



Exploration & Production

GENERAL SPECIFICATION

PIPING VALVES VESSELS

GS PVV 772

Thermal insulation (cold service)
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1. Scope

This standard specification defines the technical requirements concerning insulating materials and for the thermal insulation of equipment and piping for onshore and offshore installations.

The following are excluded:

- Equipment and piping:
 - For hot service
 - For cyclic service
 - Buried
 - Subject to acoustic protection
- Instruments.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
ISO 2219	Expanded pure agglomerated cork for thermal insulation - Characteristics, sampling and packaging second edition
ASTM A 525	Standard specification for general requirement for steel sheet, zinc-coated (Galvanised) by the hot-dip process
ASTM C 552	Standard specification for cellular glass thermal insulation
ASTM C 591	Specification for unfaced preformed rigid cellular polyurethane - Thermal insulation
ASTM C 945	Practice for design consideration and spray application of a rigid cellular polyurethane insulation system on outdoor service vessels
ASTM C 950	Repair of rigid cellular polyurethane roof insulation
ASTM C 755	Selection of vapour retarders for thermal insulation
ASTM C 585	Inner/outer diameters of rigid thermal insulation for nominal sizes of pipe/tubing, NBS system, practise
ASTM C 549	Perlite loose fill for nominal sizes of pipe/tubing, NBS system, practise
ASTM C 516	Vermiculate loose fill for nominal sizes of pipe/tubing, NBS system, practise
ASTM C 647	Properties/test of mastics/coatings of thermal insulation, guide
ASTM C 921	Packaging material properties/testing
ASTM C 168	Standard terminology relating to thermal insulating materials

Reference	Title
ASTM D 2856	Standard test method for open-cell content of rigid cellular plastics by the air pycnometer
ASTM C 871	Standard test methods for chemical analysis of thermal insulation. Materials of leachable chloride, fluoride, silicate, and sodium ions
ASTM C 929	Standard practice for handling, transporting, shipping, storage, receiving and application of thermal insulation material for use in contact with austenitic stainless steel
ASTM D 1621	Standard test method for compressive properties of rigid cellular plastics
ASTM C 1046	In situ measurement of heat flux measurement of heat flux and temperature on building envelope component, practise
ASTM C 461	Standard test method for mastics and coatings used with thermal insulation
ASTM C 1033	Pipe insulation installed vertically, test
ASTM C 687	Thermal resistance
ASTM C 1104/1104M	Standard test method for determining the water vapour sorption of unfaced mineral fibre insulation
ASTM C 165	Compressing properties, practice for measuring
ASTM E 84	Standard test method for surface burning characteristics of building materials
ASTM E 96	Standard test method for water vapour transmission of material
ASTM D 1622	Standard test method for apparent density of rigid cellular plastics
ASTM C 518	Heat flow meter test
ISO 844	Testing of rigid cellular plastics; compression test
ISO 845	Cellular plastics and rubbers; Determination of Apparent Density
ASTM C 177	Standard test method for steady-state heat flux measurement and thermal transmission properties by means of the guarded-hot-plate apparatus
ASTM C 795	Standard specification for thermal insulation for use in contact with austenitic stainless steel
ASTM C 871	Standard test methods for chemical analysis of thermal insulation. Materials for leachable chloride, fluoride, silicate, and sodium ions
ASTM C 929	Standard practice for handling, transporting, shipping, storage, receiving and application of thermal insulation materials for use in contact with austenitic stainless steel
ASTM D 1621	Standard test method for compressive properties of rigid cellular plastics
ASTM C 240	Standard test methods of testing cellular glass insulation block

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS COR 350	External protection of offshore and related structures and equipment by painting
GS PVV 211	Pressure vessels according to ASME VIII div.1 or div.2
GS PVV 212	Pressure vessels according to PD 5500

3. Insulation systems

3.1 Design of systems

The thermal insulation systems are defined in the tables in the Appendices.

For special cases not covered by the Appendices, the **Contractor** shall submit any variant to the **COMPANY** for approval before use.

3.2 Use of the systems

The following parameters and criteria provide a quick guide for selecting the most appropriate system or systems for each situation:

3.2.1 Equipment configuration

- Horizontal and vertical vessels
- Piping.

3.3 Definition of atmosphere or environment

Rural: atmosphere distanced from all chemical and industrial activities and all urban centres, and unaffected by the maritime climate (air that is relatively pure and free of dust).

Industrial: atmosphere characterized by the presence of dust and fumes (products of the direct or indirect combustion of carbon, sulphur, nitrogen, etc.), giving acid reactions to condensates ($\text{pH} < 6$).

Urban: atmosphere characterised, like the industrial atmosphere, by the presence of dust and condensates with acid reactions ($\text{pH} < 6$).

Marine: atmosphere which prevails at sea, along coastlines and immediately inland, and characterised by the presence in the air of seawater spray, more or less saline mist and by the absence of dust. Condensates are normally alkaline ($\text{pH} > 7$).

Note:

- The urban atmosphere is treated as rural atmosphere.
- The tropical atmosphere is treated as industrial or marine atmosphere, depending on the geographic location of the structure.
- The atmosphere for "Offshore" structures is considered as a special case.

3.4 Parameters coding and identification of systems

3.4.1 Parameters coding

IN	Rural, urban and industrial
MA	Marine and tropical
OS	Offshore

SNNN/SNNN: two-part code comprising a sign (S) and three digits (NNN) indicating the minimum and maximum working temperatures.

Note:

- The design temperature determines the type of insulation material to be selected.
- The service temperature helps to determine the thermal insulation thickness.
- For a given unit, it may be necessary to define two or more thermal insulation systems.
- The systems defined in Appendix 1 must be used in conjunction with the installation principles in Appendix 3 and the material specification standards in Appendix 2.
- Alternative protective jacketing may be used, depending on the area in which the equipment is installed.

4. Performance level

- **Class F:** Cold retention

Maximum unit heat gain according to values given in the job specification (W/m^2 on equipment and W/ml on piping).

- **Class G: Frost protection**

Minimum surface temperature: + 5°C.

- **Class H: Condensation prevention**

No condensation for the temperature and relative humidity weighted as design bases.

The thermal efficiency or strength of the thermal insulation shall be guaranteed for a minimum of five years from the date of acceptance.

5. General conditions for execution

5.1 Conditions on materials

5.1.1 Supply and storage

All materials shall be procured according to the material specifications in Appendix 2. They shall be accompanied by certificates of conformity.

5.1.1.1 Insulating materials

The materials required for insulation shall be procured before starting of operations, and shall remain in the original packaging, indicating the composition, type, density and thicknesses. They shall be stored sheltered from water and in accordance with the instructions in the **Supplier's** data sheets.

5.1.1.2 Fixing, sealing and vapour barrier materials (glues, mastics)

These shall be procured before starting of operations, unless the shelf life of the products is shorter than the duration of the works, and shall be stored in their original packaging according to instructions in the **Supplier's** data sheets. In some cases, it may be necessary to store them in air-conditioned premises to prevent them becoming denatured.

5.1.2 Sampling of insulation, fixing, sealing and vapour barrier materials

The **Contractor** shall take a sample for each batch of materials used to verify their compliance.

The dimensions and the necessary quantities shall be determined according to the requirements of the specifications pertaining to inspection of materials.

5.2 Preliminary conditions

The **Contractor** shall not start installation operations until a report on the premises has been prepared, indicating that:

- The thermal insulation supports (and insulation accessories) that are the responsibility of the equipment and piping **Suppliers** have been installed according to pressure vessel and piping trade practises
- All tests have been completed
- The surfaces have been appropriately protected in accordance with **GS COR 350** for carbon steels with a temperature of between -40°C and +20°C



- Tightening and fixings on flanges, valves, nozzles, etc., have been inspected (after cooling the equipment or circuits)
- Etc.

5.3 Execution conditions

5.3.1 General

Cold service insulation shall be implemented in two phases.

- In the first phase, in other words before tests, the following shall be insulated: equipment shells and heads, straight sections of piping, elbows, tees, connection points, etc.
- In the second phase, in other words after the equipment and circuits concerned have been tested, accessories such as flanges, valves, manholes and nozzles shall be insulated.

The **Contractor** shall obtain technical assistance from the **Suppliers**.

- Insulation shall be placed on dry, clean and degreased surfaces, treated if necessary with a corrosion protection.
- Insulation shall only be fitted if the substrate temperature is at least 3°C above the dew point.
- No work shall be carried out while there is precipitation in the air, except under shelter and in a controlled atmosphere.
- Insulation shall be fitted in the second phase when the substrates have been de-iced by appropriate means and the surfaces have been dried (do not use a torch).
- If sheet steel protective jacketing is fitted, the installation of M1 self-adhesive distancing strips is recommended between the vapour barrier and the plate to ensure that the vapour barrier is not perforated by the fixing screws.

5.3.2 Insulating material installation conditions

Insulation thicknesses: these shall comply with the information contained in the job specification.

The materials shall be applied according to the erection principles (Appendix 3).

Only healthy and dry materials shall be applied.

The minimum and maximum temperatures of the environment or the application surfaces shall be limited according to the **Supplier's** data sheets concerning the materials and products used.

Cut-outs in the insulation material shall be clean, and shall allow perfect juxtaposition of the items.

Insulation shall be mounted in zigzag fashion, and in the case of multi-layer insulation, the "upper layer joints shall be offset from those of the lower layers".

The jointing of components shall be executed in accordance with the **Supplier's** instructions and Appendices 2 and 3.

Each layer of insulation shall be secured independently.

The tension of the retaining straps shall be such that the insulation is not damaged (before applying the vapour barrier, check that the straps have indeed been removed on the last layer in the case of a finish without sheet steel protective jacketing).

5.3.3 Protective jacketing conditions

5.3.3.1 Vapour barrier

Before starting to fit the vapour barrier, make sure that the insulation and insulation limits comply with the specifications (if necessary, proceed with partial acceptance testing, see section 7).

Application of the vapour barrier shall immediately follow installation of the insulation.

Vapour barrier shall be applied in accordance with Appendix 2 and shall comprise at least two layers of mastic reinforced with a layer of reinforcing fabric.

At accessories such as supports, nozzles and manholes, the insulation materials cut-outs shall be made with precision and sealing by appropriate mastic will be performed.

Expansion joints shall be provided to absorb differential movements due to thermal variations.

Insulation of accessories such as flanges, valves and nozzles shall be provided by insulation fixed to "break joints" in accordance with Appendix 1.

5.3.3.2 Complete water tightness (offshore and marine environment)

Circular metallics collars shall be welded on piping and equipment to warranty the complete water tightness in complementary of the material mechanical protection and elastomer coat.

The thermal insulation supports and circular collars have been installed according to the insulation fabrication design documentation as per specification **GS PVV 211** and/or **GS PVV 212** (depending which is applicable).

