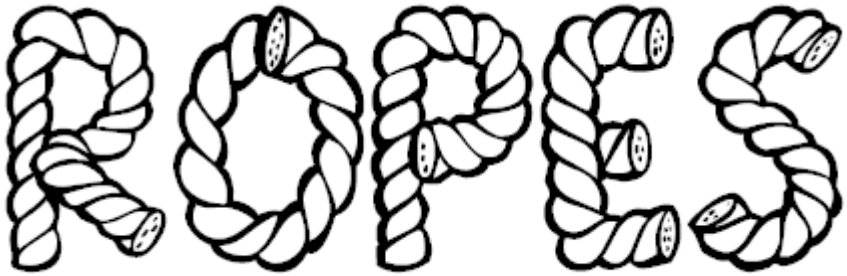
Bell Maintenance

As well as looking at what is need to be steeple keeper and the insurance aspects of doing work on the bells, this course covers looking after ropes and stays; learning how to change a rope and stay, how to adjust the length of a tail-end, and how to splice a broken rope.

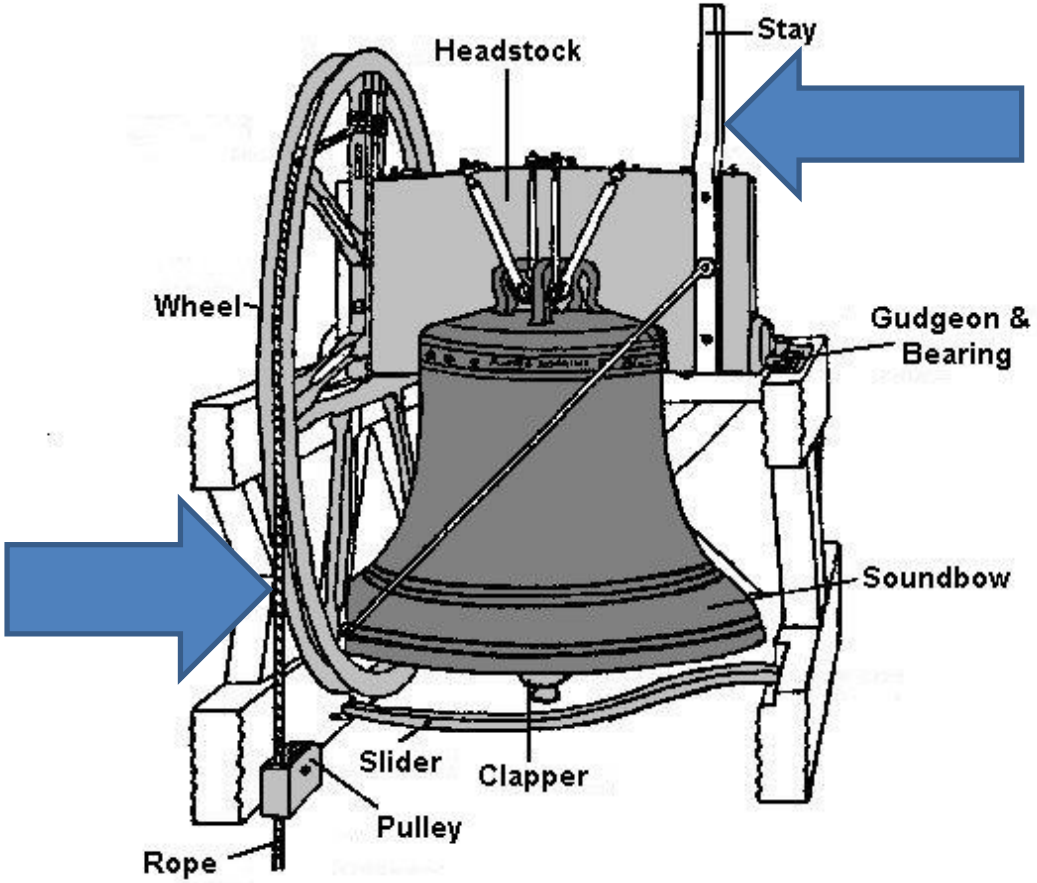
Nick Churchman/Cathy Dixon
Updated 07/03/2025

All you ever wanted to know about…..

And



The bits we are looking at…



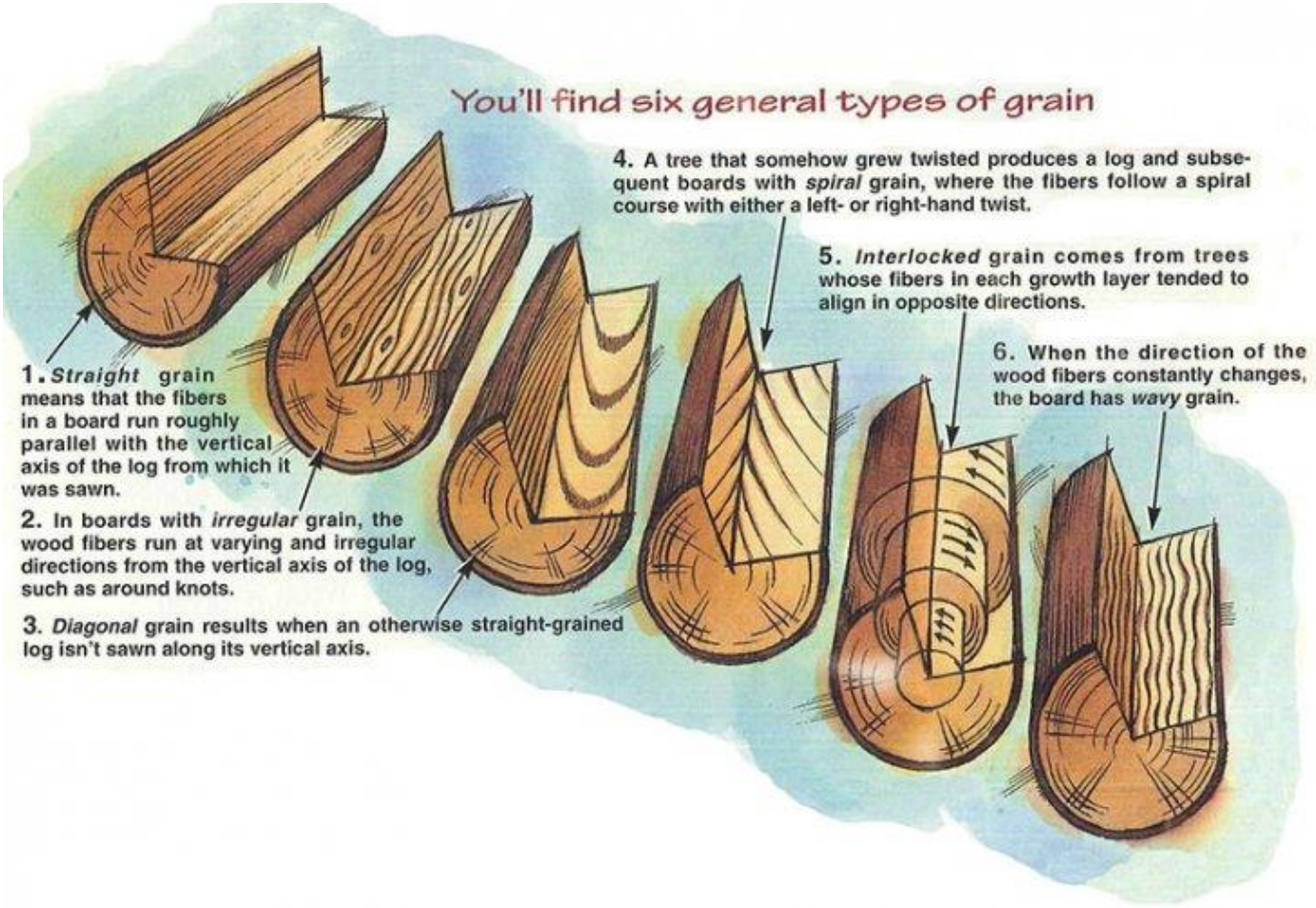
What do we want from a Stay?

