



# Steel - Beam

## Operations Procedures



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## 1.0 Purpose

This document recommends steel stockpiling and handling practices with the intention to minimize the risk of injury and product damage.

## 2.0 Overview

Squamish Terminals handles a wide variety of steel products: pipe (loose and bundled), structural (I-beam, channel, angles), plate, rebar, and coiled sheet and wire rod. Stored and handled properly, steel products present a low risk of injury and remain free from damage. However, unitizing materials can be damaged during transit or handling, causing packages to lose integrity, which could compromise the package's ability to support others in a stockpile. Also, if individual pieces are handled or stored improperly, cargo damage can occur and stockpiles can collapse resulting in loss of productivity, serious injury or death.

The primary hazard in steel stockpiling is pile stability. Some products, like plate, are inherently stable. Other commodities, like pipe, have a rounded surface that allows it to roll. Even a pile of the most stable product could fail if the center of gravity is high, off-center, or suddenly shifts. Consequently, these guidelines focus on maintaining pile stability and protecting a worker in the event the product moves unexpectedly. A risk analysis should be undertaken to determine if the potential for movement of a stockpile exists. If so, workers on foot in the vicinity should be protected from unintentional movement of the commodity. Of course, any strategies to prevent unintentional movement or collapse will also protect the product from damage.

## 3.0 Legislation and Literature

Part XIV of the Canadian Occupational Safety and Health (COSH) Regulations addresses Materials Handling, which requires operators of motorized equipment to be protected from falling objects (s. 14.4), restricts non-authorized workers from a materials handling area (s. 14.38), and most importantly, requires that, "...all materials...must be stored in a manner so that there is no risk to the health and safety of any employee". (s. 14.50 (f)). Of course, COSH regulations, Part XIX, (Hazard Prevention Programs) require employers to implement and monitor a program to prevent hazards.

Other than the general references in the CLC, no regulatory standards directly address steel handling and storage, nor do any industry standards exist. The American Association of Railroads (AAR) impose extensive requirements for loading steel products on railcars, and the National Safety Code for Motor Carriers addresses loading steel coils and concrete pipe on trucks. However helpful, those standards deal with load securement while moving. A website hosted by German marine insurance agencies, *Transportation Information Service* (<http://www.tis-gdv.de>) references steel products directly, but mostly in the context of cargo loss and stowage. One local stevedoring company has developed written safe work procedures regarding steel pipe, based on best practices, professional testing and consultation. These guidelines draw upon all these resources.

## 4.0 General Safety Mandatory Requirements

- Foreman discusses beam discharge operational plan with crew to ensure Longshore understand operation, safety and PPE. Tool box talk to ensure all workers are aware of hazards and understand the procedure.
- All workers must wear all required Personal Protective Equipment
- All drivers must wear seatbelts while driving machinery and trucks
- No use of electronic devices while on site (lunchroom only)
- No smoking on site, smoking in designated smoking shelter only
- Drugs or alcohol strictly prohibited
- Ensure required / effective communication at all times (i.e. radio, hand signals, eye contact, etc.)
- Safe hatch entrance practices to be adhered to.
- Environmental hazards to be identified, eliminated and/or controlled
- Equipment that is not operating properly must be reported immediately
- Watch for moving machinery
- When working with partners, be aware of what the others are doing
- Always maintain clean working area
- NEVER STAND IN THE BIGHT

## 5.0 Receiving and Stockpiling

### 5.1 Dunnage

Typically made from wood, dunnage allows the commodity, when sitting on the ground, to be accessed by a lift truck, and separates tiers of commodities in a pile. Dunnage also unitizes and distributes the load of individual pieces. Each layer of dunnage must support the distributed load of all commodities above it, which might total many tonnes. Consequently, dunnage should be well supported and of substantial quality and size.

#### *Guidelines*

- Dunnage should be free from rot, cracks, splits and crushed areas. Inspect regularly and dispose of any suspect material.
- For steel products, dunnage should be a minimum of 4 in. x 4 in. Rough 4x4 is recommended. Planed, nominal 4x4 lumber is significantly smaller than rough ( $4^{1/8} \times 4^{1/8}$ ) and more prone to damage.
- For structural strength, dunnage should be high quality structural grade and species. Dunnage should be #2 and better Hem/Fir, or ideally, #2 and better douglas fir. Avoid softwood, like cedar, and utility or landscape grade wood.
- Each piece of dunnage should be level and fully supported by the ground or the commodities it rests upon. Fill voids with short longitudinal pieces so that the dunnage is in effective contact with the ground or commodity below it.
- Dunnage should be placed at each end of the commodity and spaced between as necessary to properly support the cargo depending on weight and length, with, of course, a minimum of two pieces per tier.
- Dunnage should be vertically aligned as each tier is stowed on top of the one below.