In the case of water tight insulation, the materials used and the implementation conditions shall comply with Appendix 3.

They shall be covered by a minimum of two layers of elastomer coat type Hypalon^R or equivalent reinforced with compatible fiber glass fabric.

5.3.4 Equipment insulation

The insulating materials shall be fitted in accordance with section 5, and according to Appendix 2 and information from the **Suppliers**.

5.3.5 Piping insulation

Insulation materials shall again be applied in accordance with section 5, and according to Appendix 3 and information from the **Suppliers**.

On piping with diameters of less than 2", elbows may be made of angle iron.

Insulation of accessories such as flanges, valves and accessories shall be applied in the second phase using insulation fixed to "break joints" in accordance with Appendix 1.

5.4 Repair of execution defects

By agreement with the **COMPANY**, after determining the extent of the defects, the following methods of repair shall be applied.

5.4.1 Minor cladding defects

Minor defects shall be repaired locally, overlapping the adjacent parts.

5.4.2 Insulation system execution defects

The elements shall be removed and replaced.

6. Technical content of tenders

Tenders shall include the following details for thermal insulation systems:

- Methods and means used to install the insulation
- Data sheets for the proposed materials, and their sources
- Certificates issued by approved laboratories (concerning trials and tests relating to the proposed materials)
- Detailed length measurements for each item of equipment, and summary by type of equipment and insulation classes
- A Quality Assurance Plan (QAP), including in particular:
 - A nominal functional organisation chart
 - The presence of an inspector at the request of the **COMPANY** shall be indicated in the job specification
 - The list of installation and inspection phases, and their associated procedures
 - List of installation and inspection equipment
 - Resources provided for protection against adverse climatic conditions.

7. Tests, inspections and acceptance

7.1 Tests

During the work, the **Contractor** shall check the following points, in accordance with the systems selected. The results of these checks shall be recorded in the control sheets.

- Conformity of thermal insulation supports
- Condition of surfaces to which the thermal insulation is applied
- Climatic conditions of application
- Surface temperatures
- Quality of materials (compliance with specifications)
- Thickness and number of layers
- Quality of implementation
- Effectiveness of fixings and sealants (remove excess overflow from joints and strips before applying the vapour barrier)
- Quality of application of the vapour barrier and sealing at terminations (first phase)

- Finishing (second phase)
- Compliance with specifications.

7.2 Inspection

As part of the QAP, the **Contractor** shall determine the inspection operations and shall submit them to the **COMPANY**. These actions are linked to the different phases of execution and checking (see section 7).

7.3 Acceptance

7.3.1 Quality control

During acceptance testing, a check shall be run to ensure that all the inspections listed in section 7 (tests) have been carried out and that the results are satisfactory.

7.3.2 Thermal efficiency

Thermal efficiency shall be at least equal to that specified by the **COMPANY**.

After start-up of the installation, the following shall be checked:

- Absence of condensation and frost (according to design climatic parameters)
- Surface temperature
- Absence of ice on insulation (indicating bad workmanship).

The results of the tests shall be confirmed by a report.

A second check shall be carried out before the end of the warranty period.

Acceptance test operations shall be confirmed by a report.

The **Contractor** shall guarantee that the insulation has been executed in strict compliance with this document. The system is defined in the insulation thickness tables.

8. Technical documentation

The technical documentation submitted by the **Contractor** on completion of the work shall include:

- Certificates of conformity of the insulating materials
- Certificates connected with tests and inspections by approved laboratories
- Particular execution standards
- Miscellaneous inspection forms
- Reports of tests and checks of thermal efficiency and effectiveness
- Acceptance test report.



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List of thermal insulation systems

Equipment \ Parameters of choice	Env.	T°C min/max	Type of insulation	Type of jacket	System No.	Remarks
Pressure vessels Vertical or Horizontal	IN/MAOS	Amb(2) to - 50°C	Cellular glass	Without jacketing	001	
				Lacquered galvanised steel plate	002	
				Stainless steel plate	003	
	IN/MA	Amb(2) to - 70°C	PIR (1)	Without jacketing	004	
				Lacquered galvanised steel plate	005	
				Stainless steel plate	006	
	IN/MA OS	-51 to -140°C	Cellular glass	Without jacketing	007	
				Lacquered galvanised steel plate	008	
				Stainless steel plate	009	
	IN/MA	-71 to -140°C	PIR (1)	Without jacketing	010	
				Lacquered galvanised steel plate	011	
				Stainless steel plate	012	
Note: (1) Polyisocyanurate foam (2) In France: ambient temperature "Amb" is 20°C						

Appendix 1

Parameters of choice Equipment	Env.	T°C min/max	Type of insulation	Type of jacket	System No.	Remarks
Piping	IN/MA OS	Amb(2) to - 50°C	Cellular glass	Without jacketing	013	
				Lacquered galvanised steel plate	014	
				Stainless steel plate	015	
	IN/MA	Amb(2) to - 70°C	PIR (1)	Without jacketing	016	
				Lacquered galvanised steel plate	017	
				Stainless steel plate	018	
	IN/MA OS	- 51 to -140°C	Cellular glass	Without jacketing	019	
				Lacquered galvanised steel plate	020	
				Stainless steel plate	021	
	IN/MA	- 71 to -140°C	PIR (1)	Without jacketing	022	
				Lacquered galvanised steel plate	029	
				Stainless steel plate	024	
Note: (1) Polyisocyanurate foam						
(2) In France: ambient temperature "Amb" is 20°C						

**Description of system No. 001
To be used with standard drawing(s)
Appendix 3 No. 01 to 05**

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
Bonding material	Adhesive	No. 520	Min. consumption 2.5 kg/m^2	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption 3 kg/m^2	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 580 or (581*)	Min. consumption: 4 kg/m^2 in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: *No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

Description of system No. 002
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
Bonding material	Adhesive	No. 520	Min. consumption 2.5 kg/m^2	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption 3 kg/m^2	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m^2 in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/E Heads, shell 0.63 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strap on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 003
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
Bonding material	Adhesive	No. 520	Min. consumption 2.5 kg/m^2	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption 3 kg/m^2	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Min. consumption 4 kg/m^2 in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 or 23 CND 17.13.03 05 Finish/State MAT Heads, shell 0.50 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strap on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 004
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	Min. consumption 2.5 kg/m ²	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 580 or (581*)	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

Description of system No. 005
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 31	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	Min. consumption 2.5 kg/m ²	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/ E Heads, shell 0.63 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 006
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	Min. consumption 2.5 kg/m ²	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 or Z3 CND 17.13.03 05 Finish/State MAT Heads, shell 0.50 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 007
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
	Anti-abrasive	No. 500	Max. consumption: 0.70 kg/m^2	Apply to 1st layer Assemble when hardened
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer if temp. $< -80^\circ\text{C}$ Min. consumption: 3 kg/m^2	
Fixing		No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 580 or (581*)	Min. consumption: 4 kg/m^2 in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

Description of system No. 008
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
	Anti-abrasive	No. 500	Max. consumption: 0.70 kg/m^2	Apply to 1st layer Assemble when hardened
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer if temp. $< -80^\circ\text{C}$ Min. consumption: 3 kg/m^2	
Fixing		No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Consumption: 4 kg/m^2 in 2 layers min	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/ E Heads, shell 0.63 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 009
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
Insulation	Anti-abrasive	No. 500	Max. consumption: 0.70 kg/m^2	Apply to 1st layer Assemble when hardened
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer if temp. $< -80^\circ\text{C}$ Min. consumption: 3 kg/m^2	
Fixing		No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Consumption: 4 kg/m^2 in 2 layers min	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/E Heads, shell 0.63 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 010
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer Min. consumption: 3 kg/m ²	
Fixing		No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 580 or (581*)	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

Description of system No. 011
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/E Heads, shell 0.63 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 012
To be used with standard drawing(s)
Appendix 3 No. 01 to 05

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per segments	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 Finish/State MAT Heads, shell 0.50 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

**Description of system No. 013
To be used with standard drawing(s)
Appendix 3 No. 06**

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
Bonding material	Mastic	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption: 3 kg/m^2	
Fixing		No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 580 or (581*)	Consumption: 4 kg/m^2 in 2 layers min	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

**Description of system No. 014
To be used with standard drawing(s)
Appendix 3 No. 06**

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
Bonding material	Mastic	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Consumption: 4 kg/m ² in 2 layers min	
	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/E Heads, shell 0.50 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min.	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

**Description of system No. 015
To be used with standard drawing(s)
Appendix 3 No. 06**

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system $\geq 80\text{mm}$ forecast a minimal two layers system
Bonding material	Mastic	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption: 3 kg/m^2	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m^2 in two layers	
	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 or Z3 CNDT 17.13.03 0S Finish/State MAT Heads, shell 0.50 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min.	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

**Description of system No. 016
To be used with standard drawing(s)
Appendix 3 No. 06**

Component	Description	Reference	Requirements	Remarks
Insulation	Rigid polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Mastic	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption: 3 kg/m ²	
Fixing		No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 580 or (581*)	Consumption: 4 kg/m ² in 2 layers min.	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

**Description of system No. 017
To be used with standard drawing(s)
Appendix 3 No. 06**

Component	Description	Reference	Requirements	Remarks
Insulation	Polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Mastic	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/E Heads, shell 0.50 mm min. and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 018
To be used with standard drawing(s)
Appendix 3 No. 06

Component	Description	Reference	Requirements	Remarks
Insulation	Polyisocyanurate foam	No. 36	If total thickness < 50 mm, 1 layer with longitudinal + circumferential stepped edges. If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Mastic	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	The bonding adhesives and jointing mastic must be proven compatible with and chemically neutral to the equipment's anticorrosive system
Sealant	Mastic	No. 530 or 531 or 532 or 533	Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Min. consumption: 4 kg/m ² in two layers	
	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 or Z3 CND 17.13.03 OS Finish/State MAT Heads, shell 0.50 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Neutral silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 019
To be used with standard drawing(s)
Appendix 3 No. 06

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
	Anti-abrasive	No. 500	Min. consumption: 0.70 kg/m ²	Apply to 1st layer Assemble when hardened
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer if temp. < -80°C Min. consumption: 3 kg/m ²	
Fixing		No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 580 or (581*)	Consumption: 4 kg/m ² in 2 layers min.	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

**Description of system No. 020
To be used with standard drawing(s)
Appendix 3 No. 06**

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
	Anti-abrasive	No. 500	Max. consumption: 0.70 kg/m^2	Apply to 1st layer Assemble when hardened
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer if temp. $< -80^\circ\text{C}$ Min. consumption: 3 kg/m^2	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Consumption: 4 kg/m^2 in 2 layers min	
	Glass fabric	No. 610	100 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/ E Heads, shell 0.50 mm min. and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min.	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 021
To be used with standard drawing(s)
Appendix 3 No. 06

Component	Description	Reference	Requirements	Remarks
Insulation	Cellular glass	No. 31	Minimum thickness of each layer: 40 mm	For insulation system ≥ 80 mm forecast a minimal two layers system
	Anti-abrasive	No. 500	Max. consumption: 0.70 kg/m^2	Apply to 1st layer Assemble when hardened
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m^2 from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer if temp. $< -80^\circ\text{C}$ Min. consumption: 3 kg/m^2	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Consumption: 4 kg/m^2 in 2 layers min	
	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 Finish/State MAT Heads, shell 0.40 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. $4.8 \times 15.9 \text{ mm}$ + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, $16 \times 0.5 \text{ mm}$ min.	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 022
To be used with standard drawing(s)
Appendix 3 No. 06

Component	Description	Reference	Requirements	Remarks
Insulation	Polyisocyanurate foam	No. 36	If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 580 or (581*)	Consumption: 4 kg/m ² in 2 layers min.	
	Glass fabric	No. 610	100 mm overlap minimum	
Jacketing material	NOT SPECIFIED			
Jacket fixing				
Water-proofing sealants				

Note: No incompatibility of adhesion between mastics 886.05/886.06 and HYPALKOTE coating.

