

Merenkukkuhallitus

TIEDOTUSLEHTI NRO 17/25.9.1995

ALUSTEN KEULAPORTTIMÄÄRÄYKSET

Luokituslaitosten kansainvälinen yhteistyöorganisaatio International Association of Classification Societies (IACS) on antanut uudet määräykset alusten suljettuun ylärakenteeseen johtavista keulaporteista ja niiden soveltamisesta olemassa oleviin ro-ro-matkustaja-aluksiin.

Uudet määräykset:

United Requirement S8 BOW DOORS and INNER DOORS; 24.8.1995, sekä

United Requirement S16 BOW DOORS AND INNER DOORS, RETROSPECTIVE APPLICATION OF UR-S8, AS AMENDED 1995, TO EXISTING RO-RO PASSENGER SHIPS; 25.7.1995

julkaistaan oheisena englanninkielisinä.

Merenkukkuhallitus ilmoittaa, että suomalaisen aluksen turvallisuuskirja lakkaa olemasta voimassa 1.7.1996, mikäli aluksen keulaportti ei täytä näissä määräyksissä asetettuja vaatimuksia.

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Dnro 11/00/95
ISSN 0430-5345

UR - S8 BOW DOORS and INNER DOORS

S8.1 General

S8.1.1 *Application*

S8.1.1a These rules give requirements for the arrangement, strength and securing of bow doors and inner doors leading to a complete or long forward enclosed superstructure.

S8.1.1b Two types of bow door are provided for :

- **Visor doors** opened by rotating upwards and outwards about a horizontal axis through two or more hinges located near the top of the door and connected to the primary structure of the door by longitudinally arranged lifting arms,
- **Side-opening doors** opened either by rotating outwards about a vertical axis through two or more hinges located near the outboard edges or by horizontal translation by means of linking arms arranged with pivoted attachments to the door and the ship. It is anticipated that side-opening bow doors are arranged in pairs.

Other types of bow door will be specially considered in association with the applicable requirements of these rules.

S8.1.2 *Arrangement*

S8.1.2a Bow doors are to be situated above the freeboard deck. A watertight recess in the freeboard deck located forward of the collision bulkhead and above the deepest waterline fitted for arrangement of ramps or other related mechanical devices may be regarded as a part of the freeboard deck for the purpose of this requirement.

S8.1.2b An inner door is to be fitted. The inner door is to be part of the collision bulkhead. The inner door needs not be fitted directly above the bulkhead below, provided it is located within the limits specified for the position of the collision bulkhead, refer to regulation II-1/10 of the SOLAS Convention. A vehicle ramp may be arranged for this purpose, provided its position complies with regulation II-1/10 of the SOLAS Convention. If this is not possible a separate inner weathertight door is to be installed, as far as practicable within the limits specified for the position of the collision bulkhead.

S8.1.2c Bow doors are to be so fitted as to ensure tightness consistent with operational conditions and to give effective protection to inner doors. Inner doors forming part of the collision bulkhead are to be weathertight over the full height of the cargo space and arranged with fixed sealing supports on the aft side of the doors.

S8.1.2d Bow doors and inner doors are to be arranged so as to preclude the possibility of the bow door causing structural damage to the inner door or to the collision bulkhead in the case of damage to or detachment of the bow door. If this is not possible, a separate inner weathertight door is to be installed, as indicated in S8.1.2b.

S8.1.2e The requirements for inner doors are based on the assumption that vehicles are effectively lashed and secured against movement in stowed position.

S8.1.3 Definitions

Securing device - a device used to keep the door closed by preventing it from rotating about its hinges.

Supporting device - a device used to transmit external or internal loads from the door to a securing device and from the securing device to the ship's structure, or a device other than a securing device, such as a hinge, stopper or other fixed device, that transmits loads from the door to the ship's structure.

