

Carefully to Carry

SEPTEMBER 2006

Steel hatchcovers

Introduction

The steady increase in the size of ships especially bulk carriers during the past thirty years has been accompanied by a steady increase in the cost of manning and running them. As a partial counter to this escalation in costs, equipment, such as steel hatchcovers were developed and introduced onboard ship shortening the turnaround time in a port, and enabling larger ships to be manned by smaller crews. As is so often the case, however, new developments create new problems, and steel hatchcovers were no exception to this rule.

This report considered steel hatchcovers in general and MacGregor-Navire hatchcovers in particular. We are indebted to the original MacGregor-Navire Organisation for their assistance in providing the earlier technical information required in preparation of this article.

The aim of the report is to consider claims for sea water damage to cargo carried in ships fitted with steel hatchcovers to analyse the causes of the leakage and to suggest ways and means whereby the incidence of such claims might be decreased. The fitting of steel hatchcovers on the weather-deck of seagoing ships is now the rule rather than the exception, and it thus essential to eliminate the underlying causes of cargo damage from ingress of sea water through steel hatchcovers.

Claims statistics

That the problem is worthy of study is shown by the following figures compiled during two studies of claims for damage to cargo by leakage of sea water through steel hatchcovers.

The first set of figures appeared in the 5th *Carefully to Carry* report published in 1965 and covered 15 cases handled by the Club:

Largest claim US\$240,000

Lowest claim US\$2,200

Total claimed US\$903,422

Average claim US\$60,200

More recently, during the period 1987-2001, the Club handled 236 large



“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.

claims (gross value in excess of US\$100,000), paying out approximately US\$57M. The average value for the period was US\$243,000.

Advantages of steel hatches

The advantages of the installation of steel hatchcovers on a ship are several, greater strength which contributes to the safety of the vessel, the ease and speed with which they can be moved to open and close the hatches and the minimal number of persons required to operate them in comparison with the crew needed for traditional hatchcovers. This last point may be easier to appreciate in the context of large modern bulk carrier of, say 9 cargo holds, with twin hatches at each hold and a deck crew of only 12 men in total.

Against these advantages must be placed the high costs of initial purchase and routine maintenance.

The development of the automatic steel hatchcover

History

In the 1930s, the hatch openings of ships were covered with beams, wooden boards and tarpaulins very much as they had been for centuries past. Metal had been used for slab type pontoons but the MacGregor-Navire Organisation had the idea of using an eccentric wheel, to lower and raise these pontoons and, in the raised position, to move them to one end of the coamings, lifting them at that point into a vertical position. In the lowered position they would rest on a rubber gasket and, by the use of cleats, become weather tight. This revolutionary but simple modification was still in operation in the mid 1940s.

Development

In the late 1940s, coupled with an international marketing development programme, these simple individually moved panels were linked together and counter balanced in such a way that one wire could be used to move them to one end of the hatch where they would automatically assume a vertical position and stow in a small area. This principle became internationally known as the 'single pull hatchcover' and on the weather-deck, is still the most widely used means of cargo protection. Refinements and modifications have been incorporated, basically in the fields of automation techniques and, of course, folding hatchcovers motivated by hydraulic or electrical means, piggy back covers, stacking covers, coiling covers and more recently the sequential or non sequential multi panel covers of the modern container vessels have also been in wide use throughout the maritime world. However for illustrative purposes, we will restrict our comments to the single pull type of operation.

Fig A.
Section through side
or end of hatchcover.

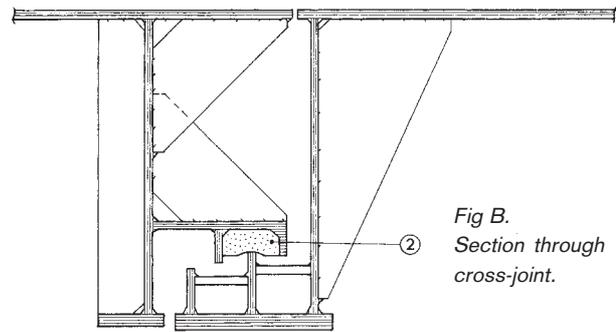
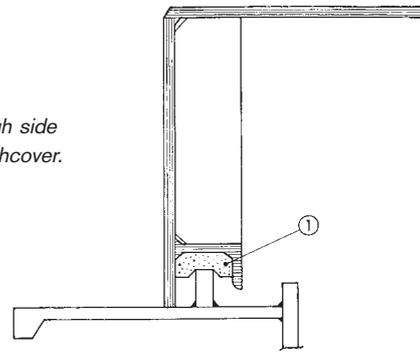


Fig B.
Section through
cross-joint.