Description of system No. 029
To be used with standard drawing(s)
Appendix 3 No. 06

Component	Description	Reference	Requirements	Remarks
Insulation	Polyisocyanurate foam	No. 36	If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
Vapour barrier	Mastic	No. 590	Consumption: 4 kg/m ² in 2 layers min	
	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat lacquered galvanised steel sheets		Quality Plastisol Finish/State 100/E Heads, shell 0.50 mm min. and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min.	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.

Description of system No. 024
To be used with standard drawing(s)
Appendix 3 No. 06

Component	Description	Reference	Requirements	Remarks
Insulation	Polyisocyanurate foam	No. 36	If total thickness > 51 mm, multilayered max layer thickness 50 mm without stepped edges	
Bonding material	Adhesive	No. 520	1st layer applied dry Minimum consumption: 2.5 kg/m ² from 2nd layer	
Sealant	Mastic	No. 530 or 531 or 532 or 533	Except 1st layer Min. consumption: 3 kg/m ²	
Fixing	Adhesive tape	No. 579	Min. 2 per pipe section	
	Mastic	No. 590	Consumption: 4 kg/m ² in 2 layers min	
Vapour barrier	Glass fabric	No. 610	50 mm overlap minimum	
Spacer	Elastomer	No. 690	19 mm min. thick	
Jacketing material	Flat stainless steel sheets		Quality Z8 C 17 Finish/State MAT Heads, shell 0.40 mm and covers	
Jacket fixing	Self-tapping screws		Stainless steel cheese-head self-tapping screws, dia. 4.8 x 15.9 mm + neoprene spacers	Fixing sheets to sheets
	Straps		Stainless steel, 16 x 0.5 mm min.	Retaining sheets (3)
Water-proofing sealants	Preformed cords	No. 534	Diameter according to swage	Applied continuously
	Silicon mastic in cartridges	No. 535		For sealing the finishing work

Note: (3) If necessary, retaining strip on elevated equipment or piping jacket plates exposed to wind.



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List of materials and accessories with codes

Material/Equipment	Form	Numbering
Insulation		
Expanded cellular glass	Panels, pipe sections or segments	31
Polyurethane foam (PUR)	Drum (injection)	35
Polyisocyanurate foam (PIR)	Panels, pipe sections or segments	36
Adhesives		
Two-part adhesive without solvent	Drum	520
Two-part adhesive with acetate solvent	Drum	521
Sealing mastic with aliphatic solvent	Drum	530
Sealing mastic with aromatic solvent	Drum	531
Sealing mastic with aliphatic solvent	Drum	532
Sealing mastic with aliphatic solvent	Drum	533
Anti-abrasive		
Anti-abrasive coating on cellular glass	Drum	500
Vapour barrier		
Jacket sealing mastic	Drum	580
Jacket sealing mastic	Drum	581
Jacket sealing mastic	Drum	590
Reinforcing fabric	Roll	610
Accessories		
Spacer	Roll	690
Insulating spacer	Plate	571
Supports	Steel section bar	573
Self-adhesive tape	Roll	579
Sealing		
Sealant	Preformed cords	534
Silicon mastic	Cartridge	535

Thermal insulation material specifications No. 031

Insulating material: Expanded cellular glass			Form: Panels, pipe sections or segments			
Properties	Documents		Min/max values		Remarks	
	Reference	Appld				
Product						
Apparent density	Prod data sheet	*	T4: 120 kg/m ³ ± 10% S3: 135 kg/m ³ ± 10%			
Percentage of cells closed	ASTM D 2856	*	100%			
	Prod data sheet					
Service temperature limits	Prod data sheet	*	- 260°C to 430°C		Specify service T°C	
Thermal conductivity	ASTM C 177	*	W/m°C		Tm°C = mean temperature	
	ASTM C 518	*	Tm°C		T4	S3
	Prod data sheet	*	-180	.	0.018	0.018
			-100	.	0.027	0.028
			0	.	0.041	0.043
			100	.	0.062	0.063
			200	.	0.087	0.090
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M0			
	ASTM E 84					
Specific heat	Prod data sheet	*	0.20 Kcal/kg°C or 0.84 j/kg°C			
Water vapour permeability	ASTM E 96	*	None			
	Prod data sheet					
Water absorption	ASTM C 240		None, apart from temporary surface retention			
	Prod data sheet	*				
Coefficient of linear expansion	ISO 2896		9 x 10 ⁻⁶ /°C or 9 x 10 ⁻⁶ /°C			
	Prod data sheet	*				
Dimensional stability	ASTM D 2126		Perfect			
	Prod data sheet	*				
Compressive strength	ASTM C 240	*	T4: 7 kg/cm ² S3: 9 kg/cm ²		Average value at break	
	ASTM C 165	*				
	Prod data sheet					
Flash point	ASTM C 240	*	T4: 4 kg/cm ² S3: 5 kg/cm ²			
	ASTM C 165	*				
	Prod data sheet					
Resistance to chemical agents	Prod data sheet	*	All common acids except fluoric acid and strongly alkaline solutions			

Note:



Thermal insulation material specifications No. 035

Insulating material: Polyurethane foam (PUR)			Form: Drum		
Properties	Documents		Min/max values		Remarks
	Reference	Appld			
Product			Liquid foam to be injected		
Apparent density	ASTM D 1622	*	50 kg/m ³ min		
	ISO 845	*			
	Prod data sheet	*			
Percentage of cells closed	ASTM D 2856	*	90 to 95%		
	Prod data sheet				
Service temperature limits	Prod data sheet	*	-170 to 100°C		
Thermal conductivity	ASTM C 177	*	Tm°C	W/m°C	Tm°C = mean temperature
		*	-165	0.015	
	Prod data sheet	*	-70	0.023	
			0	0.020	
			50	0.024	
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M1		
	ASTM E 84				
Specific heat	Prod data sheet	*	5500 Cal/kg		
Water vapour permeability	ASTM E 96		30 to 20 g/m ² /24 h		
	ISO R 1663	*			
Water absorption	ASTM D 2842		5% by volume		
	ISO DIS 2896	*			
	Prod data sheet				
Coefficient of linear expansion	ASTM D 196	*	70 * 10 ⁻⁶ m/m°C		
	ASTM C 696	*			
	Prod data sheet				
Dimensional stability	ASTM D 2126				
	Prod data sheet				
Compressive strength	ASTM D 1621		190 to 350 kPa		
	DIN 52421	*			
	Prod data sheet				
Flash point	ASTM C 203		200 to 550 kPa		
	DIN 53423	*			
	Prod data sheet				
Resistance to chemical agents	ASTM C 871		Excellent resistance except to concentrated acids and methanol		
	Prod data sheet	*			

Note: To be used only for locally filling of valve boxes or similar.

Thermal insulation material specifications No. 036

Insulating material: Polyisocyanurate foam (PIR)			Form: Panels, pipe sections or segments		
Properties	Documents		Min/max values		Remarks
	Reference	Appld			
Product			Expanded foam using FORANE 141 B		
Apparent density	ASTM D 1622	*	50 kg/m ³ min. up to 120 kg/m ³		
	ISO 845	*			
	Prod data sheet	*			
Percentage of cells closed	ASTM D 2856	*	90 to 95%		
	Prod data sheet				
Service temperature limits	Prod data sheet	*	-170 to 100°C		
Thermal conductivity (material aged at least one month)	ASTM C 177	*	Tm°C	W/m°C	Tm°C = mean temperature
		*	-165	0.015	
	Prod data sheet	*	-70	0.023	
			0	0.020	
			50	0.024	
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M1		
	ASTM E 84				
Specific heat	Prod data sheet	*	0.40 Kcal/kg°C		
Water vapour permeability	ASTM E 96		30 to 25 g/m²/24 h		
	ISO R 1663	*			
Water absorption	ASTM D 2842		5% by volume		
	ISO DIS 2896	*			
	Prod data sheet				
Coefficient of linear expansion	ISO 2896	*	130 to 70 * 10 ⁻⁶ m/m°C		
	Prod data sheet				
Dimensional stability	ASTM D 2126		24h/100°C ± 1		
	Prod data sheet	*	24h/-15°C -0.2 to + 0.8		
			24h/70°C 95% HR +1 to +2		
Compressive strength			350 to 380 kPa		
	ISO 844	*			
	Prod data sheet				
Flash point			500 to 600 kPa		
	ISO 1209	*			
	Prod data sheet				
Resistance to chemical agents	ASTM C 871		Excellent resistance except to concentrated H ₂ SO ₄ , methylene, acetone and methanol		
	Prod data sheet	*			

Note: Material aged at least one month.



Thermal insulation material specifications No. 520

Adhesive: Two-part adhesive			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.31 to 1.40 ± 0.03 kg/l	
	Prod data sheet	*		
Dry extract	Prod data sheet	*	100%	
Solvent type	Prod data sheet	*	No solvent	
Service temperature limits			-70 to 150°C	
	Prod data sheet	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	Inflammable	
Dry film thickness	Prod data sheet	*	2 to 2.2 mm	
Water vapour transmission			0.5 to 2g/m ² /24h for 2 to 2.2 mm dry film	
	Method B	*		
Water vapour permeability	ASTM E 96		0.007 g/m ² /24h/cm/mmHG	
	Method E	*		
Resistance to hydrocarbons, oils and greases			Good	
		*		
Flash point Part A Part B Mixture	Prod data sheet	*	Greater than 105°C	
	Prod data sheet	*	Greater than 200°C	
			Greater than 105°C	
Application delay			Approximately 45 minutes "effective application time"	
	Prod data sheet	*		

Note: ENDOPRENE 888/01 adhesive 81.82 or equivalent.



