How to secure steel coils in 20'gp container
如何将钢卷固定在 20'gp 集装箱内

General
总则

Following points to be observed for securing coils:
钢卷固定必须满足以下要求：

- correct length of the cradle for weight distribution
  托架长度要合适，以分散钢卷重量
- blocking against side and length shifting in floor height above the bedding
  垫塞要避免钢卷底座上的层高内发生侧面和长度变化
- lashing in four direction or several coils together to one full block
  从 4 个方向绑紧或将多卷钢卷绑在一起

The below securing guideline is valid for all types of coils. Coils can be loaded eye to the sky, eye to the door or eye to the side. Usually loading coils eye to the sky is not so problematic, as the coil weight is not so high and the weight is better distributed. Loading eye to the side is the common method and usually used for the heavy coils. Therefore the first chapter explain stuffing coils eye to the side. All guidelines like weight distribution, bedding, blocking and lashing have to be followed by all stuffing methods (eye to sky and eye to door). At the end some special chapters added for loading coils eye to the door.

以下固定原则适用于各种钢卷。钢卷可以眼孔向上、向门或侧向的方式放置。通常情况下，钢卷以眼孔向上的方式放置不会产生问题，因为此时钢卷重心低，更容易分散重量。眼孔侧向放置方法也很常用，通常用于重型钢卷。因此，第 1 章将介绍眼孔侧向装货。所有装货方式（眼孔向上和向门）都必须满足分散重量、底座支撑、垫塞和绑紧等所有原则要求。最后章节补充钢卷眼孔向门装载方式。

Part A coil stowed with eye to the side
部分 A 眼孔侧向装载

1. Preparation of cradle
准备托架

Build a cradle which meets the following requirements:
制作满足以下要求的托架：

Length (a) in cm to be calculated: coil weight in kg / 48 kg/cm. (Limit: 4,8t per meter = 48kg per cm) or longer.
计算长度（a）（厘米）：钢卷重量（公斤）/48（公斤/厘米）（限值：4.8 吨/米 = 48 公斤/厘米）或更长。

Maximum free end b on each side depends on the thickness of used square timber.
各端的最长自由长度(b)取决于所用方形木条的厚度。

10x10cm: max 50cm.
10x10 厘米：最长 50 厘米。
15x15cm: max 75cm.
15x15 厘米：最长 75 厘米
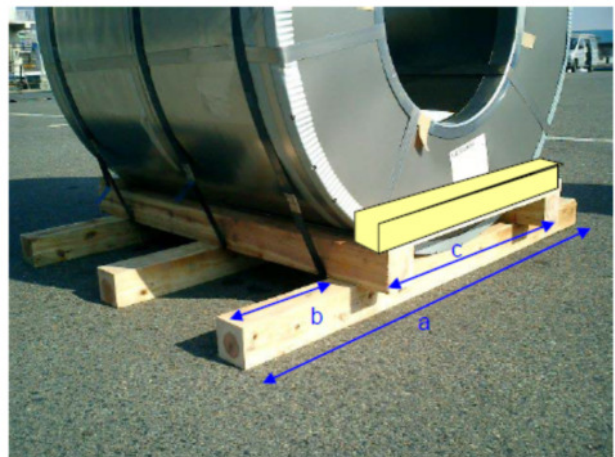20x20cm: max 100cm.
20x20 厘米：最长 100 厘米
25x25cm: max 125cm.
25x25 厘米：最长 125 厘米
30x30cm: max 150cm.
30x30 厘米：最长 150 厘米

If hard wood is used above value can be extended by 10cm. Hapag-Lloyd do not recommend the use of timber with 25x25cm or higher and also hard wood because of environmental reasons.
如果使用硬木，以上数值可加长 10 厘米。考虑到环境原因，Hapag-Lloyd 不建议使用 25x25 厘米或更大垫木以及硬木。

If not possible to meet these requirements, coils are too heavy for loading on timber bedding. Then steel bedding or other container types like flatracks required. Pls contact first your sales office, when you intend to ship heavier coils.

如果不满足上述要求，则垫木底座支撑不了钢卷重量。此时需要使用钢型底座或平板箱等容器。需要运输重型钢卷时，请事先联系当地销售办。

In summery of above requirement, coils of more than 15t can not be shipped in 20' standard container. If somebody insists to ship heavier coils, stuffing method has to be agreed with special cargo department of Hapag-Lloyd case by case.