Locking device - a device that locks a securing device in the closed position

S8.2 Strength Criteria

S8.2.1 Primary structure and Securing and Supporting devices

S8.2.1a Scantlings of the primary members, securing and supporting devices of bow doors and inner doors are to be determined to withstand the design loads defined in S8.3, using the following permissible stresses :

shear stress : $\tau = 80/k \text{ N/mm}^2$

bending stress : $\sigma = 120/k \text{ N/mm}^2$

equivalent stress : $\sigma_c = (\sigma^2 + 3 \tau^2)^{0.5} = 150/k \text{ N/mm}^2$

where k is the material factor as given in S4, but is not to be taken less than 0.72 unless a direct fatigue analysis is carried out.

S8.2.1b The buckling strength of primary members is to be verified as being adequate.

S8.2.1c For steel to steel bearings in securing and supporting devices, the nominal bearing pressure calculated by dividing the design force by the projected bearing area is not to exceed $0.8 \sigma_F$, where σ_F is the yield stress of the bearing material. For other bearing materials, the permissible bearing pressure is to be determined according to the manufacturer's specification.

S8.2.1d The arrangement of securing and supporting devices is to be such that threaded bolts do not carry support forces. The maximum tension in way of threads of bolts not carrying support forces is not to exceed $125/k \text{ N/mm}^2$.

S8.3 Design loads

S8.3.1 Bow doors

S8.3.1a The design external pressure, in kN/m^2 , to be considered for the scantlings of primary members, securing and supporting devices of bow doors is not to be less than the pressure normally used by the Society nor than :

$$p_e = 2.75 \lambda C_H (0.22 + 0.15 \tan \alpha) (0.4 V \sin \beta + 0.6 L^{0.5})^2$$

where :

V contractual ship's speed, in knots,

L ship's length, in m, but need not be taken greater than 200 metres,

λ coefficient depending on the area where the ship is intended to be operated :

$\lambda = 1$ for seagoing ships,

$\lambda = 0.8$ for ships operated in coastal waters,

$\lambda = 0.5$ for ships operated in sheltered waters,

Note : Coastal waters and sheltered waters are defined according to the practice of each Classification Society. As an example, coastal waters may be defined as areas where significant wave heights do not exceed 4m for more than three hours a year and sheltered waters as areas where significant wave heights do not exceed 2m for more than three hours a year.

$$C_H = \begin{cases} 0.0125 L & \text{for } L < 80\text{m} \\ 1 & \text{for } L > 80\text{m} \end{cases}$$

α flare angle at the point to be considered, defined as the angle between a vertical line and the tangent to the side shell plating, measured in a vertical plane normal to the horizontal tangent to the shell plating,

β entry angle at the point to be considered, defined as the angle between a longitudinal line parallel to the centerline and the tangent to the shell plating in a horizontal plane.

S8.3.1b The design external forces, in kN, considered for the scantlings of securing and supporting devices of bow doors are not to be less than :

$$F_x = p_e A_x$$

$$F_y = p_e A_y$$

$$F_z = p_e A_z$$

where :

A_x area, in m², of the transverse vertical projection of the door between the levels of the bottom of the door and the upper deck or between the bottom of the door and the top of the door, whichever is the lesser,

A_y area, in m², of the longitudinal vertical projection of the door between the levels of the bottom of the door and the upper deck or between the bottom of the door and the top of the door, whichever is the lesser,

A_z area, in m², of the horizontal projection of the door between the levels of the bottom of the door and the upper deck or between the bottom of the door and the top of the door, whichever is the lesser,

- h height, in m, of the door between the levels of the bottom of the door and the upper deck or between the bottom of the door and the top of the door, whichever is the lesser,
- l length, in m, of the door at a height $h/2$ above the bottom of the door,
- w breadth, in m, of the door at a height $h/2$ above the bottom of the door,
- p_e external pressure, in kN/m^2 , as given in S8.3.1a with angles α and β defined as follows :
- α flare angle measured at a location on the shell $h/2$ above the bottom of the door and $l/2$ aft of the intersection of the door with the stem, as shown in Figure 1,
 - β entry angle measured at a location on the shell $h/2$ above the bottom of the door and $l/2$ aft of the intersection of the door with the stem, as shown in Figure 1,

For bow doors, including bulwark, of unusual form or proportions, e.g. ships with a rounded nose and large stem angles, the areas and angles used for determination of the design values of external forces may require to be specially considered.

