



Chapter 1 – Preparation, Survey and Load

Under SOLAS Chapter VI, the term 'grain' covers wheat, maize (corn), oats, rye, barley, rice, pulses, seeds and processed forms thereof, whose behaviour is similar to that of grain in its natural state. For all grain cargoes, the hold must be cleaned properly prior to loading. If cargo holds are not cleaned sufficiently to prevent cargo contamination, the cargo may be damaged and there will be large financial claims. The requirements for and extent of cleaning the holds depends on:

- The previous cargo carried
- the next cargo to be carried
- the charterers' requirements
- the requirements of shippers and/or the requirements of the authorities and receivers at the load port.

Typical hold cleaning will involve sweeping the tank top before washing the hold. Washing may be conducted twice, with the first round using seawater and the second using fresh water. Alternative chemicals may be needed.

1.1 Hold Cleaning

Prior to the commencement of hold cleaning, a toolbox talk should take place, including all the personnel involved. During the talk, the hold cleaning schedule should be discussed. All equipment and chemicals that will be used should be fully explained and the safety data sheets (SDS) understood by all. The SDS should be available for consultation by the cleaning team and also displayed on the ship's notice boards.

Appropriate permits to work (PTWs), including an enclosed space entry permit, should be completed prior to entry. For operations that take several days, permits should be created on a daily basis, as this will help reduce the risk of accidents.

Safety routines should be established and the wearing of suitable personal protective equipment (PPE) throughout the hold cleaning is essential. Mandatory PPE should include oilskins, safety shoes/safety sea boots, eye protection, hand protection and safety helmets complete with a chin strap. High visibility jackets/waistcoats will help ensure the visibility of the cleaning team in the hold.

Prior to high-pressure hold washing, excess cargo residue on the tank top should be removed by hand sweeping and lifted out of the holds using a portable de-mucking winch.

Regardless of the nature of the previous cargo, all holds should then be thoroughly cleaned by sweeping, scraping and high-pressure seawater washing to remove all previous cargo residues and any loose scale or paint. Particular attention should be paid to anything that may be trapped behind beams, ledges, pipe guards or other fittings in the holds. The seawater washing should be carried out using a high-pressure hold cleaning gun, supplemented by the deck air line to provide increased pressure. This is the most commonly used method of hold cleaning and the hold cleaning gun normally requires two seafarers to safely control the increased water pressure.



Figure 1.1: Crew member operating a cleaning gun within a cargo hold.



Figure 1.2: Hold cleaning equipment in the stowed position above the deck. Note the flange on the deck wash line.

Some ships are fitted with fixed hold cleaning equipment, normally fitted under the hatch covers. This method of hold cleaning is less labour intensive. A flexible high-pressure hose is connected between a flange on the hatch cover and the deck high-pressure hold washing line.



Figure 1.3: Fixed hold cleaning gun under hatch covers and fixed hold cleaning connection on deck.

Other ships have permanent high-pressure hold cleaning equipment that can be lowered through a flange on the main deck, turned 90 degrees and bolted to the high-pressure deck wash service line.

All cargo residues washed down must be removed via the hold eductors or de-mucking winch. Special attention should be paid to cargo residues:

- Wedged behind pipe brackets
- around hold ladders, under-deck girders and transversals
- at the ventilators to ensure that remnants have been removed
- in hold bilges and recessed hatboxes.

After cleaning and removal, bilge suction must be tested both before and after washing and the results entered in the cargo notebook and/or deck logbook.

Chemical wash

One of the most difficult hold cleaning tasks is the preparation of a ship for grain cargo after discharging a dirty or dusty cargo such as coal or iron ore, particularly if it has left 'oily' stains on the paintwork or other deposits stubbornly adhering to the steel surfaces. Greasy deposits that remain on the bulkheads will require a degreasing chemical wash and a fresh water rinse in order to pass a grain inspection. The degreasing chemical should be environmentally acceptable for marine use and safe for application by the crew. If special training or PPE is required, this must be planned for. Product SDS of any cleaning or degreasing chemical used should be read, understood and followed by all persons involved with the cleaning process.

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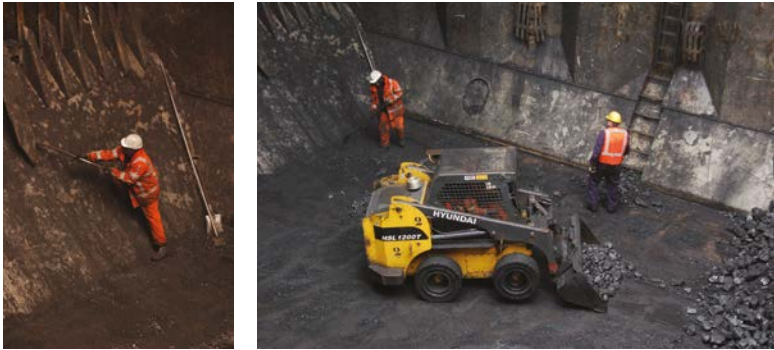


Figure 1.4: Coal residue in cargo holds.

