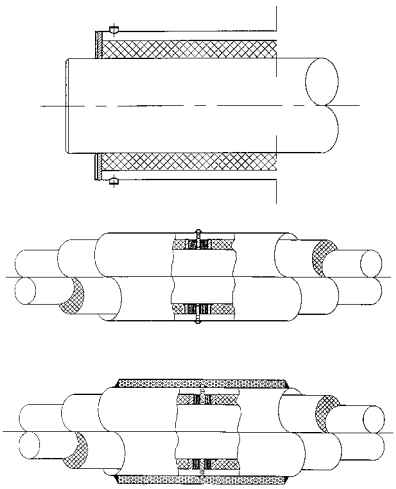
Anchors
The position of the anchors determines and controls the expansion of the inner pipe.

End points
consist of a steel disc welded in between the inner and the encasing pipe in such a way as to be pressure-tight. The end points also fulfil the function of a vacuum-tight end seal. To be used for temperatures of up to 110° C.

FW STEEL-CASED PIPE-IN-PIPE anchors up to 200° C
The friction between the encasing pipe and the soil is a multiple of the anchor force arising, so that no concrete thrust blocks are needed to dissipate the anchor forces.

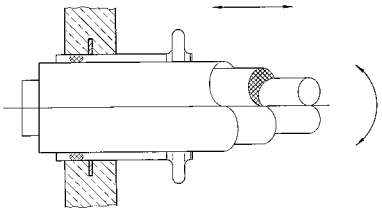
FW STEEL-CASED PIPE-IN-PIPE anchors up to 400° C
In such cases the exterior of the encasing pipe receives additional thermal insulation over a length of around two metres.

FW STEEL-CASED PIPE-IN-PIPE anchors transmit the forces originating from the inner pipe to the encasing pipe through steel discs that are thermally separated from each other. The encasing pipe disc has openings in it (for air pressure testing and evacuation) and so does not form a sealing bulkhead.

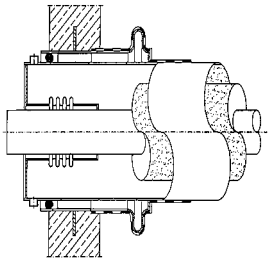


The Components

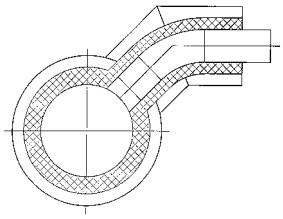
FW STEEL-CASED PIPE-IN-PIPE wall duct
A structure (whether the building where the heat is required, an inspection chamber or the district heating station) and a pipeline connected to it show different settling characteristics. In addition the steel encasing pipe, being at a temperature of 20-30° C, tries to expand axially. FW STEEL-CASED PIPE-IN-PIPE wall ducts with lenticular compensators are designed to withstand these forces and remain watertight.



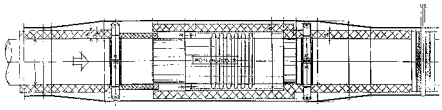
FW STEEL-CASED PIPE-IN-PIPE axial compensator seal
An axial compensator not incorporating any section of inner or outer pipe is pushed over the continuous inner pipe bearing the medium, and is welded vacuum-tight on the one hand to the inner pipe and on the other hand to a steel disc mounted on the encasing pipe. In this way, flexible and yet vacuumtight enclosure of the end of the encasing pipe is achieved.



FW STEEL-CASED PIPE-IN-PIPE Tees
Particularly for minor branches off big main pipelines, weldolets are used; otherwise tees as per DIN 2615.
The tee can go off at an angle of 45° or 90° upwards or downwards, or straight to the side.

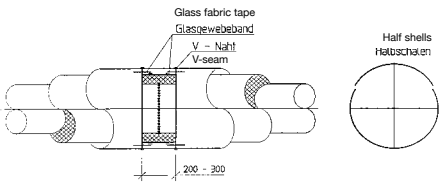


Axial compensators in FW STEEL-CASED PIPE-IN-PIPE
Axial compensators supplied by well-known manufacturers are installed into the FW STEEL-CASED PIPE-IN-PIPE directly. The compensators are prestressed at the factory, so that no prestressing errors can be made on site. The heat insulation mounted on them is designed in such a way as to ensure adequate insulation, whatever the position of the compensator (sliding insulation).
Axial compensators are designed by FW to afford a safety margin of 20% in respect of the degree of expansion.