S8.3.1c For visor doors the closing moment M_y under external loads, in kN.m , is to be taken as :

$$M_y = F_x a + 10 W c - F_z b$$

where :

- W mass of the visor door, in t,
- a vertical distance, in m, from visor pivot to the centroid of the transverse vertical projected area of the visor door, as shown in Figure 2,
- b horizontal distance, in m, from visor pivot to the centroid of the horizontal projected area of the visor door, as shown in Figure 2,
- c horizontal distance, in m, from visor pivot to the centre of gravity of visor mass, as shown in Figure 2.

S8.3.1d Moreover, the lifting arms of a visor door and its supports are to be dimensioned for the static and dynamic forces applied during the lifting and lowering operations, and a minimum wind pressure of 1.5 kN/m^2 is to be taken into account.

S8.3.2 Inner doors

S8.3.2a The design external pressure, in kN/m^2 , considered for the scantlings of primary members, securing and supporting devices and surrounding structure of inner doors is to be taken as the greater of the following :

- $p_e = 0.45 L$,
- hydrostatic pressure $p_h = 10 h$, where h is the distance, in m, from the load point to the top of the cargo space,

where L is the ship's length, as defined in S8.3.1a.

S8.3.2b The design internal pressure p_i , in kN/m^2 , considered for the scantlings of securing devices of inner doors is not to be less than :

$$p_i = 25$$

S8.4 Scantlings of bow doors

S8.4.1 *General*

S8.4.1a The strength of bow doors is to be commensurate with that of the surrounding structure.

S8.4.1b Bow doors are to be adequately stiffened and means are to be provided to prevent lateral or vertical movement of the doors when closed. For visor doors adequate strength for the opening and closing operations is to be provided in the connections of the lifting arms to the door structure and to the ship structure.

S8.4.2 *Plating and secondary stiffeners*

S8.4.2a The thickness of the bow door plating is not to be less than that required for the side shell plating, using bow door stiffener spacing, but in no case less than the minimum required thickness of fore end shell plating .

S8.4.2b The section modulus of horizontal or vertical stiffeners is not to be less than that required for end framing. Consideration is to be given, where necessary, to differences in fixity between ship's frames and bow door stiffeners.

S8.4.2c The stiffener webs are to have a net sectional area, in cm^2 , not less than :

$$A = \frac{Q k}{10}$$

where :

Q shear force, in kN, in the stiffener calculated by using uniformly distributed external pressure p_e as given in S8.3.1a.

S8.4.3 *Primary structure*

S8.4.3a The bow door secondary stiffeners are to be supported by primary members constituting the main stiffening of the door.

S8.4.3b The primary members of the bow door and the hull structure in way are to have sufficient stiffness to ensure integrity of the boundary support of the door.

S8.4.3c Scantlings of the primary members are generally to be supported by direct calculations in association with the external pressure given in S8.3.1a and permissible stresses given in S8.2.1a. Normally, formulae for simple beam theory may be applied.

S8.5 Scantlings of inner doors

S8.5.1 General

S8.5.1a Scantlings of the primary members are generally to be supported by direct calculations in association with the external pressure given in S8.3.2a and permissible stresses given in S8.2.1a. Normally, formulae for simple beam theory may be applied.

S8.5.1b Where inner doors also serve as vehicle ramps, the scantlings are not to be less than those required for vehicle decks.

S8.5.1c The distribution of the forces acting on the securing and supporting devices is generally to be supported by direct calculations taking into account the flexibility of the structure and the actual position and stiffness of the supports.

S8.6 Securing and supporting of bow doors

S8.6.1 General

S8.6.1a Bow doors are to be fitted with adequate means of securing and supporting so as to be commensurate with the strength and stiffness of the surrounding structure. The hull supporting structure in way of the bow doors is to be suitable for the same design loads and design stresses as the securing and supporting devices. Where packing is required, the packing material is to be of a comparatively soft type, and the supporting forces are to be carried by the steel structure only. Other types of packing may be considered. Maximum design clearance between securing and supporting devices is not generally to exceed 3 mm.

