Subject:

Fire protection for external high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors, and fuel oil piping

ClassNK

Technical Information

No. TEC-0434

Date 5 February 2002

To whom it may concern

As we have already informed you by Technical Information No. 414, all ships the keels of which were laid or which were at a similar stage of construction before 1 July 1998 of 500 tons gross tonnage and upward and which are engaged in international voyage shall comply with the following requirements by 1 July 2003 according to the 74 SOLAS 94 Amendment Chapter II-2 Regulation 15.
In this respect, we have revised the description of Technical Information No. 414 at this time as follows.
Technical Information No. 414 is cancelled accordingly.

1. High pressure fuel oil injection piping.
   (1) All external high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors are to be protected with a jacketed piping system capable of containing fuel from a high pressure line failure. The jacketed piping system is to include a means for collection of leakage.
   (2) Arrangements are to be provided for alarm to be given of a fuel line failure. Alarm systems are to be provided with visual and audible alarm at monitoring station or control station for main engine. But if it is difficult to provide alarm systems at monitoring station or control station for main engine, providing alarm systems at local station in engine room is accepted. M0-ships are to be provided for alarm systems in accordance with the requirement of the “Rules for Automatic and Remote Control Systems”.
   (3) Diesel engines for life boats and the following diesel engines are not required to comply with this regulation.
      (i) having a maximum continuous out put 375 KW or less and,
      (ii) having fuel injection pumps serving more than one injector and,
      (iii) provided a suitable enclosure for the fuel injection piping system.

2. Flange connections and mechanical joints (threaded pipe joints, compression joints, etc.) in fuel oil piping are to be provided with suitable means mentioned below to prevent oil from spraying except where deemed unnecessary by the Society.
   (a) Anti-splashing tape (FN tape)
   (b) Metal flange cover designed in accordance with IMO MSC Circ. 647 (See attachment)
   (c) Effective insulation in way of the connections or joints of fuel oil pipes in accordance with JIS F 7008-1996 or equivalent (See attachment)
   (d) Means approved by the Society suitable to prevent oil spray

(To be continued)

The phrase "where deemed unnecessary by the Society" means the following cases where the possibility of leak and spray of oil onto highly heated surface is less:

(1) Pipings of flammable oil located below the lowest engine room floor.
(2) Pipings that have little possibility of oil spraying out of, even if damaged at the connections and joints, due to low design pressure. (e.g. Over flow line, Drain line, etc.)
(3) Pipings that contain no fuel oil inside under normal conditions, and used occasionally and intentionally for short times. (e.g. FO filling line)

Above items (2) and (3) are applicable only for piping of Group 3 and only when there is no sources of ignition directly under the connections or joints.

3. All surfaces of machinery installations with high temperatures above 220°C are to be water- cooled or effectively insulated with non-combustible material. Where the insulation is oil absorbent or penetrative material, the insulation is to be encased in steel sheathing or equivalent material.

You are requested to conduct necessary working for the vessel by 1 July 2003 in order to comply with the requirements of the 74 SOLAS 94 Amendment Chapter II-2 Regulation 15.
Please note that the jacket piping system for high pressure fuel oil injection pipe and alarm systems are required approval of the Society. You are requested to send all relevant drawings to Machinery Department in order to get their approval.

For any questions about the above, please contact:

NIPPON KAIJI KYOKAI (ClassNK)
Survey Department, Administration Center, Head Office
Address: 4-7, Kioi-cho, Chiyoda-ku, Tokyo 102-8567, Japan
Tel.: +81-3-5226-2027 / 2028
Fax: +81-3-5226-2029
E-mail: svd@classnk.or.jp

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Attachment:
1. IMO MSC Circ. 647
2. JIS F 7008-1996

Appendix 3

SPRAY SHIELDS

1 Scope

SOLAS regulations II-2/15.2.11, II-2/15.3 and II-2/15.4, require oil fuel, lubricating oil and other flammable oil piping to be screened or otherwise suitably protected to avoid as far as practicable oil spray. This appendix provides guidance to comply with these regulations.

2 Application

Spray shields are intended for use around flanged joints, flanged bonnets and any other flanged connection in oil pressure systems which are located above the floor plates and which have no insulation in way of the joints. The purpose of spray shields is to prevent the impingement of leaked or sprayed flammable liquid onto a hot surface or other source of ignition. (Refer to appendix 7, guidance for insulation of hot surfaces.)