- Strength
- Elasticity
- Anti Rot

Stays – What wood do we use?

Fraxinus excelsior

Stays – Why use Ash?

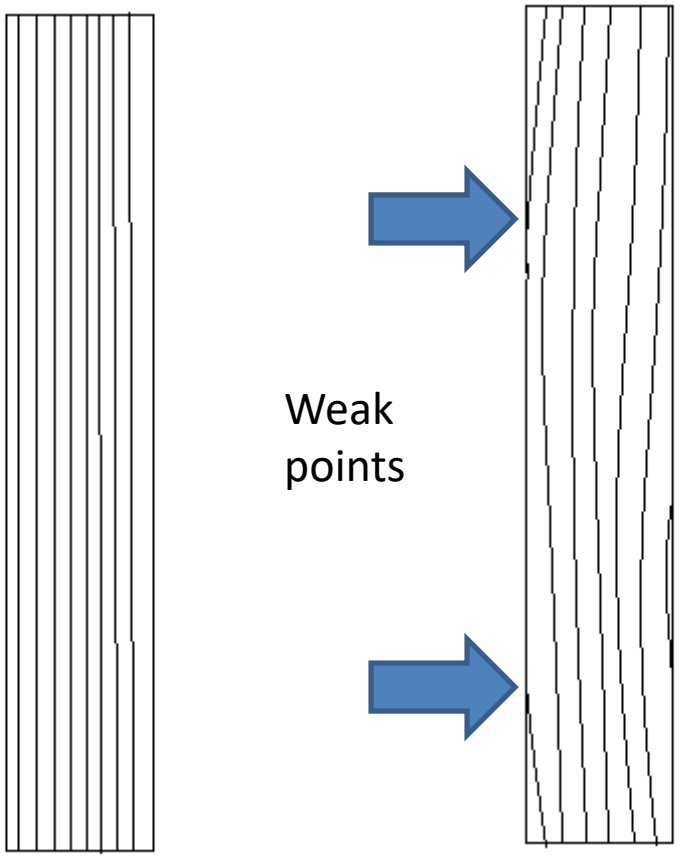


Stays – Why use Ash?

Hard woods are less likely to rot.

Straight grain gives strength, and also gives elasticity.

If the grain is not straight, lines can form weak spots where cracks can occur.



Stays – Why use Ash?

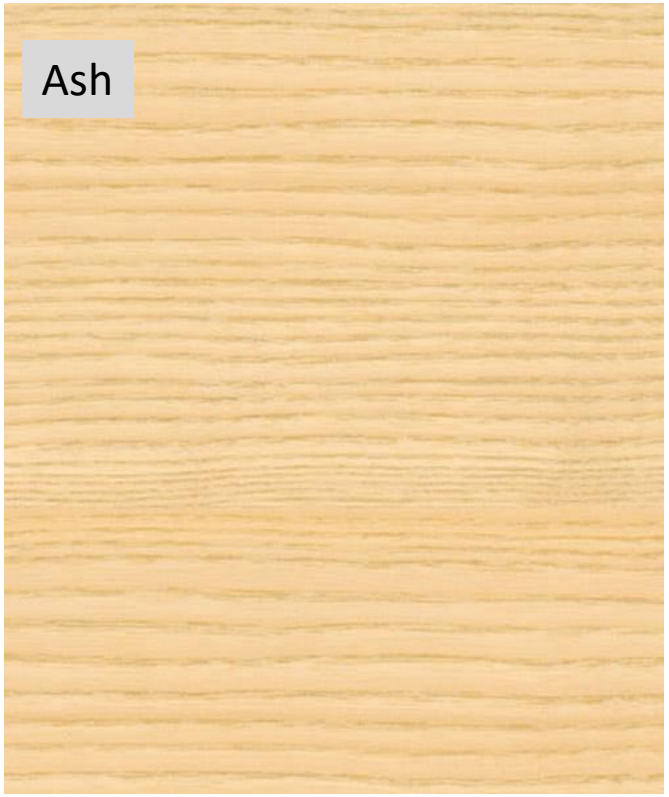
The science bit……..

