LOSS PREVENTION Briefing

NORTH SERVICE, STRENGTH, QUALITY

LOSS PREVENTION BRIEFING FOR NORTH MEMBERS CARGO / JUNE 2018

Carriage of Steel Cargoes

Contents

Introduction

From the construction industry to the automotive and the defence industries, steel is one of the most commonly used products in the world today. The U.S. Department of Commerce reported that in 2016, over 401 million tonnes of steel was exported from the top 20 steel exporting countries.

Source: U.S Department of Commerce

Problems can arise when transporting steel cargoes by sea. For a carrier, one of the biggest issues lies in its condition before loading. If the pre-shipment condition of the cargo is not properly recorded at the time of loading, this can lead to the cargo owner successfully bringing a claim that his cargo was damaged whilst on board the vessel.

Most problems can be avoided if the carrying vessel's crew carefully checks and records the pre-shipment condition of the cargo, and follows best practice on cargo handling, stowage and securing.

Carriage of steel cargoes

Issues with the carriage of steel

There are many potential issues that can arise when handling and transporting of steel cargoes. We will look at some of the more commonly found issues.

Pre-shipment condition

It is the duty of the carrier (usually the shipowner) to deliver the cargo in the same condition that it was loaded. If it isn't, the carrier may face a claim for any damage noted upon discharge.

It is not uncommon for steel cargoes to be damaged prior to loading on to the vessel. If the cargo is exposed to adverse environmental conditions or subject to poor handling, this can lead to rusting or mechanical damage before shipment.

It is therefore very important that the Master ascertains that the condition of the cargo prior to loading and that the description of the cargo is accurately reflected in the bill of lading.

If the cargo is found damaged (mechanically damaged or rusted) before shipment, this damage should be carefully noted at the time on both the mate's receipt and the bill of lading.

A rusted steel coil pre-shipment

Mechanical damage whilst handling

Incorrect handling of the cargo whilst it is being loaded can lead to mechanical damage. Poor slinging, the use of incorrect lifting gear and rough handling with fork lifts can all lead to serious product damage and result in rejection of the cargo by the receiver.

Poor handling can lead to steel damage.

The vessel's crew should monitor closely the handling of the cargo and record any damage before it is accepted on board.

Wetting damage in the hold

The cargo can be affected by the conditions within the vessel's cargo holds. For example, if the vessel's cargo hatches are not weathertight, seawater and/or rain water may enter the holds and come into contact with the cargo, leading to rusting.

Wetting through ship sweat and cargo sweat whilst on passage must be avoided. The most effective means is through proper ventilation of the hold. By monitoring and recording the dew points of the air within the cargo hold and the ambient air, correct and effective ventilation can be maintained.

For more information on ventilation Members can download North's loss prevention guide: 'Cargo Ventilation' in the Members' Area of the North website.

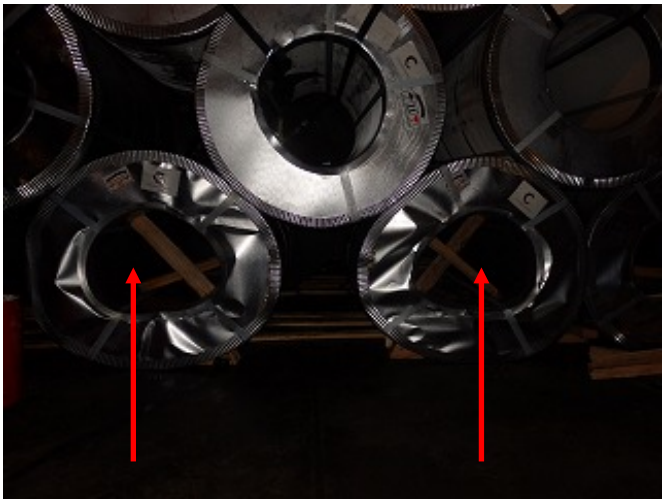
Carriage of steel cargoes

Rusted cargo of coils in a ships hold

Mechanical damage on voyage

Incorrect stowage on board, such as using unsuitable dunnage or poor standards of cargo stowage and securing can lead to cargo movement or shifting whilst on passage.

One of the primary reasons is overloading. A common scenario concerns too many tiers of steel coils which lead to ovalisation of the lower tiers. As well as potential cargo damage, there is also a risk of hull damage should a steel cargo shift on passage, or of damage to the tank top from overloading.