Thermal insulation material specifications No. 521

Adhesive: Two-part adhesive			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.31 to 1.40 ± 0.03 kg/l	
	Prod data sheet	*		
Dry extract	Prod data sheet	*	93 to 95%	
Solvent type	Prod data sheet	*	Acetates	
Service temperature limits			-70 to 150°C	
	Prod data sheet	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	Inflammable	
Dry film thickness	Prod data sheet	*	2 to 2.2 mm	
Water vapour transmission			0.5 to 2g/m ² /24h for 2 to 2.2 mm dry film	
	Method B	*		
Water vapour permeability	ASTM E 96		0.007 g/m ² /24h/cm/mmHG	
	Method E	*		
Resistance to hydrocarbons, oils and greases			Good	
		*		
Flash point Part A Part B Mixture	Prod data sheet	*	Greater than 105°C	
	Prod data sheet	*	Greater than -2°C	
			Greater than 33°C	
Application delay			Approximately 4 hours "effective application time"	
	Prod data sheet	*		

Note: ENDOPRENE 888/00 adhesive 81.80 or equivalent.



Thermal insulation material specifications No. 530

Adhesive: Sealing mastic			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.38 to $\pm$ 0.05 g/ml	
	Prod data sheet	*		
Dry extract			93% to $\pm$ 2%	
	Prod data sheet	*		
Solvent type			Aliphatic	Compatibility on anti-corrosion coating to be verified
	Prod data sheet	*		
Service temperature limits			-80 to 100°C	
	Prod data sheet	*		
Response to flame	LCCP report		M2	
Dry film thickness			2 mm	
	Prod data sheet	*		
Water vapour transmission	ISO 2528		1.07 g/m ² /24 h for 2 mm dry film	
	Method B	*		
Resistance to hydrocarbons, oils and greases				

Note: Mastic 886/05 type product.



Thermal insulation material specifications No. 532

Adhesive: Sealing mastic			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.40 to $\pm$ 0.05 g/ml	
	Prod data sheet	*		
Dry extract			97% to $\pm$ 1%	
	Prod data sheet	*		
Solvent type				Compatibility on anti-corrosion coating to be verified
	Prod data sheet	*		
Service temperature limits			-80 to 120°C	
	Prod data sheet	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M4	
Dry film thickness			2 mm	
	Prod data sheet	*		
Water vapour transmission	ISO 2528			
		*		
Resistance to hydrocarbons, oils and greases				

Note: Mastic 30.45 type product.



Thermal insulation material specifications No. 533

Adhesive: Sealing mastic			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.40 to $\pm$ 0.05 g/ml	
	Prod data sheet	*		
Dry extract			90%	
	Prod data sheet	*		
Solvent type			Aliphatic	Compatibility on anti-corrosion coating to be verified
	Prod data sheet	*		
Service temperature limits			-80 to 100°C	
	Prod data sheet	*		
Response to flame	LCCP report		M1	
Dry film thickness			2 mm	
	Prod data sheet	*		
Water vapour transmission	ISO 2528		1.07 g/m ² /24 h for 2 mm dry film	
	Method B	*		
Resistance to hydrocarbons, oils and greases				

Note: Mastic 886/06 type product.



Thermal insulation material specifications No. 531

Adhesive: Sealing mastic			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.52 to $\pm$ 0.06 kg/l	
	Prod data sheet	*		
Dry extract			92%	
	Prod data sheet	*		
Solvent type			Aromatic	Compatibility on anti-corrosion coating to be verified
	Prod data sheet	*		
Service temperature limits			-130°C to +70°C	
	Prod data sheet	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	Inflammable	
Dry film thickness			1.8 mm	
	Prod data sheet	*		
Water vapour transmission			1.3 to 0.3 g/m ² /24 h for 1.8 mm dry film	
	Method B	*		
Water vapour permeability	ASTM E 96			
	Method E			
Resistance to hydrocarbons, oils and greases				
Flash point			Approximately 51°C	
	Prod data sheet	*		

Note: FLEXTRA 95.50 type mastic product.



Thermal insulation material specifications No. 500

Anti-abrasive material: Anti-abrasive coating on cellular glass			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.66 to 1.80 ± 0.05 kg/l	
	Prod data sheet	*		
Dry extract			53 to 64%	
	Prod data sheet	*		
Solvent type			Aromatic or chlorine	According to suppliers
	Prod data sheet	*		
Service temperature limits			-200 to +120°C	
	Prod data sheet	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M1	
Flash point			Below 5°C	
	Prod data sheet	*		

Note: Anti-abrasion product 886/10, 30.16 or similar, to be applied to the surface of the cellular glass in contact with the vessel or piping.

Apply insulation after the anti-abrasive mastic has hardened.

This product must not be used if the layer concerned is bonded.

* To temperature between -200°C and +350°C a product type HTAA from Pittsburgh Corning (M0) or equivalent could be used.



Thermal insulation material specifications No. 580

Vapour barrier material: Jacket sealing mastic			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.10 approx. at 20°C	
	Prod data sheet	*		
Dry extract			30% +/- 2% by volume	
	Prod data sheet			
Solvent type			Aliphatic and/or aromatic	
	Prod data sheet	*		
Service temperature limits			-30 to 120°C	
	Prod data sheet	*		
Response to flame	LNE report No. 601979		M1	
	LCPP			
Water vapour transmission	NF H 00-030		0.2 g/m ² /24 h for 1.15 mm dry film	
	Method B			
Water vapour permeability	ASTM E 96		0.00134 g/m ² /h/mmHg	
	Method E			
Resistance to hydrocarbons, oils and greases			Good	
Weather resistance			Excellent	
Dry film thickness			1.15 mm	
	Prod data sheet	*		

Note: MONOLAR or similar type product, to be used as vapour barrier if there is no jacketing plate.



Thermal insulation material specifications No. 581

Vapour barrier material: Jacket sealing mastic			Form: Drum
Properties	Documents		Requirements
	Reference	Appld	
Product			Mastic thinned with solvent for finishing
Dry extract	Volume	ISO 2811	1.23 ± 0.05 (kg/l) Manual 1.26 ± 0.05 (kg/l) Airless 50%
		*	
	Prod data sheet		
	Weight		
Solvent type	Prod data sheet	*	
Service temperature limits	Prod data sheet	*	-40 to +80°C
Response to flame	Depth decree	*	M1 (non inflammable)
Water vapour transmission	ISO 2528		< 0.32 g/m ² /24 h for 1.5 mm dry film
	Prod data sheet		
	LNE report No. 606 0037		
Water vapour permeability		*	0.000623 g/m ² /h/mmHg
	Prod data sheet		
Resistance to hydrocarbons, oils and greases		*	

Note: HYPALKOTE or similar type product, to be used as vapour barrier when there is no jacketing plate.



Thermal insulation material specifications No. 590

Vapour barrier material: Jacket sealing mastic			Form: Drum	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Apparent density			1.20 approx. at 20°C	
	Prod data sheet	*		
Dry extract	Prod data sheet	*	51 to 60% ± 2% "Manual" 51 to 60% ± 2% "Airless"	
Solvent type	Prod data sheet	*	Aliphatic and/or aromatic	
Service temperature limits			-40 to 100°C	
	Prod data sheet	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M1	
	LCPP			
Water vapour transmission		*	0.2 to 0.5 g/m ² /24 h for 2 to 2.7 mm	
	Method B			
Water vapour permeability	ASTM E 96	*	0.0009 g/m ² /24h/cm/mmHg	
	Method E			
Resistance to non-oxidizing mineral dilute acids and bases		*	Good	
Weather resistance		*	Good	
Dry film thickness	Prod data sheet	*	2 to 2.7 mm	
Flash point	Prod data sheet	*	33 to 38°C approx.	

Note: ISOLARM IGN 671/65, mastic 65.05, non-UV product or equivalent to be used if steel sheet jacketing is planned, otherwise use product data sheet 580 or 581.



Thermal insulation material specifications No. 610

Vapour barrier material: Reinforcing fabric			Form: Roll	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Composition			Woven glass fibre fabric	
	Prod data sheet	*		
Weight per m ²			57 grammes/m ²	
	Prod data sheet	*		
Thickness			20/100 mm	
	Prod data sheet	*		
Weft			3.7 filaments/cm	
	Prod data sheet	*		
Response to flame			M0	
	Decree dated 30/06/83modified 28/08/91	*		
Warp			2 x 3.7 filaments/cm	
	Prod data sheet	*		
Tearing strength Warp Weft			50 kg/5 cm 50 kg/5 cm	
	Prod data sheet	*		

Note: Product type 557 Fix 15 HEXCEL GENIN or similar.



Thermal insulation material specifications No. 690

Jacketing material: Self-adhesive elastomeric spacer			Form: Roll	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Product			Flexible elastomer foam with adhesive surface	
		*		
Compressibility under load		*	25% distortion under 15 daN/dm ²	
		*		
	Prod data sheet			
Response to flame	LNE report No. 487/331.01	*	M1	
	Prod data sheet			
Water absorption			< 15% by volume	
	Prod data sheet	*		
Service temperature limits	DIN 267		-40 to +90°C	
	Prod data sheet	*		
Section			19 x 25 mm	
	Prod data sheet	*		
Chemical resistance			Insensitive to most chemical agents	
	Prod data sheet			



Thermal insulation material specifications No. 571

Fixing material: Insulating spacer			Form: Plate	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Product			Reticulated PVC	
	Prod data sheet	*		
Service temperature			Min -200° - Max +70°	
	Prod data sheet	*		
Apparent density			130 kg/m ³	
	ISO 845	*		
Compressive stress			3 MPa	
	ISO 844	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M1	

Product			BAKELISED wood	
	Prod data sheet	*		
Service temperature			Min -200° - Max +100°	
	Prod data sheet	*		
Density			1360 kg/m ³	
	Prod data sheet	*		
Compressive stress			260 MPa	
	ISO 844	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M4	

Product			Rigid polyurethane foam	
	Prod data sheet	*		
Service temperature			Min -200° - Max +70°	
	Prod data sheet	*		
Apparent density			240 kg/m ³	
	ISO 845	*		
Compressive stress			3.5 MPa	
	ISO 844	*		
Response to flame	Decree dated 30/06/83 modified 28/08/91	*	M4	



Thermal insulation material specifications No. 573

Fixing material: Supports			Form: Steel section bar	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Product			1 - Galvanised steel e 24-2	
	Prod data sheet	*		
Galvanization			Rich class C	
Width			30 to 60 mm	
	Prod data sheet	*		
Thickness			3 to 6 mm	
	Prod data sheet	*		

Note:



