

Derby Diocesan Association of Church Bellringers Consultant's Report	Report DDACB 09/05
Church of Saints Peter and Paul Old Brampton – Inspection of Bells	Issue Date 29/08/05

1.0 Introduction

The inspection was requested by Mr Ron Baxter on behalf of the PCC and was carried out by DDA bell consultants Robin Lyon and Mike Banks on the 11th and 18th August 2005.

Gordon Halls carried out the last DDA inspection in 1994 and his report highlighted the detrimental effect that rainwater ingress was having on the wooden structural components of the bell installation. In recent years the PCC has carried out remedial work on the tower which has stopped the ingress of rainwater, but there remains a legacy of problems relating to decay in wooden components. This report recommends that the structural condition of the bell chamber floor be investigated and should its condition necessitate replacement, this will provide an ideal opportunity to make additional improvements to the ringing installation (described in Appendix A).

The introduction of Perspex sheeting into the south and west louvre openings to block ingress of wind blown rain has reduced sound levels outside the tower.

The bells and their fittings are generally in good order and remedial work recommended in section 8.0 of this report will be of low cost and capable of being done as a DIY activity.

2.0 Tower

The stone built tower is situated at the west end of the church and has angled buttresses and a broach spire. On the south wall there is a clock face. There are four spire lights near the top of the spire and four louvered openings to each aspect at the base of the spire. Below these are four more louvered openings near the top of the main body of the tower. All openings are well protected from bird ingress by galvanised mesh fitted external to the louvre slats. In addition, wind blown rainwater entry is blocked by Perspex sheeting applied to the insides of the louvre slats in each of the four spire lights and similarly to the other openings on the south and west aspects of the tower. To complete the work on rainwater exclusion, the tower has been completely repointed and looks to be in sound structural condition.

The tower contains 6 bells hung for full circle ringing. Outside bell sound levels were measured approximately 28 metres to the north and 28 metres to the south of the tower giving the results tabulated below.

BELL	1	2	3	4	5	6
Sound levels NORTH dB(A)	70/70	72/72	76/74	76/76	76/75	76/77
Sound levels SOUTH dB(A)	61/61	62/62	64/65	64/64	68/69	68/68

Sound levels on the north side are at a typically acceptable level but those on the south side are decidedly muted being, on average, 9 dB(A) quieter. It is recommended that the Perspex sheeting in the louvre openings on the south and west walls be replaced by Galebreaker fabric to reduce sound attenuation in these directions.

Ringling is carried out from an upstairs ringing room reached via enclosed stone steps added to the north side of the tower.

3.0 Ringing Room (Figure 1)

The ringing room is roughly 3,6 metres square and is well lit artificially by two fluorescent tubes supplemented by daylight from a window above the clock case and a small round window below. The clock is driven by auto-wound weights positioned in the original weight shaft which extends through the ceiling into the bell chamber immediately above.

The ringing circle is not good; the ropes to bells 6,1 and 2 lie in a straight line (making rope sight difficult) and the ropes for bells 6 and 1 are too close together. In an ideal world there should be a clear space around each rope of 600mm, particularly on the heavier bells, but rope 6 is too close to the clock case and rope 5 is too close to the east wall.

The ceiling comprises tongue and groove boarding fixed to the underside of the bell chamber floor joists and has a total thickness of about 220mm. A hooped iron ladder gives access to the bell chamber via a trap door in the northwest corner. Since there is no intermediate room between the ringing chamber and the bell chamber, the bell sound levels in the ringing room are higher than desirable. Sound levels were measured at 77 - 82 dB(A) as shown in the table.

BELL	1	2	3	4	5	6
Handstroke sound level dB(A)	78	80	82	79	81	79
Backstroke sound level dB(A)	77	80	81	79	81	80

To maintain satisfactory voice communication between ringers and remain within legislative guidelines on sound levels, 80 dB(A) is the absolute maximum that is considered tolerable in ringing rooms for general ringing. The target is 10 dB(A) less than this, specifically to achieve ringing room sound levels for each bell of between 68 and 72 dB(A) with ideally no more than 3 dB(A) spread between all bells. Much of the sound comes through the large ceiling bosses and the unsealed trap door. Also the old weight shaft acts as a

sound conduit. Wall to wall carpeting reduces reverberation in the ringing room and so is already helping with sound control.

The ceiling height is 4120mm which is good. A minimum ceiling height of 3700mm is considered to be necessary from a safety point of view since should an inexperienced ringer break the stay on a bell he/she should have time to let go of the rope before being lifted to the ceiling!

The bell chamber is reached by an iron ladder in the northwest corner.