Ash

Mechanical characteristics	
Modulus of elasticity under bending	13400 N/mm^2
Modulus of rupture under bending	120 N/mm^2
Tension strength	165 N/mm^2
Compression strength	52 N/mm^2
Brinell hardness perpendicular to the fibres	38 N/mm^2
Janka Hardness	4.4 kN
Nail withdrawal strength in N per mm depth and mm diameter	16 N/mm^2

Oak

Mechanical characteristics	
Modulus of elasticity under bending	13000 N/mm^2
Modulus of rupture under bending	88 N/mm^2
Tension strength	90 N/mm^2
Compression strength	61 N/mm^2
Brinell hardness perpendicular to the fibres	34 N/mm^2
Janka Hardness	4.5 kN
Nail withdrawal strength in N per mm depth and mm diameter	17 N/mm^2



Grain is straight and even

Stay Types – Plain Stay

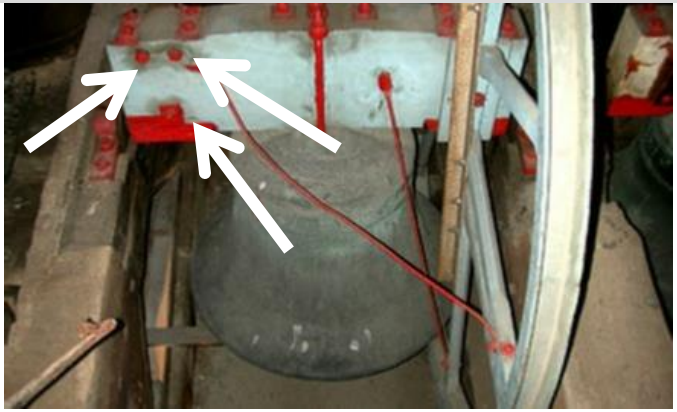
These are by far the most common type…

A plain stay resting up against slider with the bell in the “up” position

- They are fairly straightforward to fit
- They have been used forever
- They are found on both metal and wooden headstocks.

Plain Stays

A plain stay on a wooden headstock, held on by 3 bolts (below) and a metal strap (above)



A plain stay on a metal headstock, just held in place with two bolts

Stay Types – Hastings Stays

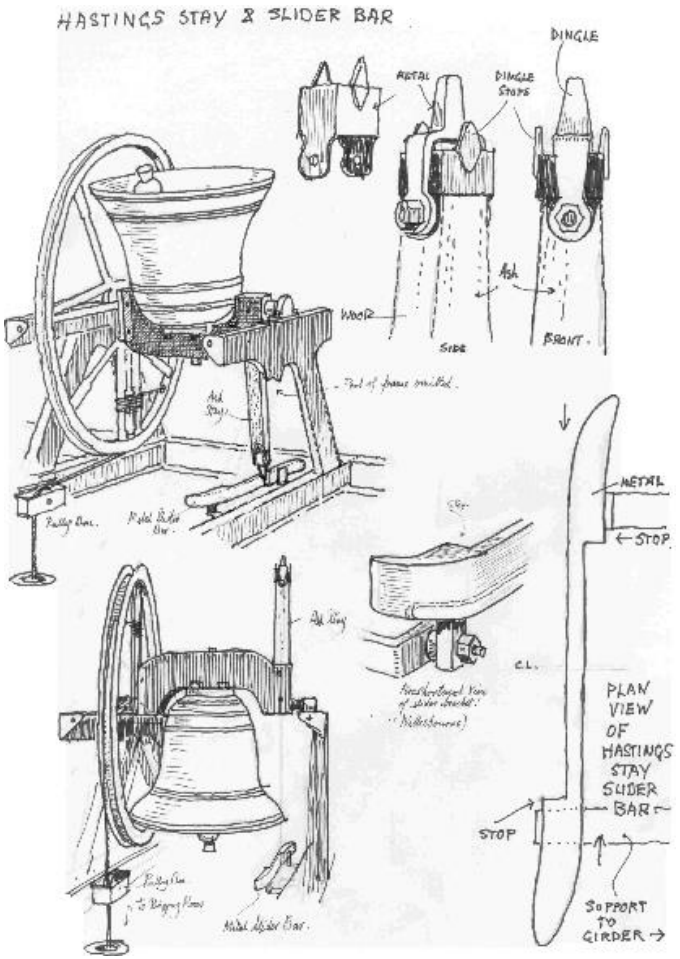
- Used mostly during the first half of 20th century.
- Invented by the Rev. J. F. Hastings, M.A., who was one time vicar of Martley, in Worcestershire.
- Only found on “modern” metal Taylor headstocks
- More difficult to fix than plain stays, as they need shaping.

Hastings Stays

Hasting Stay up against end stop

More difficult to fit, what's the point?

What advantage do Hasting stays offer, and for who?



Drawing of Hasting stay mechanism

General suggestions

- Always keep a couple of spare roughly sized stays available.
- If you have one stay that breaks a lot (a training bell perhaps) keep a spare ready to go i.e. with the correct dimensions!
- If you can get a set of measurements for all your stays, do so, it makes life easier.

My stay is broken. Can I mend it?

Fixing Broken Stays

Many people have tried it!

Some with better results than others.

The repaired stay will never be as strong as a new stay, but can be useful to act as a temporary spare.

Any suggestions on how they can be joined together?