On-site connections
All the materials for creating a connection, except the additional welding consumables, are supplied by FW (mineral wool insulation, steel bands and crimps to secure it, glass fabric strips as protection during welding, bare steel pipe from which half-shells for the encasing pipe can be cut, shrink material or polyethylene wrapping strips to provide passive corrosive protection for the encasing pipe).

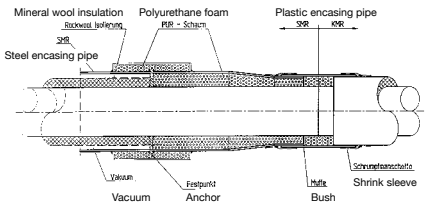
FW's route plans show which on-site connections can be «drawn together» (only one weld in the encasing pipe) and which cannot (two welds in the encasing pipe).



Transitions between steel-cased and plastic-cased pipe-in-pipe without inspection chamber

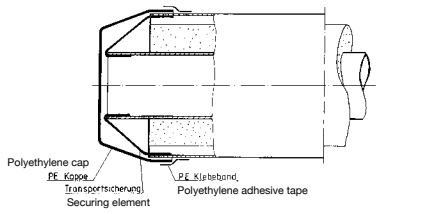
The limit of FW's delivery performance is the weld seam of the inner pipe at the steel/plastic pipe transition.

The construction unit is prefabricated with an adapter to connect it up to the continuing plasticcased pipe-in-pipe.



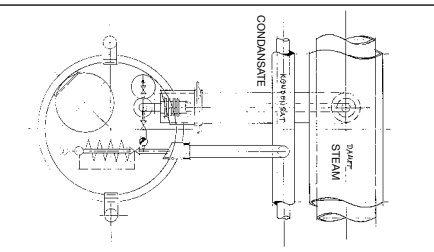
Securing elements and transportation caps

All FW STEEL-CASED PIPE-IN-PIPE construction units are fitted at both ends with a red polyethylene cap which is fixed to the encasing pipe in a water-tight manner with adhesive tape. This is to prevent dirt and water entering the pipe during transportation and assembly on-site. The caps remain the property of FW GmbH.



FW STEEL INSPECTION CHAMBERS

These inspection chambers are an integral part of the system and are prefabricated at the factory, completely equipped ready for operation with all the necessary pipes and fittings. They are fitted with a waterproof access lid, ladder, pump well and concrete floor, and also with chamber ventilation and evacuation points. FW STEEL INSPECTION CHAMBERS are built as vertical cylinders with diameters of up to 4.2 metres. These inspection chambers are also supplied for purely plastic-cased pipe-inpipe systems. They are watertight, proof against flooding and can be installed - if it is absolutely essential - within 10 hours. These chambers need a concrete antiflotation block cast around the bases.



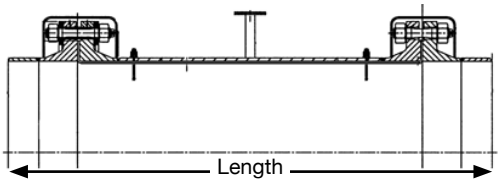
FW/Dr Schnabel isolation flanges

To isolate a cathodic corrosion protection system, if installed, from continuing parts of the system, isolation flanges are installed.

A PTFE isolation length mounted between two pairs of flanges isolates the protective current.

DN	Length	Pipe	Weight (kg)
50	597	60.3 x 2.9	20
65	613	76.1 x 2.9	27
80	637	88.9 x 3.2	32
100	665	114.3 x 3.6	45
125	677	139.7 x 4.0	62
150	705	168.3 x 4.5	77
200	825	219.1 x 6.3	116
250	990	273.0 x 7.1	173
300	1036	323.9 x 7.1	219
350	1111	355.6 x 8.0	315
400	1251	406.4 x 8.8	416
500	1561	508.0 x 6.0	570
600	1561	610.0 x 6.0	679

DN	Length	Pipe	Weight (kg)
700	1561	711.0 x 8.0	927
800	1581	813.0 x 8.0	1238
900	1601	914.0 x 10.0	1561
1000	1621	1016.0 x 10.0	1920



FW SAFETY PIPING

Steam generator for thermal prestressing

FW SAFETY PIPING for corrosive waste water: drainage point, inner pipe, encasing pipe and lenticular compensator made of stainless steel.

A modified version of the FW STEEL-CASED PIPE-IN-PIPE system is FW SAFETY PIPING for conveying media that represent a potential hazard to the environment.

Ship accidents leading to spills of large quantities of crude oil are increasing in frequency. The single-hull tanker no longer meets today's safety requirements, and will certainly soon be a thing of the past. The same applies to pipelines.