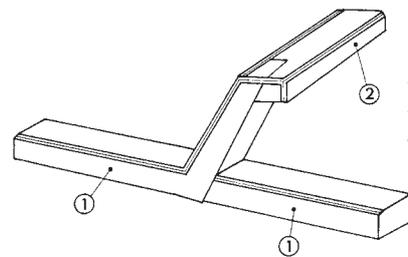


Fig C.
Details of cross-joint
rubber inserts.

Coamings

The sealing round the edge of the hatch to prevent the ingress of water consists of hard rubber gasket strip retained on three sides in a channel bar within the hatchcover framework and resting on the compression bar which is a square section steel bar welded onto the coaming bars (see Fig A). The maintenance of this type of installation is dealt with later but it is worth mentioning at this stage why a 'double drainage' trough is designed inboard of this compression bar. Should anything be trapped on the coaming during the closing operation, or a local deformation in the compression bar be caused by for example a derrick runner wire or cargo handling damage, then in this local area there is a small access for the possible entry of water, which whilst not being dangerous, could damage a fairly large amount of cargo. Incorporation of double drainage allows any such water to be taken away and is a wise safeguard against such minor localised sealing problems.

Moving parts

Maintenance necessary for the continuance of original weather tightness is essential and it will be obvious that correct maintenance of moving parts, i.e. wheels, chains, gypsies etc., will alleviate the possibility of the

assembly being subjected unnecessarily to rough treatment because of undue wear taking place on these parts.

What the claims have to tell us

Strength

Each automated steel hatchcover panel consisting of steel plate, sections, beams etc., all designed and assembled to the strict requirements of a classification society is, in comparison with the hatch beams, boards and tarpaulins which preceded it, immensely strong. However, this can be a disadvantage under certain circumstances, especially when the vessel is labouring in a seaway.

Although ships give the impression of great strength, such is the power of the sea, when the weather is adverse, that any ship which does not yield to the force of the waves would quickly founder. In fact, the ship must act, rather as a boxer does, by riding those blows which cannot be avoided so as to absorb the greater part of the energy directed at it. In so doing, the ship 'works' along its length and across its width all the time.

In these conditions, the very strength and rigidity of the steel hatchcovers as compared with the greater flexibility of the ship, can cause the weather-tight joints between the vessel's structure (hatch) and the covers to move as the ship works in a seaway. Yet it is at just such a time that hatchcovers no matter what their type need to be most resistant to water in order to protect the cargo beneath them.

Analysis of claims

In carrying out the research necessary to compile the statistics mentioned in the earlier study, it was found that in only one instance was general cargo damaged. All other ships were carrying bulk cargoes with maximum dead-weight and minimum permissible freeboard. In many cases the log extracts for the voyage state that seas and waves were continually washing over the decks and hatches. How high then are the waves which are met in the open sea? The height depends mainly on the strength of the wind and the length of time during which it has been blowing, but reproduced below is part of the international Beaufort Scale of Wind which gives the average wave height likely to be experienced for various wind strengths from gale to hurricane.

Freeboard

As the average freeboard of the ships considered in the earlier survey was 2.75 metres it can safely be said that, from these figures for wave heights, most ships carrying a dead-weight cargo, which also encounter

Wind force	Limits of speed in knots	Descriptive terms	Probable mean height of waves
7	28-33	Near Gale	4.0
8	34-40	Gale	5.5
9	41-47	Strong Gale	7.0
10	48-55	Storm	9.0
11	56-63	Violent Storm	11.0
12	64-71	Hurricane	Over 14.0

strong winds while on passage, will have the decks and hatches awash at frequent intervals.

Conclusions from claims

From further study, other factors emerged which were present in many of the cases. With very few exceptions, the voyages had taken place in the northern hemisphere, and three quarters of all the voyages had taken place during the winter months between October and April. Indeed, one third of all the voyages took place during the months of December and January. Not surprisingly, bad weather was experienced on every voyage, but in no case was it of such severity as to offer certain defence of 'perils of the sea' under the Hague rules. Neither was it severe enough to justify penetrations of the rubber seals of the hatch joints, provided that the seals were in good condition. However, in very many cases, survey reports from the discharge port criticised the condition of the hatchcovers and coamings indicating a poor standard of maintenance.