Replacing stays – Both types

Remove old stay carefully from the bell when it is in the down position

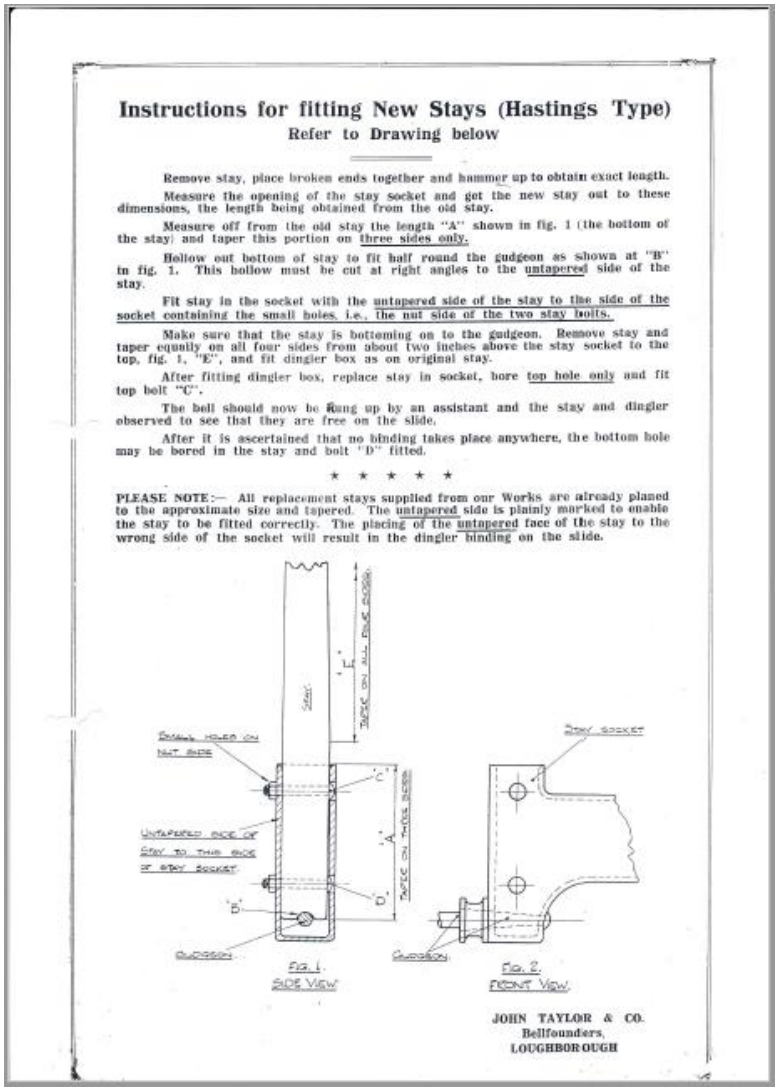
Replacing stays – Both types

- Remove old stay and join parts back together to get length
- Tools needed:
  - Saw
  - Plane (an electric one if possible)
  - Tape Measure
  - Drill and drill bits
  - Adjustable Spanner
  - Time!

Replacing a broken Hastings Stay

Hasting Stays are tapered

The “official” way as given in Taylor’s notice



Instructions for fitting New Stays (Hastings Type)

Refer to Drawing below

Remove stay, place broken ends together and hammer up to obtain exact length.

Measure the opening of the stay socket and get the new stay out to these dimensions, the length being obtained from the old stay.

Measure off from the old stay the length "A" shown in fig. 1 (the bottom of the stay) and taper this portion on three sides only.

Hollow out bottom of stay to fit half round the gudgeon as shown at "B" in fig. 1. This hollow must be cut at right angles to the untapered side of the stay.

Fit stay in the socket with the untapered side of the stay to the side of the socket containing the small holes, i.e., the nut side of the two stay bolts.

Make sure that the stay is bottoming on to the gudgeon. Remove stay and taper equally on all four sides from about two inches above the stay socket to the top, fig. 1, "E", and fit dingler box as on original stay.

After fitting dingler box, replace stay in socket, bore top hole only and fit top bolt "C".

The bell should now be rung up by an assistant and the stay and dingler observed to see that they are free on the slide.

After it is ascertained that no binding takes place anywhere, the bottom hole may be bored in the stay and bolt "D" fitted.

★ ★ ★ ★ ★

PLEASE NOTE:— All replacement stays supplied from our Works are already planed to the approximate size and tapered. The untapered side is plainly marked to enable the stay to be fitted correctly. The placing of the untapered face of the stay to the wrong side of the socket will result in the dingler binding on the slide.

Fig. 1. SIDE VIEW

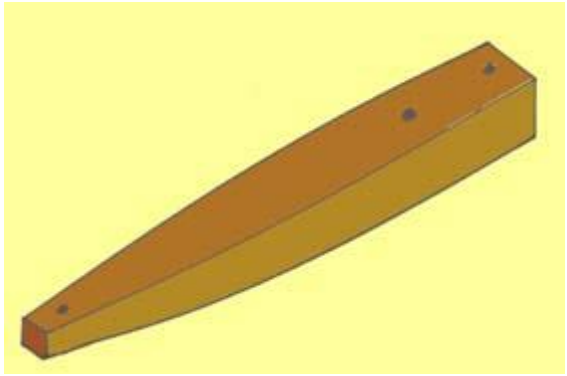
Fig. 2. FRONT VIEW

JOHN TAYLOR & CO.
Bellfounders,
LOUGHBOROUGH

Replacing a Broken Hasting Stay

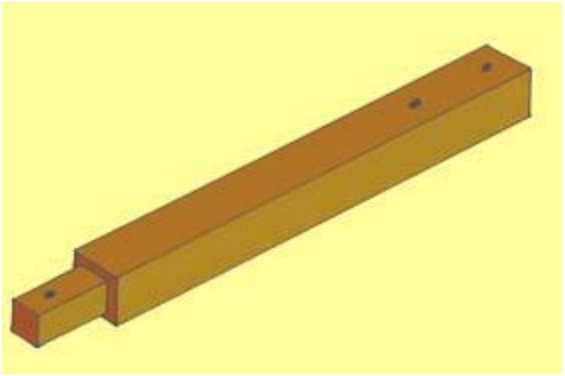
A Different Approach

The Whiting Society website gives details on how to make a square top section Hastings stay.



This is easier to shape than the traditional tapered design.

This can make like a little easier.



See:

https://www.whitingsociety.org.uk/articles/stay-making/hastings-stay.html

Replacing a broken Hastings stay

Hasting Stays must be the correct length

What do you think the problems would be if they are not?

Too long

- Binding
- Bell won't stand

Too short

- Bell won't stand
- Bell will go over the balance

Replacing a Plain Stay

- Easy! (Compared to a Hastings Stay)
  - Cut to length
  - Plane to size
  - Drill holes

- Fit

Length is not so crucial as Hastings stays, but there are limits.

What could be the problems?

Ropes

Two main types of ropes used:

Natural Fibre

There are two natural fibres that are used for making bell ropes:

Flax is the most common type used. Flax can tend to absorb moisture and change length – shorter in winter and longer in summer.

Hemp is a little harder wearing than flax, but can be more expensive than flax. Suffers from the same problem, but to a lesser extent.