An example of coil ovalisation

Steel types and finishes

North recognises three main categories of steel cargoes; finished, semi-finished and unfinished. They are differentiated by:

- Finished products are wrapped for carriage and will not undergo any further processing
- Semi-finished products are unwrapped and may be subject to further processing.
- Unfinished products (usually also unwrapped) will be subject to further extensive re-processing and may even be melted again to create finished products in smelters at the port of discharge.

Finished or semi-finished products are usually intended for immediate use in manufacturing. For example, a cold rolled coil intended for a car manufacturing plant can be unrolled upon arrival at its destination then cut and moulded to make car doors.

The sensitive and often high-value nature of finished and semi-finished steel cargoes presents an enhanced risk of damage claims. Therefore, North offers to cover the costs of a steel pre-load survey for Members prior to carrying finished or semi-finished products.

Appendix 1 lists some of the more commonly found steel cargoes, their finish and pre-load survey requirements.

Steel pre-load surveys

Due to the risks concerning the condition, handling and carriage of steel cargoes, it is important to ensure that all reasonable steps are taken to ensure the bill of lading accurately reflects the condition of the cargo.

To assist Members, North places great importance on the appointment of a suitably experienced surveyor to conduct a steel pre-load survey for finished and semi-finished products.

Carriage of steel cargoes

Cold rolled coils in storage prior to loading.

Appointing a surveyor

The appointment of a suitably experienced surveyor is vital in reducing the potential for claims arising from pre-shipment damage.

A surveyor can offer valuable assistance to the Master in conducting a pre-load inspection of the steel product to make sure its condition is suitable for shipment. A suitably experienced surveyor will understand the importance of finding visible damage and rusting. They will also be able to advise the Master on the correct clausing to describe the condition of the cargo on the mate's receipt and bill of lading.

The surveyor will most likely need a minimum of a full working day in which to mobilise and commence the pre-load condition checks of the cargo in its entirety. Therefore, allow ample time to appoint a surveyor.

It is important that the surveyor is given clear instructions on their appointment. This includes the requirement to:

- Check the condition of the steel prior to shipment
- Assist the Master with clausing the mate's receipt and bill of lading correctly
- Independently verify the condition and weathertightness of the ship's hatch covers
- Issue a full and detailed report after loading and testing is completed

The surveyor's checks should include the following:

- The storage facilities that the steel has been kept
- Description on how the steel was transported to the facility
- Checking for mechanical damage; such as damage sustained from forklifts or slings.
- Checking for wetting and rusting damage and identifying its source; e.g. testing for the presence of chlorides to determine it is fresh water or otherwise
- Check the packaging on any finished or semi-finished products is undamaged and suitable

Hatch testing

To avoid allegations of water damage through ingress into the hold, and to show evidence of exercising due diligence to ensure the vessel's seaworthiness, it is recommended that the attending surveyor inspects and tests the cargo hold hatches to ensure they are weather tight. The two most common methods are hose testing, or ultrasonic testing.

Ultrasonic testing

An ultrasound transmitter is placed in the hold while a hand-held detector on the weather deck is moved around the joint areas of closed openings. The strength of the received signal, measured in decibels, determines whether or not the joint is weathertight.

Advantages:

- Can be used at any stage of loading
- Low risk of damaging cargo
- Gives an accurate indication of weather tightness and areas where there is a lack of compression
- Can be used in sub-zero temperatures
- Can be used in wet weather
- Only requires one surveyor to carry out the test

Disadvantages:

- Equipment may be expensive
- Proper training of users is required
- Requires periodic calibration

Ultrasonic hatch cover testing

Carriage of steel cargoes

Hose testing

A high pressure jet of water is directly applied to the joints of closed hatch cover panels from the weather deck. Any leakage into the cargo hold is observed. Classification society rules specify that the pressure of the water jet should be at least 0.2 N/mm2 and that the hose should be no more than 1.5 m from the joint under test. In the case of recessed joints which cannot be jetted directly, it is recommended that the recess drain holes at the ends of transverse guttering's be temporarily plugged during testing to allow a head of water to build up over the joints.

