

Carefully to Carry

SEPTEMBER 2006

Testing weather-tight integrity of dry cargo vessels' hatchcovers

Ultrasonic testing is now widely used throughout the industry to test and prove the weather-tightness of hatchcovers

In 1989 IACS introduced its guidance to owners concerning the care and survey of hatchcovers as follows:

"Loss of weather-tight integrity continues to be a constant factor leading to cargo damage which could result in a threat to the safety of the crew, the ship and its cargoes, despite advances in modern shipbuilding technology, construction, navigation and means of preventing ingress of water into hold spaces."

Little appears to have changed over the intervening years.

Regulation 3.12 of the International Load Line Convention 1966 which states:

"Weather-tight. Weather-tight means that in any sea conditions water will not penetrate into the ship".

Regulation 16 of the convention concerns *"hatches closed by weather-tight covers."*

The *"means for securing weather-tightness"* is defined in regulation 16.4 of the convention which states:

"The means for securing and maintaining weather-tightness shall be to the satisfaction of the Administration. The arrangements shall ensure that the tightness can be maintained in any sea conditions, and for this purpose tests for tightness shall be required at the initial survey, and may be required at periodical surveys and at annual inspections or at more frequent intervals."

Traditionally the routine tightness testing of hatchcovers and which owners of dry cargo vessels will be familiar, has been conducted by:

- Chalk test
- Light test
- Hose test.



"The carrier shall properly and carefully load, handle, stow, carry, keep, care for and discharge the goods carried."

Hague Rules,
Articles iii, Rule 2

Carefully to Carry Advisory Committee

This report was produced by the Carefully to Carry Committee – the UK P&I Club's advisory committee on cargo matters. The aim of the Carefully to Carry Committee is to reduce claims through contemporaneous advice to the Club's Members through the most efficient means available.

The committee was established in 1961 and has produced many articles on cargoes that cause claims and other cargo related issues such as hold washing, cargo securing, and ventilation.

The quality of advice given has established Carefully to Carry as a key source of guidance for shipowners and ships' officers. In addition, the articles have frequently been the source of expertise in negotiations over the settlement of claims and have also been relied on in court hearings.

In 2002 all articles were revised and published in book form as well as on disk. All articles are also available to Members on the Club website. Visit the Carefully to Carry section in the Loss Prevention area of the Club website www.ukpandi.com for more information, or contact the Loss Prevention Department.

And more recently

- Ultrasonic test.

Traditional methods

The chalk test

Chalk is applied to the compression bars of the coamings and the individual panel cross seams. The hatches are then battened down fully and in the proper manner after which they are immediately re-opened and the rubber packing (joints) carefully examined. Where a clean regular chalk mark is observed on the packaging it is assumed that sufficient pressure exists between the joint and the adjacent compression bar. If the chalk mark is found to be intermittent or less pronounced at some points than at others then it is assumed that weather-tight integrity does not exist over those areas. This dated method can only be considered as indicative of a possible problem with likely inconclusive results even after rectification of possible defects which may have been exposed by the test. IACS recommendations:

“Upon completion of installation of hatchcovers, a chalk test is to be carried out. This to be followed by a hose test with a pressure of water of not less than 200Kn/m².”

The light test

The simplest means of establishing if a defect exists and its location is by means of the light test. The hatches are battened down fully and properly for seagoing, the surveyor/observer entering the hold and viewing the underside of the covers from below. In strong sunlight defects will/should readily be visible with daylight shining through any gaps in the packaging. If the test is being undertaken during poor light conditions strong torchlight properly directed from above will serve the same purpose.

The hose test

The most commonly used of the traditional tests is the hose or water test whereby a strong jet of pressurised water is directed at the seams and joints of the hatchcovers. Hatchcovers are battened down fully in the proper manner and with the surveyor stationed in the hold a survey assistant must be stationed on deck/top of the hatchcovers to ensure that the water, usually supplied from the vessel's fire main is directed at a constant and sufficient pressure in the proper direction. Ideally the hose must be held at a distance no more than one metre from the joint under test with a pressure, as before noted, of not less than 200Kn/m². There are however a number of disadvantages, these include:

- Time-consuming method

- Ensuring adequate water pressure
- Excessive water draining from decks when vessel may be alongside wharf, pier or jetty
- Test cannot be safely carried out when vessel is laden for fear of wet damage to the cargo
- Two surveyors are required to undertake the test
- Test cannot be carried out if weather conditions/air temperatures are at or below 0°C.

Ultrasonic test

There has been, over the past 12 to 15 years since the ultrasonic testing equipment became available, a great debate concerning the efficiency and acceptability of this type of equipment. However, the technique is now widely used throughout the industry to test and prove the weather-tightness of hatchcovers. The equipment, when properly used, gives the exact location and the extent of leakage, is relatively easy and quick to operate and does not require the assistance of crew members once the hatchcovers have been properly battened down.



Ultrasonic testing of hatchcover

Sound is generally produced by a vibrating body. Air surrounding the body forms waves and transmits sound. The frequency of the sound so produced is measured in cycles per second, hertz, which indicates the number of vibrations the sound wave makes over a period. The smaller the number of vibrations, the lower the frequency. Ultrasonic sound vibrations are similar to those of sound audible to the human ear whose upper and lower limits are 15 and 20Khz. The frequency of ultrasonic sound is above 20Khz, is propagated in a directional fashion and is somewhat similar to that of a beam of light whose intensity diminishes with distance.

Ultrasonic waves produced by a transmitter placed within an enclosed space will be released through the smallest of openings. Thus any leakage of the sound may then be detected by a receiver or detector

between frequencies of 36.7 and 40.7Khz and convert them into aural frequencies or into digitally reproduced information.

Whereas originally no class approval of the equipment was sought by the manufacturers and no training of operators was considered necessary, class type approval and operator training is undertaken by some manufacturers of ultrasonic equipment used in the testing of hatchcovers.

The training courses include:

- Principles of the technique
- The ultrasonic equipment
- Hatchcover types
- Typical defects identified
- Testing and reporting procedures.

The basic procedure comprises placing the transmitter in the cargo hold, switching it on, properly closing and securing the hatchcovers or access equipment to seaworthy requirements.

The ultrasonic waves emitted by the transmitter within the enclosed space will leak through the smallest of apertures. Location of leaked emissions in way of hatchcovers can be precisely detected from outside the hold by moving the hand-held detector along the periphery and cross seams of the covers. Evaluation of the extent of leakage can be established from a reading of the digital scale.

During testing by any of the above noted methods a record of the location and extent of any leakages detected should be kept. The hatches then opened, the causes of leakages, if any, identified – the defects rectified, covers re-secured and subjected to a further test which should prove them to be fully weather-tight.