Thermal insulation material specifications No. 579

Accessory: Self-adhesive tape			Form: Roll	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Composition			Weft and warp glass fibre reinforced polypropylene film	
	Prod data sheet	*		
Support thickness			35 microns	
	Prod data sheet	*		
Adhesive			Hot melt	
	Prod data sheet	*		
Adhesion			1500 g/cm	
	Prod data sheet	*		
Breaking load			28 kg/cm	
	Prod data sheet	*		
Service temperature limits			80°C	
	Prod data sheet	*		
Width			50 mm	
	Prod data sheet	*		

Note:



Thermal insulation material specifications No. 534

Sealing material: Sealant			Form: Preformed cords	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Product			Silicon	
Dry extract: volume	Prod data sheet	*	36 to 52% ± 2%	
Service temperature limits	Prod data sheet	*	-40 to 120°C	
Adhesion	Prod data sheet	*	1500 g/cm	
Response to flame	Decree dated 30/06/83 modified 28/08/91		M1	
Water vapour transmission	Method B	*	0.98 g/m ² /24 h for 1 mm	
Water vapour permeability	ASTM E 96	*	0.002 g/m ² /24h/cm/mmHg	
Resistance to hydrocarbons, oils and greases		*		

Note:



Thermal insulation material specifications No. 535

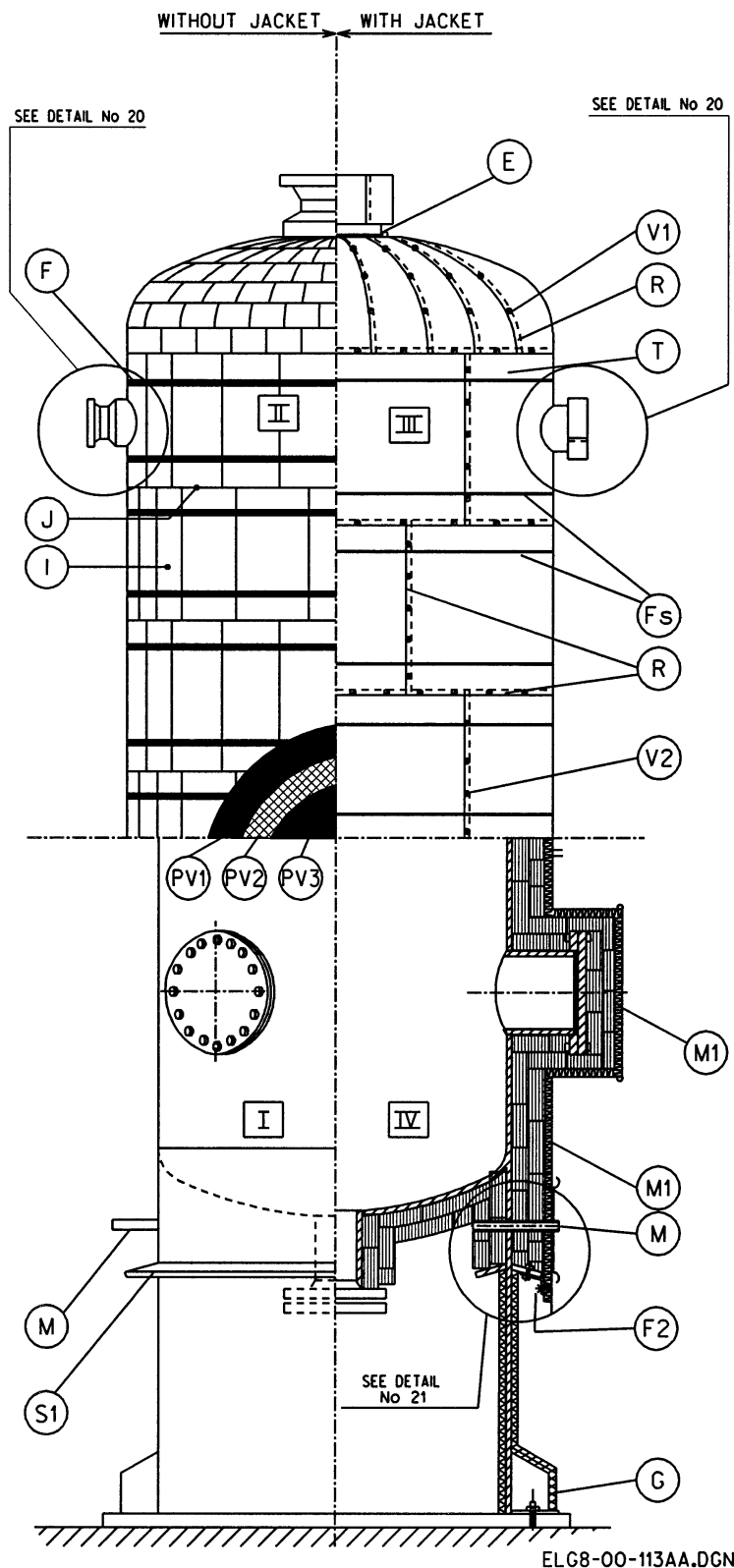
Sealing material: Neutral silicon mastic			Form: Cartridge	
Properties	Documents		Min/max values	Remarks
	Reference	Appld		
Product			Silicon	
Dry extract: volume	Prod data sheet	*	95 to 97%	
Solvent type	Prod data sheet	*	Aliphatic and/or aromatic	
Service temperature limits	Prod data sheet	*	-60 to 250°C	
Response to flame	Decree dated 30/06/83 modified 28/08/91		M1	
Water vapour transmission		*	0.98 g/m ² /24 h for 1 mm	
Water vapour permeability	ASTM E 96 Method E	*	0.002 g/m ² /24h/cm/mmHg	
Resistance to hydrocarbons, oils and greases		*		
Flash point	Prod data sheet	*	38°C approx.	

Note:



Appendix 3

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Preparation of pressure vessel (GS PVV 211 / GS PVV 212)

M= Vent for skirt

S1= Internal and external terminations

Fitting insulation/Vapour barrier

I= Insulation in segments or pipe section form (double layer for thicknesses ≥ 80 mm)

J= Lap jointing mastic

F= Adhesive tape binding if necessary (minimum 2 per segments)

PV1= First layer of mastic-bonding

PV2= Reinforcing fabric

PV3= Second layer of mastic-smoothing

Fitting protective Jacketing Finishing

E= Termination

Fs= Safety strap (for tall vessels) minimum two per plate

R= Overlap (mini 30 mm) with mastic sealant for vertical swage

T= Jacket plate with swage

V1= Screw fixing plate to plate

V2= Screw fixing plates to steel frame (to be applied in area of overlap if possible)

Cross-section

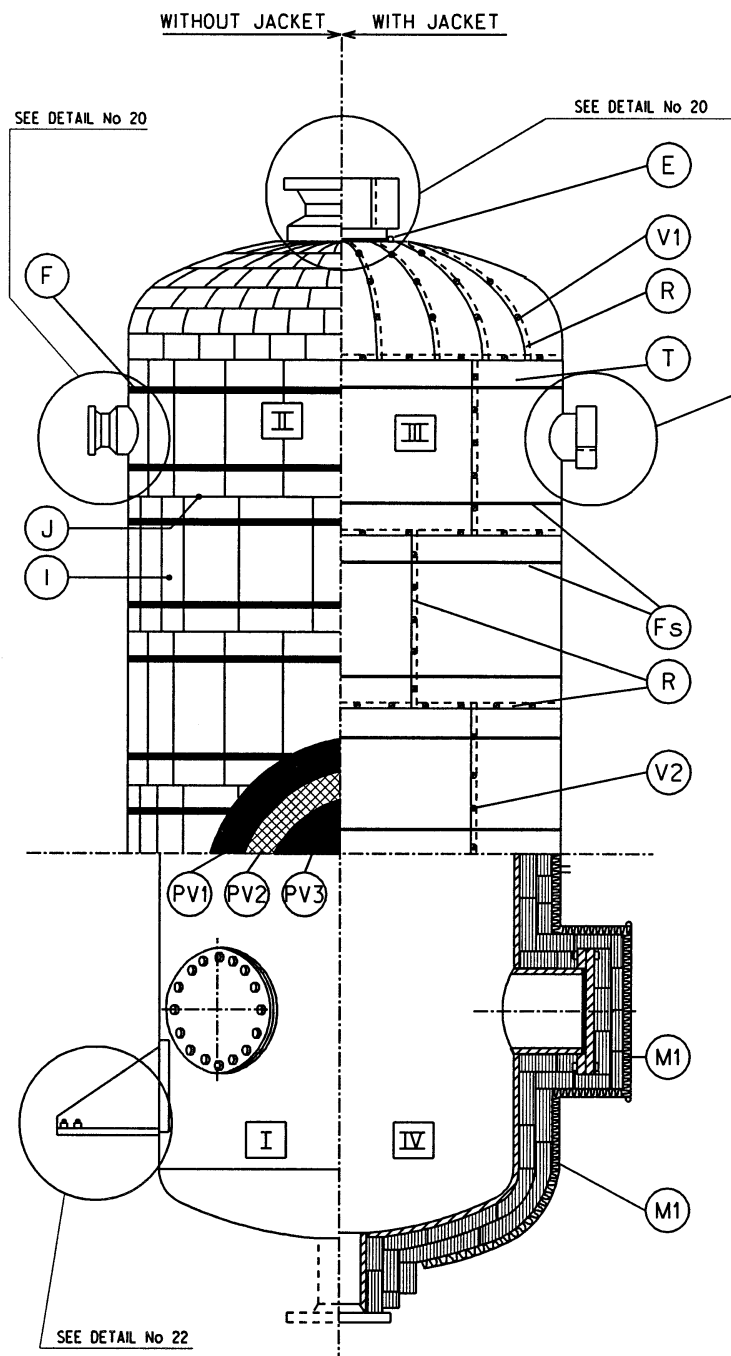
F2= Anti-corrosion treated binding or flat iron, bolted at C4

M1= Spacer providing physical protection of vapour barrier

Variant

G= Fireproofing

Principles of assembly No. 01 Vertical vessel on skirt (all Ø)



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Preparation of pressure vessel (GS PVV 211 / GS PVV 212)

Fitting insulation/Vapour barrier

I= Insulation in segments or pipe section form (double layer for thicknesses ≥ 80 mm)
J= Lap or staggered jointing mastic
F= Adhesive tape binding if necessary (minimum 2 per segments)
PV1= First layer of mastic-bonding
PV2= Reinforcing fabric
PV3= Second layer of mastic-smoothing