Advantages:

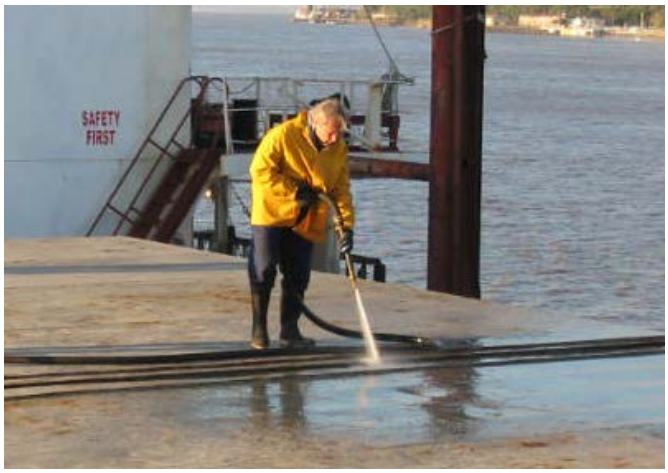
- Inexpensive.
- Can be used in wet weather,
- Widely accepted.

Disadvantages:

- Cannot be used with cargo on board.
- Cannot be used in sub-zero temperatures.
- Two surveyors necessary (one to inspect jetting, one to observe leakage within the hold),
- Crew assistance required for jetting.
- Difficult to identify exact areas of leakage.
- It can be a potential source of pollution if there is any oil or pollutant on the deck area.
- Does not provide an indication of hatch seal compression

Like ultra-sonic testing, hose testing must be conducted correctly otherwise the results have limited value.

For more information on hatch cover testing please refer to our Loss Prevention Briefing on the subject.



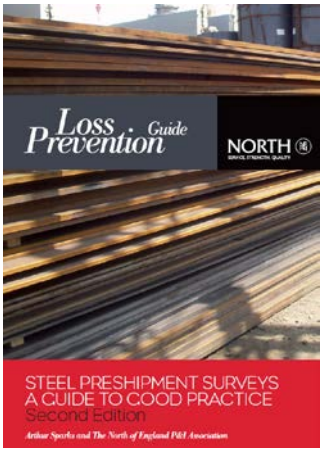
Hose testing of cargo hatch lids.

Bills of Lading

As already noted, problems with steel cargoes are often evident prior to shipment. It is important that the Master understands the importance of clausing the mate's receipts and bills of lading to reflect the actual apparent condition of the cargo on loading.

The most common issue with steel cargoes is displaying signs of rusting prior to loading. However, rusting is a long and gradual process which may start as soon as a piece of steel is produced. Simply describing steel cargo as 'rusty' when shipped is of little help in any future disputes.

Therefore there are 27 recognised clauses which could be used to describe the degree of rust on steel cargo or its steel packing. These clauses can be found in North's Loss Prevention Guide: *Steel Preshipment Surveys a Guide to Good Practice*. This also offers guidance on the clauses to use to describe other forms of steel damage.



This guide is available for Members on the North website to download.

Stowage, securing and carriage

In addition to the actual loading of the steel cargo, the hold preparation, stowage and securing are all important factors.

To assist the Master meet the carrier's obligations on the stowage and safe carriage of steel cargoes, North encourages Members to consider a surveyor's assistance to assist with the tally and the stowage of the cargo after the pre-load survey is complete.

Carriage of steel cargoes

The Master's responsibility

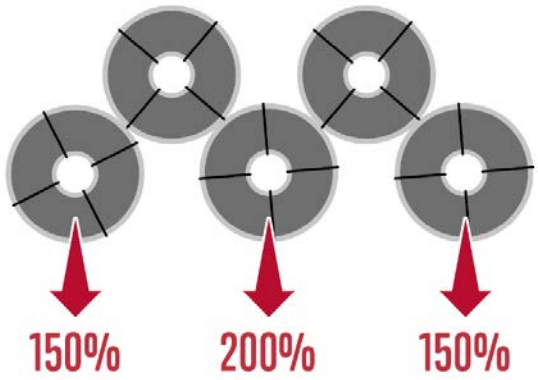
Where charterers are responsible for the loading and securing of the cargo in the charter party, specific instructions on what actions are to be taken should not be given by Masters. They must ensure that their supervision does not become an intervention, as they may then be assuming responsibility for cargo stowage and securing and liability in the event of an incident. An intervention is defined as an act by a Master that limits a charterer's right of control of the stowage, which may then transfer the liability for that stowage from a charterer to an owner.

Irrespective of who has responsibility for loading and securing the cargo under the terms of the charter party, Masters have an overriding duty and authority under the SOLAS Convention Chapter V, Regulation 34-1, to take any action deemed necessary to ensure the safety of the vessel.