A means is to be provided for mechanically fixing the door in the open position.

S8.6.1b Only the active supporting and securing devices having an effective stiffness in the relevant direction are to be included and considered to calculate the reaction forces acting on the devices. Small and/or flexible devices such as cleats intended to provide local compression of the packing material are not generally to be included in the calculations called for in S8.6.2e. The number of securing and supporting devices are generally to be the minimum practical whilst taking into account the requirements for redundant provision given in S8.6.2f and S8.6.2g and the available space for adequate support in the hull structure.

S8.6.1c For opening outwards visor doors, the pivot arrangement is generally to be such that the visor is self closing under external loads, that is $M_y > 0$. Moreover, the closing moment M_y as given in S8.3.1c is to be not less than :

$$M_{y0} = 10 W c + 0.1 (a^2 + b^2)^{0.5} (F_x^2 + F_z^2)^{0.5}$$

S8.6.2 Scantlings

S8.6.2a Securing and supporting devices are to be adequately designed so that they can withstand the reaction forces within the permissible stresses given in S8.2.1a.

S8.6.2b For visor doors the reaction forces applied on the effective securing and supporting devices assuming the door as a rigid body are determined for the following combination of external loads acting simultaneously together with the self weight of the door :

- i) case 1 F_x and F_z
- ii) case 2 $0.7 F_y$ acting on each side separately together with $0.7 F_x$ and $0.7 F_z$,

where F_x , F_y and F_z are determined as indicated in S8.3.1b and applied at the centroid of projected areas.

S8.6.2c For side-opening doors the reaction forces applied on the effective securing and supporting devices assuming the door as a rigid body are determined for the following combination of external loads acting simultaneously together with the self weight of the door :

- i) case 1 F_x , F_y and F_z acting on both doors,
- ii) case 2 $0.7 F_x$ and $0.7 F_z$ acting on both doors and $0.7 F_y$ acting on each door separately,

where F_x , F_y and F_z are determined as indicated in S8.3.1b and applied at the centroid of projected areas.

S8.6.2d The support forces as determined according to S8.6.2b i) and S8.6.2c i) shall generally give rise to a zero moment about the transverse axis through the centroid of the area A_x . For visor doors, longitudinal reaction forces of pin and/or wedge supports at the door base contributing to this moment are not to be of the forward direction.

S8.6.2e The distribution of the reaction forces acting on the securing and supporting devices may require to be supported by direct calculations taking into account the flexibility of the hull structure and the actual position and stiffness of the supports.

S8.6.2f The arrangement of securing and supporting devices in way of these securing devices is to be designed with redundancy so that in the event of failure of any single securing or supporting device the remaining devices are capable to withstand the reaction forces without exceeding by more than 20 per cent the permissible stresses as given in S8.2.1.

S8.6.2g For visor doors, two securing devices are to be provided at the lower part of the door, each capable of providing the full reaction force required to prevent opening of the door within the permissible stresses given in S8.2.1a. The opening moment M_0 , in kN.m, to be balanced by this reaction force, is not to be taken less than :

$$M_0 = 10 W d + 5 A_x a$$

where :

- d vertical distance, in m, from the hinge axis to the centre of gravity of the door, as shown in Figure 2,
- a as defined in S8.3.1c.

S8.6.2h For visor doors, the securing and supporting devices excluding the hinges should be capable of resisting the vertical design force ($F_z - 10W$), in kN, within the permissible stresses given in S8.2.1a.

S8.6.2i All load transmitting elements in the design load path, from door through securing and supporting devices into the ship structure, including welded connections, are to be to the same strength standard as required for the securing and supporting devices.

S8.6.2j For side-opening doors, thrust bearing has to be provided in way of girder ends at the closing of the two leaves to prevent one leaf to shift towards the other one under effect of unsymmetrical pressure (see example of Figure 3). Each part of the thrust bearing has to be kept secured on the other part by means of securing devices. Any other arrangement serving the same purpose may be proposed.