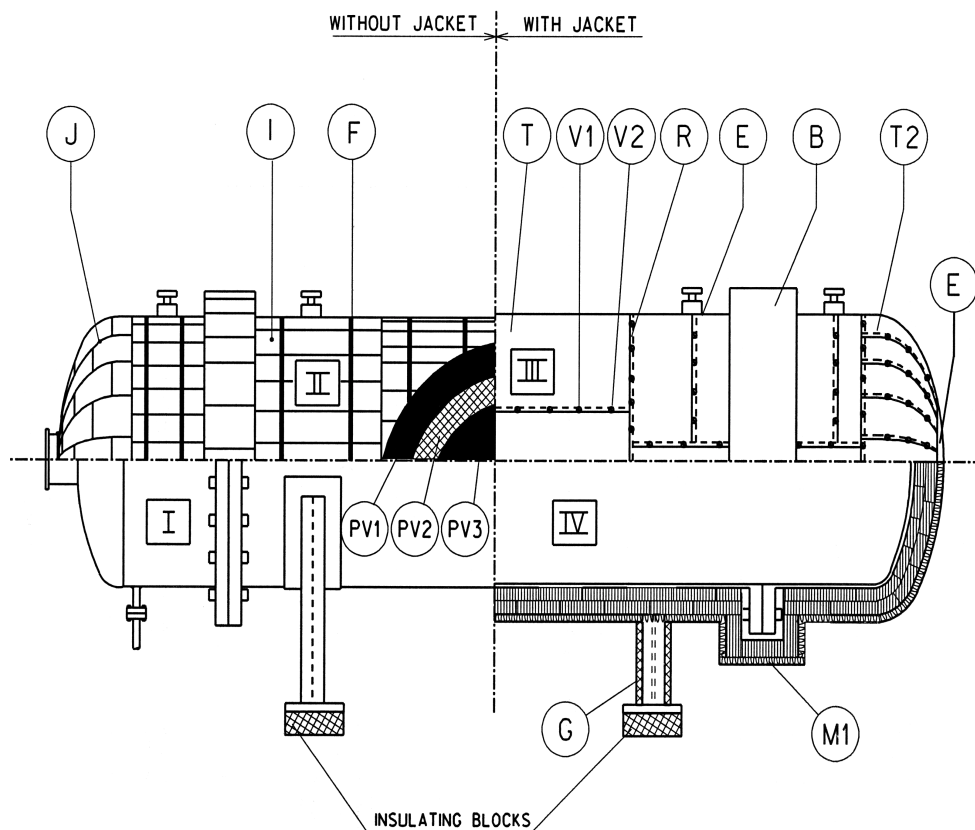
Fitting protective jacketing, Finishing

E= Termination
Fs= Safety strap (for all vessels) minimum two per plate
R= Overlap (mini 30 mm) with mastic sealant for vertical swage
T= Jacket plate with swage
V1= Screw fixing sheet to sheet
V2= Screw fixing to steel frame to be applied where necessary for large capacity tanks.

Cross-section

M1= Spacer providing physical protection of vapour barrier

Principles of assembly No. 02 Vertical vessel on lateral supports (all Ø)



ELG8-00-113AC.DGN

Preparation of pressure vessel (GS PVV 211 / GS PVV 212)

Fitting insulation/Vapour barrier

I= Insulation in segments or pipe section form (double layer for thicknesses ≥ 80 mm)
J= Lap jointing mastic
F= Adhesive tape binding if necessary (minimum 2 per segments)
PV1= First layer of mastic-bonding
PV2= Reinforcing fabric
PV3= Second layer of mastic-smoothing

Fitting protective jacketing, finishing

B= Sheet steel cover
E= Termination
R= Overlap (mini 30 mm) with jointing mastic for vertical swage
V1= Screw fixing sheet to sheet
V2= Screw fixing to steel frame to be applied where necessary for large capacity tanks
T2= Flat sheet with flat swage and continuous silicon seal:
- head made up of segments for $\varnothing > 1000$ mm
- shaped or conical head allowing for ext $\varnothing > 1000$ mm

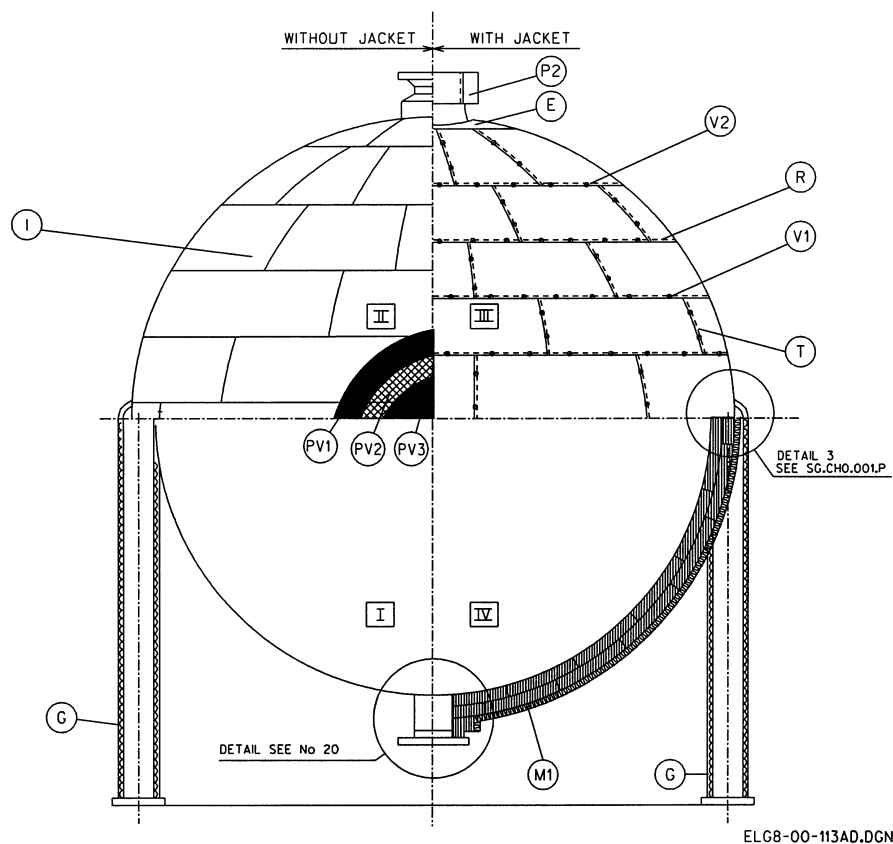
Cross-section

M1= Spacer providing physical protection of vapour barrier

Variant

G= Fireproofing

Principles of assembly No. 03 Horizontal vessel on saddles (all $\varnothing$)



Preparation of pressure vessel (GS PVV 211 / GS PVV 212)

Fitting insulation/Vapour barrier

I= Insulation in segments or pipe section form (double layer for thicknesses $\varnothing > 80$ mm)
J= Lap jointing mastic
F= Adhesive tape binding if necessary (minimum 2 per segments)
PV1= First layer of mastic-bonding
PV2= Reinforcing fabric
PV3= Second layer of mastic-smoothing

Variant

G= Fireproofing

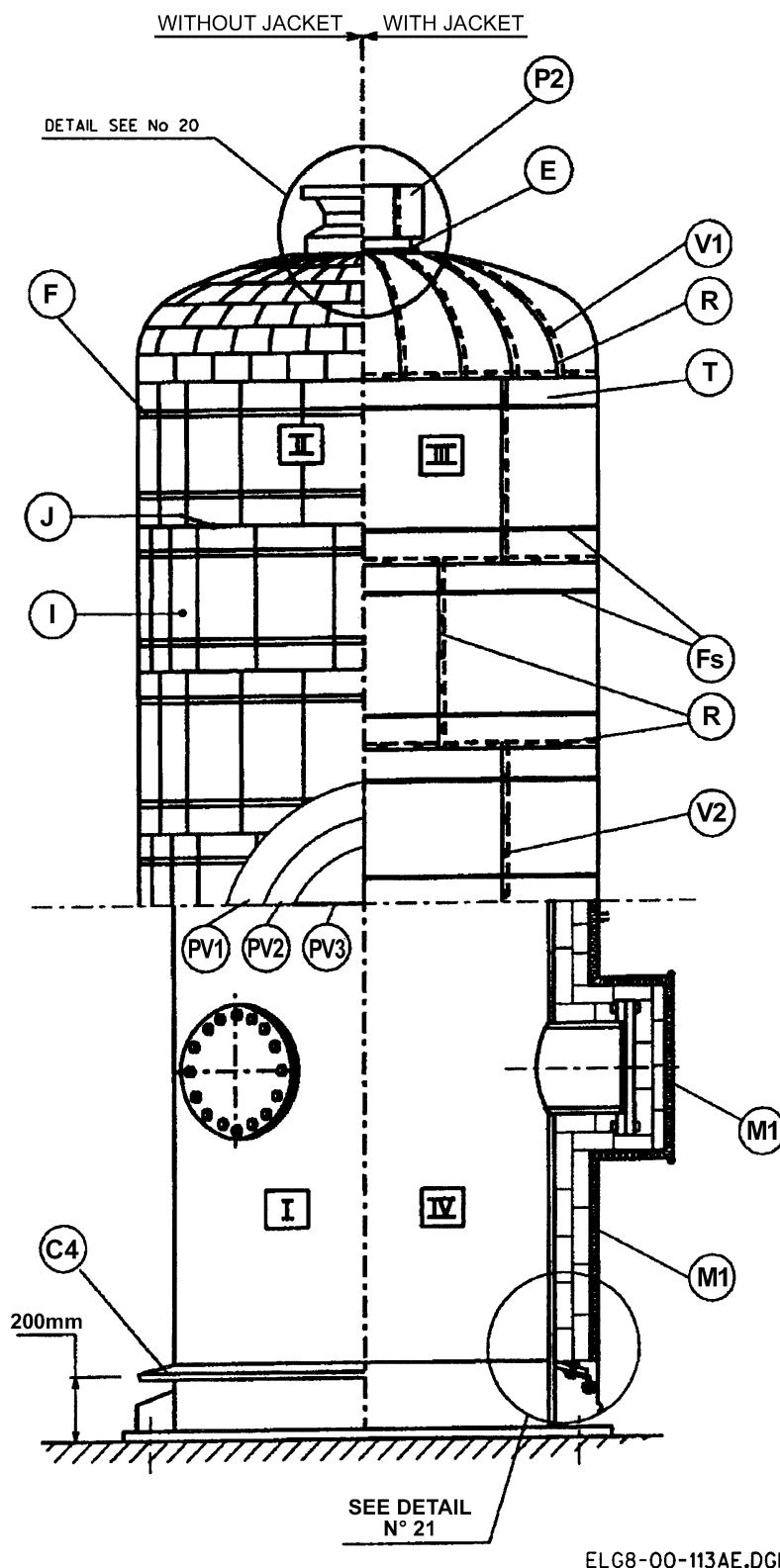
Fitting protective jacketing, finishing

E= Finition
R= Overlap (mini 30 mm) with jointing mastic for vertical swage)
T= Jacket sheet with swage
V1= Screw fixing sheet to sheet
V2= Screw fixing to steel frame to be applied where necessary for large capacity tanks