To remove any greasy deposits from the hold steelwork, all holds should be high-pressure chemical washed using the hold cleaning gun and air line booster.

Numerous degreasing chemicals are available and they work quite effectively when directly injected into the fire main via the general service pump strainer cover. Manufacturer's instructions must always be followed, PPE worn and all safety instructions followed.

A typical 100,000 dwt bulker will require around 100 litres per hold, or 25 litres of degreasing chemical on each bulkhead.

To avoid the use of long lengths of hose to deliver chemicals, the chemical station should be situated as close as possible to the injection point of the fire and general service (GS) pump. The easiest way to control the rate of chemical flow is by fitting a temporary small hand-operated valve on top of the strainer cover.

An alternative method is to use an eductor system to pump the chemical directly from the drum into the discharge nozzle. The quantity of chemical introduced is controlled by the operator lifting the nozzle clear of the drum. However, this method of educting the chemical from the drum into the discharge nozzle is time consuming, awkward for the operator and restricts their movement around the hold. In addition, it carries a greater risk of an accident, or spillage of degreasing chemical, because the chemical drums have to be lowered into each hold.

A degreasing chemical injection station may consist of:

- A transparent container of 120-litre capacity, graduated in 10-litre units
- a 5 m length of transparent reinforced hose, one end fitted with a 40 cm long steel uptake branch pipe and the other end open. The branch pipe is inserted into the chemical container and the open end of the transparent reinforced pipe is connected to the hand valve on the pump strainer cover using two pipe clamps. The small hand valve on the strainer cover may be used to control the flow of chemical into the fire pump.

Prior to starting the high-pressure seawater chemical wash, all fire hydrants and anchor wash hydrants on deck should be checked to confirm they are fully closed. The hydrant serving the hold cleaning gun should be opened and the fire and GS pump started.

To avoid unnecessary chemical waste, predetermined times of injecting the chemical into the fire main should be agreed between the hold cleaning party and the person controlling the rate of chemical injection. As an example, on a 100,000 dwt bulker, it takes approximately 20 minutes to complete a chemical wash in each hold, after which the chemical should be washed off using high-pressure salt water.

At the same time as the chemical wash, the hold should be hand scraped with sharp long-handled steel scrapers. All loose scale and flaking paint must be removed.

Fresh water rinse and general hold preparation

The final stage of hold washing is the fresh water rinse. Whenever salt water washing is used to clean hatches, the relevant holds should always be rinsed with fresh water to minimise the effects of corrosion and to prevent salt contamination of future cargoes.

Arrangements should be made, in good time, to ensure sufficient fresh water is available on board. A ship preparing for a grain cargo will usually carry additional fresh water, often in the after-peak tank, which can be pumped into the fire main via a GS pump. As an example, a typical 100,000 dwt bulk carrier will require around 30 T of fresh water per hold.

Before undertaking a fresh water rinse, the supply line (normally the deck fire main or similar) will need to be flushed through to remove all residual salt water. Therefore, fresh water rinsing of the holds is generally left until the end of hold cleaning operations to minimise the amount of fresh water required. If a GS pump is used, the flushing through typically takes a few minutes. Once the fire main is clear of salt, all deck fire hydrants and anchor washers should be inspected and confirmed as closed.

If a GS pump is to be used for the hold rinse, to prevent possible pump damage a return line into the fresh water tank should be set up using a hose connected from the fire main into the after-peak vent.

On completion of the hold fresh water rinse, all hatch entrances, hatch trunkings and ladders should be hand washed and fresh water rinsed using the fresh water high-pressure gun. It is not advisable to rinse and clean the access ladders and hatches before washing the main hold, because splashing from the hold bulkheads will often contaminate the freshly washed ladders. Bulkheads either side of all the ladders should be hand cleaned and jet washed, as far as can be safely reached, using long-handled Turk's head brushes. Note that Turk's head brushes are a type of cleaning brush where the bristles are arranged to prevent the end of the brush from coming into contact with the surface being cleaned.

Safety body harnesses should always be used when working at height in the tank. If required, a bosun's chair or other approved access arrangement should be used when undertaking this task. A risk assessment must be carried out for any working at height activity.