Cargo securing manual and tank top strength

For any cargo, the Master and their surveyor should always consult the vessel's cargo securing manual.

This includes referring to the tank top strength calculations for the vessel. For some cargoes, such as steel slabs or billets, it is a relatively easy calculation, and the position of the dunnage is clear. However, for steel cargoes such as coils this is not so easy. When a steel coil is placed on the tank-top plating without any timber dunnage, the contact area is very small and the loading in way of that contact area is large. In most instances the cargo securing manual will provide instruction on how many tiers of coils of a certain weight can be carried using a set amount of dunnage.



The load of the second tier coils transfers to the first further increasing the point load on the tank top.

It is of course possible to deviate from the cargo securing manual, as the manual itself will only cover certain commonly carried cargoes and not all possible cargo types.

Therefore the manual will have a section on how to calculate the securing requirements for other cargoes by both the advanced method and rule of thumb method. If the Master is required to carry a cargo such as steel coils outside of the limitations prescribed in the cargo securing manual and is considering taking additional measures - such as applying additional dunnage to spread the load on the tank top - they should first seek clarification from the classification society or flag State with regard to any calculations on the tank top strength. The presence of a surveyor by the ship owner can be helpful at such times.

Sheet coil stowage

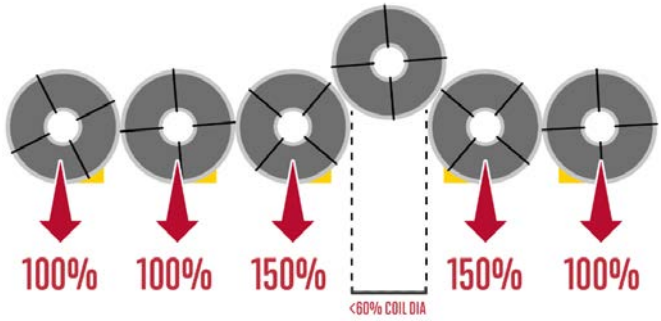
Coils should be stowed on the round with their axis facing fore-and-aft. They should be placed in rows across the vessel's hold, on top of flat-board or square section timber dunnage laid lengthways across the tank-top. The dunnage should be positioned over tank top structural stiffening members.

Coils should be stowed hard up against each other both port and starboard. Wedges should be inserted against the inboard bilge of each coil and preferably nailed to the tank-top timber dunnage. Timber dunnage should be fitted between outboard coils and the ship's structure.

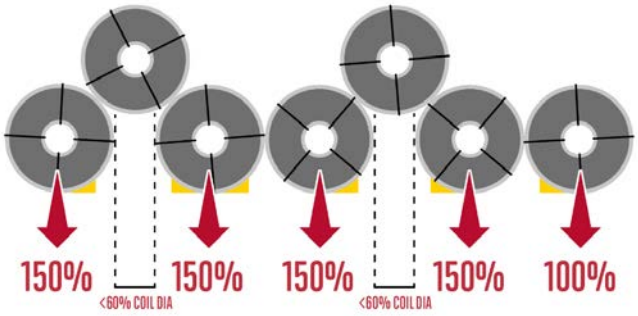
If the coils are to be stowed in a single tier only, the last coil on the tier should be positioned on a higher level so as to act as a wedge for the tier below. This coil is referred to as a locking coil, and should preferably be loaded as near as possible to the vessels' centreline. If there are multiple rows of coils, the locking coils should be staggered to avoid a single line of weight concentration on the tank top. The space allocated for the locking coil should not be more than 60% of the coil's diameter.

The bottom edge of the locking coil should be about one-third of the diameter of the coil. As the locking coil settles during the voyage, this will force the port and starboard coils outboard.

Carriage of steel cargoes

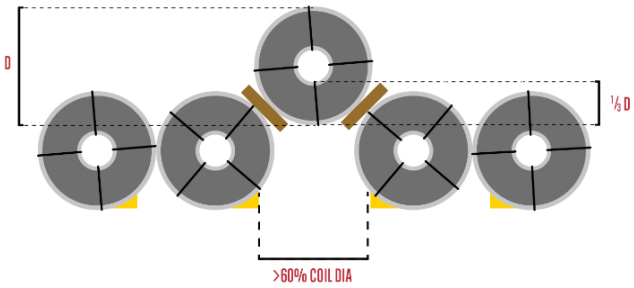


Single tier coils with locking coil.



Double tier coils with locking coils.