4.0 Bell Chamber (Figure 2)

The bell chamber is well lit by electric lights both below and above the bell frame. There is a clearance of about 700mm between the floor and the underside of a steel beam which shores up the bell frame foundation beams. This is an obstacle to accessing the bells for maintenance work and regular sweeping of the floor would make this task more pleasant! The top of the frame is 2230mm above the floor and is reached via a short wooden ladder in the pit of bell 2. This ladder is missing one rung, making it unsafe, and should be repaired as soon as possible. The confined space of this pit makes negotiation of the ladder a challenge in any case!

The floor boss for the rope from bell 2 comprises a short box section. One side of the box has become detached and is fouling the rope. This must be rectified as soon as possible.

The bell chamber floor has suffered for many years from dampness resulting from ingress of rainwater. Although ingress of rainwater is now resolved, it is probable that the joist ends in the west wall have rotted to the point where they cannot safely transmit the floor weight into the wall. A 152 X 76mm rolled steel joist, set north/south in the ringing room walls, supports this side of the floor. There is serious rot evident in the tongue and groove boarding in the centre of the floor and a lack of support for the floor under the tenor bell. It seems likely that some joists may have partly succumbed to dry rot at mid span and it is recommended that the boards should be lifted to enable a structural survey to be carried out.

5.0 Bells

An old peal of four bells was augmented to five and hung in a new wooden frame by John Taylor of Loughborough in 1887. In 1923 John Taylor recast these five bells and augmented to six bells by the addition of a new treble.

The following table summarises the bell details:

Bell	Diameter mm (ins)	Weight kg (cwt/qrs/lbs)	Date	Founder
1	641 (25.25)	171 (3-1-12)	1923	John Taylor
2	699 (27.5)	209 (4-0-13)	Recast 1923	John Taylor
3	768 (30.25)	270 (5-1-8)	Recast 1923	John Taylor

4	806 (31.75)	305 (6-0-0)	Recast 1923	John Taylor
5	886 (34.875)	414 (8-0-17)	Recast 1923	John Taylor
6	1010 (39.75)	614 (12-0-9)	Recast 1923	John Taylor

(Details are taken from the book "The Church Bells Of Derbyshire" by Pat Halls and George Dawson).

All of the bells have flat tops (i.e. no canons) and are in good condition. None has been turned and all show only slight wear at the clapper strike points. All appear to be tightly bolted to their headstocks with the exception of bell 5. There is evidence that there may be very slight movement between the headstock and the bell mounting pad and it would be prudent to check tighten the four bolts holding the bell to its headstock. The clock strikes the hour on bell 6.

6.0 Bell Fittings

6.1 Headstocks. All are cast iron and in a sound condition.

6.2 Bearings. All are self-aligning ball bearings with no sign of lubricant loss from the shaft seals. (It should be noted that the bearings are sealed for life and under no circumstances should they be regreased). Ball bearings tend to last a very long time in this sort of application with the added bonus that eventual failure is benign. Their condition can only be properly assessed following a full strip, however a rough check was carried out by feeling each bearing for "rumble" whilst its associated bell was rung full circle. A hint of rumble was detected on the south bearings for bells 2,4 and 5. These bearings should survive for several more years and so immediate action is not essential. There is severe rot in the wooden wedges which help prevent axial movement of the bearing housings in their chairs as fitted to bells 1 and 2. These wedges should ideally be replaced although there is no sign of movement.

6.3 Clappers. All are of the independent type and firmly bolted into their headstocks by means of castellated nuts locked by split pins. All are made from wrought iron with little wear on their strike faces and swing freely on greased nylon bushes. There is very little wear apparent in the nylon bushes with the exception, perhaps, of the tenor clapper which shows more (but still acceptable) wear. In view of the reported odd-struckness of bells 5 and 6 the positions of their clappers in relation to the bell sound bows was measured. The clapper in bell 6 appears to be centrally mounted but the clapper in bell 5 is slightly offset by 5mm. This may contribute to this bell being odd struck.

6.4 Wheels. The wheels on bells 1,3,4,5 and 6 are generally in good condition. There is a nut holding one of the strengthening irons on the wheel of bell 1 which only just engages its bolt thread and this ought to be attended to. One segment of the wheel flange for bell 3 is coming loose near to the garter hole and should be monitored. The biggest problem is bell wheel 2 which has a section of rim missing near the

garter hole due to being used as a hand hold when negotiating the short wooden ladder giving access to and from the top of the frame. The segment should be glued and screwed back in place with sheet brass inserts fixed in the slots spanning the gaps between adjacent segments.