Cross-section

M1= Spacer providing physical protection of vapour barrier
P2= Manhole casing

Principles of assembly No. 04 Spherical vessel on legs



Preparation of pressure vessel (GS PVV 211 / GS PVV 212)

C4= Termination

Fitting insulation/Vapour barrier

I= Insulation in segments or pipe section form (double layer for thicknesses ≥ 80 mm)

J= Lap jointing mastic

F= Retaining adhesive binding if necessary (minimum 2 per segments)

PV1= First layer of mastic-bonding

PV2= Reinforcing fabric

PV3= Second layer of mastic-smoothing

Fitting protective jacketing, finishing

E= Termination

Fs= Safety strap (for all vessels) minimum to per sheet

R= Overlap (mini 30 mm), with jointing mastic for vertical swage

V1= Screw fixing sheet to sheet

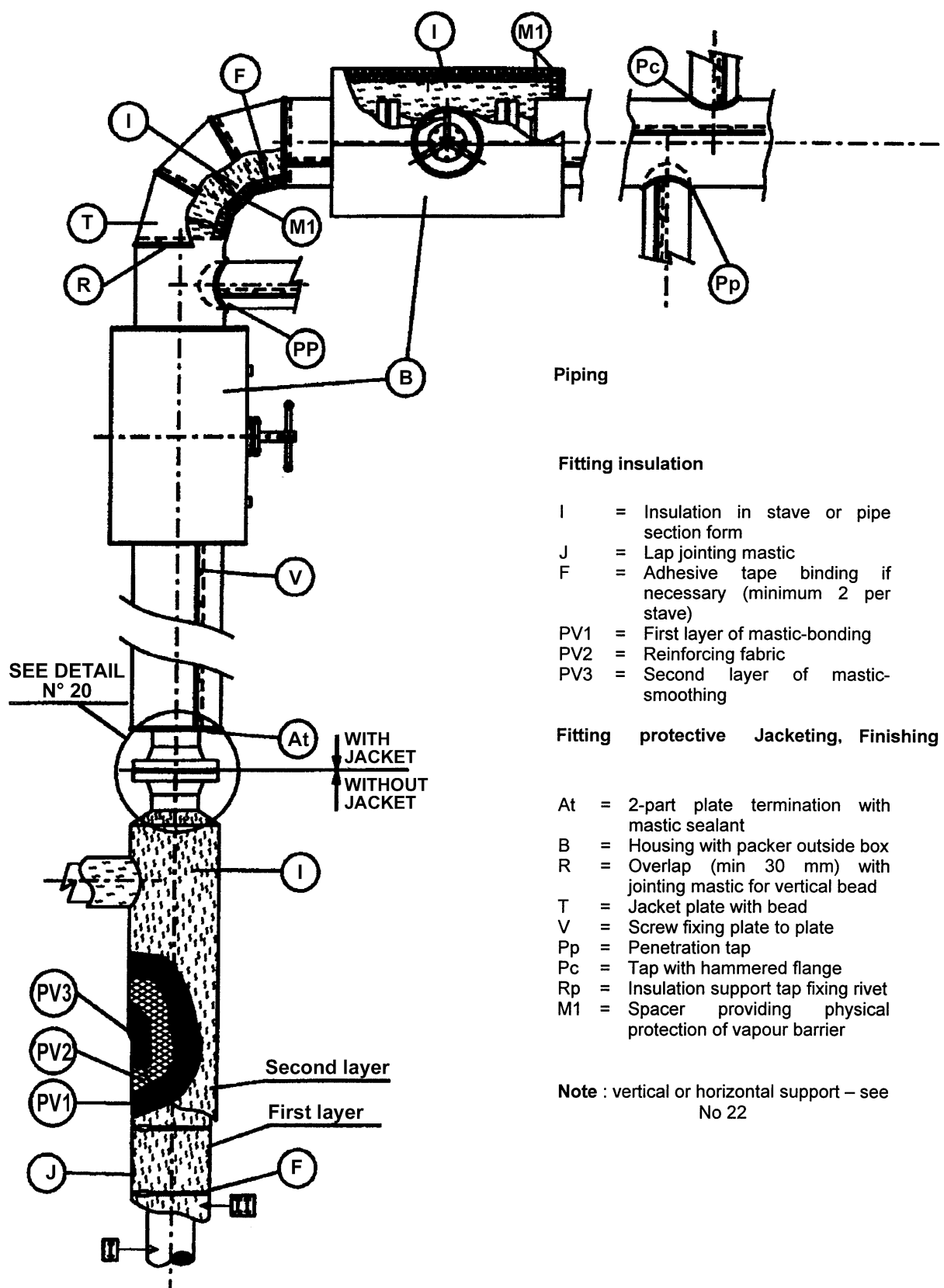
V2= Screw fixing to steel frame to be applied where necessary for large capacity tanks

Cross-section

M1= Spacer providing physical protection of vapour barrier

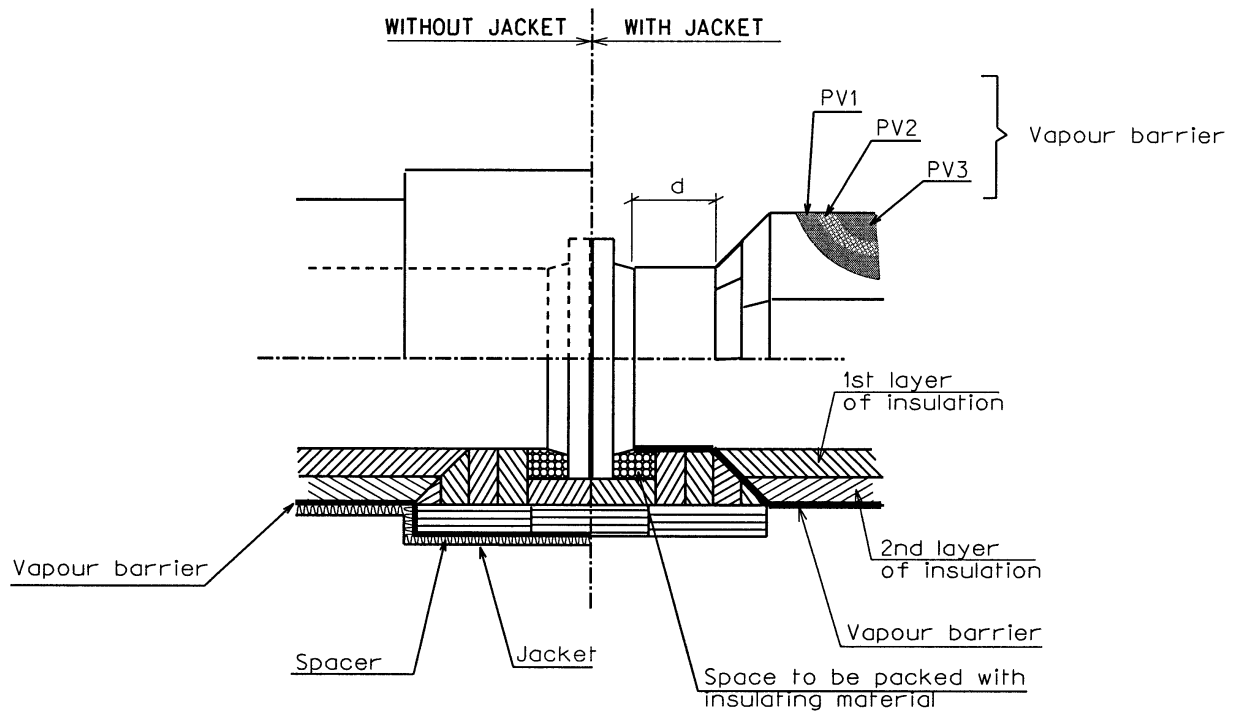
P2= Manhole casing

Principles of assembly No. 05 Flat bottomed storage vessel



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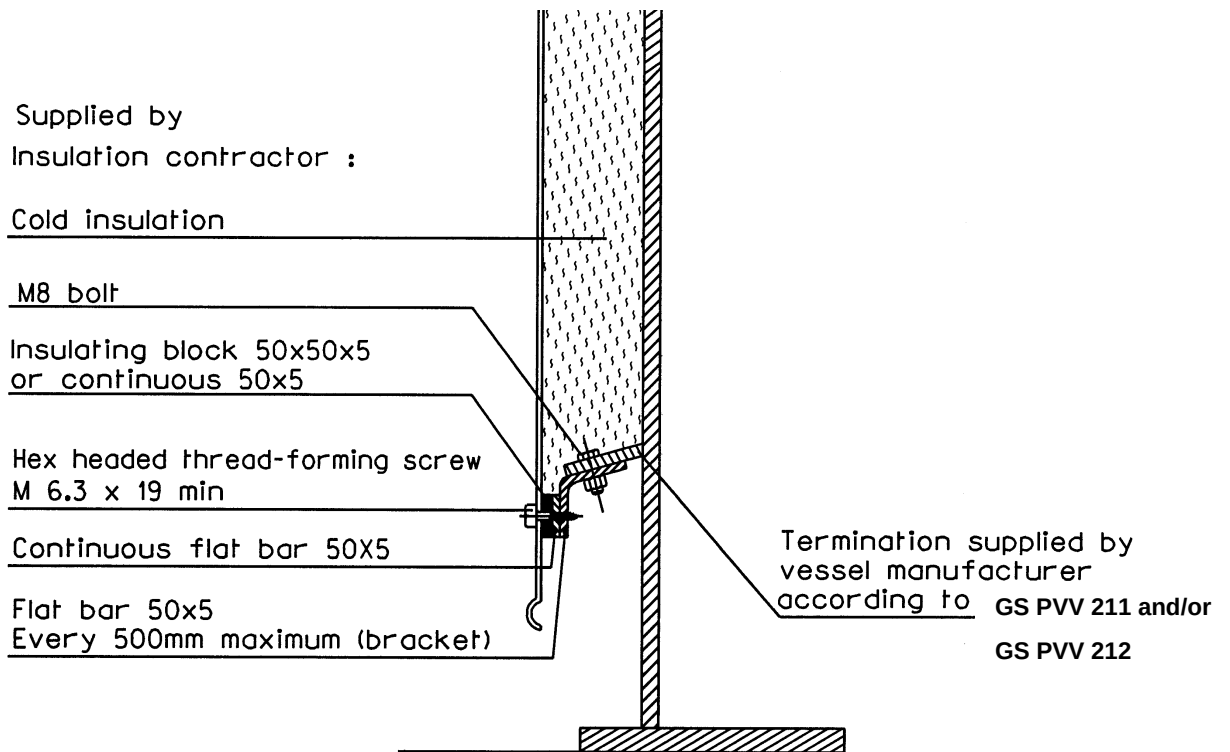
Principles of assembly No. 06 Piping