Where liquids have to transported that are
• **polluting**
• **hazardous**
• **expensive**
leakages can cause enormous damage, resulting in high costs and, in the worst case, danger to life.

FW SAFETY PIPING minimises or eliminates such risks. The ring space between the inner pipe carrying the medium and the encasing pipe serves to contain

- sensor cables to detect and locate leakages
- heat insulation, where media are conveyed at other than ambient temperature
- inert gas as a control medium for the permanent monitoring of the integrity of the inner and encasing pipes (or alternatively a vacuum, for the same reasons, but additionally providing enhanced heat insulation by the thermos flask effect)
- the axial expansion of the inner pipe when hot media are carried
- any liquid leaking from the inner pipe, which is captured by the encasing pipe
- heat tracing system is required

FW SAFETY PIPING is “made to measure”. Our engineers have great experience in

- pipeline construction
- civil engineering
- thermal engineering
- materials technology
- vacuum technology
- the selection of approved monitoring systems
- quality management and
- obtaining licences from the building authorities

Well-trained and responsible master craftsmen and skilled workers, combined with strict quality management systematically applied - the welds in the inner pipe are tested in our own radiographical laboratory - ensure that the pipe systems prefabricated in our factories are safe, reliable, robust and constantly monitored.

Conveyance of all kinds of media including
- **heating oil**
- **exhaust gases**
- **chlorine**
- **petrol**
- **lactic acid**
- **sulphur**
- **diesel oil**
- **prussic acid**
- **styrene**
- **crude oil**
- **sulphuric acid**
- **glycerine**
- **used oil**
- **hydrochloric acid**
- **glycol**
- **thermal oil**
- **formic acid**
- **paints**
- **kerosene**
- **caustic soda**
- **varnishes**
- **acetone**
- **nitric acid**
- **solvents**
- **industrial waste water**
- **acetic acid**
- **adhesives**
- **landfill leachate**
- **benzene**
- **foodstuffs**

Ireland, FW SAFETY PIPING for contaminated waste water, DN 100/200, 150/200, 150/250, 100° C, 6 bars, inner and encasing pipes of stainless steel

Stationary vacuum pump

FW SAFETY PIPING DN 100/125, DN 300/350, 3,600 metres, transporting kerosene and diesel oil

Selected district heating networks and pipelines realised with FW STEEL-CASED PIPE-IN-PIPE / FW SAFETY PIPING

References

Duiker Amsterdam, Muidertrekvaart

2 x DN 900/1200,
135 °C,
PN 40

Proj.-no.	Client	Location	Temp., Pressure	Medium	DN medium pipe
Germany					
4975/08	EON/Stw. Erfurt/PRT	Erfurt, Paulsborner Str.	220 °C, 16 bar	Steam	500/150/900
5084/08	Stw. Würzburg	Würzburg, Uni Hubland	180 °C, 4,25 bar	Steam	400/70/650
5556/08	EON/Rotus	Lauterbach, Dampfleitung Heggenstaller	220 °C, 20 bar	Steam	80/60/250
5602/08	Stw. Gießen	Gießen, TREA	240 °C, 26 bar	Steam	80/80/300
4846/07	Prokon Energiesysteme Nord	Weener, Anschluß Papierfabrik	320 °C, 32,7 bar	Steam	300/210/800
5061/07	EnBW Stuttgart	Stuttgart, Medienleitungen Flughafen	180 °C, 8 bar	Steam	200/70/400
			120 °C, 8 bar	Condensate	100/30/200
			12 °C, 7 bar	Drinking water	110PEHD/30/200
5215/07	VW Chemnitz	VW-Motorenwerk	140°C, 22 bar	Hot water	300/80/550
					200/60/450
					150/50/300
5240/07	Pfizer Pharma	Illertissen	200 °C, PN 25	Steam	150/60/350
5251/07	Stw. Würzburg	Würzburg, Gattinger Straße	220 °C, PN 16	Steam	400/125/700
					80/60/250
					65/60/250
5345/07	Vattenfall Europe Berlin	Breitscheidplatz/ Gedächtniskirche	130 °C, 16 bar	Hot water	400/70/600
					250/60/550
					65/40/250
5347/07	Vattenfall Wärme	Berlin; Spandauer Damm	130 °C, 16 bar	Hot water	600/50/750
					400/50/550
					450/50/600
					225PEHD/30/200
5372/07	Favorit	München, Olympiahalle	180 °C, 23 bar	Hot water	125/60/350
5403/07	Dührkopp GmbH	Düsseldorf, Klärwerk	50 °C, 14,5 bar	Sewage	100/50/250
4653/06	Vattenfall Europe Berlin/PRT	Berlin, Buch			
		Helios-Kliniken	230 °C, 13 bar	Steam	80/60/250
				Condensate	25/30/125

