標　題：

デイーゼル機関の燃料噴射ポンプと
燃料噴射装置の間の高圧燃料油管及び
可燃性油管の火災対策について

NKテクニカル インフォーメーション

No.： 414

Date： 平成 13 年 8 月 10 日

関係船主　各位

SOLAS 条約 第Ⅱ－２章 第 15 規則 (74 SOLAS 94 Amendment) に従い鋼船規則が改正され、1998 年 7 月 1 日以前に建造された(1998 年 7 月 1 日以前にキールが据え付けられた船舶又はこれと同等の建造段階にあった船舶)総トン数 500 トン以上の国際航海に従事する船舶には、2003 年 7 月 1 日までに以下のような火災対策が求められます。

1.デイーゼル機関の高圧燃料ポンプと燃料噴射弁の間の高圧燃料油管については

1) 二重化し内管の損傷による漏洩油を保持できるようにする。 又、漏れ油をＦＯドレン管系に導くようにする。

2) 高圧燃料管（内管）の損傷を知らせる為の警報装置を備える。この警報は一般船の場合機側に設ける。M ゼロ船の場合は機側、機関制御室及び船橋に設けること。警報は可視可聴とし、Mゼロ船では延長警報も連動させる。

3) 但し、次の全てを満足するデイーゼル機関及び救命艇用デイーゼル機関については、この規則を適用しない。

a) 連続最大出力 375KW 以下である。

b) ２個以上の燃料噴射弁に燃料を供給する燃料噴射ポンプを備えている。

c) 高圧燃料油管の損傷による漏油が発火源に飛散することを防ぐための有効な囲いを有している。

2.可燃性油管のフランジ継手、特殊継手（くい込み式継手等）からの漏洩及び飛散防止の措置を行う。

＊可燃性油管からの漏油・飛散防止に対しては鋼船規則 D 編 1.3.4 - 1 に本会が承認した油の飛散防止措置を講じなければならないと規定しておりますが、一例として NK 船級船の一般的な可燃性油管とその飛散防止措置を添付致します。

3. 表面温度が 220℃を越える機関に対しては、水冷却又は不燃性材料による有効な被覆を設けなければならない。又、この被覆材が吸油性又は浸油性を有する場合には、被覆材を鋼又は同等の耐浸油性材料で覆わなければならない。但し、火災のおそれがない場合にはこの限りでない。

ClassNK 財団法人 日本海事協会
東京都千代田区紀尾井町4番7号 〒102-8567

船主殿におかれましては2003年7月1日までに必要な工事を終了される様、お願い申し上げます。

以上。

本件に関してご不明な点は、本部 検査技術部にお問い合わせ下さい。

お問合せ ： 検査技術部

Tel： 03－5226－2027

Fax： 03－5226－2029

Method of preventing for oil spraying from pipe joints (Example)

Fluid	Piping system	Design Press. (MPa)	Design Temp. (℃)	Kind of Joints	Means to prevent from oil spraying
FO	Transfer line	0.3	50	Flange	Not applicable because of piping class "Group Ⅲ"*
	Purifier line	0.5	90	Flange	Apply effective insulation. (JIS F 7008, etc)
	Supply line	0.8	140	Flange	Apply effective insulation. (JIS F 7008, etc)
	Pipes for Gauging	0.3	50	Bite Joint Threaded Joint	Not applicable due to piping class "Group Ⅲ"*
		0.5	90		Apply anti-splashing tape (FN tape)
		0.8	140		
DO	Transfer line	0.5	60	Flange	Apply anti-splashing tape (FN tape) or spray shield in accordance with App.3 of MSC / Circ.647 at joints only within 3m from high heat surface.
	Purifier line				
	Supply line				
	Pipes for Gauging			Bite Joint Threaded Joint	
LO	Transfer line	0.3	80	Flange	Not applicable due to piping class "Group Ⅲ"*
	Purifier line	0.8	60	Flange	
	Supply line	0.4	50	Flange	
	Pipes for Gauging	0.3	80	Bite Joint Threaded Joint	
		0.4	50		
		0.8	60		
Hyd. Oil	C.P.P. Hyd. Oil line	7	50	Flange	Apply anti-splashing tape (FN tape) or spray shield in accordance with App.3 of MSC / Circ.647.
	Pipes for Gauging	7	50	Bite Joint Threaded Joint	
Thermal Oil	Heating line	0.5	190	Flange	Apply effective insulation. (JIS F 7008, etc)
	Pipes for Gauging	0.5	190	Bite Joint Threaded Joint	Apply anti-splashing tape (FN tape) or spray shield in accordance with App.3 of MSC / Circ.647.