The results of the research can, therefore, be summarised as follows:

- Usually, the only vessels involved were those carrying bulk and dead-weight cargoes.
- Their freeboard was not very large.
- All voyages included a period of heavy weather.
- The majority of the sample voyages were confined to the northern hemisphere.
- 75% of the sample voyages took place during the winter months.
- Hatch survey reports indicated that some hatches and coamings were in poor condition.

Suggested remedies

Proper securing

Can anything be done in the future to eliminate or reduce the leaking of this type of hatchcover? Of the six points previously listed, it is the last on which, in our

view, attention should be concentrated. However, while it is true that in most cases an adverse survey report has been presented, this is by no means so in every case. Some survey reports have stressed the very good condition of the seating of the seals and equipment of the hatches and in one case, the ship was actually on her maiden voyage.

What then is the reason for the hatch leakage in these cases? Is it the extra rigidity of the covers which was mentioned earlier, or is there some other reason? Considering the nature of the weather experienced on the voyages in question, it is likely that the working of the ship was a contributory factor. But can the leakage be explained in other ways? The answer may be that the covers were improperly or carelessly secured.

In the past, when hatches were secured with boards and tarpaulins, the need for care in their securing was very obvious. The ships were also much smaller and there were more seamen to perform the tasks connected with leaving port, such as the lowering and securing of derricks and the battening down of hatches. The crew had to work as a team because the various jobs could not be done by one or two men alone and with teamwork there is less risk that the job will be improperly done. Lastly a poorly secured hatch was immediately apparent to the ships officers and steps could be taken to remedy the situation.

Nowadays however, on modern bulk carriers, there are fewer crew members, and with the likelihood of no cranes or derricks to stow to relieve the monotony of securing the 6 to 9 hatches. For the one or two men concerned, the prospect of securing a long line of hatchcovers stretching away along the weather-deck is not an inviting one, and when there are added discomforts of wind and rain, it is not surprising if the securing is not always carried out as conscientiously as perhaps it ought to be. Steel cleats and wedges are not as interesting as canvas tarpaulins and wooden wedges even if they are stronger and more efficient and therefore safer. There are also a great many of them; hatches of say 40ft x 30ft will probably have 6 panels secured around the edges by about 40 cleats and further secured by about 50 cross seam wedges. The essential points to remember in securing hatchcovers are firstly that the joints cannot be effective if insufficient pressure is applied, and secondly, but by no means less important, that the pressure must be evenly distributed along the whole length of the joint.

Type of cargo stresses

The type and distribution of cargo carried can affect the stresses experienced by a ship in a seaway and thus the degree of bending and twisting she suffers. In

this respect homogeneous cargoes of low density, such as bulk grain, are better than high density cargoes such as ore concentrates or steel products. Bulk carriers are designed as single deck vessels which means that high density cargoes will be stowed at the bottom of the holds, causing severe racking strains of hogging and sagging. These racking strains may well cause the hatchcovers to leak if the cleats and wedges are not secured properly. In these conditions, it is important to ensure that the cleats remain tight.

Leakage despite proper securing

However, in spite of these comments, it is a fact that in conditions of severe weather, leakages can and will occur through steel hatchcovers which are properly secured. This was illustrated by the decision of the US Court of Appeal in the case of the *Sabine Howaldt* 1971 AMC539.

The *Sabine Howaldt* was a vessel of 2,300 gross tons, 306 feet in length with a beam of 40 feet. Her bridge amidships and her engines aft, and the four cargo holds were served by two hatches only, one forward and one abaft the bridge. The fore deck hatch was about 60ft x 18ft and had the protection of solid bulwarks at the ships side, while the after deck with open rails at the ships side was 3 feet higher than the fore deck and had a hatch of about 68ft x 18ft. The holds were separated by bulkheads with the forward hatch serving Nos. 1 and 2 and the after hatch serving Nos. 3 and 4.

At the time the *Sabine Howaldt* was seven years old and her classification, which was the highest in Germanischer Lloyd, had been maintained at her annual survey in April, 1965. The charter voyage during the following December was from Europe to the USA with a full cargo of steel products, which were loaded in good condition but were rusted and pitted from contact with sea water when discharged from No. 4 hold and also but to a lesser extent, from No. 1 hold.

Before completion of loading, the surveyor for the charterer inspected the hatchcovers and found them in good condition with no dents, bending or other damage and no staining on the inside of the coamings to indicate previous leakage. His report found the ship seaworthy. After the hatches had been closed and tightened down they were inspected by the chief officer together with another officer and a log entry was made by the chief officer that the MacGregor-Navire hatchcovers were "closed and wedged".