Figure 1.5: Holds drying after washing.

When it is safe to open the hatches, all the hatch coamings should be hand washed using long-handled Turk's head brushes and jet washed with fresh water using a high-pressure fresh water gun. With the hatch covers open, binoculars should be used to inspect the holds for any cargo remains.

To prevent possible condensation in the hold, all recessed hold eductors (if fitted) must be drained of any water residue and be cleaned, dry and odourless. There is usually a small stainless steel drain plug on the underside of the eductor that can be temporarily removed to allow the eductor water to drain into the bilge area. When the eductor is empty, the drain plug must be replaced and secured. The eductor hold plate must be secured with all the securing bolts. Duct tape should be used to cover both the securing bolts and the recessed lid handles.

Hold bilges should be completely dried out, odourless and in a fully operating condition.

The tank top must be completely dry and any indentations on the tank top must be wiped dry. The hold should be made completely odourless by maximising hold ventilation. Two layers of clean hessian cloth should be fitted to the bilge strainer plate to further restrict cargo particles entering the bilge area. Duct tape is used to cover the small gap between the bilge strainer and the tank top. The hold hydrant area, if fitted, should be cleaned and dried out and the steel cover refitted and secured in place with all its bolts/screws.

To avoid taint problems, fresh paint should not be applied within the holds or under the hatch covers at any time during the hold preparation, unless there is sufficient time for the paint to cure and be free of odour as per the manufacturer's instructions. This is because most marine coatings require at least seven days for the paint to be fully cured and odour free. All paint used in the holds or on the underside of the hatch covers should be certified grain compatible and a certificate confirming this should be available on board.

Freshly painted hatches/covers will normally result in instant failure during the grain inspection. The paint must have been given time to cure.

Processed grains, or grain cargoes that are highly susceptible to discolouration and taint, should only be stowed in holds where the paint covering is intact. It is important that there is no bare steel, rust, scale or rust staining in the hold.

To prevent cargo debris from the main deck being walked into the accommodation or brought into freshly washed cargo holds, the main decks and accommodation block should be washed down as soon as possible after clearing the discharge port.

Always be mindful of potential pollution from the cargo remains. As such, all cargo residue and washings must be removed in accordance with applicable regulations.



Figure 1.6: Ship's main deck covered in previous cargo.

1.1.1 Ballast Hold

If the ship has a ballast hold that has been used to transport cargo, this should be discharged as early as possible in the discharge sequence to allow the ship's personnel time to remove all cargo debris and prepare the hold for ballasting.

A good working relationship with the stevedores may allow the removal of cargo remains from the ballast holds by use of the shore crane or other cargo-handling facilities.

The bilges and strums of the ballast hold should be thoroughly cleaned and all traces of previous cargo removed. The bilge suction should be tested and confirmed as clear prior to any washing out of the cargo holds, and the bilge spaces should be pumped out and secured with the ballast line blanks.

To prevent ballast water ingress into the bilge area, it is essential that the rubber joint/gasket is in good condition and that all the ballast blank securing bolts are fitted tightly.

1.1.2 Hatch Covers

All the hatch trackways should be swept clean and then carefully hosed down. Compressed air guns should be used with caution and suitable PPE should be worn to ensure both face and body protection.



Figure 1.7: Hatch undersides and rubber packing.

All hatch corner drains, including the non-return valves, should be checked and confirmed as clean and clear. The blanking caps on the hatch corner drains, which are used to ensure hold airtightness, should be attached by a chain to the drain. Blanking caps or plugs are provided where drains do not have an approved automatic means of preventing water ingress into the hold.



Figure 1.8: Hatch drain with cap attached by small chain.

All inner hatch coamings should be washed and then rinsed using a fresh water high-pressure gun. If time permits, it is usually more convenient to wash this area in port where it is sheltered, rather than at sea. If it is permitted by the Port Authority, all hatch tops should be dock water washed, ensuring that cargo remains are retained on board and not washed into the dock. The fitting of plugs to all deck scuppers should help prevent any pollution incidents and claims alongside.



Figure 1.9: Scupper plug fitted.

It is essential that hatch top and deck washing is only carried out with Port Authority permission.



Figure 1.10: In ports where helicopters are used for pilot transfer, it is a normal requirement of the port to wash down the helicopter area and at least one hatch length either side of the helicopter area (ensuring that cargo debris is not washed into the dock).

To prevent cargo claims due to water ingress, all hatch seals (both longitudinal and transverse), hold access lids and seals around the hatch sides should be chalk marked and water tested using deck wash hoses. For more detail on these procedures, see Chapter 55.