S8.7 Securing and locking arrangement

S8.7.1 *Systems for operation*

S8.7.1a Securing devices are to be simple to operate and easily accessible.

Securing devices are to be equipped with mechanical locking arrangement (self locking or separate arrangement), or to be of the gravity type. The opening and closing systems as well as securing and locking devices are to be interlocked in such a way that they can only operate in the proper sequence.

S8.7.1b Bow doors and inner doors giving access to vehicle decks are to be provided with an arrangement for remote control, from a position above the freeboard deck, of :

- . the closing and opening of the doors, and
- . associated securing and locking devices for every door.

Indication of the open/closed position of every door and every securing and locking device is to be provided at the remote control stations. The operating panels for operation of doors are to be inaccessible to unauthorized persons. A notice plate, giving instructions to the effect that all securing devices are to be closed and locked before leaving harbour, is to be placed at each operating panel and is to be supplemented by warning indicator lights.

S8.7.1c Where hydraulic securing devices are applied, the system is to be mechanically lockable in closed position. This means that, in the event of loss of the hydraulic fluid, the securing devices remain locked.

The hydraulic system for securing and locking devices is to be isolated from other hydraulic circuits, when in closed position.

S8.7.2 *Systems for indication/monitoring*

S8.7.2a Separate indicator lights and audible alarms are to be provided on the navigation bridge and on the operating panel to show that the bow door and inner door are closed and that their securing and locking devices are properly positioned.

The indication panel is to be provided with a lamp test function. It shall not be possible to turn off the indicator light.

S8.7.2b The indicator system is to be designed on the fail safe principle and is to show by visual alarms if the door is not fully closed and not fully locked and by audible alarms if securing devices become open or locking devices become unsecured. The power supply for the indicator system is to be independent of the power supply for operating and closing the doors. The sensors of the indicator system are to be protected from water, ice formation and mechanical damages.

S8.7.2c The indication panel on the navigation bridge is to be equipped with a mode selection function "harbour/sea voyage", so arranged that audible alarm is given if vessel leaves harbour with the bow door or inner door not closed and with any of the securing devices not in the correct position.

S8.7.2d A water leakage detection system with audible alarm and television surveillance are to be arranged to provide an indication to the navigation bridge and to the engine control room of leakage through the inner door.

S8.7.2e Between the bow door and the inner door a television surveillance system is to be fitted with a monitor on the navigation bridge and in the engine control room. The system must monitor the position of doors and a sufficient number of their securing devices. Special consideration is to be given for lighting and contrasting colour of objects under surveillance.

S8.7.2f A drainage system is to be arranged in the area between bow door and ramp, as well as in the area between the ramp and inner door where fitted. The system is to be equipped with an audible alarm function to the navigation bridge for water level in these areas exceeding 0.5m above the car deck level.

S8.8 Operating and Maintenance Manual

S8.8.1 An Operating and Maintenance Manual for the bow door and inner door has to be provided on board and contain necessary information on :

- . main particulars and design drawings,
- . service conditions, eg service area restrictions, acceptable clearances for supports,
- . maintenance and function testing,
- . register of inspections and repairs.

This Manual has to be submitted for approval.

Note : It is recommended that recorded inspections of the door supporting and securing devices be carried out by the ship's staff at monthly intervals or following incidents that could result in damage, including heavy weather or contact in the region of the shell doors. Any damages recorded during such inspections are to be reported to the Classification Society.

S8.8.2 Documented operating procedures for closing and securing the bow door and inner door are to be kept on board and posted at appropriate place.

