

Description

Ventilation System Design For Livestock Vessel

Ventilation system is one of the key factors to keep animals live healthy during transportation. The minimum air flow has been recommended by “Australian Marines Orders Part 43” for vessel intended to export animals from Australia.

There are following recommended design guidelines to comply.

1.) Minimum air change requirement.

2.) Minimum air speed of 0.5 m/sec throughout pen area (animal confined space).

For above item (1) is no problem to all ship's owner to comply. The challenging part is item (2) as followings.

a.) No sharp edges are allowed within the animal space area and to minimize any obstruction in the pen area to allow animal to move freely. Fresh air of 0.5 m/sec air speed must be delivered to all decks (can be up to 10 decks) by big ventilation trunks and big fans. Fresh air will be delivered to pen areas from air outlet at designated position.

To ensure minimum air speed can be delivered to the extreme corner of animal's space. We design an air acceleration guide to increase the air speed for more than double to the original main ventilation trunk through the air outlet (refer to sketch and photos of Type 1 and 2 air acceleration guide attached).

b.) Vessel to sail at sea need to comply with recommended watertight integrity requirement. Ventilation trunk penetrate from top of the hull to bottom will create a hazard to this requirement. To overcome this problem, others ship owner normally design two separate sets of ventilation trunk to serve top and bottom pen areas. But this will need to use more fans. It will also take out more animal's space and create obstruction to the animals. We design a new system by using trunk over trunk as shown on sketch attached to overcome this problem.

This method has been accepted by marine authority and has been used on our vessels “GHENA” converted in year 2010.

Refer to drawing Figure 1

Shown typical ventilation fan and ventilation trunk construction layout with air outlet arrangement.

1. Typical deck level to separate animals.
2. Thick line to show the watertight deck (main deck) of the vessel. This deck need to maintenance watertight integrity.

Refer to drawing Figure 2

Type 1 guide with upper and lower air acceleration guide

1. Shown the angle of air acceleration guide and to be determined in according to calculation.
2. Shown the upper air acceleration guide and the size and shape to be in according to the actual calculation.
3. Shown the lower air acceleration guide and the size and shape to be in according to the actual calculation.
4. Shown the distance in between upper and lower air acceleration guide and to be in according to the actual calculation.

Refer to drawing Figure 3

Type 2 guide with only lower air acceleration guide

1. Shown the angle of air acceleration guide and to be determined in according to calculation.
2. Shown the upper air acceleration guide and the size and shape to be in according to the actual calculation.
3. Shown the distance in between upper trunk and lower air acceleration guide and to be in according to the actual calculation.

Refer to drawing Figure 4

Watertight double trunk arrangement

1. Shown air outlet to be open only at the outer trunk.
2. Shown air acceleration guide arrangement to be similar to others guides.
3. Shown inner ventilation trunk with no opening at main deck and is comply to load line regulation of watertight integrity.

Claim

Ventilation System Design For Livestock Vessel

From “Australian Marines Orders Part 43” for vessel intended to export animals from Australia.

1.) Minimum air speed requirement.

The design of the acceleration guide as shown on drawing by us can achieve the minimum air speed of 0.5 m/sec throughout pen areas.

Fresh air pressure from main ventilation trunk will be accelerated due to sudden change in air channel and will travel much further by the air guide (refer to sketch attached).

2.) Down flooding at main deck (freeboard deck) level.

We overcome the problem of down flooding criterion (watertight integrity) by using a single ventilation trunk from top of the vessel to the bottom. We design a new system by using trunk over trunk as shown on drawing attached to overcome those problem. This method has been accepted by marine authority and has been used on our vessels “GHENA” converted in year 2010.

3.) A Green Livestock Carrier

Livestock carrier is a floating farm keeping animals with high density in enclosed space. The vessel equipped with self-sustainable systems for sailing from country to country. There are many machinery onboard and require electric power to operate. Besides proper water and food supply. Good ventilation is vital to keep animals in a healthy condition during the long journey.

To provide good ventilation system for few thousands big cattle or more than 30 thousands sheep living in high density condition within the pen areas of

approximate 9,000m². It needed minimum of 50 number high capacity big axial fans with more than 150,000 m³/hour of volume flow each fan to deliver the required minimum velocity of 0.5m/sec to all pen areas. The ventilation fans are taken out major electric power supply from the vessel.

The power require to drive each fan is approximate 30KW. Total power require will be approximated 1,500 KW. A few high capacity generators has been installed to deliver the required electric power round the clock.

Refer to Figure 1. Our air acceleration guide invention can increase the air velocity at the air outlet to approximate two times of the air velocity in the main ventilation trunk. Therefore, the air velocity in the main ventilation trunk can be reduced, but able to achieve the require air velocity at the air outlet. We adopted above ventilation system developed by us and using a smaller fan with less electric power consumption to save total electric power requirement for fans up to approximate 25% in our latest converted vessel “MV DAREEN” in 2011.

With our invention of ventilation trunk over ventilation trunk at the freeboard deck. We no need to have a separate set of ventilation trunk to serve the upper and lower decks. We reduced the number of ventilation trunks and fans require to serve both upper and lower decks. This invention also complies with the stringent stability criteria for livestock vessel by all marine classification societies.

With our invention of air acceleration guide, a smaller capacity fans has been used for the main ventilation trunk. The slower air velocity in the main ventilation trunk has no impact to the high air velocity requirement at the air outlet to all pen areas.

By our inventions, we had reduced the capacity of the new generators, burn lesser fuel, produced less carbon dioxide and achieved more environmental friendly livestock carrier. This has been proven and working very well with above ventilation system in our latest converted livestock carrier “MV DAREEN” since in operation from October 2011.