3 Design

Many types of spray shields are possible and they need not necessarily be attached to the joint, or totally enclose the joint. An example of a spray shield which provides a total enclosure is given in figure 3.1. This spray shield is designed to wrap completely around the joint and is long enough to provide an overlap equal to one-quarter of the joint's circumference. The shield is wrapped around the sides of the flange far enough to cover the heads of the bolts. The finished width is equal to or exceeds "A+B+A". The shield is laced tightly with wire and the overlap is pointed away from potential ignition sources.

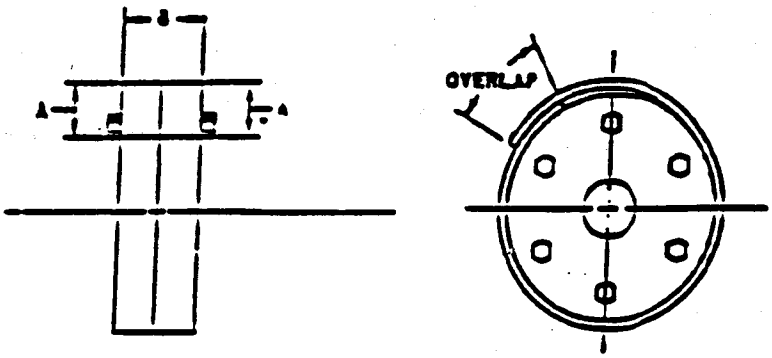


FIGURE 3.1

4 Inspection and maintenance

Spray shields should be inspected regularly for their integrity and any which have been removed for maintenance purposes should be refitted on completion of the task.

Standard specification of thermal insulation for piping

1. Scope This Japanese Industrial Standard specifies design and application standards of thermal insjlation for exhaust gas piping and smoke ducts in engine room, general piping, heat trace piping and tanks, and antisweating for ventilating air dusts in ships.

Remarks: 1. General piping means steam piping, lubricating oil piping, fuel oil piping, thermal medium piping and hot water piping.
2. Exhaust gas piping and smoke ducts include those provided in a funnel stack.
3. This standard makes reference to the following standards:
JIS A 9504 – Man made mineral fiber thermal insulation materials
JIS G 3302 – Hot-dip zinc-coated steel sheets and coils
JIS G 3313 – Electrolytic zinc-coated steel sheets
JIS L 3102 – Cotton canvas
JIS R 3414 – Textile glass fabrics

2. Design standards

2.1 Scope Thermal insulation shall be applied to piping in which the temperature of internal fluid is 60°C or more, and antisweating, to areas subjected to deterioration by falling dew condensation except for cooling fresh water piping.

2.2 Temperature condition The thickness of heat insulating material shall be designed under the temperature condition that the surface temperature of heat insulating material assumes 55°C when the temperature of the engine room is 35°C.

2.3 Equation of calculation of thickness of heat insulating material The thickness of heat insulating material shall be determined by the following equations:

$$Q=\frac{2\pi(\theta_o-\theta_r)}{\frac{2}{\alpha\cdot d_1}+\frac{1}{\lambda}\ln\frac{d_1}{d_0}}=\frac{\pi\cdot(\theta_s-\theta_r)}{\frac{1}{\alpha\cdot d_1}} \quad \text{(Basic equation)}$$

$$d_1\cdot\ln\frac{d_1}{d_0}=\frac{2\lambda}{\alpha}\cdot\left(\frac{\theta_o-\theta_s}{\theta_s-\theta_r}\right) \quad \text{(Applied equation 1)}$$

$$d_1\cdot\ln\frac{d_1}{d_0}\geqq\frac{-2\lambda}{\alpha}\cdot\left(\frac{\theta_o-\theta_s}{\theta_s-\theta_r}\right) \quad \text{(Applied equation 2)}$$

where

Q : heat transmission (W/m)
d_0 : inside diameter of heat insulating material (m)
d_1 : outside diameter of heat insulating material (m)
λ : heat transfer coefficient of heat insulating material (W/mK)
α : heat transfer coefficient at surface (W/m^2K) (α=11.63)
θ_o : internal temperature (°C)
θ_r : external (room) temperature (°C)
In : natural logarithm
θ_s : surface temperature of heat insulating material (°C)

Remarks: 1. The left-hand side of the basic equation shows the heat transferred to the pipe surface from the inside of the pipe, whereas the right-hand side shows the heat radiation due to thermal conduction between the engine room and heat insulating material.
2. Applied equation 1 is a modified version of the basic equation.
3. In determining the thickness of heat insulating material, the left-hand side value (for each outside diameter of pipe and for each thickness of heat insulation material) and the right-hand side value of applied equation 2 shall be determined, the values of the left-hand side and the right-hand side thus determined shall then be compared, and the thickness shall be determined on the basis of the left-hand side value satisfying the conditions that the left-hand side value > the right-hand side value and that they are approximately equal.