A more accurate method of testing a hatch for leakage is to use ultrasonic equipment. However, this is usually carried out by shore personnel who are trained in the use of this equipment.



Figure 1.11: Hose testing and a typical hose test.



Figure 1.12: Ultrasonic hatch testing for leaks.

Faulty or suspect sections of hatch rubber should be replaced in their entirety. Localised replacement or 'building up' of hatch rubbers using sealing tape is discouraged.



Figure 1.13: Poor practice: use of hatch tape to build up a cross joint is discouraged.

1.1.3 Grain Cleaning Checklists

'Grain clean' is by far the most common standard of cleanliness used in the transport of bulk and break bulk cargoes. While exact requirements may vary between regions, the US National Cargo Bureau suggests that, for a hold to be certified 'grain clean' and so fit for loading a cargo such as soya beans, it should be free of:

- Stains and residues of the previous cargo
- loose rust scale and paint scale
- any other contaminants
- insect infestation
- odours
- moisture.

Grain cleaning 'operational' checklist

As soon as the ship starts cleaning preparations, the Master should make regular daily reports of hatch cleaning progress to the operator.

Prior to commencing the grain clean, the Master and crew should check and confirm the following:

- If the previous cargo is likely to cause problems during the cleaning voyage, the Master must advise the operator well in advance so that sufficient cleaning time, manpower and materials can be planned. A lack of communication between ship and shore may result in difficulties for the ship and costly off-hire time for the operator
- if the after-peak tank is to be used for the carriage of additional fresh water, ensure that the after-peak tank can be discharged via the deck service line. If the after-peak tank is filled with fresh water, ensure the ship can still maintain the minimum bow height as per classification rules (details are given in the ship stability book)
- the ship has a fully operational de-mucking winch

- all bilge sounding pipes and temperature pipes (if fitted) are clear with no old sounding rods or any obstructions or blockages
- all sounding pipes have a fully operational screw thread and the gasket is in good condition, ie the sounding cap can be screwed down tightly to prevent water ingress
- the ship has no ballast tank leaks
- the ship's ballast pumps, eductor(s) and GS pumps are working correctly. Advise the operator if there are any problems
- where applicable, the ship has a 'grain certified' paint certificate for inside the holds and hatches
- all hatch corner drains and non-return valves are working correctly and are complete
- all hold ladders on forward and aft bulkheads are in good condition to allow safe access for all personnel
- all hold bilge plates have all the securing bolts fitted and the ship's approved ballast holds have the ballast line blanks in place. This is often a spectacle piece that can be rotated on deck
- all ballast line hold cover plates have all bolts fitted and all are in good condition
- all hatch access lids can have a hatch seal or padlock fitted after loading to prevent unauthorised entry into an oxygen-depleted area
- the ship is free of infestation. This includes all the storerooms, which are also liable to be inspected by grain inspectors
- approved grain stability books are on board and the pre-calculated load conditions (using appropriate grain shift moments) have been completed. In some ports, these calculations have to be approved by the local authorities
- a hold cleaning schedule using realistic times has been prepared.

Order of events	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
(In port) Hatch undersides	X	X					
Wash down decks		X					
HP salt water wash holds		X	X				
Chemical wash holds, scrape and SW rinse				X			
FW rinse and hold preparation					X		
Clean hatch cover undersides					X		
Check holds and hatch water-tightness					X	X	

Table 1.1: An example of a simplified schedule. Note that this schedule assumes that the vessel's previous cargo was coal or iron ore. If the vessel's previous cargo was grain, the chemical wash may not be required, but the holds should still be hand scraped to remove any loose scale and paint.

Grain cleaning equipment list

A typical equipment list should include:

- A fully working high-pressure hold cleaning gun, complete with sufficient deck wash down hoses and air lines, all in good condition

Fire hoses must not be used as wash down hoses as they are part of the ship's safety equipment.

- a fully operational salvage pump and approved spares
- sufficient fresh water to complete a high-pressure fresh water rinse of all the holds

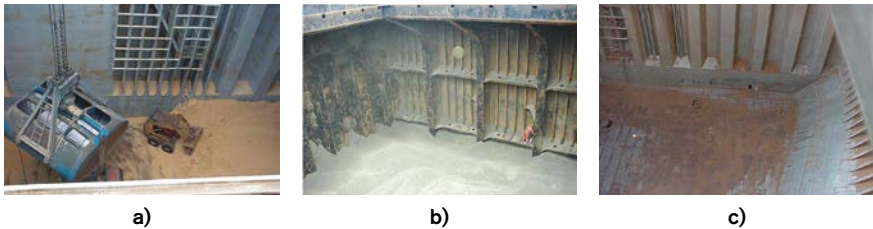
It will be more cost effective to over-supply fresh water for hold cleaning than for the ship to run out during hold cleaning. (A typical 100,000 dwt bulker requires around 30 T per hold.)