Proj.-no.	Client	Location	Temp., Pressure	Medium	DN medium pipe
5019/06	LAUBAG, IMO	Meuselwitz, Düker Schnauder	300 °C, 13,5 bar	Steam Condensate	150/140/500 80/50/250
5070/06	Stw. Kassel/Richter	Kassel, Energiezentrale Mittelfeld	220 °C, 10 bar	Steam	400/120/700-1000

Duiker Brunswick, crossing of the River Oker

2 x DN 500/700,
135 °C,
PN 25

5139/06	Mainova/SWR/Fichter	Frankfurt/M., Verbindungsstraße Goetheplatz-Kaiserstr.	220 °C, 4,8 bar	Steam	500/160/900
5155/06	Mainova AG	Frankfurt/M., Nizzaleitung	400 °C, 21,3 bar	Steam	450/200/900
4940/05	Energieversorgung Gera/IKR	Gera, Regenüberlauf-becken am Stadion	220 °C, 14,5 bar	Steam	600/150/1000
5055/05	Flughafen Düsseldorf/LTG	Düsseldorf, Flughafen Winterdiensthalle	140 °C, 16 bar	Hot water	150-150/40-40/600 100-100/40-40/500
4367/04	Südhessische Gas/PRT	Darmstadt, Umlegung Bundesbahn/KNELL-Gelände	350 °C, 12 bar	Steam	200-250/1000-1100
4537/04	MVV Mannheim	Umlegung MARENA	130 °C, 13 bar	Hot water	900/1000/1200-1400
4706/04	Schering AG/NOHL	Berlin, Laborgeb. S 116	250 °C, 10 bar	Steam Hot water	100/40/250 150/90/400
3923/03	Stadtwerke Duisburg AG	Duisburg, Rheindüker	130 °C, PN 16	Hot water	500
4100/03	Harpen EKT	Berlin, Gropiusstadt	130 °C, PN 25	Hot water	600
4142/03	Messe Frankfurt GmbH	Frankfurt/M.,Messehalle	180 °C, 9 bar	Steam	200, 250, 300
4447/03	Mainova AG	Frankfurt/M., Anschluss Bankhaus	400 °C, 21,3 bar	Steam	300
4578/03	Bewag	Berlin, Schlesische Straße	140 °C, PN 16	Hot water	500
4601/03	August Storck KG	Halle/Westf.	205 °C, PN 16 135 °C, PN 16	Steam Condensate	100 - 300 65
4656/03	Heinrich Mack Nachf.	Illertissen	200 °C, PN 25	Steam	50 - 200
3968/02	MCE Voest, Berlin	Fürstenwalde, Reifenwerk Pneumant	200 °C, 30 bar	Steam	125

Selected district heating networks and pipelines realised with FW STEEL-CASED PIPE-IN-PIPE / FW SAFETY PIPING