3. Materials

3.1 Classification of heat insulating materials The classification and applicatin of heat insulating materials shall be as given in **Table 1.**

Table 1 Classification of heat insulating materials

Classification	Material
Rockwool heat insulation board Rockwool heat insulation sleeve	JIS A 9504 - Rockwool
Glasswool heat insulation board Glasswool heat insulation sleeve	JIS A 9505 - Glasswool

Remark: Heat insulating material shall, as a rule, be manufactured by using rockwool and glasswool, but alternative materials may be used if they are considered to have equivalent heat insulating effects.
No asbestos materials shall be used.

3.2 Classification of covering materials Covering materials of thermal insulation shall be classified as given in **Table 2.**

Table 2 Classification of covering materials

Classification	Material
Hot-dip zinc-coated steel sheets and coils	JIS G 3302 - Hot-dip zinc-coated steel sheets and coils
Electrolytic zinc-coated steel sheets	JIS G 3313 - Electrolytic zinc-coated steel sheets
Glass cloth	JIS R 3414 - Glass cloth
Glass cloth lined with aluminium foil	–
Canvas cloth	JIS L 3102 - Cotton canvas

Remark: Covering materials for thermal insulation shall, as a rule, be as given in the table, but alternative materials may be used if they are considered to have equivalent effects.

4. Standard practices of work

4.1 Standard practices of work by service application The application standards shall, as a rule, be as follows:

It is recommended that the thickness of each hear insulating material should be determined in accordance with **Tables 4, 5, 7, 8, 9 and 10.**

(1) **Insulatin of exhaust gas piping and smoke ducts** The application areas and the materials of thermal insulation for exhaust gas piping and smoke ducts shall be as given in **Table 3** and **Fig. 1.**

Table 3 Work area and materials

Areas of application		Material	
		Heat insulating material	Covering material
Piping	Up to funnel deck	Rockwool heat insulating board Rockwool heat insulating sleeve	Hot-dip zinc-coated steel sheets and coils or electrolytic zinc-coated steel sheets
	Within funnel stack (Up to a height of 2 m above funnel deck)		Glass cloth
Flange joints		Rockwool heat insulating board	Glass cloth lined with aluminium foil or glass cloth

Remarks:
1. Since the thickness of heat insulating material is calculated on the basis of the case where rockwool is used, thickness of heat insulating with other materials shall be calculated by using the calculation equation shown in 2.3.
2. The heat insulating material shall be lashed securely to prevent it from falling apart.
3. Hexmeshed wire nets may not necessarily be applied.
4. No thermal insulation may be applied to areas within a funnel stack above the height of 2 metres or more from funnel deck.