* Except where flange parts of pipings are located within 3 meters from steam pipe lines, thermal oil pipe lines, exhaust gas pipe lines, boiler, silencers, and exhaust gas driven turbochargers in addition to that design pressure of such pipings exceeds 0.4 MPa .

(NOTE) 1.The procedure of fitting up with the tapes and sheets are to be carried out in accordance with the manufacture's instruction.

2.See attached App.3 of MSC / Circ.647 (Attachment 1) and JIS F 7008 (Atachement 2)

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.

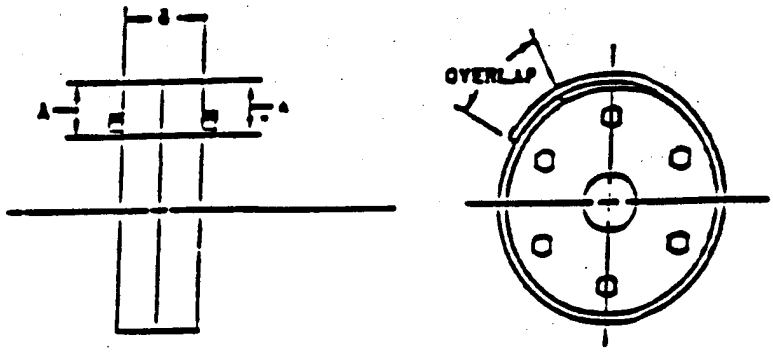

FIGURE 3.1

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.

F 7008-1996

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:

$$Q=\frac{2\pi(\theta_0-\theta_r)}{\frac{2}{\alpha\cdot d_1}+\frac{1}{\lambda}\ln\frac{d_1}{d_0}}=\frac{\pi\cdot(\theta_s-\theta_r)}{\frac{1}{\alpha\cdot d_1}} \quad \text{(Basic equation)}$$

$$d_1\cdot\ln\frac{d_1}{d_0}=\frac{2\lambda}{\alpha}\cdot\left(\frac{\theta_0-\theta_s}{\theta_s-\theta_r}\right) \quad \text{(Applied equation 1)}$$

$$d_1\cdot\ln\frac{d_1}{d_0}\geq\frac{-2\lambda}{\alpha}\cdot\left(\frac{\theta_0-\theta_s}{\theta_s-\theta_r}\right) \quad \text{(Applied equation 2)}$$

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_0 : 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