References

Proj.-no.	Client	Location	Temp., Pressure	Medium	DN medium pipe
Germany					
4133/02	Mainova AG	Frankfurt/M.	220 °C, 3,5 bar	Steam	400
4187/02	Stadtwerke Würzburg AG	Würzburg, Langgasse	180 °C, 4,25 bar	Steam	300
4261/02	Volkswagen AG	Wolfsburg, K-QS-Technikzentrum	175 °C, 25 bar	Hot water	65
4436/02	Stadtwerke Chemnitz AG	Chemnitz, Stolberger Straße	140 °C, 22 bar	Hot water	500
4485/02	Stadtwerke München GmbH	München, Georg-Brauchle-Ring	200 °C, 32 bar	Steam	50, 80, 250
3762/01	Bewag	Berlin, Spandauer Straße	140 °C, PN 16	Hot water	250, 300, 500
3787/01	Volkswagen AG Wolfsburg	Wolfsburg, KGQ-Gebäude	175 °C, 25 bar	Hot water	150, 250
3876/01	TICONA	Kelsterbach	300 °C, 18 bar	Steam	100
3934/01	Siemens AG	Minden, Knoll AG	300 °C, 18 bar	Steam feed water	65, 200
4093/01	Braunschweiger Versorgungs AG	Braunschweig, Okerdüker	135 °C, PN 25	Hot water	500
4094/01	Mainova AG	Frankfurt/M., Bankhaus	220 °C, 3,5 bar	Steam	400
4108/01	Stadtwerke Würzburg AG	Würzburg, Schießhausstraße	200 °C, 5 bar	Steam	200
4129/01	Stadtwerke Chemnitz AG	Chemnitz, Kasbergstraße	140 °C, 23 bar	Hot water	250
4215/01	Volkswagen AG Mosel	Mosel, Halle 11	180 °C, 15 bar	Hot water	30, 400
3389/00	FHW Märkisches Viertel	Berlin, Techowpromenade	140 °C, 17 bar	Hot water	150
3818/00	Anton Meyer GmbH + Co. KG	Münster, Domagkstraße	250 °C, 10 bar	Steam	40, 300
3887/00	Mainova AG	Frankfurt/M., Tiefgarage am Theater	220 °C, 3,5 bar	Steam	500
3900/00	Kraftanlagen München GmbH	Pfaffenhofen, Biomasse HKW	250 °C, PN 25	Steam	200, 250
3961/00	STEAG	Essen, Umlegung Ruhrschiene	200 °C, 32 bar	Hot water	500
4030/00	Samson AG	Frankfurt/M.	280 °C, 12 bar	Steam	100
3534/99	Pirelli	Höchst/Odenwald	230 °C, 23 bar	Steam	150
			90 °C, PN 16	Condensate	50
3761/99	Bewag	Berlin, Unter den Linden 1. BA	140 °C, PN 16	Hot water	500
2807/98	Wuppertaler Stadtwerke AG	Wuppertal, Unterdörnen	180 °C, PN 16	Steam	400
3440/98	Kraftanlagen Saarbrücken	Freiburg, Fraunhofer Institut	180 °C, PN 16	Steam	125
3016/97	Knoll AG	Ludwigshafen	300 °C, PN 40	Steam	150
3076/97	Stadtwerke München GmbH	München, Westspange	200 °C, PN 25	Steam	500
3437/97	Bewag	Berlin, Rohrdammweg	140 °C, PN 25	Hot water	800
2875/96	Daimler-Benz AG	Bremen	130 °C, PN 16	Hot water	150
2879/96	Fernwärmeverbund Saar	Völklingen, Saarschiene, Los 2	180 °C, PN 40	Hot water	600
2942/96	MVV Mannheim AG	Mannheim-Waldhof	250 °C, PN 25	Steam	500
2991/96	Energieversorgung Gera GmbH	Gera	210 °C, PN 16	Steam	700
2756/95	Bewag	Berlin, Rad- und Schwimmsportstadion	140 °C, PN 25	Hot water	600, 800
2033/94	Bewag	Berlin, Wolfener Straße	140 °C, PN 25	Hot water	800, 1000, 1200
2291/94	Bewag	Berlin, Hotel Adlon	140 °C, PN 16	Hot water	600
2294/94	Bewag	Berlin, Blumberger Damm	140 °C, PN 25	Hot water	800
2488/94	Neckarwerke Stuttgart AG	Altbach-Deizisau, HKW 2	130 °C, PN 25	Hot water	700
2057/93	Bewag	Berlin, Straße der Pariser Kommune 38	140 °C, PN 25	Hot water	400, 500
1443/91	BASF AG	Ludwigshafen	250 °C, PN 25	Steam	400
980/88	Höchst AG	Frankfurt/M.	200 °C, PN 16	Steam	450
777/87	LKW Kitzingen	Kitzingen	170 °C, PN 25	Hot water	250
779/87	Stadtwerke Würzburg AG	Würzburg	250 °C, PN 25	Steam	350
811/87	Stadtwerke Kassel	Kassel	140 °C, PN 25	Hot water	550
735/86	Stadtwerke Heidelberg AG	Heidelberg	140 °C,PN 40/25	Hot water	300
657/85	Plenarsaal Bonn, Altes Wasserwerk (Ersatzparlament)	Bonn	5 °C, PN 16	Cooling water	125
659/85	Daimler-Benz AG	Stuttgart	160 °C, PN 25	Steam	250, 350
483/84	Stadtwerke Hannover AG	Hannover, Los 97//VI	140 °C, PN 25	Hot water	500
496/84	Glaswerk Schuller	Wertheim/M.	200 °C, PN 25	Steam	200, 300
430/83	US Army/NATO	Friedberg/Hessen	170 °C, PN 25	Steam	25
170/79	Saarberg-Fernwärme GmbH	Völklingen, Saarschiene	180/100 °C, PN 40	Hot water	600

Strasbourg, above-ground canal crossing

2 x DN 300/600,
180 °C,
PN 25 (heating)
1 x DN 125/400,
250 °C,
PN 25 (Sterilisation)
span width 32 m