Unit: mm

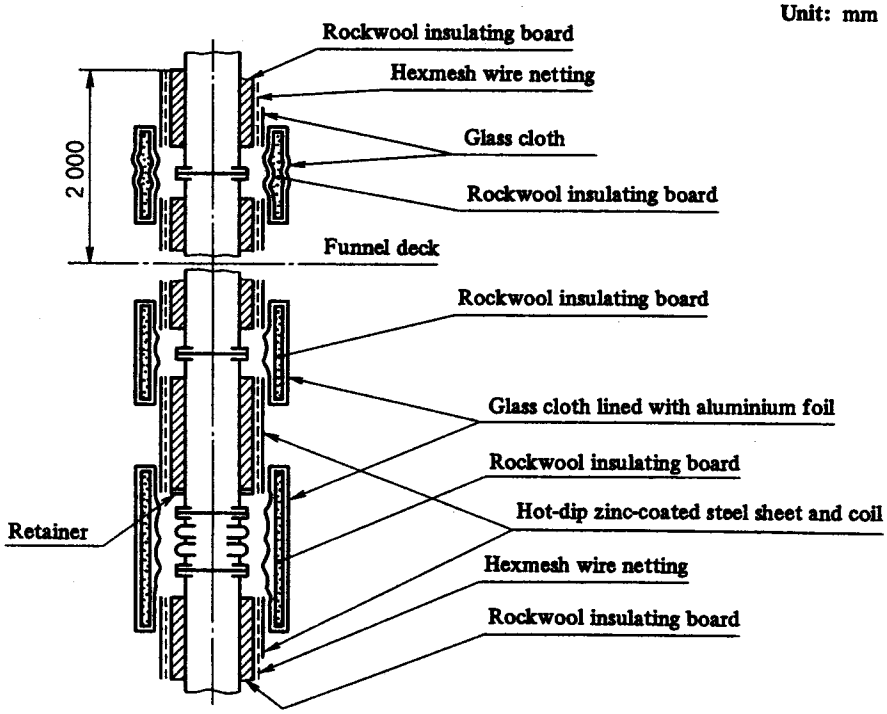


Fig. 1

Table 4 Thickness of heat insulating material for gas piping and smoke ducts in engine room

Unit: mm

<table>
<tr><th rowspan="2">Nominal dia.</th><th colspan="6">Temperature of internal fluid (reference)</th></tr>
<tr><th>250° C or less</th><th>Over 250° C but 300° C or less</th><th>Over 300° C but 350° C or less</th><th>Over 350° C but 400° C or less</th><th>Over 400° C but 450° C or less</th><th>Over 450° C but 500° C or less</th></tr>
<tr><td>100 or less</td><td rowspan="9">50 (40)</td><td>50 (40)</td><td rowspan="2">65 (40)</td><td>75 (50)</td><td rowspan="2">90 (50)</td><td>100 (50)</td></tr>
<tr><td>Over 100 but 200 or less</td><td rowspan="5">65 (40)</td><td rowspan="6">90 (50)</td><td rowspan="3">115 (50)</td></tr>
<tr><td>Over 200 but 300 or less</td><td rowspan="4">75 (40)</td><td rowspan="2">100 (50)</td></tr>
<tr><td>Over 300 but 400 or less</td></tr>
<tr><td>Over 400 but 500 or less</td><td rowspan="4">115 (50)</td><td rowspan="4">125 (50)</td></tr>
<tr><td>Over 500 but 600 or less</td></tr>
<tr><td>Over 600 but 700 or less</td></tr>
<tr><td>Over 700 but 800 or less</td></tr>
<tr><td>Over 800 but 1 500 or less</td><td>100 (50)</td><td>140 (50)</td></tr>
</table>

Remark: Figures in parentheses show the thickness of heat insulating material at flange joints.

Table 5 Thickness of heat insulating material for exhaust gas piping and smoke ducts in funnel stack

Unit: mm

<table>
<tr><th rowspan="2">Nominal dia.</th><th colspan="6">Temperature of internal fluid (reference)</th></tr>
<tr><th>250° C or less</th><th>Over 250° C but 300° C or less</th><th>Over 300° C but 350° C or less</th><th>Over 350° C but 400° C or less</th><th>Over 400° C but 450° C or less</th><th>Over 450° C but 500° C or less</th></tr>
<tr><td>100 or less</td><td rowspan="9">40 (40)</td><td>40 (40)</td><td rowspan="2">50 (40)</td><td>65 (40)</td><td rowspan="2">75 (40)</td><td>90 (40)</td></tr>
<tr><td>Over 100 but 200 or less</td><td rowspan="5">50 (40)</td><td rowspan="6">75 (40)</td><td rowspan="3">100 (40)</td></tr>
<tr><td>Over 200 but 300 or less</td><td rowspan="4">65 (40)</td><td rowspan="2">90 (40)</td></tr>
<tr><td>Over 300 but 400 or less</td></tr>
<tr><td>Over 400 but 500 or less</td><td rowspan="4">100 (40)</td><td rowspan="4">115 (40)</td></tr>
<tr><td>Over 500 but 600 or less</td></tr>
<tr><td>Over 600 but 700 or less</td></tr>
<tr><td>Over 700 but 800 or less</td></tr>
<tr><td>Over 800 but 1 500 or less</td><td>90 (40)</td><td>125 (40)</td></tr>
</table>

Remark: Figures in parentheses show the thickness of heat insulating material at flange joints.