If the gap left for the locking coil is greater than 60% of the locking coils diameter then the gap size should be reduced either by applying dunnage on either side of the coil or by using two locking coils.



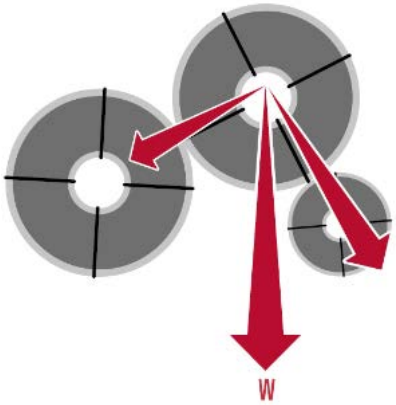
Locking coil with dunnage

If multiple tiers of coils are carried these should be stowed in the grooves formed by the coils in the tier below. The coils on the upper tiers should be secured to the coils of the tier below by the use of wires set tight by rigging screws or by metal strapping bands, tensioned correctly.

If gaps remain at the end of the tiers, these should be braced with dunnage to prevent any movement whilst on passage.

Each row of coils should be separated from the next by a gap of at least 150 mm. Similarly, end rows should be kept well clear of bulkheads by using dunnage.

When a second tier coil is loaded, its weight is transferred to the tank top through the two coils below it. This weight distribution is evenly spread if the coils are the same size. However, if the coils are of different sizes then the majority of the weight is through the smaller coil.



Weight distribution: coils of different sizes.

Wire rod coils

Coils of wire should be checked to ensure that the coils are as rigid as possible and securing bands are correctly applied. Coils with slack securing bands will not be able to be stacked satisfactorily.

Wire rod coils should be stowed in the same way as sheet coils - across the vessel's hold in rows with their axis in the fore-and-aft line of the ship. These should be loaded on top of dunnage laid across the tank-top.

As with sheet coils, the upper tiers should be stowed in the grooves from the lower tier to form a tight rigid stow. However unlike sheet coils, the next row in the hold should be hard up alongside the previous row to form one solid block.

Direct contact with the tank top and ships sides should be avoided, and dunnage used to support the coils.

If the block of coils does not fill the cargo compartment and an open face is left, that face must be secured using wire lashings in conjunction with timber, pallets or fencing in a fashion similar to that used to secure blocks of break-bulk cargo.

Re-bars and small diameter pipes

These are usually arranged in bundles and are likely to have irregular dimensions that may prevent stowage in regular tiers.

Carriage of steel cargoes

The bundles should be stowed in the fore-and-aft line of the ship on dunnage laid across the hold on the tank-top. Dunnage should also be in place at the extremities of the stow to ensure the steel is not in direct contact with the hull. Also dunnage should be used as required to level the stow and prevent gaps.

Re-bars and small diameter pipes in bundles awaiting loading

Large diameter pipes

Pipes are usually shipped either loose or in bundles depending on their size. Bundles of pipes should be stowed fore-and-aft in a manner similar to that used for re-bars and small diameter pipes. Dunnage should be laid where possible in line with tank top structural stiffeners.

The second and subsequent tiers should be stowed in the grooves created by the previous tier.

Pipes of similar diameters should be stowed together where possible to create the tightest stow.

Any gaps at the sides of the stow should be chocked with strong dunnage to ensure that the pipes remain secure throughout the voyage.

Upper tiers should be lashed using wire rope and timber placed between the lashings and the pipes to prevent damage. This will also give the wire a better grip on the pipe surfaces.

Large diameter pipes

Blocks / slabs / billets / blooms and plates

Often irregular in shape, stowage of this cargo requires large amounts of dunnage to spread the load evenly across the vessel's tank top.

Plates can be stowed either transversely or longitudinally in the hold. They should be stowed tight, even and level with a minimum of void spaces between the plates.

Dunnage should also be used to chock any voids, to level the stow and to separate the cargo from the ship's hull and tank top.

Stacking of plates should be avoided unless the stacks are supported and can be tied together with timber dunnage at intermediate levels. Staggered stowing with plates overlapping each other will produce a tight and secure block of cargo that is more stable and therefore less likely to shift during the voyage.

Steel slabs should be stowed in a similar fashion to plates. Slabs should be stowed mostly in the fore-and-aft direction. The stow should be staggered so that they overlap one another and with others across the hold to form a good stable locking stow. Between the tiers of slabs there should be a suitable amount of dunnage to avoid large voids in the stow. If the cargo is properly interlocked, there is less risk of the cargo shifting on passage.

