Code of practice for the safe use of long link chain as a means of adjusting rigging in the entertainment industry.

This document was produced by:

The Health and Safety Executive was consulted in the production of this publication. It endorses the sensible, proportionate, reasonable and balanced advice to riggers and managers of locations and events, concerning the use of long link chain set out in this guidance.

Introduction
The requirement in the European Machinery Directive that lifting chain shall be short link caused confusion about the use of long link chain used in entertainment rigging. This code of practice aims to clarify the legal position and provide guidance on selection and safe use.

Scope
This code states the legal requirements and provides guidance on selection, marking, storage, inspection and safe use of grade 8 long link chain suitable for use in entertainment rigging.

Definitions
For the purposes of this document, the terms and definitions in given in BS EN 818-1 and the following apply.

Long link chain
Long link chain is chain having a pitch dimension considerably in excess of 3 x nominal diameter (d_n) of the chain. For the purposes of the code it is in the range $6d_n$ – $7.6d_n$

Deck chain
A deck chain is a short length of long link chain. The length is variable but is typically 5ft /1.5m. Another term for deck chain is boat chain.

Legal requirements
The accepted use for long link chain in the entertainment industry is as a structural element loaded only in straight pull. It is not used as a lifting accessory in the way defined by the Machinery Directive. The UK Health and Safety Executive have agreed that provided it is of an acceptable quality and used only in this manner, long link chain can continue to be used as the most appropriate engineering solution for this application.

Selection of long link chain
Long link chain suitable for entertainment rigging should have appropriate dimensions and be of a suitable quality. There is no national or international standard specific to this type of chain. However the European standard for grade 8 short link chain can be adapted for this purpose. The following specification has been agreed between the major manufacturers and should be specified when purchasing new chain. It may also be used to assess chain already in service.

Chain specification
The chain to be in conformity with EN 818-2 except there will be a single size as follows:

Table 2a – Dimensions

Dimensions in millimetres							
1	2	3	4	5	6	7	8
Nominal size d_n	Material diameter tolerance	Weld diameter d_s max	Pitch			Internal width away from weld w_1 min	External width over the weld w_2 max
			p_n	p max	p min		
13	± 0,52	15		98,8	78	22,1	52

Table 5a – Working load limits and test requirements

1	2	3	4	5
Nominal size, d_n mm	Working load limit WLL t	Manufacturing proof force MPF kN	Breaking force BF kN min	Bend deflection f mm min
13	5,41	133	212	1,5

The total ultimate elongation shall be not less than 15%

Note:
The bases for calculation of dimensions in table 2a columns 3 to 8 are as follows:

Maximum diameter at weld	$d_{s\,max} = 1{,}15\ d_n$
Nominal pitch	Not specified
Minimum pitch of chain	$p_{min} = 6\ d_n$
Maximum pitch of chain	$p_{max} = 7.6\ d_n$
Minimum internal width, away from the weld	$w_1 = 1{,}7\ d_n$
Maximum external width, over the weld	$w_2 = 4\ d_n$

Dimensions given in table 2a are full calculated values rounded to 0,1 mm.

Chain rating
When used in overhead rigging, the WLL should be reduced by 50% to provide a minimum factor of safety of 8:1.

Marking
Each deck chain length must be identifiable and bear the manufacturer's mark.

Storage
When not in use, deck chains should be returned to proper storage. The storage should be dry, free from injurious pollution and extremes of temperature. They should not be left in an area where other activities might cause them to be damaged.

Inspection and marking of long link chain
Periodic Inspection
Long link chain is not a lifting accessory but it is work equipment and therefore subject to the inspection requirements of PUWER. As the risks of failure are similar to those of lifting accessories, it is recommended that the examination and inspection regime for deck chains is the same as that used for lifting accessories, ie that required by Regulation 9 of LOLER.

The user should have a means of verifying that the deck chain has been inspection within the required period and found fit for service, eg colour code, access to inspection report.

This inspection should be carried out by a competent person. The deck chain should be in a reasonably clean condition and the inspection carried out in adequate lighting. If any of the following faults are present, the deck chain should be withdrawn from service:

(1) Illegible markings;
(2) Stretched chain; if there is any visible narrowing of the link or any lack of free articulation between the links. See figure 1 below.

(3) Bent or twisted links;
(4) Cuts, nicks, gouges, cracks, excessive corrosion or heat discolouration.
(5) Wear at the interlink seats;

Correct shape of link.

Narrowing of link indicates stretch due to overload. Withdraw from service.

Figure 1

Pre-use Inspection
Each deck chain should be inspected prior to use to check that it is not damaged.

Exceptional circumstances
Long link chain that has been subjected to shock loading should be taken out of service and inspected by a competent person before being used again.

Safe use of long link chain
Use of long link chain should be planned and supervised by a competent person, in accordance with the manufacturer's instructions and this code of practice.

Long link chain may be used in the following entertainment rigging situations in accordance with the manufacturer's instructions:

- Providing adjustment in bridle legs used 'above the hook' (supporting the hoist).
- As a means of making secondary suspensions taut.
- Providing adjustment in other rigging assemblies.

Long link chains must be used:

- 'In-line' only and not passed around any object.
- Without twisting any links.
- Without side loading or stretching any link.
- Without trapping 'dead' links under shackles or hooks.

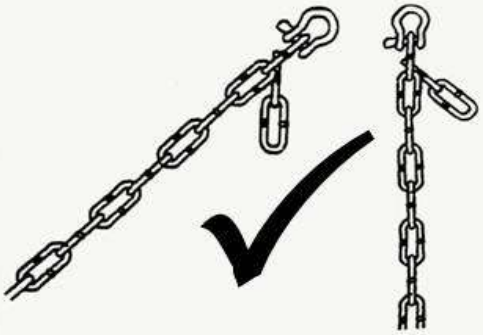
Long link chain should never be used as a sling in either 'basket' hitch or choked configuration. Neither should it be used in any situation where a link may be subject to bending or twisting forces or where the chain may suffer shock loading. Unused links should not be trapped under shackles that connect the chain to other equipment.

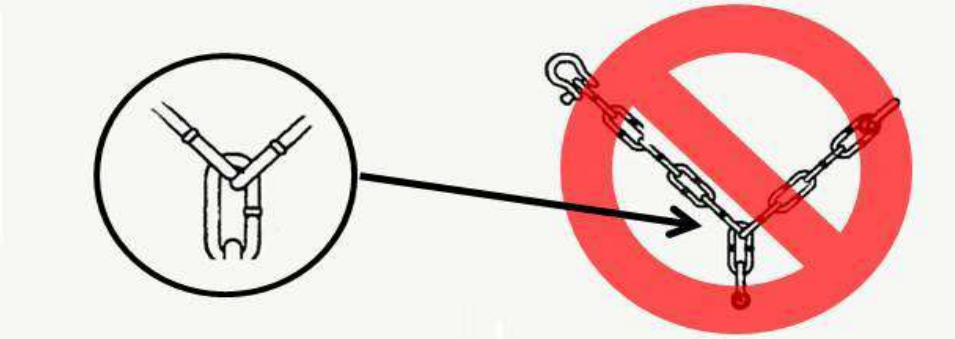
Long link chain should only be used below the lifting machine in exceptional circumstance and only when this use has been agreed by a competent person.

SAFE USE OF LONG LINK CHAIN IN ENTERTAINMENT RIGGING

Do not trap 'dead' links under shackles

Keep links straight





Do not use a link as the root of a bridle, use a shackle to bridge

Never use long link chain in basket or choke hitches