## 5.2 Stockpiling

Each commodity has its own safe stockpiling requirements. Generally, each tier above the bottom tier must be supported by a tier of equal or greater width. Piles must be level and straight and each pile must only contain beam of the same width i.e. 20" only piled with 20" and 12" only piled with 12" etc. Piles can contain different lengths as long as the dunnage is placed correctly. In winter, consider the extra weight of heavy snow. Also, piles or tiers should not be built upon snow or ice covered surfaces as the pile might slip or shift as the snow or ice melts.

### ***Worker safety***

- The front and back face of the piles should not exceed 4 ft. in height.
- If a higher front or back face is necessary, workers on foot should maintain a 10 ft. distance from the front or back of the pile.
- When stockpiling adjacent to a safety walkway, piles should start a minimum of 3 ft. from the safety walkway.
- Foremen should be notified of any instability in the pile, and the necessary safety precautions should be taken (start new tier, break down pile, blocking pile etc.)
- Dunnage should not be lifted above shoulder height, if the pile is above shoulder height, dunnage should be placed directly on load before going to pile. The load must be lowered, and the machine park brake applied while placing dunnage. Load can then be placed onto pile. Eye contact must be maintained with the lift truck driver at all times.
- Dunnage may need to be adjusted once the load is in place, ensure that fork lift is clear from pile before adjusting.

As discussed previously, proper banding provides integrity to bundled beam. All broken bundles must be set aside and only stowed 1 tier high.

- Maximum height of bundled beam should be based on maintaining a stable pile. Due regard should be given to pile height and stability based on the width of the beam.
- The height of the stack should not exceed its depth.
- Dunnage should be placed at each end and as required in between.
- Care must be taken to ensure each piece of dunnage is fully supported in compression (do not bridge voids).

## 6.0 Cargo Description

Steel Beam (channel, wide flange, H-Beam or I-beam) is structural steel which is usually bundled and varies in height and flange width. The beam comes in many different thicknesses and lengths which will affect the weight and bundle size.

## 7.0 Procedure – Discharge from Vessel - Gantry

### 7.1 Preparation

Ensure all equipment is operational and ready, including:

- Appropriate and rated stevedoring gear (web chains, canaries, HK Cutters, flat strap cutters etc.)
- Protection Equipment (PPE) – minimum requirement includes safety vests, steel toed boots, gloves and hard hats. (Hard hats needed while working under the swing of the boom).

Organize materials and documentation, including:

- Dunnage ( 8ft 4x4's (lengths may vary)
- Wood salvage bins

### 7.2 Beam Discharge from Vessel - Gantry

- 1) For Hold Entry, follow safe work practices, if in doubt talk to Foreman
- 2) When unlashng beam, take safe position. Watch for lashing wire springing back when cutting
- 3) When discharging beam, appropriate and rated stevedoring gear to be used (i.e. web chains, canaries, etc.)
- 4) Set up Save-all net or alternate barrier to prevent workers falling into water.
- 5) Ensure proper lifting appliances and rigging practices are used at all times
- 6) There must be sufficient number of web chains, so that the load remains well supported
- 7) Prior to and during shift, visually inspect web chains for signs of any damage
- 8) Lifting Chains, Pre-Slung Wires, and/or breakout slings can be used for break out only. Once hooked up, the load should be steadied or moved to a safe place to apply stevedore web chains
- 9) Holdmen place web chains under beam being mindful of pinch points, twisted slings and overlapping, before hooking to head. Web chains must support load - if the pre-slings stay attached to the frame, the weight of the lift must be on the web chains. Along the length of the load, 90° pulls should be maintained
- 10) When cherry-picking, holdmen are to rig up one end of beams with lifting chain, topside slowly lifts the load high enough that web chains can be passed under and properly spaced to ensure the load is level
- 11) All cargoes that are being turned, web chains must be crossed and load widths should be no greater than the lifting frame width
- 12) Any load that can be turned should be turned as low as possible in the hatch (when able) and not between the legs of the crane
- 13) Cargo stowed fore and aft can be taken out as a basket lift, as long as it is not being turned.
- 14) Topside to take lift to ensure load is level. If not, place load down and adjust slings
- 15) Holdmen must move to a safe location, so the load and/or frame does not pass over head and no one is in the bight
- 16) **Crane operator must move the load away from Holdmen and take safest path when travelling out of hatch. The load may need to be moved to the centre of the hatch and set down in order for holdmen to move to a safe location.**
- 17) The load must be landed on bunks evenly.