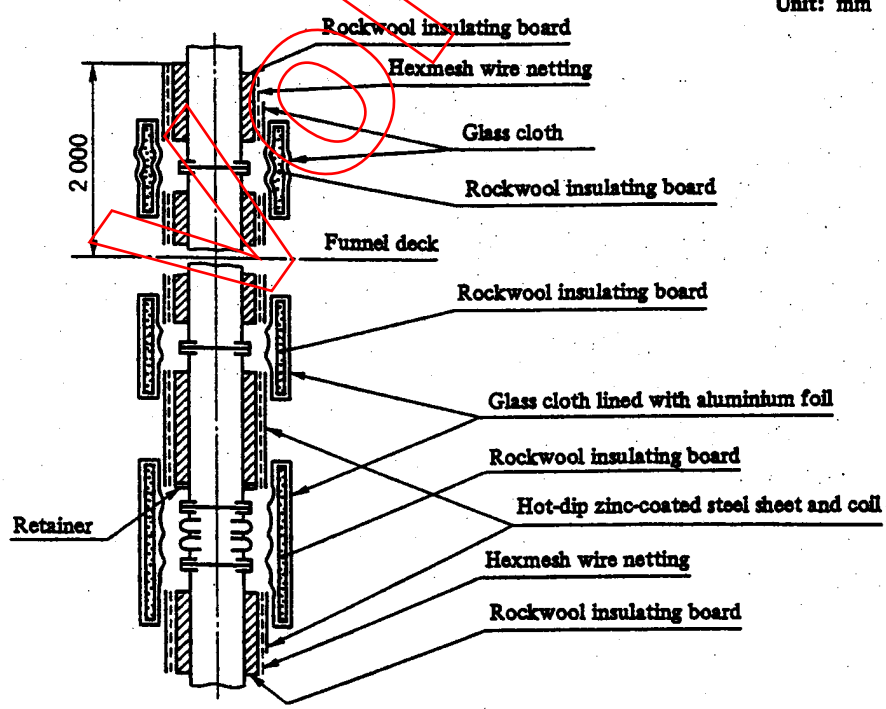

Fig. 1

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="8">65 (40)</td><td rowspan="8">90 (50)</td><td rowspan="3">115 (50)</td></tr>
<tr><td>Over 200 but 300 or less</td><td rowspan="3">75 (40)</td><td>100 (50)</td></tr>
<tr><td>Over 300 but 400 or less</td><td rowspan="7">115 (50)</td></tr>
<tr><td>Over 400 but 500 or less</td><td rowspan="6">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="8">50 (40)</td><td rowspan="8">75 (40)</td><td rowspan="3">100 (40)</td></tr>
<tr><td>Over 200 but 300 or less</td><td rowspan="3">65 (40)</td><td>90 (40)</td></tr>
<tr><td>Over 300 but 400 or less</td><td rowspan="7">100 (40)</td></tr>
<tr><td>Over 400 but 500 or less</td><td rowspan="6">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

Areas of application	Material	
	Heat insulating material	Covering material
Piping	Glasswool heat insulating board or Glasswool heat insulating sleeve	Glass cloth
Flange joints	Glasswool heat insulating board	

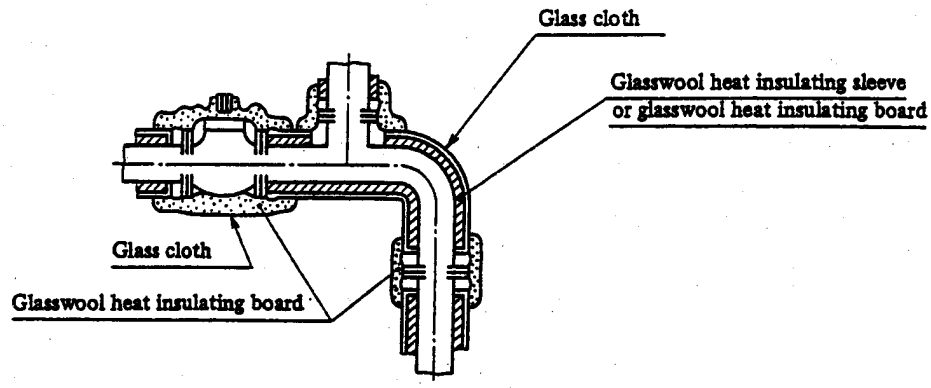

Fig. 2

Table 7 Thickness of heat insulating material for general piping

Unit: mm

Nominal dia.	Temperature of internal fluid (reference)				
	115° C or less	Over 115° C but 185° C or less	Over 185° C but 205° C or less	Over 205° C but 250° C or less	Over 250° C but 300° C or less
10 or less	10 (10)	10 (10)	10 (10)	10 (10)	10 (10)
Over 10 but 20 or less		20 (20)	20 (20)	25 (25)	40 (40)
Over 20 but 50 or less			25 (25)	30 (25)	
Over 50 but 80 or less				40 (40)	50 (40)
Over 80 but 100 or less		25 (25)	30 (25)		
Over 100 but 150 or less					
Over 150 but 200 or less	25 (25)				
Over 200 but 250 or less			40 (25)		
Over 250 but 300 or less					65 (50)