The *Sabine Howaldt* sailed from Antwerp on the 15th December at a draught less than permitted as she was not down to her winter marks, and by midnight on the third day, the wind had risen to force 9 on the Beaufort Scale. The wind increased to force 10 by 09.00 on the

18th, blew with that force until about 17.00 and then began to ease. During the whole of this period the ship pitched and rolled heavily in the high seas which had been whipped up by the wind, and waves were continually breaking across the decks.

The respite offered by the easing of the wind during the evening of the 18th December was not to last for long. On the 20th the wind reached force 9/10, remained at 7/8 moderate to fresh gale – during the whole of the next day, gathering strength for the coming onslaught. On the 23rd December, the ship was hove-to for twelve hours trying to reduce the battering from hurricane force winds, heavy confused swells and the huge seas which were breaking over her fore-castle deck hatches and upper works, bending, twisting and vibrating her continuously.

The violence of the weather was severe enough to cause structural damage for, after the worst of the storm was over, it was discovered that the pedestal holding the master switch control for the capstan had been torn loose leaving a hole in the deck, a galley port hole was smashed, the catwalk gangway from amidships to poop was torn loose and destroyed, denting a ventilator at the same time. Several parts of the ship's superstructure and fixtures were dented and the covers from two winches disappeared after being ripped off.

When the weather first deteriorated at the beginning of the voyage, the chief officer, in the company of another officer, made a second inspection of the hatches from inside the cargo holds. He found no leakage through the hatchway although waves were washing across the covers. He also examined the covers on arrival in the USA on 3rd January and found hatches, covers and gaskets all in good condition, as did the surveyors for both the owners and the charterers. Nevertheless, sea water had entered the hold and it was decided that the severe stresses to which the ship had been subjected had momentarily deformed the rectangular opening of the hatch thereby disturbing the seal between the gasket with the compression bar on the coming allowing sea water, which was pouring over the decks and hatches, to enter the hold.

After considering all the circumstances, including the fact that on both the previous and following voyages the hatchcovers had not leaked in spite of heavy weather, the Court of Appeal decided that the violence of the wind and the confused cross-swells that had wrenched and twisted the ship during the voyage were a 'peril of the sea' and that the owners were not liable for the damage to cargo resulting from the leaking of the hatchcovers.

While it is impossible to say what the effect of the storm would have been had the ship been equipped with wooden hatch boards and tarpaulins, the situation in which the *Sabine Howaldt* would then have found herself would have been far more dangerous: certainly for the safety of the cargo and possibly for the ship also. The collapsing of the amidships cat walk would undoubtedly have torn the tarpaulins covering the hatch over Nos. 3 and 4 holds, allowing a much larger volume of sea water to enter those holds to the certain detriment of the cargo and possibly to the ultimate danger of the ship itself.

Summary

This section can be summarised as follows:

- Hatches can leak in a seaway if they are not secured as tightly as possible, and checked as appropriate during the voyage.
- There is more likelihood of leaking if the ship is carrying high density cargoes.
- Even though every care is taken as in the first item, above, it is possible for steel covers to leak if the ship becomes twisted in certain conditions of weather without any fault on the part of the shipowner at all.

Proper maintenance

Having considered the contents of numerous survey reports on the condition of hatchcovers, there can be no doubt whatsoever that maintenance lies at the heart of the problem. It is absolutely crucial for hatchcovers to be maintained at the highest standard if cargo damage is to be avoided.

To achieve this standard is less easy than to state its requirements, because the modern bulk carrier has a smaller crew for its size than the older type general cargo ship, and spends little time in port. Adequate maintenance is therefore difficult to carry out in port because of cargo being worked, or at sea because the hatches are then secured for the passage whether the vessel be fully laden or in ballast.

Working parts

The marine environment is an extremely corrosive one and every opportunity must be taken to minimise its effect, particularly in respect of the cleats which secure the pontoons. It is the shipowner's/operator's responsibility to undertake the required maintenance whatever the problems.

Rubber seals

Although routine maintenance must be carried out whenever opportunity arises, the most important factors determining the ability of the hatches to remain

weather tight are firstly the rubber seals on the under-side of the panels and secondly the compression bars with which the seals make contact when the hatches are in a closed and secured position.