- 1 × portable pressurised fresh water gun, complete with extended handle and 30 m of pressurised hose
- 6 × long-handled steel scrapers, c/w handles
- 3 × lightweight, strong, aluminium extension poles with capability to extend to approximately 5 m
- 6 × long-handled rubber squeegees complete with 1 m rubber blades
- 10 × heavy-duty bass brooms, c/w handles, suitable for hold cleaning
- 6 × corn brooms, c/w with handles
- 6 × heavy-duty mops, c/w handles
- 6 × spare mop heads suitable for above
- 4 × galvanised, roller wringer mop buckets
- 6 × Turk's head brushes, round head 4 inch, c/w handles
- 6 × small 6 inch wide, hand shovels, steel, suitable for digging out hold bilges
- 3 × 25 m length, lint-free soogee cloth, width approx 30 cm
- 1 × 50 m length burlap, 1 m wide
- 10 × rolls of 50 m length, 10 cm wide, grey, industrial-strength duct tape
- 6 × 20 m length, 'yellow' wash down hoses, duraline, 45 mm diameter, c/w couplings suitable for ship's fire main
- 4 × plastic jet nozzles, suitable for use with hoses
- 4 × 50 m lengths, transparent plastic, reinforced garden hose, c/w male and female plastic couplings to join each section
- 2 × universal tap connectors for use with reinforced transparent plastic garden hose
- sufficient hatch sealing tape to comply with operator's instructions
- 4 × 500 watt, portable lightweight halogen lights to illuminate hatches during cleaning, each lamp to be complete with 50 m of cable and a fitted waterproof plug
- 10 × spare halogen bulbs for above

- 2 × 50 m extension cables each c/w 3 waterproof outlet sockets and a waterproof plug
- 5 × 20 litre drums of concentrated cleaning product
- sufficient drums of degreasing chemical wash suitable for use with seawater.

1.2 Surveys and Inspections

Prior to loading grain, ships are usually subject to a survey by an approved independent surveyor. The surveyor will require the vessel's particulars and details of (at least) the last three cargoes carried. They will inspect the holds for cleanliness and infestation, or the presence of any material that could lead to infestation.



**Figure 1.14: a) Discharging soya meal.
b) Tapioca cargo sticking.
c) Cargo hold after discharging minerals.**

When the surveyor is satisfied with the condition of the hold, the ship will be issued with a certificate that states which holds are fit to load grain.

1.2.1 Inspection Failures



Figure 1.15: Tank showing previous cargo residue.

It is important that the Master and officers are fully aware of the level of cleanliness required for the next cargo to be loaded. A review of Figure 1.15, showing a ship that failed a grain survey, would suggest that:

- The ship's crew completed a very quick salt water wash
- no chemical wash was undertaken
- no hard scraping of the bulkheads was completed
- previous hold cleaning had not been supervised.

Examination of the stiffeners reveals:

- Staining from the previous cargo (coal)
- cargo dust residues
- deposits of previous cargoes in hard to reach places
- flaking paint and scale.

For loss prevention, it is important that:

- Records of cleaning are kept up to date
- photographs are taken as a record of cleaning
- cargo information is recorded and reported accurately
- cargo is observed throughout the loading operation
- cargo is determined as either on or off spec as soon as possible
- any off spec or tainted cargo is segregated
- in the event of contamination, samples and evidence are collected and labelled appropriately.

1.3 Pre-loading

1.3.1 Fumigation

Depending on the quality of the grain to be carried, the charterer may also require the holds to be fumigated. This may be accomplished on passage using fumigant tablets in protective sachets that are introduced into the cargo on completion of loading. It may also be undertaken at the load port (or occasionally at discharge).

The ship will normally be advised of how the fumigation is to be carried out and of any special precautions that will have to be taken. In all cases, the preparations (such as inspecting the holds and hatch covers for gastight integrity) and fumigation must be carried out in accordance with the IMO publication *Recommendations on the Safe Use of Pesticides in Ships* (Reference 1). Most flag and port States also set their own laws and regulations related to fumigation and pesticide use, which must be complied with. Gas detectors and proper PPE must be available and relevant crew should receive appropriate training in their use.

After introduction of the fumigant, an appropriate period should be allowed (normally 12 hours) for the gas to build up sufficient pressure to enable any leaks to be detected. The vessel must not depart from port before this period has expired. For fumigation in port, typically the crew are disembarked until the fumigation is complete.