(2) **Thermal insulation of general piping** The areas of application and heat insulating materials for general piping shall be as given in **Table 6** and **Fig. 2.** It is recommended that the thickness of heat insulating material should be as given in **Table 7.**

Table 6 Work area and materials

<table>
<tr><th rowspan="2">Areas of application</th><th colspan="2">Material</th></tr>
<tr><th>Heat insulating material</th><th>Covering material</th></tr>
<tr><td>Piping</td><td>Glasswool heat insulating board or Glasswool heat insulating sleeve</td><td rowspan="2">Glass cloth</td></tr>
<tr><td>Flange joints</td><td>Glasswool heat insulating board</td></tr>
</table>

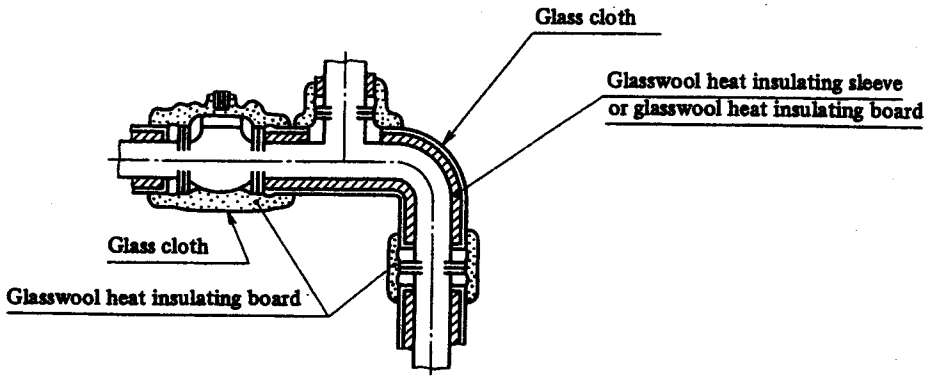


Fig. 2

Table 7 Thickness of heat insulating material for general piping

Unit: mm

<table>
<tr><th rowspan="2">Nominal dia.</th><th colspan="5">Temperature of internal fluid (reference)</th></tr>
<tr><th>115° C or less</th><th>Over 115° C but 185° C or less</th><th>Over 185° C but 205° C or less</th><th>Over 205° C but 250° C or less</th><th>Over 250° C but 300° C or less</th></tr>
<tr><td>10 or less</td><td rowspan="8">10 (10)</td><td>10 (10)</td><td>10 (10)</td><td>10 (10)</td><td>10 (10)</td></tr>
<tr><td>Over 10 but 20 or less</td><td rowspan="3">20 (20)</td><td>20 (20)</td><td>25 (25)</td><td rowspan="2">40 (40)</td></tr>
<tr><td>Over 20 but 50 or less</td><td rowspan="2">25 (25)</td><td>30 (25)</td></tr>
<tr><td>Over 50 but 80 or less</td><td rowspan="5">40 (40)</td></tr>
<tr><td>Over 80 but 100 or less</td><td rowspan="4">25 (25)</td><td rowspan="3">30 (25)</td><td rowspan="4">50 (40)</td></tr>
<tr><td>Over 100 but 150 or less</td></tr>
<tr><td>Over 150 but 200 or less</td><td rowspan="3">25 (25)</td></tr>
<tr><td>Over 200 but 250 or less</td><td rowspan="2">40 (25)</td></tr>
<tr><td>Over 250 but 300 or less</td><td>65 (50)</td></tr>
</table>

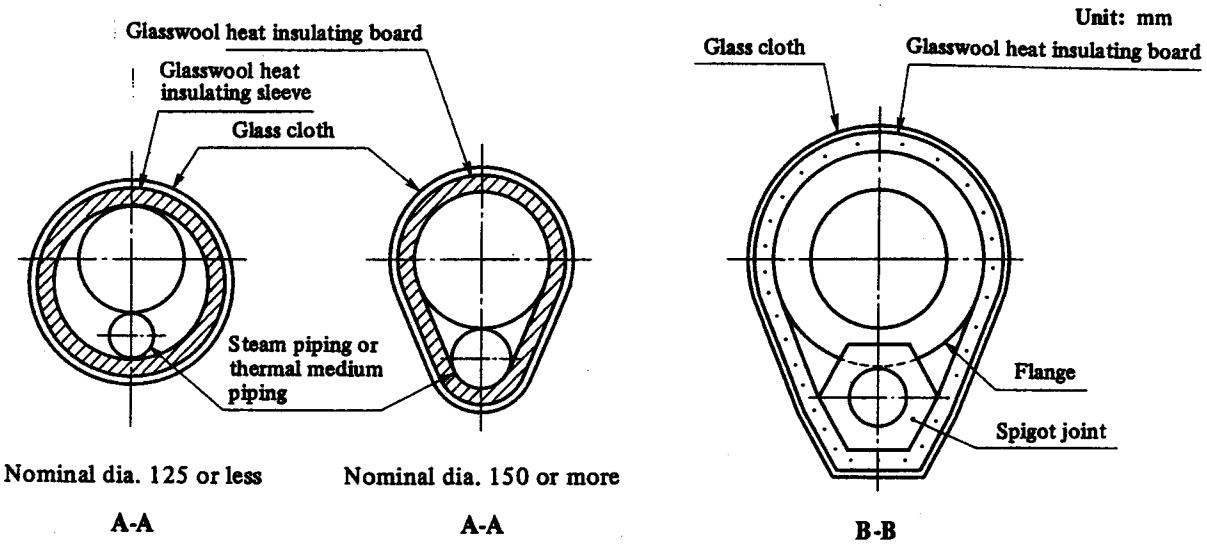
Remarks:
1. Figures in parentheses show the thickness of heat insulating material at flange joints.
2. Since the thickness of heat insulating material is calculated on the basis of the case where glasswool is used, thickness of other heat insulating material shall be calculated by using the calculation equation shown in 2.3.

