Worcester Cathedral
Guild of Bellringers

ROPE-RUNS

Updated Nov 2020

As the passage of the moving bell-rope is affected by pulleys, bosses and chutes there is a lot of scope for friction to affect the ringing experience. What started as a look at a few problems turned into a wholesale exercise in checking every rope-run.

Pulleys are important to ease friction where the rope changes direction but they take significant energy from it to make them turn. Ideally bells would have only a single main pulley so the rising rope going up to backstroke has **no** pulleys to rotate. With a double main pulley (six of the ring - Treble, 3rd, 4th, 9th, 9#, 10th) the backstroke has **one** to turn. Any significant draw away from vertical, usually in the carillon room, adds additional pulleys. The 2018-19 work has concentrated on having a maximum of **two** for any bell with the only exception now being the 3rd.

There are now **31** pulley blocks (16 main, 15 guidance). All should be regularly checked for ease of running and should make no noise. Pulleys should not be too small - more rotations equates to more loss of energy from the rope - ideally they should all be **6" diameter** - any future replacements of the 5" ones should be larger not like-for-like.

The anodised aluminium ceiling / floor **bosses** are excellent at allowing the rope to slide through them and also very good for drawing the rope from vertical by a small amount (up to 1 in 12). We have used these to replace wooden bosses and quite a number of unnecessary pulleys.

Rope **chutes** are used in the carillon room, mostly as a safety device protecting the rope from accidental handling but also to prevent rope 'flap' on the 8 bells where it is out of vertical (2, 2#, 3, 5, 6, 6b, 5#, 9#). Three (2#, 4, 9#) needed no action, two have been moved and re-fitted (5, 6b), eight new ones have been installed (8, 7, 5#, 2, 3, 9, 10, 6), and there are a possible further three to be made (11, 12, 1).

The table below lists all the work done.

ROPE GUIDANCE

B/P indicates how many pulleys the bell has to operate going up to the backstroke.

	Main Pulley	B/P	Belfry	Carillon Room
1	Double (2019)	**1**	Boss (2018) Floor Boss	No chute Floor Boss (2019)
	The old main double pulley box (1970's) has been replaced by a new one. The pulleys sited on top of the beam and on the carillon room floor have replaced by new bosses, as the overall draw from the vertical is quite small.			
2	Single (2019)	**2**	Beam Boss (2018) Beam Boss (2016) Floor Boss (2018)	Sloping Chute (2018) Ceiling Pulley (2007) Floor pulley (WBF 2002)
	This has been massively improved by allowing the rope to drop straight in the belfry, and replacing the beam pulley by a boss thus limiting the guiding pulleys to 2. The main pulley, one of the old wooden ones from 1970's, has been replaced.			
2#	Single (2018)	**2**	Floor Pulley (2018)	Sloping Chute (2018) Floor Pulley (2018)
	As this was a new installation it initially seemed unnecessary to examine it closely. However, the go didn't seem quite good enough so the 3 new pulleys were dismantled and lubricated which made quite a difference – Jan 2019			
3	Double	**3**	Floor Pulley (2018)	Sloping Chute (2018) Floor pulley (WBF 2002)
	Replacing the poor floor pulley helped here, as did replacing a badly positioned cracked flapper board with a new chute. The main pulley, which is relatively new, benefitted from a stripdown, clean, lubrication and re-assembly in Mar 2019. This is now the only bell whose rope has to operate 3 pulleys at backstroke, which could be changed but there seems little need to do so.			
4	Double	**1**	Floor Boss (2018)	Vertical Chute (2017)
	The worn wooden boss on the belfry floor was replaced by a metal one. The main double pulley was cleaned and greased Jan 2019 with a noticeable positive effect. This was always one of the easier bells but it has been improved.			
5	Single (2018)	**2**	Floor Boss (2018)	Sloping Chute (2018) Ceiling Pulley Floor Pulley
	A huge improvement in 'go' was achieved by replacing the double main pulley with a single which meant re-routing the rope in the carillon room, removing the long single chute which went through the belfry floor. To reduce the tendency of the rope to drift at handstroke the floor pulley was mounted several inches off the floor. The carillon room floor pulley benefitted from a stripdown and re-assembly in Oct 2019. The carillon ceiling pulley was replaced in Jan 2020. The main pulley was re-aligned slightly in Jan 2020. The chute was re-aligned for the rope to drop through a new hole in floor Sep 2020, when the 5# rope was run through the hole that this bell used.			