总而言之，上述要求禁止使用 20'的标准集装箱运输超过 15 吨重的钢卷。如果坚持运输重型钢卷，必须与 Hapag-Lloyd 特种货物部门就装货方法达成一致。

The coils have always to be place in the container with the bedding in length direction. The bedding needs to have minimum 2 timbers in one-piece, placed as fare as possible to the outward position, close to the container side walls. Additional beddings below the middle of the coils are not a requirement from the container owner, but can be added.

钢卷装货必须用集装箱，底座按长度方向放置。底座需要装有至少 2 条一片式垫木，两者要尽量远离和外向放置，并且要靠近集装箱侧壁。所有集装箱均未要求在钢卷中心下部放置其它底座，但也可以加上。

Example1: coil weight: 7650kg, c=65cm Result: a=160cm, b= (160-65cm)/2=48cm square .timber 160x10x10cm possible.

示例 1：钢卷重量：7650 公斤、c=65 厘米 结果：可使用 a=160 厘米、b= (160-65 厘米)/2=48 厘米的 160x10x10 厘米的方木。

Example2: coil weight: 9960kg, c=75cm Result: a=208cm, b= (208-75cm)/2=67cm square .timber 210x15x15cm possible.

示例 2：钢卷重量：9960 公斤、c=75 厘米 结果：可使用 a=208 厘米、b= (208-75 厘米)/2=67 厘米的 210x15x15 厘米的方木。

2. Position inside the container
   集装箱内位置

A single coil should be placed in the middle in length and athwart direction inside the container. When two coils are loaded in the container, it should be avoided to place both together in the middle. Place one as far as possible to the end wall and the other as close as possible to the door side. The space to door and end wall required for blocking and securing shall of course remain.

单钢卷应该放置在集装箱内的长度方向和横向中心处。如果集装箱要装载 2 卷钢卷，则应避免将其都放置在中心处。应将 1 卷尽量靠近端壁，另 1 卷尽量靠近门侧。当然，要预留钢卷垫塞和固定所需要的空间。

3. Blocking
   垫塞

Task of the blocking is to prevent sliding of coils in length and athwart direction. It needs to be taken in account, that the door can not take any force and the container walls are very soft. Thus the blocking is to be spread over a large surface and in the lowest possible height.

垫塞用于避免钢卷在长度方向和横向滑动。必须注意的是：箱门不能承载任何重量，箱壁也非常软。因此，垫塞分散表面要大，高度要尽可能低。

Blocking to the side: Timber (a) already there from the cradle, see chapter 2. Then two pieces (b) to be placed between (c) and (a), with a distance in between as wide as possible. To keep all pieces (b) and (c) in the same height, min. 4 pieces supports (d) to be placed below and nailed together. It is important that (b) do not touch the containers side wall.