Carriage of steel cargoes

Steel plates stored outside exposed to the elements

Alternatively, vessels with box-shaped holds could employ the 'California block stow'. This requires the slabs to be stowed squarely on top of each other to produce stowage of many individual stacks of slabs. Timber dunnage is used on the tank-top and between each tier, and as chocking between the stacks. Finally, steel bands are used around each stack to secure the slabs together.

California Block Stowage

It is important to note that this stowage method is only suitable when:

- The vessel has box-shaped holds.
- The stowage extends to both port and starboard sides.
- The cargo is sufficiently chocked against the hold side plating.
- The cargo is chocked against the hold side plating and throughout the full breadth and length of the stowage

More information on cargo securing can be located in North's loss prevention guide on *Cargo Stowage and Securing*.

The charter party

Prior to fixing a charter, it is important that the vessel's particulars with regard to cargo capabilities and any limitations are known and properly notified in the charter party.

This includes details of tank top strengths, and may include information such as maximum allowable loadings if the vessel is loaded with some holds full and other empty. On occasion this type of loading can alter the allowable tank top loading limits.

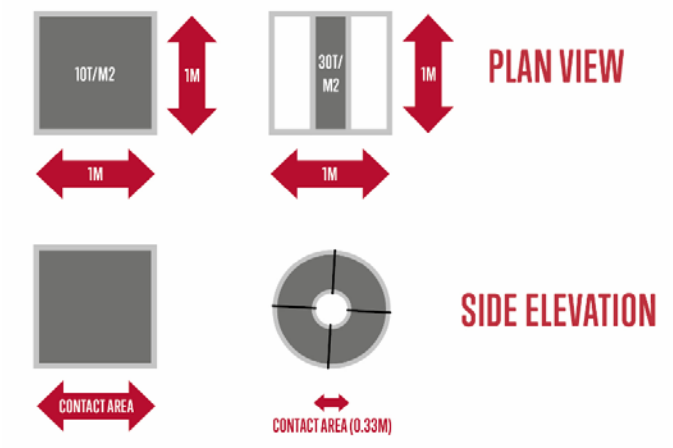
Often tank top strength is given as the maximum 'tonnes per square metre' (t/m^2) which can be loaded. But, this does not mean you can simply divide the total weight of the coils (t) by the total area (m^2) of the hold. As discussed earlier, when coils are loaded there is only a small area of contact with the vessel's tank top, and this applies a point load. Therefore the calculation must allow for this concentration of loading.

For example, the effect of a 10t block with uniformly distributed weight loaded on a 1m x 1m square will differ greatly to that of a 10t coil with a diameter and length of 1m as it acts on a much smaller surface contact area.

The pressure on the tank top is increased for the coil due to this reduced contact surface area.

To demonstrate this, assume the contact area of the coil is 0.33m x 1m.

10t block	10t coil
Pressure = mass / area Pressure = 10t / (1 x 1) Pressure = 10 t/m2	Pressure = mass / area Pressure = 10t / (1 x 0.33) Pressure = 30 t/m2



Therefore, when the cargo securing manual (or in some cases vessel certification) gives specific loading information for steel coils, this should be reflected in the

charter party to avoid any confusion related to 'tonnes per square metre' limits.

This also applies to any relevant information from the cargo securing manual relating to steel cargoes.

Further Information

Should further information be required please contact the loss prevention department: loss.prevention@nepia.com

North's loss prevention briefing on hatch cover testing can be found **here:**

http://www.nepia.com/media/289758/LP-Briefing-Hatch-Cover-Testing-May-2015-Updated-Sept-15-.PDF

North's loss prevention guide on steel pre-shipment surveys can be found **here:**

http://www.nepia.com/insights/publications/loss-prevention-publications/

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Appendix I – Steel cargo survey requirements

Product	Finished / Semi-finished	Unfinished	Pre-load survey required
Cold rolled coils	✓		✓
Hot rolled coils	✓		✓
Coiled wire rod	✓		✓
Profiles	✓		✓
Channels	✓		✓
Angle bar / bulb plate	✓		✓
Girders	✓		✓
Plates	✓		✓
Re-bars	✓		✓
Coated pipes	✓		✓
Sheet piling	✓		✓
Ingots		✓	
Slabs		✓	
Blooms		✓	
Billets		✓	
Scrap Steel		✓	

Important: this table is for guidance only and the pre-load survey requirement is at North's discretion.