5#	Single (2019)	**--**	Boss (2020)	
	This bell had a lot of work put into the roping from its old position next to the 9#, mainly to see whether drawing it 7' across the carillon room to use the bourdon rope hole was feasible. The main double pulley was first replaced, then reduced to a new single and the passage through the belfry floor eased by a metal boss. The two guiding pulleys at top and bottom of the very sloping chute have both been cleaned out. A metal boss was inserted into the worn wooden ceiling boss to avoid its grooves. This was reasonably successful and stayed for a year from Oct 2018 – it was rung to 3 peals from this position. However despite our efforts there was always too much drag and therefore it was routed back to the NE ceiling hole in Oct 2019. The bell also benefited from an anti-flap board next to its main pulley though it is not clear why it should have needed it when other bells do not. The entire arrangement was changed when the 5# was moved in Aug 2020 to the old 6b pit in the middle of the frame, where it has a straight drop to the carillon room floor with no pulleys.			
6b	Single (2019)	**2**	Floor Boss (2019)	Sloping Chute (2019) Ceiling Pulley Floor Pulley (WBF 2002)
	The rope was re-routed to the north side with new single main pulley. The old chute was cut down and re-sited with two refurbished pulleys, Feb/Mar 2019. There was a huge improvement in 'go' and The old roping, from the south side using a double pulley and cutting right through a floor beam, made little sense. From its new position under the bourdon bell it is roped in the same way, and much the same distance, but now East to West, not West to East.			
6	Single (2019)	**2**	Floor Boss (2019)	Sloping Chute (2019) Ceiling Pulley Floor Pulley (WBF 2002)
	The old wooden main pulley has been replaced by a modern one, the rope route has been changed to have a straight drop to the belfry floor, then a new chute with top and bottom pulleys (Jan 2019). This has removed a pulley from the system and is much neater.			
7	Single	**--**	Floor boss (2019)	Vertical Chute (2018) Boss (2018)
	The carillon room floor large wooden boss has been improved by adding a metal one to it. The main pulley has been re-aligned. (Jan 2019) and the garter hole adjusted to maintain the same handstroke:backstroke ratio. The wooden floor boss on the belfry floor has been replaced			
8	Single (2007)	**--**	Beam boss (2019) Floor boss (2019)	Vertical Chute (2019) Floor Boss (2019)
	This bell should have a double main pulley and a straight rope drop to the ringing room but that requires a new hole in the beam below it. The small draw needed from the single main pulley (about 1' in 15') has been achieved using 2 new metal bosses, one on the belfry floor and one on the beam. The carillon room floor pulley has been replaced with a boss (Jan 2019). The main pulley was dismantled, cleaned and re-lubricated Jan 2019.			
9#	Double (2019)	**2**	Beam boss (2019) Floor boss (2019)	Sloping Chute (2018) Floor Pulley (2018)
	Although much work had been done (JCS) to bring this rope further into the circle the key problems of the old main pulley and the short handstroke remained until Jan 2019. The main pulley has now been replaced slightly closer to the bell facilitating a move in the garter hole to create a better handstroke. The intermediate backboard and the belfry floor pulley have been replaced by bosses, so that the backstroke now only has to operate 2 pulleys not 3.			

9	Double	**1**	Boss (2018)	Vertical Chute (2018) Boss (2018)
	The unnecessary floor pulley was replaced by a boss and the main pulley thoroughly cleaned and re-lubricated Dec 2018. For some reason the double pulley unit has 7" rollers. This bell now handles extremely well.			
10	Double (2006)	**1**	Metal boss	Vertical Chute (2018) Boss (2018)
	The two totally unnecessary guidance pulleys on the belfry and carillon room floors were replaced by bosses. The main pulley was cleaned and re-lubricated Jan 2019.			
11	Single	**--**	-------	No chute
	The main pulley was cleaned and re-lubricated Jan 2019 but no other work was really needed.			
12	Single	**--**	Boss (2019)	No chute
	The main pulley was re-aligned and totally cleaned Jan 2019, and the floor pulley in the carillon room removed. The narrow wood 'sleeve' in the beam through which the rope runs has been removed and guidance provided by a floor boss Mar 2019. The difference in 'go' is huge			

Green items show recent actions, Red items need action / investigation