All natural fibres can rot with time. Especially in damp environments.

Ropes

Manmade Fibre

Pre-stretched Polyester (sometimes called Terylene) offers a very hard-wearing rope that will not absorb water, stretch or rot.

Only used on top ends.

It can cost more than pure Flax or Hemp, but it is much hard-wearing.

Orange/Black bands indicate this is military grade, which most rope suppliers use.

Ropes

Sally

This is made of wool and tends to compress over time and become flat (and dirty).

Checking a Rope

Checking a Rope

If it is worn, then it's usually quite obvious!

Check the tail end for worn or damaged strands.

If the tail end hits the floor, check these areas carefully.

Run a hand up the sally, looking for loss of wool, which may indicate a broken strand.

Check the garter hole area.

Top picture shows what can happen!
Bottom picture shows a Terylene rope coming through the garter hole, with no wear at all

Changing a Rope

Changing a Rope

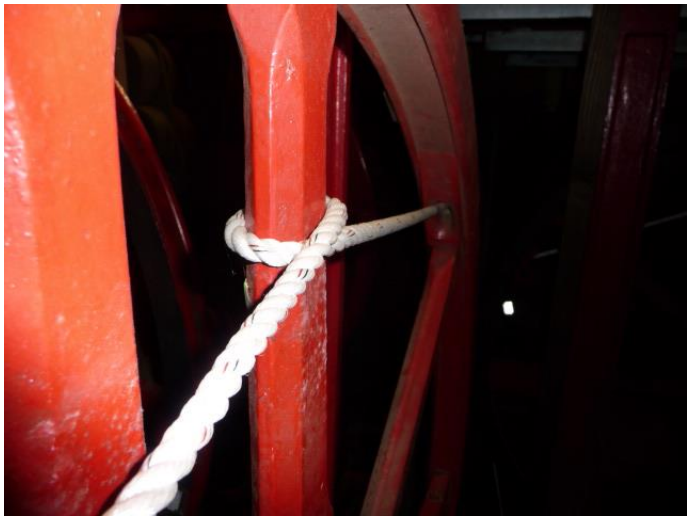
Assuming the old rope is complete, it is best to tie the new rope to the tail end of the old one and pull it up!

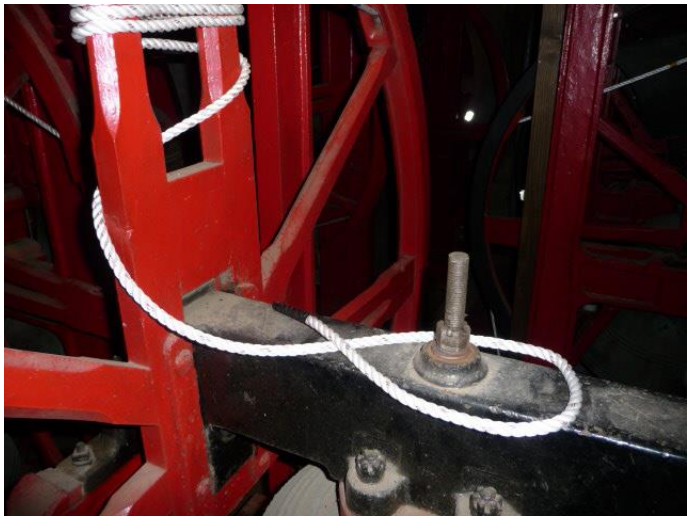
Pass the new top end through the garter hole and start to pull the rope up.

You will need a helper in the ringing room to get the sally height right.

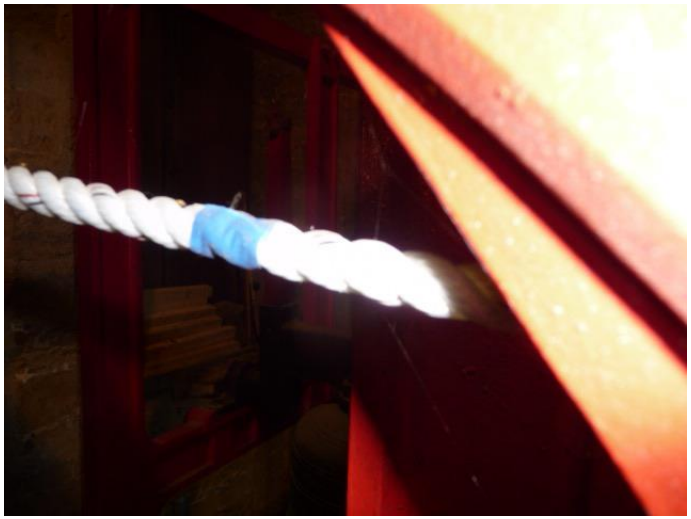
Once you have the right height, wrap the rope around the spoke once

Then wrap the rope round and round the two spokes until about 3 feet is left.





Changing a Rope



Wrap the remaining rope around the loops already made.

When you reach the end, tuck it in securely.

Once done, it is a good idea to mark just inside the garter hole with some tape.

Therefore, if you ever have to take the rope off again, you know exactly how much is needed on the wheel to give the correct sally height.

Garter Sleeves

Garter Sleeves - optional

This is a leather sleeve that fits over the rope in the garter hole.

It acts as a strain relief, which is supposed to make the rope last longer.

It can be of some benefit on natural ropes, but not much effect on man made rope, therefore, it is not so common these days.

Looking After your Ropes

Being made of natural fibre, ropes are subject to rot and mildew if the conditions are right. This also makes cleaning ropes difficult as chemicals can damage it

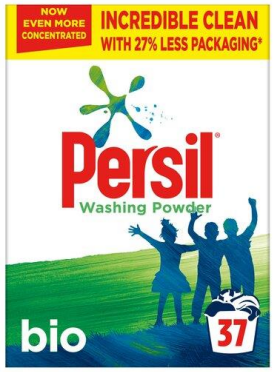
Keep ropes dry if possible.

If bells are not to be rung for some time, then remove the ropes and store them in dry conditions (mark the garter holes first!)

If you have mould/mildew, dry the rope out then use a brush and vacuum cleaner to remove the residue as much as possible. This may be sufficient.