侧面垫塞：托架已装有垫木（a），见第 2 章。此时要在（c）和（a）之间放置两条（b），两者要尽量远离。为了使所有（b）和（c）保持同高，要在下面放置最少 4 个垫块（d），并钉在一起。重要的是（b）不能接触集装箱侧壁。
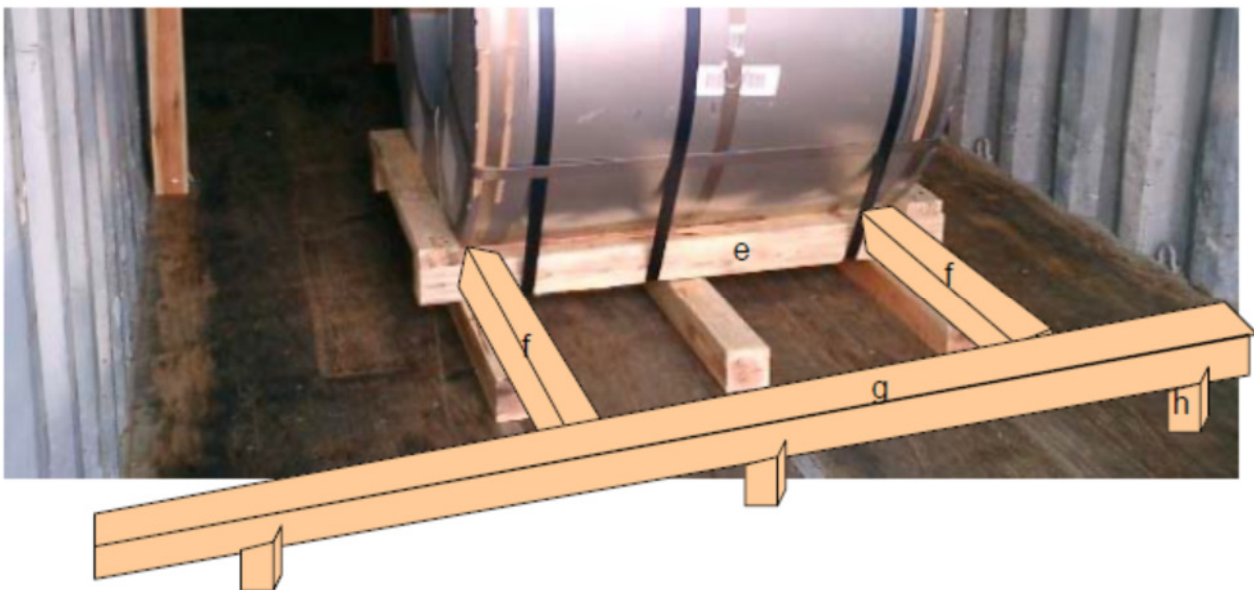
Side view:
侧视图：
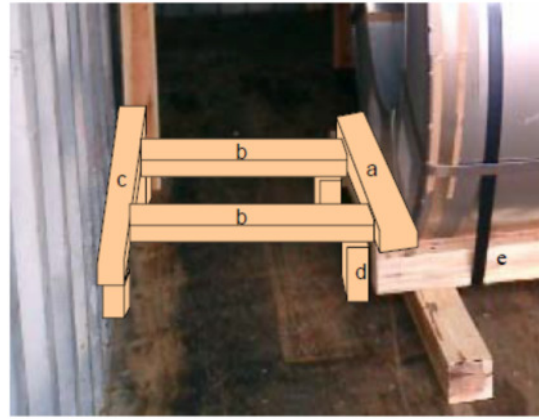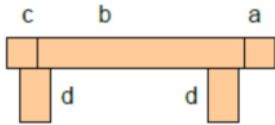
Same patter to be done on the other side.
一侧按同样方法处理。

Blocking in length direction to be placed against athwart timber (e) on which the coil rest.
顶住钢卷承载横向垫木（e）的长度方向垫塞。

Both pieces (f) need to be placed between (e) and (g), all in the same height. Best to lay pieces (f) on the bedding and put the timber (g) on top of supports (h) with the same height as the bedding. Square timber (g) to be set with its ends into the corrugated side walls of the container.

需要在（e）和（g）之间放置两条（f），它们都必须同高。最好将垫木（f）放置在底座上，将垫木（g）放置在垫块（h）上，使其与底座同高。放置方形垫木（g），将其末端卡入瓦楞状集装箱侧壁。

Blocking between 2 coils simple to be done with two pieces (f) between (e) of each coil. Blocking to end wall of the container can be done with (g) fixed into the corrugated side walls or touching the end wall over the full width, same pattern as blocking to the side (c).

在各钢卷的承载垫木（e）之间插入两条（f）即可简单垫塞 2 卷钢卷。垫塞至集装箱端壁时，可将（g）卡入瓦楞状集装箱侧壁或整个长度贴紧端壁，方式与垫塞至侧壁（c）相同。

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There are special requirements for rail shipment. A stronger blocking in length direction is required by the rail companies. To place a timber (g) in between the corrugated sidewalls is not accepted. Therefore the blocking is to be set against the corner posts and end wall of the container and into the recess of the corner post at the door side.