The entire process should be certified by a qualified fumigator. It is important that the correct dosage of fumigant is used for the cargo/holds. The holds must not be ventilated until the minimum fumigation period has expired and care must be taken to ensure that subsequent ventilation does not endanger any personnel.

1.3.2 Grain Inspection

Prior to the grain inspection, all hatches and access lids must be opened and safely secured with all locking pins/bars. All hatches should be checked for loose scale or flaking paint. There will usually be a little scale on the tank top, which can quickly be removed. If weather conditions permit during the day, the holds should be opened to allow fresh air to assist the hold drying process. Any small pools of water should be mopped dry. All hatch rubbers and centreline seals should be wiped over with a clean dry rag to confirm their cleanliness.

Prior to the inspection, the ship's personnel should lower an aluminium ladder into the first hold, together with a small number of clean brooms, scrapers, a dustpan and brush, a clean bucket and a few clean white rags. If possible, the second hold to be inspected should also be equipped with similar items.



Figure 1.16: Hold ready to load wheat.

The first team to enter the open hold should include the grain inspector and a deck officer.

Grain inspectors should always be escorted by a deck officer when inspecting the hatches.

A second team, consisting of a deck officer and some crew members, should be standing by at the top of the hatch being inspected. The second team should have available additional clean brooms, clean mops, scrapers, buckets, clean heaving lines and clean white rags.

The engineers should be on standby to test the bilges (dry sucking only). Radio contact is essential between all three teams to prevent lengthy delays. Any personnel entering the holds should have clean safety shoes or clean safety sea boots and overshoe covers. It is essential that any debris on the main deck is not walked into the clean holds. If the inspector finds a fault with a hold, it should be identified and recorded and remedial action agreed. If possible, the fault should be rectified immediately and, preferably, before the inspector leaves the ship. If this is not possible, a time should be agreed for re-inspection.

1.4 Loading Grain

The primary sources of reference for the safe loading and carriage of bulk grain cargo are the *International Maritime Solid Bulk Cargoes Code* (IMSBC Code, Reference 17) and the *International Code for the Safe Carriage of Grain in Bulk* (International Grain Code, Reference 3). The International Grain Code sets out specific requirements for the ship to comply with for loading grain. These must be incorporated into the grain loading manual along with a Document of Authorization. The manual contains stability information to allow the Master to safely load grain cargo in accordance with the Code. The ship's loading plan should consider the grain loading stability data for loading, the voyage and discharge. Risk factors that should also be considered include:

- Angles of repose and trimming. All necessary and reasonable trimming should be performed to level all free grain surfaces and to minimise the effect of grain shifting
- stowage factor for particular grains to enable accurate loading
- temperature and moisture. Typically 20°C is considered a favourable temperature for the carriage of grain but the exact requirements will be specified by the charterer
- damage from heat. In some instances, cargo may be damaged by adjacent heated fuel oil tanks
- ventilation/cargo sweat/ship's sweat. Further information on this subject can be found in Chapter 2.

Once loading commences, hatches not in use for loading should be kept closed. All holds, after passing the grain inspection and prior to loading, must be inspected on a daily basis to ensure that they are still completely dry. During loading, it is important to keep the grain cargo dry. If the grain is allowed to become wet, substantial cargo claims may result. Regular visual checks by the ship's personnel throughout the loading should ensure that the grain being loaded is not in a wet condition. These inspections should be recorded in the deck logbook.

During periods of heavy rain precipitation, cargo operations are generally suspended to avoid water damage to cargoes. However, care must be taken by the Master to ensure compliance with charterers' requirements, shipowners' advice and the requirements of the port/terminal. Typically, surveyors attend ships and assist the Master with the loading of grain cargoes during periods of inclement weather. As a general guideline, it is suggested that if grain dust can be seen emanating from the cargo hold during loading in light precipitation, then loading may be continued. As soon as the precipitation is hard enough and sufficient to knock the grain dust down, it is suggested that the Master may want to cease loading as the precipitation is now affecting the cargo. This means that some moisture may be reaching the cargo whilst the hatch covers are closed.

During loading, the inspector should periodically inspect the cargo being loaded and take samples to check for insects, moisture content and odours.

Holds containing grain cargo may be oxygen depleted and, therefore, must not be entered without an appropriate risk assessment, a valid permit to work and adherence to enclosed space entry procedures.