Looking After your Ropes

If you have to wash the rope, use cold water and a little mild hand wash detergent.
Do not use biological washing powered as the enzymes will break down the fibres and the rope will break easily.



The cleaned rope should be left to dry naturally out of direct sunlight.

You can put the rope in a pillow case and spin dry it to help speed up the drying process.

Help - My rope has broken!

To join it all back together

Tools needed – a marlin spike or fid, string, PVA glue, tape
The correct type of splice…….

Long Splice

Best suited where a rope will pass through a ceiling boss or over a pulley block for example so the finished rope needs to be a similar width to the original. It is a little more difficult to produce and takes up a greater length of rope than a short splice.

Short Splice

Suitable where the rope will not pass an obstruction, but could also still be used if spare rope is limited.

This is the choice for splicing on new tail ends and will be demonstrated.

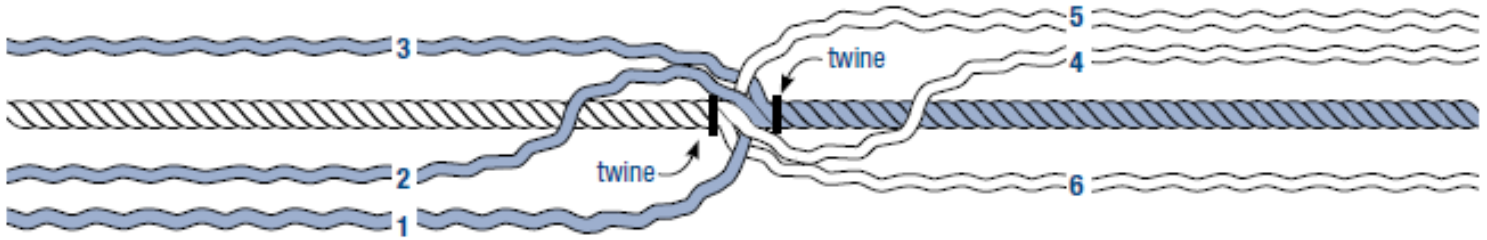
Any Questions?

Long splices

STEP 1

MARRYING THE ROPES

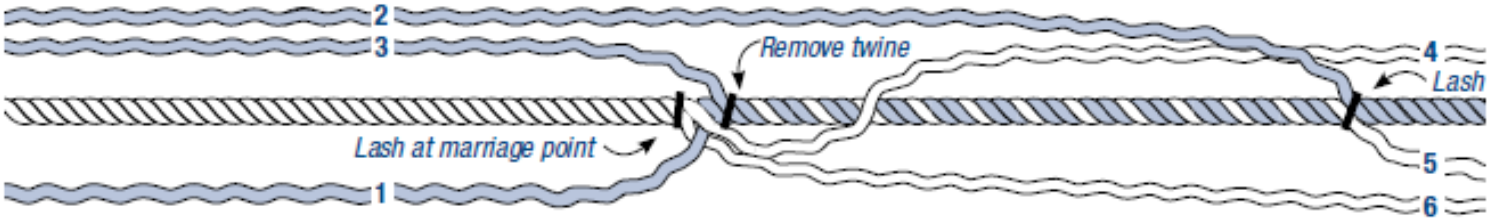
Unlay the end of each rope a minimum of 36 picks. Lash securely with twine as shown to prevent ropes from coming apart further. Place ropes together, alternating the strands from each. Note how strands are numbered to show their relative positions throughout the long splice procedure.



STEP 2

REPLACING STRANDS

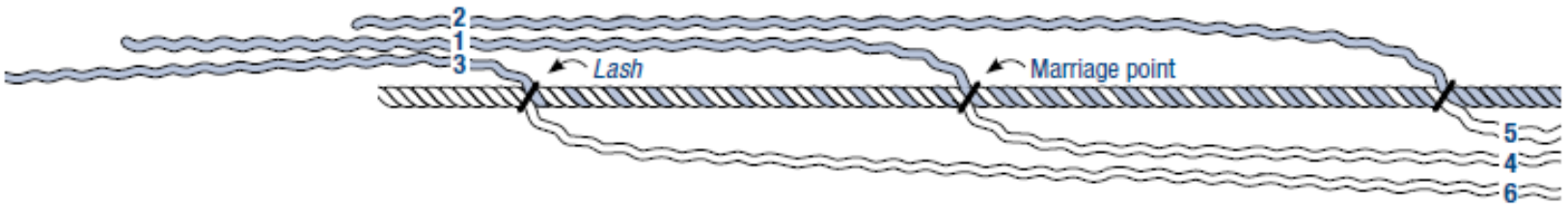
Take lashing off one side. Unlay Strand 2 a minimum of 25 picks and replace it with a strand from the other side, Strand 5, as it is being unlaid. Lash securely as shown to hold strands in place. Be sure to place lashing at the "marriage point" to hold strands securely.



Long splices

STEP 3

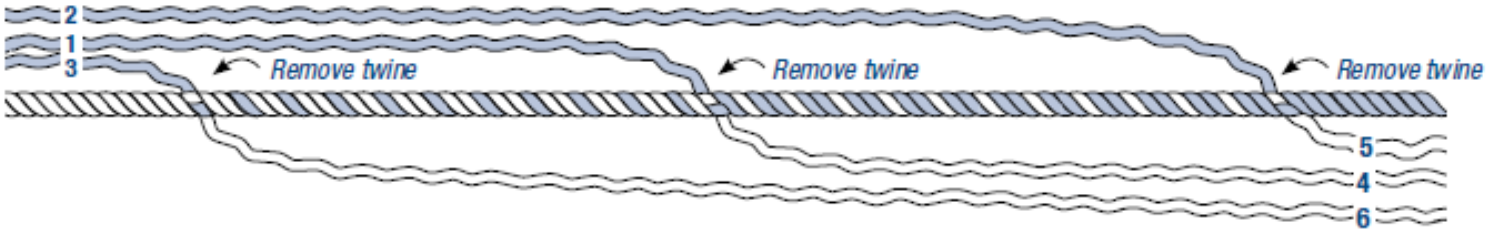
Step 3 is like Step 2, except in the opposite direction. Strand 6 is replaced with Strand 3. Each point is securely lashed as you go along. This leaves Strands 1 and 4 at the "marriage point."