铁路运输则有特殊要求。铁路公司要求长度方向的垫塞要加强。不允许在瓦楞状侧壁间放置垫木（g）。因此，垫塞要顶住集装箱角柱和端壁，卡入箱门侧的角柱凹槽。

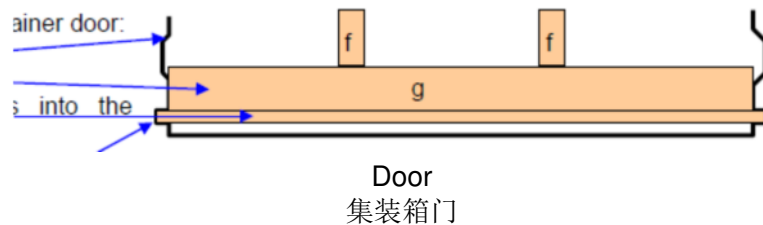Top view at container door:
集装箱门俯视图：
Container wall
集装箱壁
Strong timber
结实的垫木
Thin timber fits into the recess.
薄垫木卡入凹槽
Recess at corner post
角柱上的凹槽

Door
集装箱门

One 4X6" buffer in front of two 2X6" boards
2 块 2X6"板前面放置 1 块 4X6"缓冲板

Picture left side shows example of blocking lengthwise with use of the recess in corner post at door side.
左侧图片为使用集装箱门角柱处的凹槽在长度方向垫塞的示例。

Finally we can say that blocking is possible without nailing to the container floor and any wedges. Nails can be used to keep the wood constructions together, but no forces should be brought to the nails. Also the wedges can be used as bedding of the coil, but not for blocking.
最后，我们可以说无需在集装箱门上钻钉和插入楔板即可实现垫塞。可用钉子将木质结构钉在一起，但不可对钉子用力。另外，楔板可用作钢卷底座，但不用于垫塞。

4. Lashing
绑紧

Aim of the lashing is to secure against tipping. The height on which the lashing is fixed to the coil is usually below the middle. Therefore it is only workable when the coils are blocked in floor height as well. The lashing of each coil needs to be done by 4 lashings. Each starts and ends on the same point. As lashing material can be used best steel straps, but also nylon belts with edge protections or steel wires.
绑紧的目的是避免倾斜。钢卷的固定绑紧高度通常低于钢卷中心。因此，只有当钢卷在层高方向已垫塞时，绑紧才会起作用。每钢卷需要 4 条绑带绑紧。绑带的开始和结束绑紧位置相同。绑紧材料最好使用钢带，但也可以使用带护角的尼龙带或钢丝绳。

Front view
正视图

Top view
俯视图
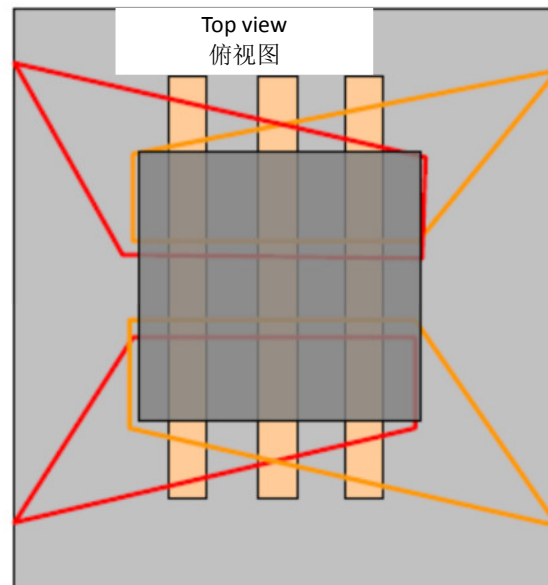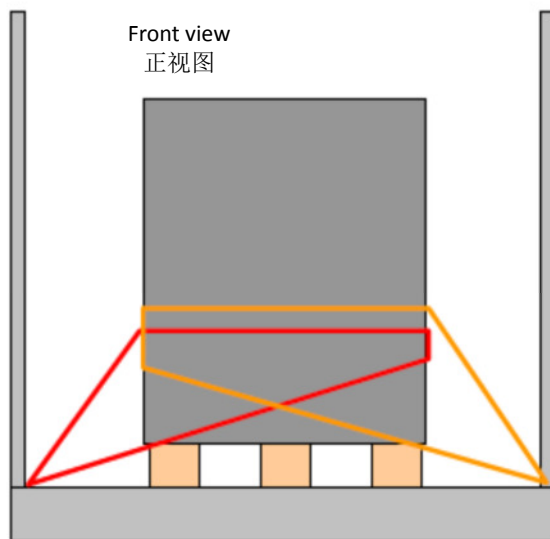
As the lashing eyes of a container can take only 1-2t, the strength of lashing material need not more than 2t.