(3) **Thermal insulation of hart trace piping** The areas of application and materials of thermal insulation for piping requiring heat tracing shall be as given in Table 8 and Fig. 3.
The thickness of heat insulating material may be based on the values given in Table 7 according to the diameter of heat trace piping and the temperature.

Table 8 Work area and materials

Unit: mm

<table>
<tr><th rowspan="2">Areas of application</th><th colspan="2">Material</th><th>Reference</th></tr>
<tr><th>Heat insulating material</th><th>Covering material</th><th>Thickness of heat insulating material</th></tr>
<tr><td>Piping</td><td>Glasswool heat insulating board or Glasswool heat insulating sleeve</td><td rowspan="2">Glass cloth</td><td rowspan="2">25</td></tr>
<tr><td>Flange joints</td><td>Glasswool heat insulating board</td></tr>
</table>



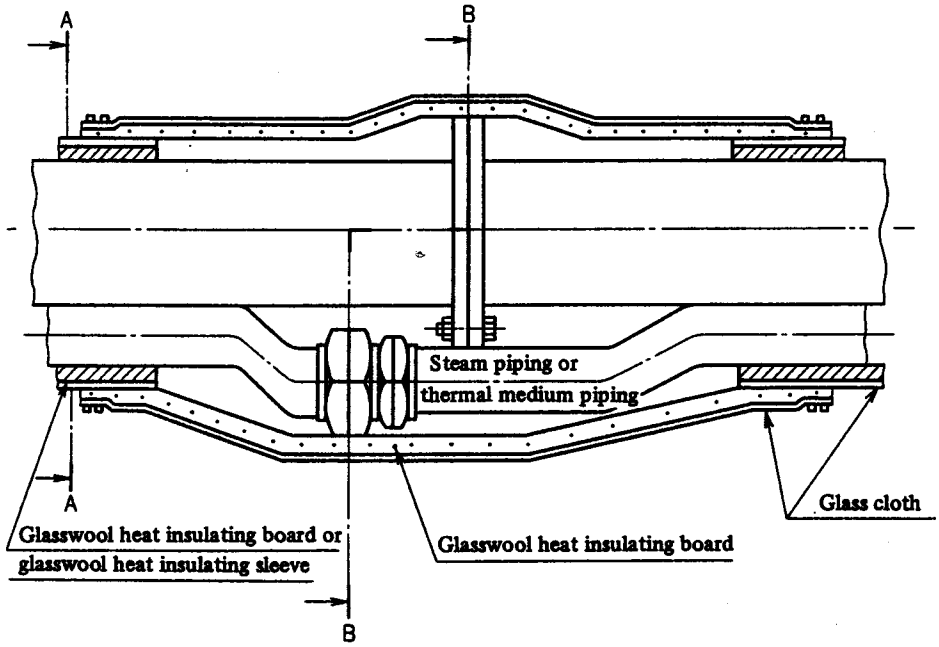


Fig. 3

(4) **Antisweating of ventilating air ducts** The areas of application and materials of antisweating for air conditioning ducts shall be as given in **Table 9** and **Fig. 4.**

Table 9 Work area and materials

Unit: mm

Areas of application	Material		Reference
	Heat insulating material	Covering material	Thickness of heat insulating material
Air conditioning duct	Glasswool heat insulating board lined with aluminium foil	nil	25
	Glasswool heat insulating board	Glass cloth or cotton canvas	