STEP 4

TYING OFF OPPOSING STRANDS

Remove all lashings and tie each pair of opposing strands (2 and 5, 6 and 3,1 and 4) with an overhand knot. Be sure knot is tied in the direction of strand twist.

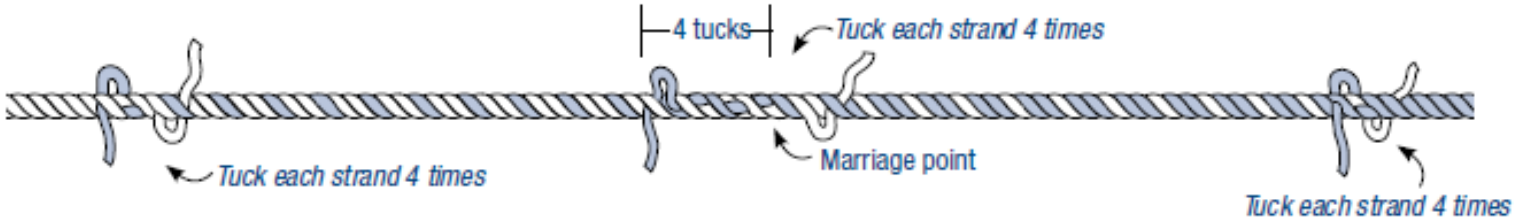


Long splices

STEP 5

FINAL TUCKING

Tuck each strand 4 times. These tucks should be at right angles to the direction of the twist in the rope.



STEP 6

TAPERING AND FINISHING THE SPLICE

The splice may be tapered by reducing each strand by 1/3, then 2/3 and performing another set of tucks for each strand for each reduction. Now roll and pound well. Finally cut the strands off close to the rope.

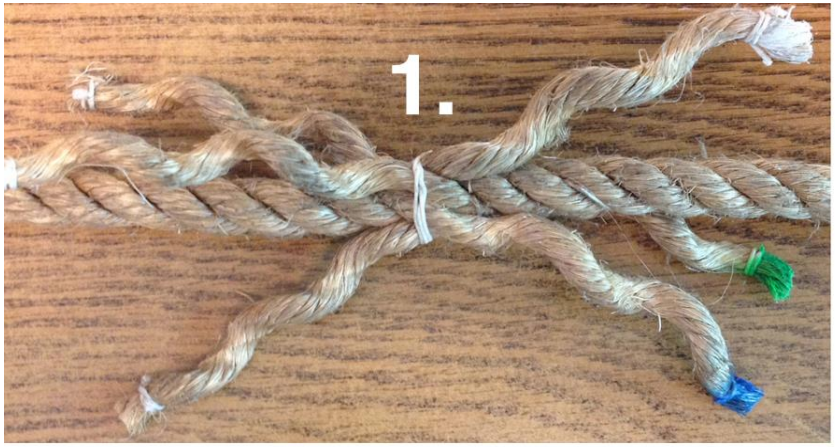
Finished splice

Short Splices

A short splice can be used in place of a knot to join two ropes or the ends of the same rope together.

If two ropes are being joined with a short splice, they should be the same type of rope and have the same diameter.

https://scoutpioneering.com/2013/03/15/splicing-rope-3/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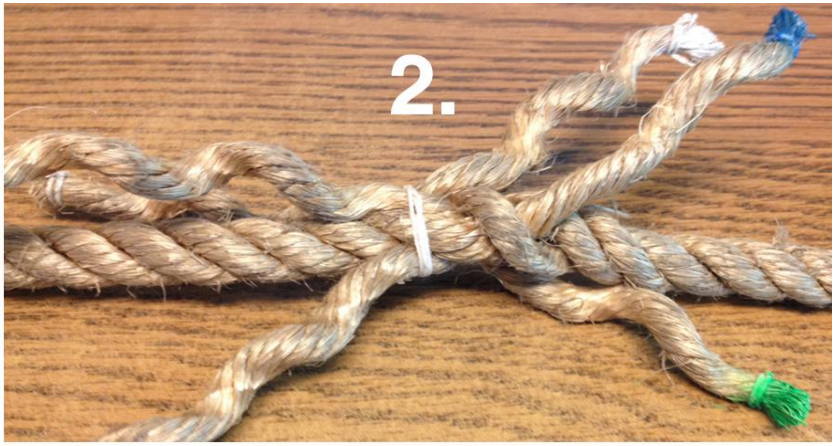
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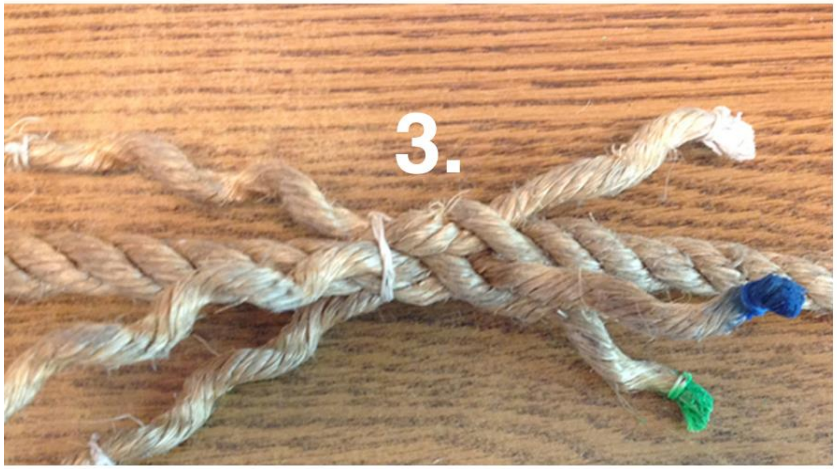
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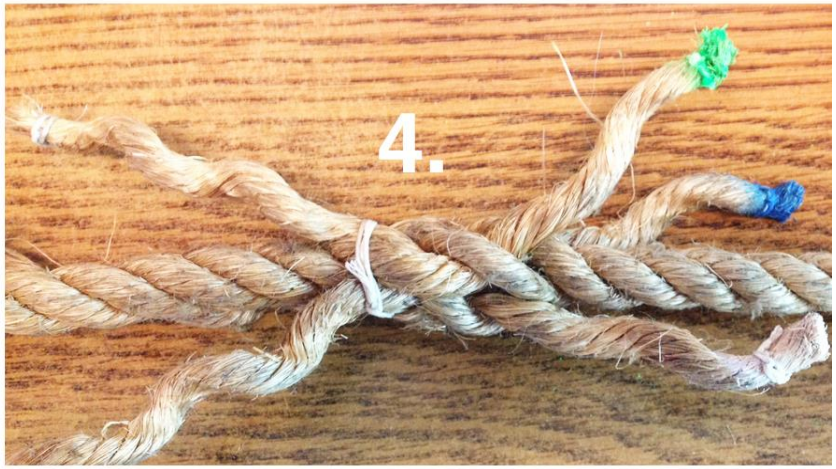
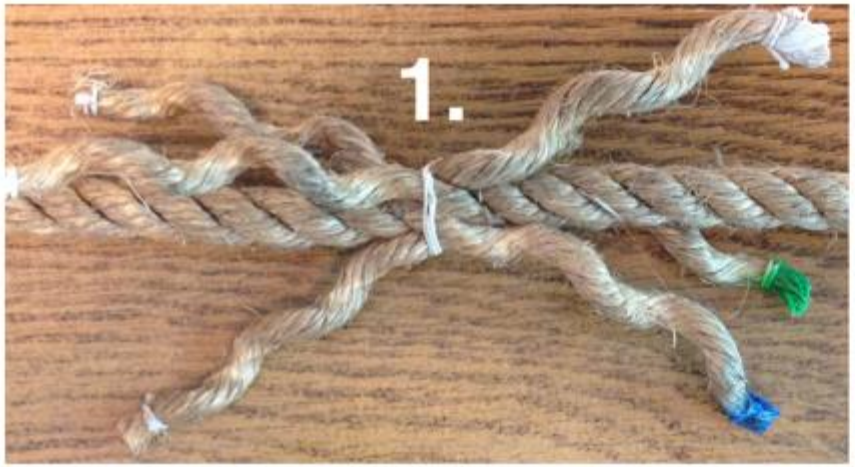