In the event that damaged cargo is discovered, the Master and Members should inform their P&I Club as soon as possible in order to appoint a local surveyor to assess the location, depth and (if possible) extent of the damage. It is often the case that the location of any damage may indicate the cause. Detailed photographs, and even drawings, of the damage location would be useful. In the event that a local surveyor cannot attend immediately, it would assist if the Master/crew photograph and document the damage clearly.



Figure 1.17: Loading grain.

Some importers require grain to be stained with a unique colour if it is being imported for animal consumption. This dyeing process is usually undertaken at the load port and is performed by mixing dyeing agent in water and then spraying the mixture onto the incoming cargo. On completion of loading, the full upper layer of grain is also sprayed with the dyeing agent.

During the loading of grain, dust clouds often develop. These are a health hazard and additional safety precautions, such as the wearing of protective goggles and dust masks, should be observed by all personnel in the vicinity of the dust cloud.



Figure 1.18: Grain dust cloud.



Figure 1.19: Loading barley.

If the Master is in any doubt about the condition of the grain during the load, they must issue a note of protest and seek advice from their operators and/or the applicable P&I Club.

1.4.1 The Separation of Products in the Holds of Bulk Carriers

There is a considerable trade in the bulk carriage of relatively small quantities of cereals, oil seeds and their derivatives, with a number of such similar products shipped simultaneously on board bulk carriers. It is not uncommon for three or more consignments to be stowed in the same hold using separation material to avoid admixtures. However, incidents have arisen where, despite the use of separation cloths, admixtures have occurred and claims have been made by cargo interests.

In addition to separation of different grades, particularly with slack holds (part filled with grain), it is necessary to have the trimmed layer secured to prevent cargo shifting. In such cases, separation principles and/or overstowage with bagged grain are options.

The steps necessary to avoid any risk of admixture are not complicated, but ships' officers should be aware of them when responsible for the stowage of multiple consignments.

The following measures may be taken:

- Where it is intended to overstow one bulk parcel with another, the lower parcel should be trimmed as flat as possible. If the surface is left uneven, there is a risk that the separation material may be damaged, either as a result of uneven stresses during the sea passage or as a result of contact with the grab or elevator legs and bulldozers. Provided this procedure is followed, a single layer of separation material of good quality is considered adequate. Recommended materials include woven polypropylene, polythene sheets or burlap
- during loading operations, it is essential that the distance between the separation material and either the top of the weather deck hatch coamings or the deckhead of the hold is measured and recorded. This makes it possible to effectively locate the separations between the parcels during discharge and avoid tearing or damaging the separation material
- loading second and third parcels may entail pouring cargo from a considerable height. As a result, the surface of the lower stow inevitably becomes depressed, as shown in Figures 1.20 and 1.21. Because of the need to ensure a relatively even surface between any two parcels, it may be wise to plan the stowage so that commodities with a high angle of repose, such as cereals and oil seed derivatives, are loaded below those with a low angle of repose, such as canary seed or linseed

Siting the separation material at a level between the slant plating of the upper and lower hopper tanks will eliminate any difficulties caused by cargo settlement.

- ideally, the level of the separation between any two parcels should not be located in the vicinity of the upper ballast tank hoppers. This will ensure that, when the inevitable settling of the cargo occurs during the course of the voyage, the surface area of the separation material will remain adequate and prevent admixture. This problem does not arise in the vicinity of the lower hopper tanks.

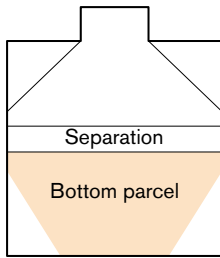


Figure 1.20: Cross-section – situation prior to loading top parcel.

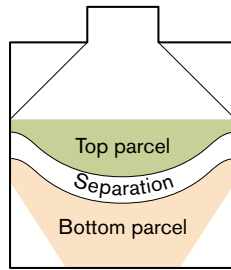


Figure 1.21: Cross-section – situation shortly after commencement of loading top parcel.

1.4.2 Completion of a Hatch

All holds to be loaded must be filled completely. It is essential that the loading spout, or other mechanism, is directed to all corners to avoid any void spaces. The grain should be allowed time to settle and then any spaces (such as hatch corners) refilled.

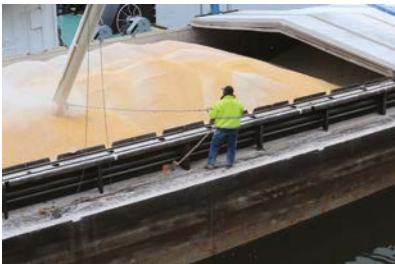


Figure 1.22: Complete filling of grain cargo.



Figure 1.23: Loading grain to all corners.