Figure 1 Definition of α and β

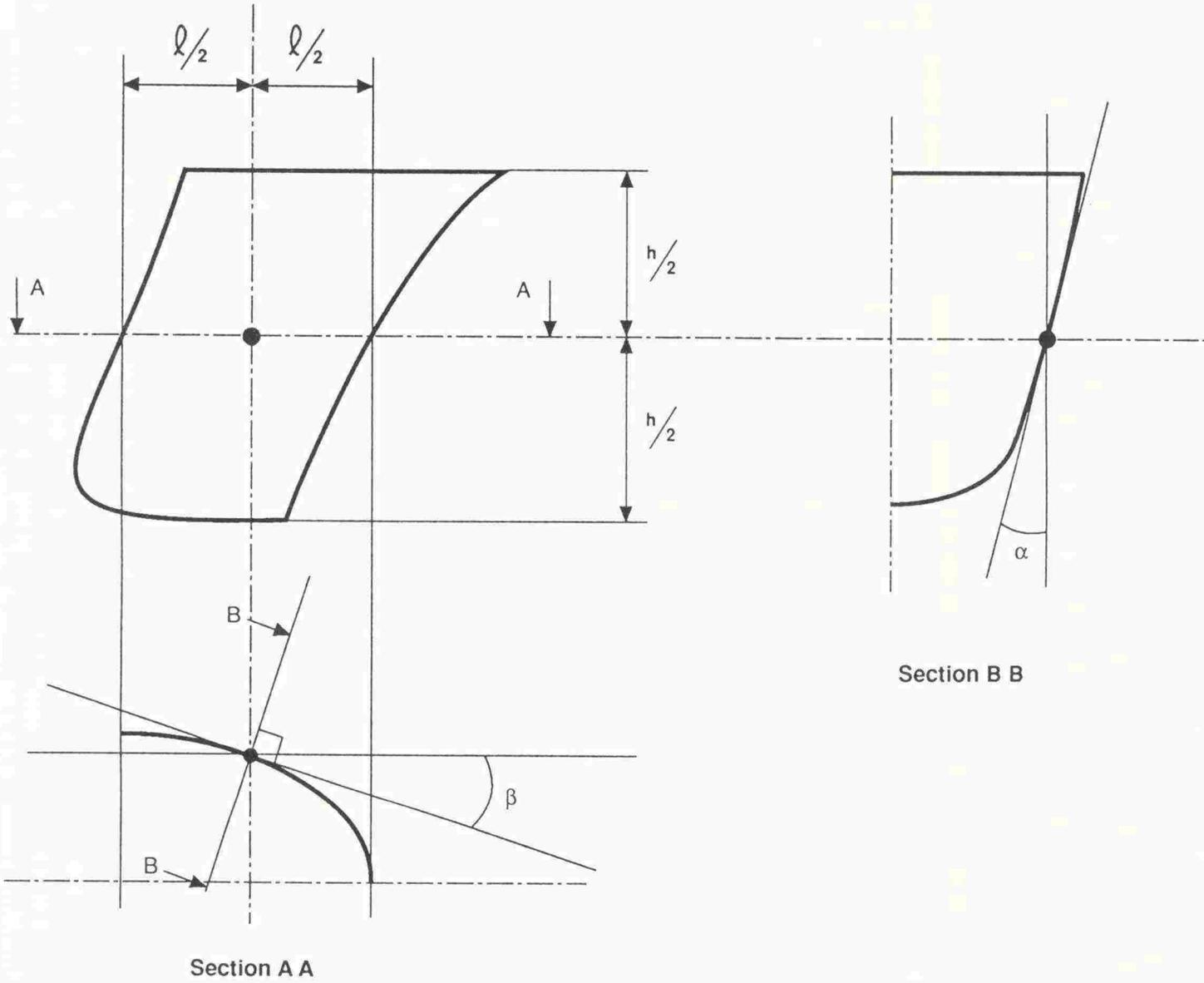


Fig. 2 Bow Door of Visor Type

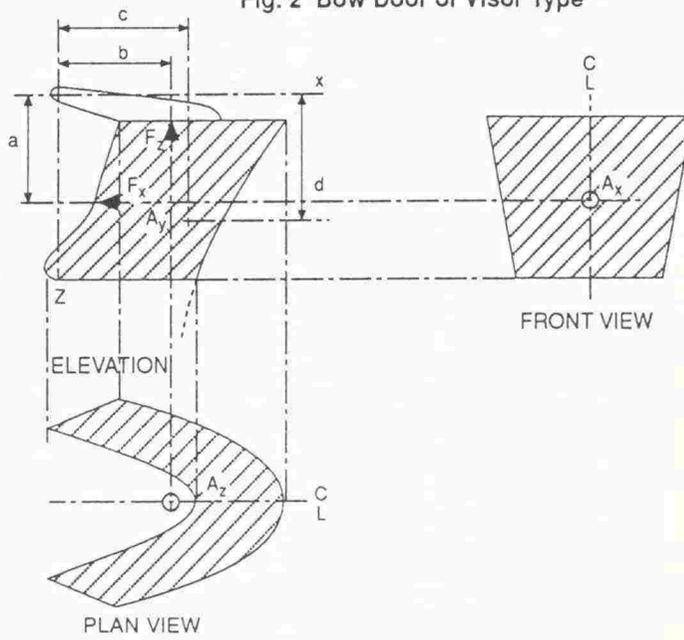
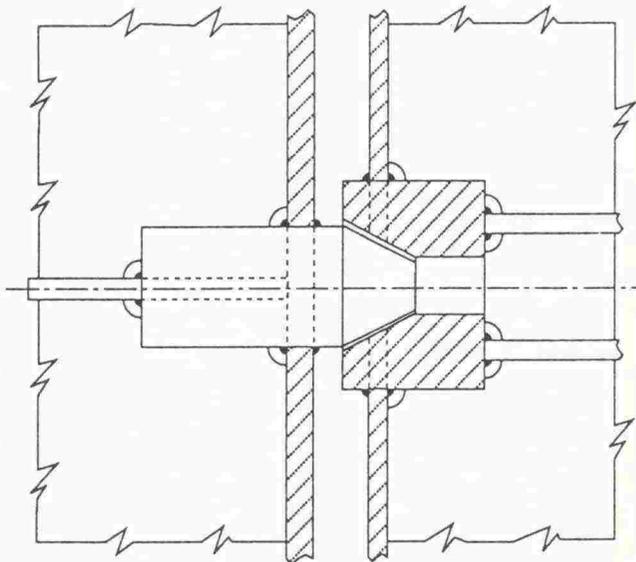


Fig. 3 Thrust Bearing



UR - S16 BOW DOORS AND INNER DOORS**RETROSPECTIVE APPLICATION OF UR-S8, AS AMENDED 1995,
TO EXISTING RO-RO PASSENGER SHIPS**

1. The structural condition of bow doors and inner doors, especially the primary structure, the securing and supporting arrangements and the hull structure alongside and above the doors, are to be specially examined and any defects rectified.
2. The requirements of S8.8 concerning operating procedures of the bow door and inner door are to be complied with.
3. The following measures are to be applied, by 1st July 1996, to all existing ro-ro passenger ships.
 - a) The location and arrangement of inner doors are to comply with the applicable requirements of the SOLAS Convention and with S8.1.2d.
 - b) Ships with visor door are to comply with S8.6.2g requiring redundant provision of securing devices preventing the upward opening of the bow door. In addition, where the visor door is not self closing under external loads (i.e. the closing moment M_y calculated in accordance with S8.3.1c is less than zero) then the opening moment M_o is not to be taken less than $-M_y$. If drainage arrangements in the space between the inner and bow doors are not fitted, the value of M_o is to be specially considered.
Where available space above the tanktop does not enable the full application of S8.6.2g, equivalent measures are to be taken to ensure that the door has positive means for being kept closed during seagoing operation.
 - c) Ships with visor door are to comply with S8.6.2h requiring securing and supporting devices excluding hinges to be capable of bearing the vertical design force ($F_z - 10W$) without exceeding the permissible stresses given in S8.2.1a.
 - d) For side-opening doors, the structural arrangements for supporting vertical loads, including securing devices, supporting devices and, where applicable, hull structure above the door, are to be re-assessed in accordance with the applicable requirements of S8.6 and modified accordingly.
 - e) The securing and locking arrangements for bow doors and inner doors are to comply with the applicable requirements of the SOLAS Convention.