Proj.-no.	Client	Location	Temp., Pressure	Medium	DN medium pipe
France					
5589/08	SOGECA	Chambéry	228 °C, 25 bar	Steam	200/90/450
5346/08	SOGECA	Montbéliard, Heizleitung	220 °C, 25 bar	Hot water	150/80/550
5236/07	CPCU Paris	Quai Stalingrad, President Roosevelt, Point du Jour	250°C, 20 bar	Steam	400/170/800 500/170/900
5032/06	UEM/SOGECA	Metz, Route de Gheneau	180 °C, 25 bar	Hot water	400/75/600
4325/03	Dalkia/SETE SOGECA	Strasbourg, Rue de Palerme	180 °C, 25 bar	Hot water	125
4350/02	Dalkia/SOGECA	Reims, Rémival 2. BA	180 °C, 19 bar	Hot water	200
4341/02	SOGECA	Strasbourg, Lilly France	210 °C, 8 bar	Steam Condensate	150 100
3951/00	ALSTOM	Belfort, Geb. 33	160 °C, 8 bar	Hot water	80
3832/00	Dalkia/SETE SOGECA	Strasbourg	180 °C, PN 40	Hot water	125
2601/00	Dalkia/SOGECA	Reims, Rémival 1. BA	180 °C, 19 bar	Hot water	200
3687/99	Dalkia/SETE SOGECA	Strasbourg	180 °C, 28 bar	Hot water	200, 250, 300
3453/98	UGINE	Isbergues	180 °C, PN 25	Hot water	150
2255/94	BGR	Montpellier	180 °C, PN 25	Hot water	250
1912/93	UGINE	Isbergues	180 °C, PN 16	Hot water	250
div.	SETE/SOGECA	Strasbourg	180 °C, 28 bar	Hot water	50 bis 200
Netherlands					
5491/08	ENECO/NUON/VSH/Logstor NL	Utrecht, Leidsche Rijn	150 °C, PN 25	Hot water	400/70/600
5262/07	ENERCO;Logstor NL	Apeldoorn	100 °C, PN 25	Hot water	300/60/500
5232/06	NUON/ Logstor	Utrecht, Rabobank	150 °C, 25 bar	Hot water	600/110/900-1000
5123/06	NUON/VSH/Logstor	Amsterdam, Düker Haarlemmerweg	140 °C, 23 bar	Hot water	300/60/500
4205/04	NUON/Logstor	Amsterdam, Düker IJburg	130 °C, 23 bar	Hot water	450/60/650
4415/02	Visser & Smit Hanab (ALSTOM, Hoofddorp)	Utrecht, Reliant Power station	150 °C, PN 25	Hot water	600
3208/98	REMU (ABB Hoofddorp)	Utrecht, Leidsche Rijn	150 °C, PN 25	Hot water	400
3041/97	EWR Leiden (ABB Hoofddorp)	Düker - Zeijl	120 °C, PN 25	Hot water	300
1667/92	AKZO (ABB Hoofddorp)	Arnhem	160 °C, PN 10	Steam	350
1814/92	Energieproduktiebedrijf UNA, Utrecht/NL (ABB Hoofddorp)	Amsterdam, Düker Rijnkanaal Gaasp und Muidertrekvaart	135 °C, PN 40	Hot water	900
1087/89	AKZO	Arnhem	140 °C, PN 16	Steam	250

Selected district heating networks and pipelines realised with FW STEEL-CASED PIPE-IN-PIPE / FW SAFETY PIPING