When the loading of a hold has been completed, the trackways, hatch drains and channel bars must be swept clean and the hatch closed. Water must not be used to wash down hatch trackways. Dry compressed air used under controlled conditions is very useful for cleaning the hatch area. Ventilators should be tightly secured.



Figure 1.24: Hatch vent to secure.

If the voyage instructions require hatch sealing tape to be used, as an additional precaution to prevent water ingress, then the hatch surfaces must be completely clean before the sealing tape is applied. In cold climates, some brands of tape will adhere better if warmed in the engine room before they are applied. Foam compound should not be used to ensure hatch watertight integrity.



Figure 1.25: Do not use foam to seal hatches.



Figure 1.26: Security seal in place.

To prevent unauthorised access to the grain holds, which may be oxygen deficient or undergoing fumigation, all hold access lids should either be padlocked or have steel security seals fitted.

1.5 Loaded Voyage

Regular checks of all hatch sealing tape (if used) should be completed and any damaged or lifting tape immediately replaced. During the voyage, entry into any cargo space must be strictly prohibited.

Ventilation during the voyage will depend on weather conditions and a comparison between the dew point of the air inside the hold and outside the hold. Under no circumstances should hold ventilation be permitted during adverse weather conditions or before fumigation in transit has been completed.

In good weather, basic cargo ventilation rules should be observed. Generally, the primary purpose of ventilating grain cargoes is to keep moisture to a minimum within the cargo hold by replacing moist air with drier air. Care should be taken to avoid both cargo and ship's sweat during the voyage. Further guidance may be obtained from Chapter 2, as well as from the publication *Bulk Carrier Practice: A Practical Guide* (Reference 2).

It is important that the ship maintains accurate ventilation records throughout the voyage. Details of periods when ventilation was carried out and times when ventilation was not possible should be recorded.

If the ship has any oil tanks adjacent to or under the cargo holds, any steam heating to these tanks should be minimised, but in any case carefully monitored to prevent cargo heating and possible cargo damage. Additionally, some cargoes may have a risk of self-heating so the temperature of the cargo should be monitored regularly. Full records should be maintained.

1.6 Cleaning Alongside After Discharge of Grain



Figure 1.27: Hatch cover underside and clean hatch rubber.

The first consideration before beginning cleaning operations is whether it is safe to enter the space. A test of the atmosphere and a risk assessment should be carried out.

On non-working hatches, remove all cargo remnants, loose scale and flaking paint from the underside of the hatch covers and from all steelwork within the hold. Then commence washing the underside of the hatch covers using a liquid soap, followed by a thorough fresh water rinse with a high-pressure water gun.



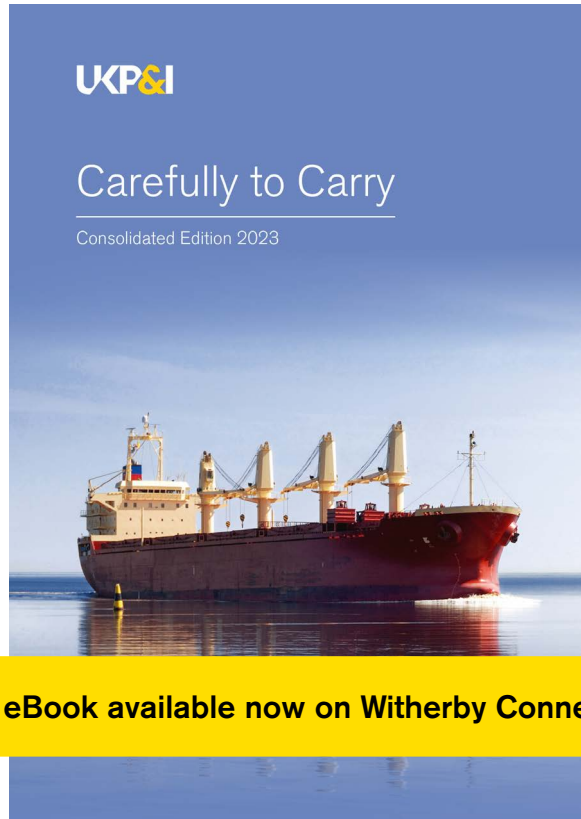
Figure 1.28: Hold suction arrangement and filter.

The hatch rubber seals should be washed to remove cargo grime, although the water gun should be used with caution to ensure that the hatch rubber seals are not damaged by the high pressure.

After washing, and depending on weather conditions, cargo dust may still lightly contaminate the underside of the hatch covers. However, these dust particles can easily be removed at a later stage using a high-pressure portable fresh water gun.



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