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

Areas of application	Material		Reference
	Heat insulating material	Covering material	Thickness of heat insulating material
Piping	Glasswool heat insulating board or Glasswool heat insulating sleeve	Glass cloth	25
Flange joints	Glasswool heat insulating board		

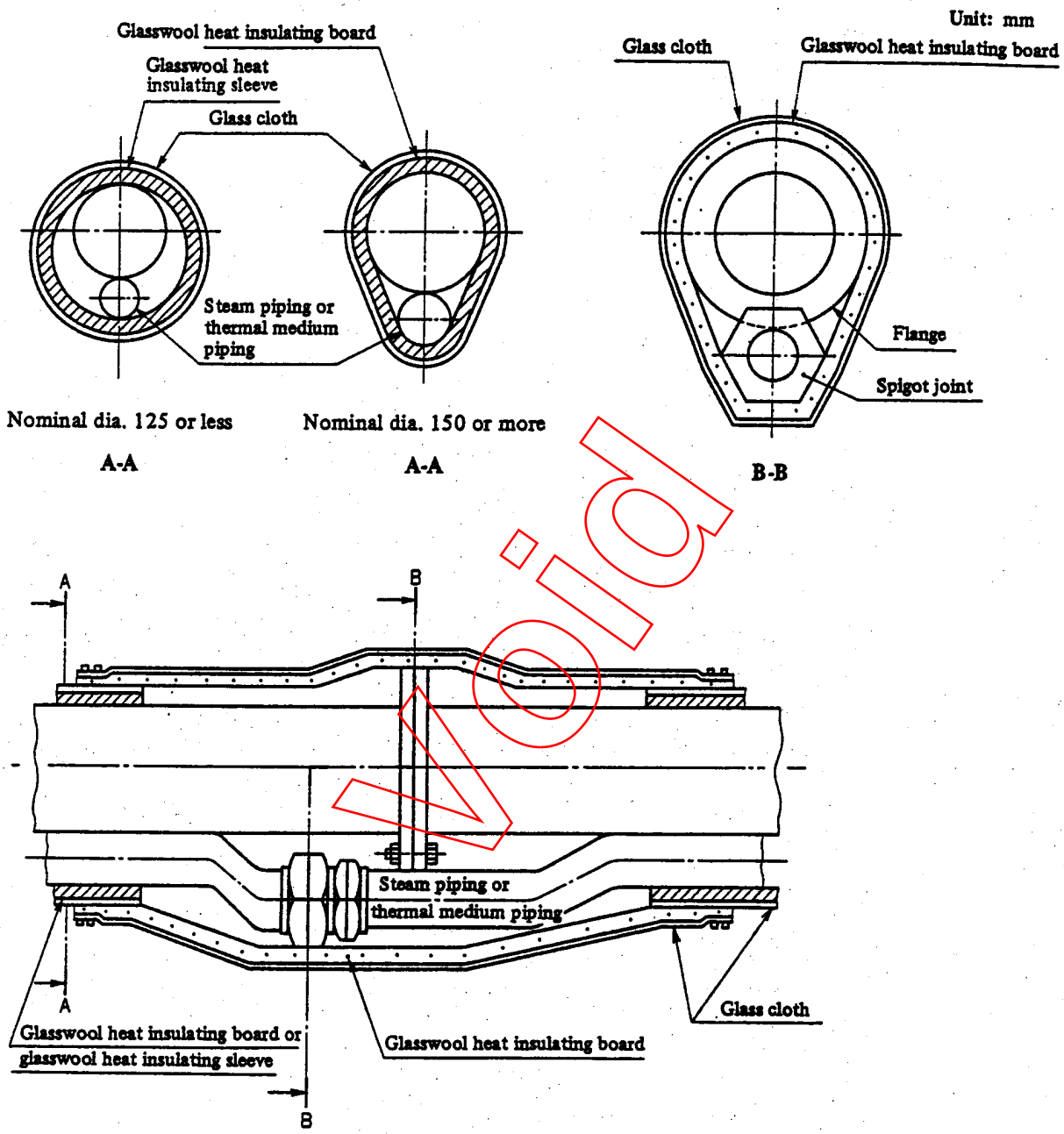

Fig. 3

(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	