因为集装箱的绑紧孔只能承载 1-2 吨的拉力，绑紧材料强度不必超过 2 吨。

5. Example
示例

Here you can see one picture of good securing a steel coil with eye to the side.

此处您可以看到钢卷眼孔侧向放置的正确固定方式图片。

For heavy, high and thin steel coils it is useful to add a blocking to the side wall in a higher position.

对于重型、高和薄型钢卷而言，在更高位置添加侧壁垫塞会起作用。

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Part B coil stowed with eye to the door
B 部分 眼孔向门放置的钢卷

Lay out the bedding (brown) and blocking to the side walls (yellow). The distance between both square timbers of the bedding should be as wide as possible, but only so far apart that the steel coil will have no contact in the middle with the floor of the container. Use stronger square timber to reach a wider distance. Length of the bedding (a) depends on the weight of the coil and will be calculated in cm: coil weight in kg / 48 kg/cm. (Limit: 4,8t per meter = 48kg per cm) or longer. At least the bedding length should be 20cm longer (10cm each side) than length of the coil to place on this bedding on each end timber for blocking in length direction. Maximum free ends (b) have the same limits as written in Part A.
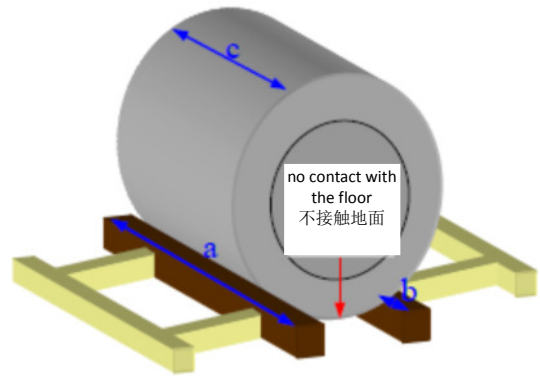
放置底座（棕色）和垫塞，使垫塞顶住侧壁（黄色）。底座的两条方形垫木之间尽量远离，但要保证钢卷中心底部不会碰到集装箱地板。使用更结实的方形垫木可增加宽度。底座（a）长度取决于钢卷长度，计算公式（厘米）为：钢卷重量（公斤）/48（公斤/厘米）（限值：4.8 吨/米 = 48 公斤/厘米）或更长。底座长度至少要比钢卷长度长 20 厘米（每侧 10 厘米），此时钢卷放置在底座的各端部垫木上，实现长度方向垫塞。最长自由长度（b）与 A 部分中的限值相同。

The blocking in length direction is to be done same way as written in Part A. Place a timber on the bedding athwart (d), one timber (f) athwart into corrugates side walls or recess of corner posts at the door and add two timber (e) as connection in between.

长度方向垫塞与 A 部分相同。在底座上放置横向垫木(d)，将垫木(f)横向卡入瓦楞状侧壁或箱门角柱凹槽，在（d）和（f）之间插入两条连接垫木（e）。

Below timber (f) small supports required to archive same height over the whole arrangement. Blocking in length direction is to be placed on both sides of each coil.

垫木(f)下面要插入小垫块，以使整个结构保持同高。
在各钢卷的两侧进行长度方向垫塞。
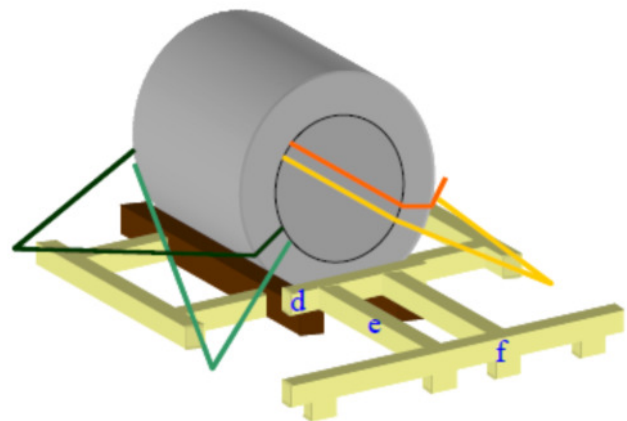
Finally the coil is to be secured by 4 nylon belts, each from each corner, like a closed circle.
最后，使用 4 条尼龙带从各角部固定好钢卷，类似闭合圆环。