References

Proj.-no.	Client	Location	Temp., Pressure	Medium	DN medium pipe
United Kingdom					
5270/07	RAF/PPSL	Menwith, Part III	40 °C, 6 bar	Light oil	80-80/40-40/400 80/40/200
4978/05	PPSL	Raleigh, HMS Raleigh			
		Payd	150 °C, 16 bar	Hot water	100-100/50-50/500
4555/03	Perma-Pipe Services Ltd (PPSL)	John Radcliffe Hosp.	150 °C, 6 bar	Hot water	150
4488/03	Perma-Pipe Services Ltd (PPSL)	Mildenhall, RAF	140 °C, PN 16	Hot water	100
4092/02	Perma-Pipe Services Ltd (PPSL)	Aberdeen	170 °C, 8 bar	Steam	100
4257/01	Perma-Pipe Services Ltd (PPSL)	Newcastle, Byker	163 °C, 15 bar	Hot water	100, 150
3285/97	ABB	Nottingham	200 °C, PN 16	Steam	100, 150
1252/90	Hoesch AG, Hamm	Eurotunnel	48 bar	Drainage pipe	400
			35 bar	Fire mains	250
966/ 88	RAF	Fairford	150 °C, PN 16	Hot water	200
Austria					
5276/07	Stw. Klagenfurt	Klagenfurt, Klinikum	210 °C, 19 bar	Steam	150/90/400
5325/06	EVN	Leitung Schichtenspeicher	130 °C, PN 10	Hot water	300/50/450
4926/06	EVN/ Bohr&Rohr	Dürnrohr, Bioethanolanlage	210 °C, 17,6 bar	Steam	350/100/600 500/120/800
5182/06	Salzburg AG	Salzburg, Wallnergasse	200 °C, 16 bar	Steam	350/90/600-700
4501/02	Salzburg AG/AMRO	Salzburg, Austria	200 °C, 16 bar	Steam	65, 150, 250, 350, 400
Switzerland					
4531/03	Lögstör	Buchs	180 °C, 25 bar	Hot water	200
2258/94	KVA Buchs	Buchs	160 °C, PN 24	Hot water	250
955/ 88	Hermitage	Lausanne	180 °C, PN 25	Hot water	40
420/ 83	NOK Baden - REFUNA	Würenlingen	130 °C, PN 16	Hot water	250
Czech Republic					
2531/95	IPS, Karlovy Vary	Nejdek	270 °C, PN 40	Steam	300
2779/95	Teplarna	Ceske Budejovice, Manesova	260 °C, PN 16	Steam	350
2010/93	ABB, Tábor	Liberec	240 °C, PN 16	Steam	350
1471/91	Plynostav, Pardubice	Ledvice	220 °C, PN 40	Steam	250
Poland					
4239/01	KELVIN	Poznan, Waste water treatment plant	180 °C, 6 bar	Steam	65
3438/98	ENERGOINWEST	Bialystok, BiaforM	225 °C, PN 25	Steam	150
3214/97	ENER GOINWEST	Bialystok, Brewery	225 °C, PN 25	Steam	300
2414/94	ABB, Zamech	Poznan	200 °C, PN 16	Steam	125
1661/92	ABB, Zamech	Bielsko-Biala	300 °C, PN 25	Steam	600, 500
South Korea					
3896/00	Moksan	Taejon 3.4 extension	210 °C, 15 bar	Steam	200
3799/00	Moksan	Sangmoodae	230 °C, 20 bar	Steam	100, 150
3488/00	Moksan	Sangpyung extension	240 °C, 20 bar	Steam	350
3257/97	Moksan	Taejon	240 °C, PN 16	Steam	600
3068/97	Moksan	Chinju, Sangpyung	240 °C, PN 16	Steam	600, 700
Other Countries					
4711/08	KE, Dänemark	Kopenhagen, Dampfleitung	300 °C, 30 bar	Steam	500/210/1000
5228/08	Pori, Finland	Dampfleitung	280 °C, 16,5 bar	Steam	300/160/700
5486/07	Power Solutions	Malpensa Airport	180 °C, 16 bar	Hot water	65/40/200

Proj.-no.	Client	Location	Temp., Pressure	Medium	DN medium pipe
5041/07	Power Solutions	Sondalo, Hospital	200 °C, 19 bar	Hot water	200/870/400 150/70/350 125/60/300 100/50/250
4850/06	IVAGO/FABRICOM	Gent, Belgien Universität Ziekenhuis	215 °C,	Steam Condensate	200/120/500-800 80/40/200
5134/06	Fortuna/Konwell	Helsinki, Finnland Huttisten Lämpö Oy	204 °C, 12 bar	Steam	150/70/350
4726/05	SAIDI	Cádiz, Spanien Security Complex	265 °C, 45,85 bar	Hot water	100/80/300-500
4063/02	Sunlight Tianjin	Tianjin-Meijang, China	295 °C, PN 25	Steam	600
4119/01	Fulton Enterprise	Antwerpen, Belgium Dampf- u. Kondensatltg. Indaver-Phenolchemie	435 °C, 46 bar 130 °C, 16 bar	Steam Condensate	300 150
3861/00	Tianjin Machinery & Electric Equipment Sunlight	Guangzhou, China	300 °C, PN 16	Steam	200
2781/95	Pan-Isovit Minsk	Kobrin, Belarus	164 °C, PN 16	Steam	40, 200
1469/91	Büro Kubetschek	Perm Ural, GUS	150 °C, PN 16	Hot water	150
1316/90	Linde AG, München	Triest, Italy	250 °C, PN 16	Steam	125
835/ 87	Ph. Holzmann	Kreta, Greece	180 °C, PN 16	Steam	200
833/ 87	Ph. Holzmann	Greece	151/180°C, PN 25	Steam	150
573/ 85	ROM, Düsseldorf	Egypt	220 °C, PN 25	Steam	250