- 18) Slingmen / Checkers / Lift trucks must remain clear of the landing area until the load is settled onto the dock
- 19) Slingmen are to inspect slings after use to look for signs of excessive wear during the discharge process and report any findings immediately
- 20) Any pre-slings, banding and/or debris must be removed and dealt with accordingly
- 21) Safe practices to be followed when lifting in or out dunnage bins etc.

## 8.0 Procedure – Discharge from Vessel - Conventional

### 8.1 Preparation

Ensure all equipment is operational and ready, including:

- Personal Protection Equipment (PPE) – minimum requirement includes safety vests, steel toed boots and hard hats. (Hard hats needed while working under the swing of the boom)

Organize materials and documentation, including:

- Dunnage ( 8ft 4x4's (lengths may vary)
- Wood salvage bins

### 8.2 Discharge of Steel Beams - Conventional

- 1) For Hold Entry, follow safe work practices, if in doubt talk to Foreman
- 2) When unlashng beam, take safe position. Watch for lashing wire springing back when cutting
- 3) When discharging beam, appropriate and rated stevedoring gear is to be used (i.e. web chains, canaries, etc.)
- 4) Set up Save-all net or alternate barrier to prevent workers falling into water
- 5) Ensure proper lifting appliances and rigging practices are used at all times
- 6) There must be sufficient number of web chains, so that the load remains well supported
- 7) Prior to and during shift, visually inspect web chains for signs of any damage
- 8) Lifting Chains, Pre-Slung Wires, and/or breakout slings can be used for break out only. Once hooked up, the load should be steadied or moved to a safe place to apply stevedore web chains
- 9) Holdmen place web chains under beam being mindful of pinch points, twisted slings and overlapping, before hooking to head. Web chains must support load - if the pre-slings stay attached to the frame, the weight of the lift must be on the web chains. Along the length of the load, 90° pulls should be maintained
- 10) When cherry-picking, holdmen are to rig up one end of beams with lifting chain, topside slowly lifts the load high enough that web chains can be passed under and properly spaced to ensure the load is level
- 11) Holdmen double-wrap beam being mindful of pinch points, twisted slings and overlapping before hooking to head
- 12) Topside to take lift to ensure load is level. If not, place load down and adjust slings
- 13) Holdmen must move to a safe location, so the load and/or frame does not pass over head

- and no one is in the bight
- 14) **Crane operator must move the load away from Holdmen and take safest path when travelling out of hatch. The load may need to be moved to the centre of the hatch and set down in order for holdmen to move to a safe location.**
  - 15) The load must be landed on bunks evenly.
  - 16) Slingmen / Checkers / Lift trucks must remain clear of the landing area until the load is settled onto the dock
  - 17) Slingmen must use pike poles to turn cargo and maintain safe working distance from load
  - 18) Slingmen are to inspect slings after use to look for signs of excessive wear during the discharge process and report any findings immediately
  - 19) Any pre-slings, banding and/or debris must be removed and dealt with accordingly
  - 20) Safe practices to be followed when lifting in or out dunnage bins etc.

## 9.0 Procedure – Receiving from Vessel

### 9.1 Preparation

Ensure all equipment is operational and ready, including:

- Various capacity forklifts with 8 foot general cargo forks
- Utility forklifts for moving dunnage
- Personal Protection Equipment (PPE) – minimum requirement includes safety vests, steel toed boots and hard hats. (Hard hats needed while working under the swing of the boom)

Organize materials and documentation, including:

- Dunnage ( 8ft 4x4's (lengths may vary)
- Site Map (See Appendix A)
- Various Forms (Check Sheets, Damage Reports, Summaries)
- Vessel Line up (distributed from Traffic)