4.

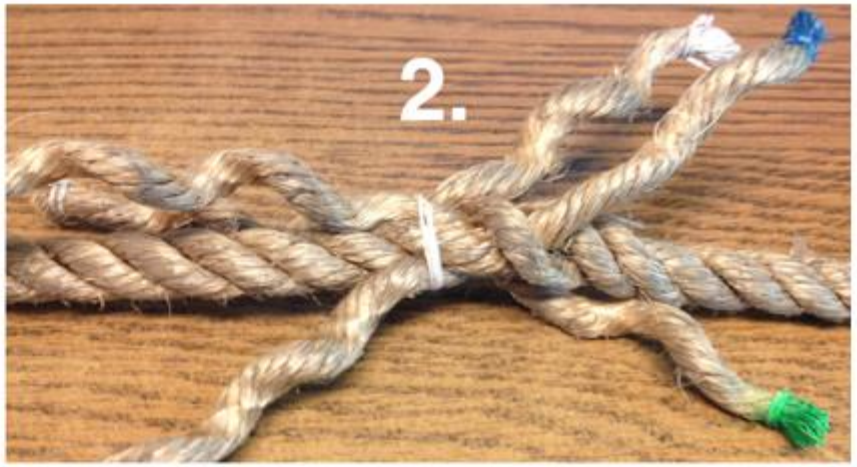

5.


6.

Short Splices

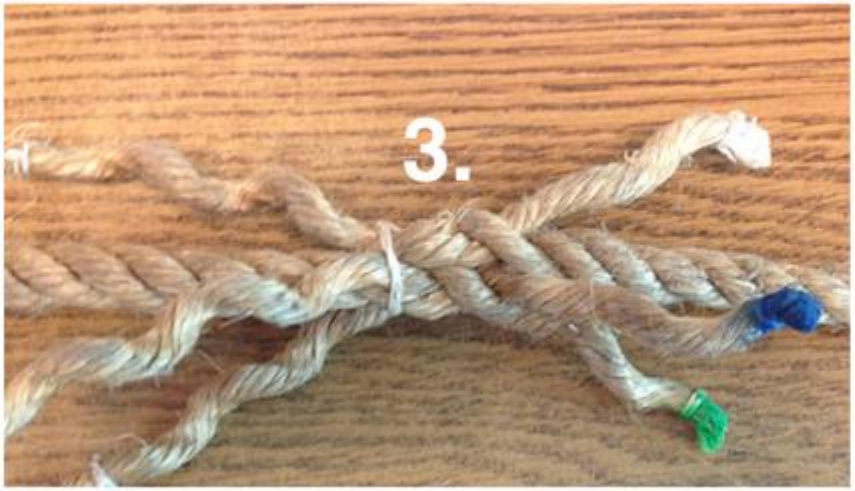
1. Unlay the ropes, intertwine the strands, and tie a temporary whipping to hold the ropes together. Tie each strand with a constrictor knot to prevent raveling.
2. Starting with one strand (blue) of the left rope, take it over one of the strands on the right rope, and tuck it under the next strand on the right.





Short Splices

3. Roll the rope towards you and take the next strand (white) in turn. Take it over the strand on the right rope, and tuck it under the next strand.
4. Roll the rope towards you again and take the third strand (green) over the next strand and under the one after on the right rope.



Short Splices

5. At this point, three strands of the left rope should be tucked under two strands on the right rope. Continue by making another tuck with each strand.
6. Continue the process until three tucks have been made with each strand. Remove the temporary whipping and splice the other left ends in the same way.

When the splice is complete, the cut ends can be coated with PVA glue to make a smooth finish. Terylene ends can be melted with a soldering iron to achieve a similar effect.

Useful websites

Short Splice

https://www.youtube.com/watch?v=PFFeDH2u7E0

Long Splice

https://www.youtube.com/watch?v=sN-cnO8Fqrc

Fitting a muffle

https://www.youtube.com/watch?v=j0clju-pNFo

Central Council stewardship and management committee online resource

https://belfryupkeep.cccbr.org.uk/