FW SAFETY PIPING

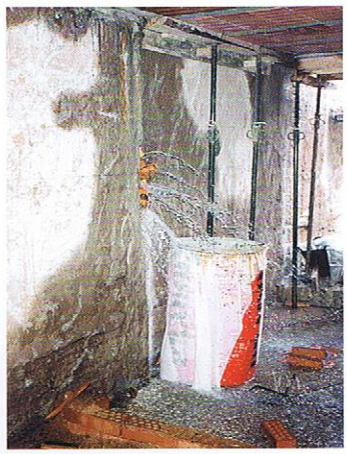
5403/07	Dührkopp	Düsseldorf	50 °C, 14,5 bar	Sewage	100-25-25/50/250
5483/07	NAMSA	Capellen, Belgien	PN 100	Fuel	
5447/07	SOGECA	Strasbourg, Frankreich	20 °C	Oil pipeline	40/50
5120/06	Stadt Dresden, York	Kälteleitung	-20 °C/+ 30 °C 13 bar	Amoniac	200/60/400 80/50/250
4841/06	Frankfurt/ Main	Propanolleitung	20 °C, 10 bar	Propanol	65/100
5047/05	Gmach & Lausser	Pösing, Holzwerke Gmach	210 °C; PN 16	Thermo Oil	80-80/50-50/450-600
8619/04	GEW Köln/ VAM	Köln Niehl	50°C, 6 bar	Fuel	250/300 200/250
4744/04	Mainova AG/Südwestdt. Rohr	Frankfurt/M., MAB	220 °C, 4,8 bar	Steam	100/50/250 250/110/550
8609/02	Perma-Pipe Services Ltd (PPSL)	Newbridge, Irland	100 °C, 6 bar	Oil pipeline	100, 150
8601/02	MVL Heinersdorf	Schwedt	0 - 20 °C, 10 bar	Raw oil	600
8600/02	Perma-Pipe Services Ltd	Mildenhall, RAF	20 °C, PN 10	Oil pipeline	25, 32
8587/01	Staatshochbauamt Köln	Würselen/Tanklager	5-25 °C 10 bar	Kerosine/Diesel	100
8546/00	Höchst AG	Frankfurt/M.	0 - 50 °C, 13 bar	Methanol	150
8550/99	Jakob Hein Lack- und Dispersionsfabrik	Walsdorf	10 °C, PN 10	Solvent	80
8541/99	Fernwärmeversorgung Niederrhein GmbH	Moers	20 °C, PN 16	Fuel	50, 65
8529/97	Grisard AG	Basel, Schweiz	200 °C, PN 16	Thermo Oil	80
8519/97	Bewag	Berlin	95 °C, PN 10 80 °C PN 16 50 °C PN 10 120 °C PN16	Sewage Sour Condensate NaOH Motherlye	40/80 50/80 25/50 40/80
2202/94	Bayer AG	Leverkusen	300 °C, PN 25	Inside chem. products outside Steam	25/100
2162/94	LAUBAG	Schwarze Pumpe	-40 bis+60 °C PN16	Shop products org. substances,	50/100, 125/200
1986/93	HKW Marienehe	Rostock	60 °C, PN 16	Heavy fuel	250
1982/93	Rhenus AG	Hannover	60 °C, PN 16	Oil pipeline	150/200
1810/92	LAUBAG	Schwarze Pumpe	-40 bis+60 °C PN10	Shop products org. substances,	50/100, 125/200
1475/91	Bosold, Kalbach	Großenlüder	300 °C, PN 25	Carpet adhesive	150/200, 200/250
1253/90	Kantonsspital	Zug, Schweiz	250 °C, 2 bar	Thermo Oil	100
3376/98	Luxemburg	Ölhochdruckleitung	20 °C, PN 150	Kerosine	150, 300

South Korea

People's Republic of China

Duisburg

Sealing of a structure by crystallisation



Approvals:

For Europe:	CE marking pursuant to the Pressure Equipment Directive Module A1
	PED 97/23/EC
	Welding Qualification EN 729-2/3
For Germany:	Water Resource Management Act. Sec. 19 l
	AD 2000 – Merkblatt HP 0
	Welding Qualification DIN 18800-7 Klasse E
For France:	CSTB Avis Technique 14/99-543
For the Czech Republic:	ZUS C1-97-0010

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