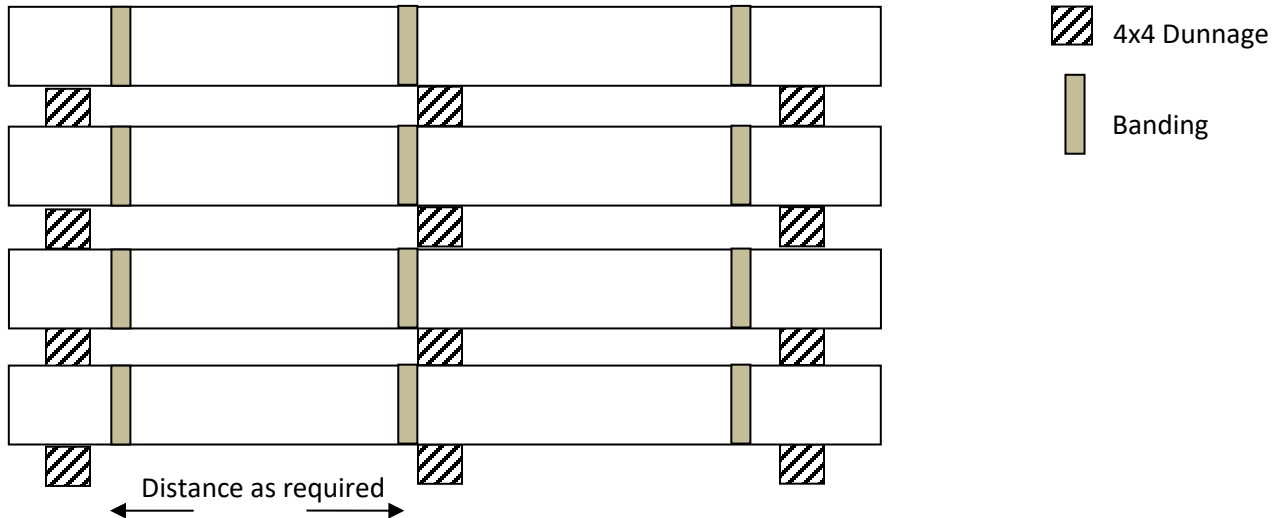
### 9.2 Handling Beam – Receiving from Vessel

- 1) Crew is dispatched to “starting area” and Foreman discusses beam receiving operational plan with crew to ensure Longshore understand operation, safety and PPE. Depending on volume of beam being offloaded there may be several “starting areas”.
- 2) Drivers deliver 4x4's to “starting areas” where beam will be placed onsite (also known as “sections” or “lay down areas”) for the purpose of aligning the piles.
- 3) Drivers use forklifts to remove beam from shipside bunk to their assigned “starting area” on site. Amount of beam taken by forklift is based on size and weight of beam bundles.
- 4) Driver lifts beam, tilts back and delivers the beam to their assigned “starting area”.
- 5) Labourer at “starting area” lays down 4x4 dunnage as stated above and depending on the length of the beam. Driver sets the bundled beam down on dunnage. Labourer will guide driver.



- 6) When loading more than 1 tier high the bundles must be placed directly over the bundles below and **must not hang over and be supported by the dunnage only**.
- 7) On the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> tiers ensure 4x4 dunnage is placed directly above the dunnage below.
- 8) Bundles are placed on dunnage as per Step #8 above. As outlined below, bundles on 2<sup>nd</sup> level must be placed directly above the bundles on the 1st level and so on, no pyramid format is permitted. Weight is distributed on the bundles below and to the ground (not only on dunnage).

## Front View



- Extra dunnage may be required to further stabilize any portion of each row/pile as required. Lengths will vary within pile (anywhere from 35' to 65' lengths – 20' lengths are kept separate – too small to mix with larger lengths). Various lengths not shown in diagram above

## Notes:

- **CAUTION TO CREW:** Always stand to side of pile; no one should be standing in front or behind working pile while load is being placed in pile.
- Any suspect dunnage is to be disposed of in bins provided (e.g. large cracks, rot, broken, etc.)
- If heavier beam is received (e.g. differences in thickness width/length) follow Steps #1 through #9 above and the amount of tiers will be determined by what the dunnage is rated for.
- Beam is to be sorted by width and as per direction from line-up.

## 9.3 Checker Duties

The Checker performs the following duties for their gang/crew:

- Counts & Records beam based on size, length and customer
- Records Storage Location
- Checks for broken, damaged or insufficient banding and has suspect bundles set aside.
- Record Any Damage
- Report Any Damage (to Foreman proactively during shift to prevent further damage from occurring)
- Submit Check Sheet
- Foreman to record daily production on Vessel Loading Summary Sheet

Types of damage the Checker should look for includes, but is not limited to the following:

- Any flaws in beam such as flange damage and twists or bends in the beam.
- Any damage on ends needs to be recorded.
- Damaged or insufficient banding.