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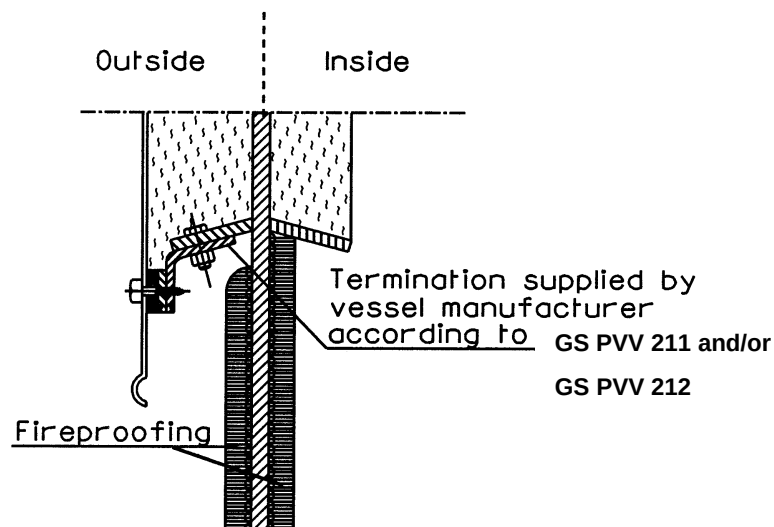
- d = minimum distance for removing bolts
- PV1 = 1st keying mastic layer
- PV2 = reinforcing fabric
- PV3 = 2nd finishing mastic layer

Principles of assembly No. 20 Lagged piping



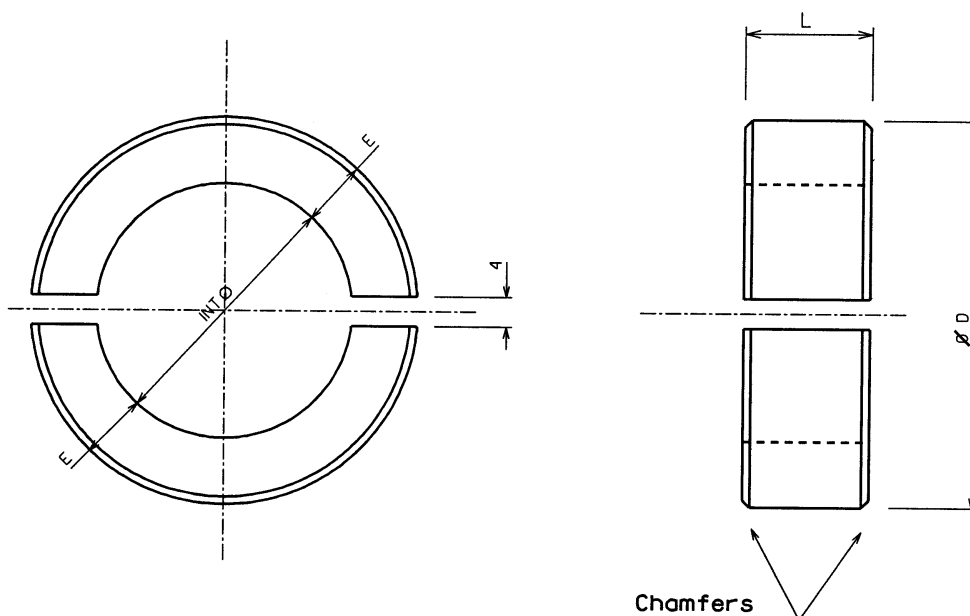
A - Insulated skirt

shell not fireproofed



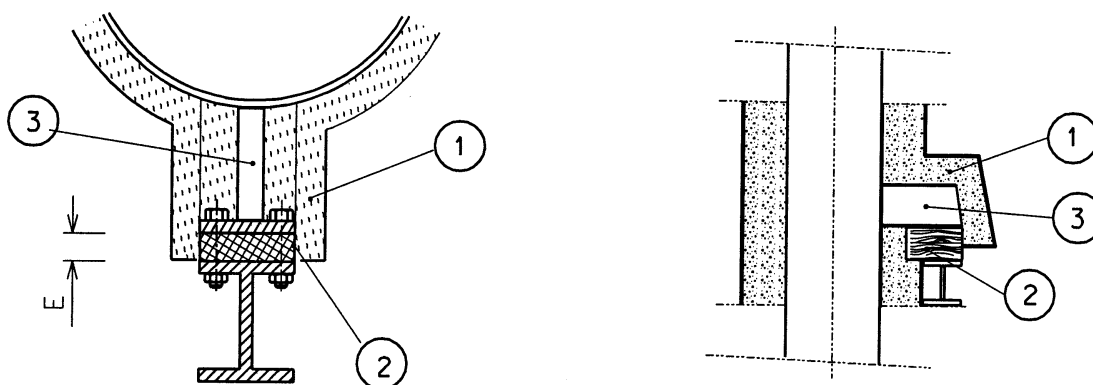
B - Fireproofed skirt

**Principles of assembly No. 21
Insulation on base deflector (on termination)**



A - Sliding supports

E= Minimum piping insulation thickness
Material: minimum 90 kg/m³ PVC foam
minimum 120 kg/m³ polysocyanurate foam
Bakelised

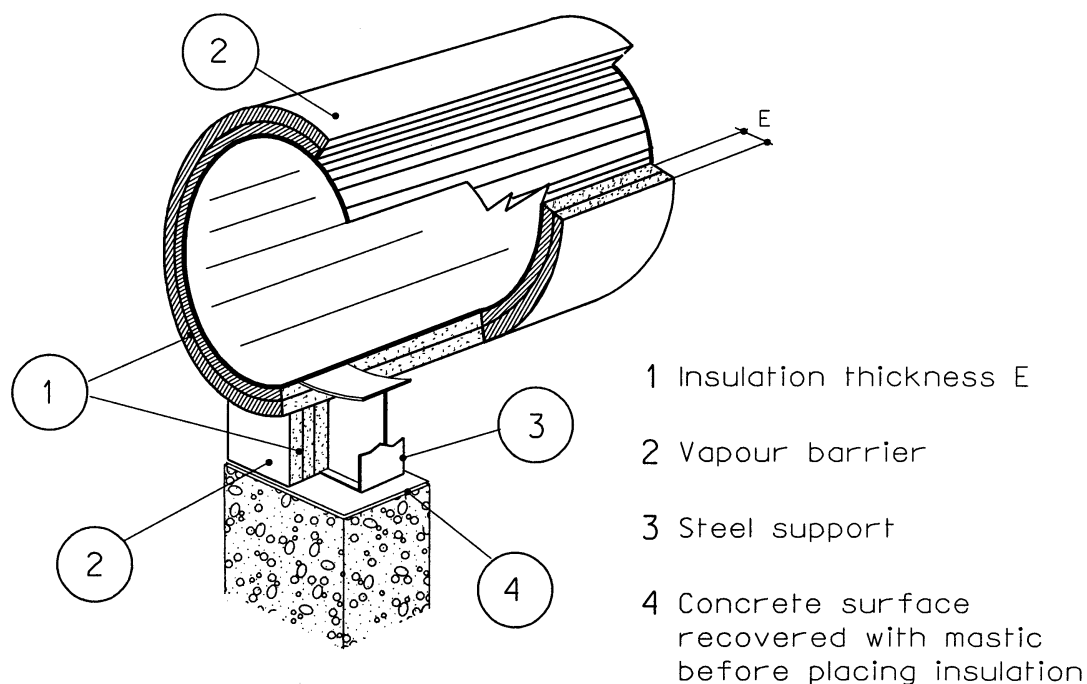


B - Vessel fixing or support points

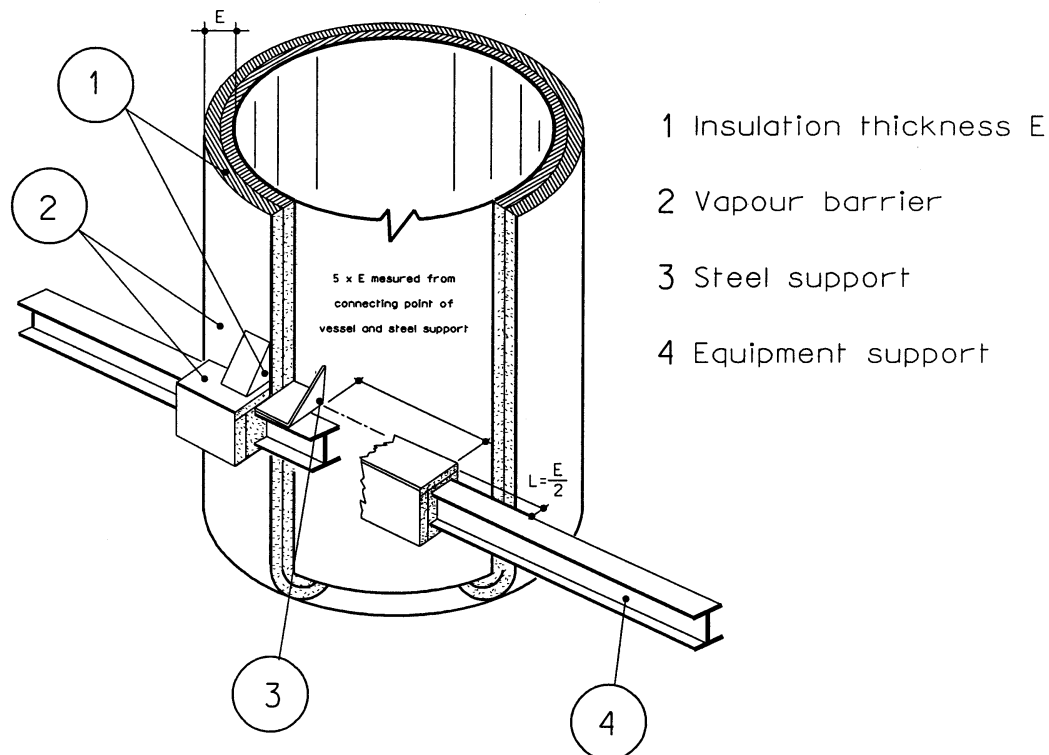
E = Minimum piping insulation thickness
Material: minimum 200 kg/m³ PVC foam
minimum 240 kg/m³ polysocyanurate foam
Bakelised wood

1 = Cold insulation
2 = Insulation block
3 = Steel support

Principles of assembly No. 22 Piping support



Insulation of equipment supports, equipment on saddles



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Insulation of equipment supports, equipment on beams

Principles of assembly No. 23 Vessel support