The effectiveness of the rubber seals can be reduced in several ways. Accidents while the hatches are being worked and during the opening and closing of the hatches can physically deform the seals. Careless painting of channels can cause 'hard spots' on the seals locally reducing its resilience. Rust scale can form underneath the seals in an uneven thickness causing 'high spots' and resulting in non-uniform compression of the rubber. Particles of cargoes such as grain or ore can become compressed between the seals and the compression bars. Finally, though every care and attention is given to the seals, age will cause them to perish or harden with the tendency for them to crack and break. Any of the above can result in the covers leaking when under stress.

Having isolated the dangers, the remedies and the safeguards suggest themselves. Good management and careful inspection at every opportunity will help to prevent all but the last. The ageing of the rubber cannot be prevented but it can and ought to be recognised and remedied before it has progressed too far. The only remedy is the replacement of the old seals with new, and the opportunity should be taken at the time of renewal to remove all traces of rust scale from the channels before preparing them and reseating the new seals.

Any seals more than two years old ought to be inspected regularly for signs of deterioration due to ageing.

Whenever packing is to be renewed, whether because of damage or old age, it is essential that the whole strip be replaced, otherwise there will be different compression strengths between the new and existing rubber.

Compression bars

Because the compression bars along the top of the hatch coamings are solid steel, there is a tendency to assume that no harm can come to them and that they need no maintenance. But in fact sound compression bars are as necessary as sound rubbers.

The most frequent way in which these bars are damaged is by impact from cargo moving into or out of the hold. This is especially so if the ship carries cargoes of constructional steel, when each lift will be awkward to handle and probably heavy as well. A load such as this striking the compression bar can easily dent, score or bend the bar.

The bars may also become damaged over a period of time by cargo wires continually passing across the same area, with the result that the original right-angled edge of the bar becomes rounded. If little or no care is taken to combat corrosion then the top surface of the bar will in time develop 'high and low spots' which will prevent the proper seating of the rubbers.

This corrosion is particularly likely to affect the compression bars of the cross-joints. Experience has shown that close attention should be paid to the cross-joints between the panels as in many instances, leakage has occurred at these joints or at some other position as a result of these joints being defective in some way. The cross-joints must be pressed firmly and evenly together. So far as the pressure on the crossjoint is concerned, the cross-wedges, whether manually or automatically operated, are of paramount importance as on these the tightness of the joint mainly depends. If the cross-wedges do not provide an effective seal, then either the seals have become too heavily compressed and require renewal; the compression bar on the adjacent panel has become bent or worn down; or there is a combination of both these defects. The situation is often rectified by welding a small plate onto the adjacent panel edge at a position where the manual wedge end rides up and over the panels to put pressure on the cross-joint. If the wedges become strained or bent, new wedges should be fitted.

Drainholes

The coamings and covers of steel hatches have been designed so that moisture is cleared away but the general cleanliness of drainholes, waterways and coamings is important, because any accumulation of cargo residues or dirt may trap condensation and rainwater resulting in possible sweat damage to the cargo and the steady deterioration of the covers by corrosion.

Ram-nek tape

From time to time, certain additional safeguards against leakage have been conducted. The usual proposal is the covering of cross-joints with some heavy adhesive tape; one proprietary brand is 'Ram-nek'. A more recent procedure is to use an expanding foam, which when sprayed onto the joints produces a hardened barrier to water. Some charterers, especially in the steel trades require the master to apply tape to the hatchcover joints and indeed supply the tape. However the very fact that tape or foam has been used has encouraged some cargo interests in the past to allege that the ships hatches must have been known to be leaking before the voyage began! Thus alleging 'lack of due diligence to make the vessel seaworthy'.

Maintenance manuals

There are two final comments which ought to be made in this section on maintenance. Vessels fitted with steel hatchcovers should have supplied to them manuals giving detailed information relating to construction, operation and maintenance of the covers, together with lists of spare parts which can be carried onboard the vessel for remedial repairs. In addition, leading manufacturers may have representatives in major sea ports readily available both to advise and also to carry out repairs and maintenance should this be required.

It is strongly recommended that major overhauls and inspections should be carried out by manufacturers' representatives at the very least, each time the vessel dry-docks, in order that the high original standard of the covers is maintained throughout the life of the ship. It has already been emphasised that the trend is for ships to spend less time in port and for crews to be smaller now than they were when ships were generally smaller. It is therefore wholly reasonable to say that shore maintenance must be the standard with crew maintenance being used as 'remedial' as and when necessary. In this way, claims on the shipowner for damage to cargo should be reduced to a minimum.