## 10.0 Procedure - Delivery to Truck

### 10.1 Preparation

Ensure all equipment is operational and ready, including:

- Various capacity forklifts with 8 foot general cargo forks
- Utility forklifts for moving dunnage
- Personal Protection Equipment (PPE) – minimum requirement includes safety vests, steel toed boots and gloves

Organize materials and documentation, including:

- Site Map (See Appendix A for Sample)
- Various forms (Checker Sheets, Damage Reports, Summaries)

### 10.2 Handling Beam – Delivery to Truck

Generally all beam is transported off site by truck. The procedures below outlined how Squamish Terminals delivers beam from site to truck.

- 1) Management provides Foreman with location of start (a “section”).
- 2) Crew is dispatched to section where the foreman will discuss operational plan with crew to ensure Longshore understand operation, safety and PPE.
- 3) Driver lifts the bundles from the pile and moves them to truck location.

- 4) Driver tilts back, lifts up forks, lowers bundles on to dunnage on the truck bed, tilt mast forward, lower forks and gently backs away from truck.
- 5) If loading 2 or more tiers high on the truck, Truck Operator places dunnage between the second and subsequent tiers. Driver lifts more bundles from the pile and moves beam to truck location. Driver tilts back, lifts up forks, lowers bundles on to dunnage forming the 2<sup>nd</sup> tier, tilt mast forward, lower forks and gently backs away from truck. **Note:** Continue this procedure until truck is fully loaded. Truck Operator secures load prior to leaving site.
- 6) Labourer removes 4x4 dunnage from each section as it becomes available, stacking 4x4's neatly and checking and culling any damaged pieces. Once a bundle of 4x4's is complete the Labourer bands it and the Forklift Operator moves it to a storage area.

**NOTE:**

- The Foreman, Labourer, Checker and Truck Driver must not stand at the side of the truck while it's being loaded. If direction has to be given to the Forklift Operator it must be done from a safe position.
- The truck driver must not position load while standing on the deck of the truck.

### 10.3 Checker Duties

The Checker performs the following duties for each truck:

- Counts & Records beam
- Record Any Damage
- Report Any Damage (to Foreman proactively during shift to prevent further damage from occurring)
- Submit Check Sheet (to Foreman at end of shift). Foreman to record production on Vessel Loading Summary Sheet
- Checker records # of beam per truck, truck # and other pertinent details on Part Order Delivery Receipt and submits to Foreman at end of shift

### 11.0 Hazards

As outlined in the Squamish Terminals (SQT) Health and Safety Policy, SQT is committed to providing a safe place of work for all employees, visitors and contractors. SQT is committed to the development, implementations and maintenance of a hazard prevention program (HPP) and methodology for managing hazards related to all activities at SQT.

As such, a Hazard and Risk Analysis has been completed for the Beam Procedure. Hazards are detailed below:

- Slips, Trips, Falls on slippery / uneven surfaces
- Pedestrians exposure to being struck by site traffic
- Site vehicles / materials handling equipment striking other vehicles or stationary obstacles / equipment

- Poor ergonomics while working with dunnage – overexertion, musculoskeletal injuries
- Falling objects (equipment, cargo, debris, broken equipment, tools) – risk of being struck or crushed
- Overhead hazards – hook, frame, slings, cargo, equipment, gear
- Collapsing load - risk of being struck or crushed
- Poor ergonomics while rigging, lifting, banding, pulling, pushing – overexertion, musculoskeletal injuries
- Falling objects (equipment, cargo, debris, broken equipment, tools) – risk of being struck or crushed
- Truck driver falling from deck of truck
- Materials handling equipment - unstable load – tipping/rolling
- Pinch Points
- Sharp edges / slivers
- Exposure to elements (wind, sunburn, heat index, cold, dust)

## 12.0 Appendices

- A. Sample Site Map
- B. Photo Gallery

## Appendix A – Sample Site Map



## Appendix B – Photo Gallery

### Discharge from Vessel



Incorrect Practice: The web chains should be crossed when turning loads

## Clearing Bunks



## Stockpiling



Dunnage is placed directly above the dunnage below

## Delivery to Truck





## 13.0 Revision Record

Document	Rev	Date	Originator	Details of Change
PRO-002	1.0	2011-07-22	SQT	Original draft
PRO-002	2.0	2013-10-16	SQT	Updated flow charts
PRO-002	3.0	2019-05-31	SQT	Updated format, Added discharge from vessel, reviewed and updated receiving from vessel and delivery to truck , added hazards
PRO-002	3.1	2019-11-29	SQT	Added general safety mandatory requirements, section 4. Reviewed discharge from vessel section 7.2, updated turning cargo and webchains.