6.5 Pulleys. All pulley wheels are made from wood and run on ball bearings which appear to be acceptable, although some sound as though they are lacking lubrication (there is no provision for re-lubrication in these bearings). The pulley wheel on bell 6 is rubbing on its sidewalls which will adversely affect the “go” of this bell, however all other pulleys appear serviceable. Bells 5 and 6 are fitted with single pulleys and double pulleys are fitted to all other bells. The double pulleys enable the ropes to be drawn sideways to improve the ringing circle in the ringing room. Despite this the ringing circle is not as good as it could be since the tenor and treble ropes are very close together; use of a double pulley on the tenor bell would enable this gap to be increased. The rope from the 5th bell is drawn sideways by means of a sloping rope box which adds friction to the freedom of movement of the rope. Use of a double pulley here would both improve the ringing circle and make ringing of the bell slightly easier.

6.6 Ropes. The rope on bell 5 should be retied a little higher since it is worn where it passes through the garter hole. All other ropes appear serviceable.

6.7 Stays. All stays are in good condition although stays to bells 1,3,4 and 5 require their fixing bolts to be tightened.

6.8 Sliders. The wooden block holding the slider pivot pin for the treble bell has almost completely rotted away. The imminent failure of this block will allow the bell to continue to rotate causing the rope to be wound upwards with possible injury to the ringer and others. **This is clearly a dangerous situation and the bell must not be rung again until the fault is rectified.** Local ringing representative Mr Stan Margereson was informed of the situation before the Bell Consultants left site. The treble rope was pulled into the bell chamber to prevent further ringing and a warning notice posted in the ringing room. All other sliders are in good condition.

7.0 Frame (Figure 3)

The frame is a conventional low-sided wooden (pine?) frame installed in 1887 and rests on four large foundation beams set east/west in the tower. It is well braced by tie rods and metal plates. Viewed from the underside, two of the tie rods on the truss between bells 5 and 6 appear to be loose and ought to be tightened.

Wind blown rain comes predominantly from the southwest and the frame has suffered in the past from the ingress of water, particularly on the west side.

The foundation beam-ends in the west wall have been severely damaged by dry rot to the point where some are no longer able to transfer frame loads into this wall. An alternative load path has been provided by installation of two 203 X 127mm universal steel beams set north/south under these wooden foundation beams. One of these steel beams is set against the east wall and the other set as far west as the clock weight pit would allow. Distortion of one of the two centre wooden foundation beams means that it provides no support to the west side of the frame under the treble and second bells. This does not seem to be a problem since there is very little frame movement when any of the bells is rung. However this beam is heavily affected by dry rot not only at its beam-ends but also on top under the treble bell and it is this which has caused the beam to distort away from the frame. It is also this considerable rot which has infested the wooden slider pivot block as described in section 4.8. It is strongly recommended that when repairing the slider this dry rot should be killed before it spreads further.

Having noted the effects of rot on the installation it is a good moment to point out that loose debris/sand should be cleaned from the frame and floor on an annual basis. In particular remove any accumulations between the frame and the walls since this acts like blotting paper, attracting damp, preventing air circulation and so creating ideal conditions for rot to continue unnoticed in the wooden frame.

8.0 Recommendations

The recommendations in this section do not require a Faculty and are classified for both immediate and longer-term actions. If the bell chamber floor is found to be structurally suspect as a result of recommendation 8.1.6 then Appendix A proposes a package of work associated with a new floor which will require a Faculty. This package will reduce sound levels in the ringing room and will improve the ringing circle.

8.1 The following recommendation should be carried out immediately.

- 8.1.1 Replace the slider pivot block under bell 1 - do not ring bell 1 again until this work is completed!
- 8.1.2 Replace the missing rim segment on the wheel of bell 2. It is recommended that this be glued and screwed in place.
- 8.1.3 Retie rope 5 higher to move the worn section of rope above the garter hole.
- 8.1.4 Repair the floor boss for the rope of bell 2.
- 8.1.5 Replace the missing rung in the ladder giving access to the top of frame.
- 8.1.6 Carry out a structural survey of the bell chamber floor.

8.2 The following recommendations should be carried out during the next 6 months.

- 8.2.1 Tighten the loose nut on bell wheel 1.

- 8.2.2 Replace the wooden location wedges on the south-side bearing housings 1 and 2.
- 8.2.3 Tighten the bolts in stays 1,3,4,and 5.
- 8.2.4 Check tighten the holding bolts on bell 5.
- 8.2.5 Tighten the tie rods in the frame truss between pits 5 and 6.
- 8.2.6 Attend to the rot on top of the foundation beam between bells 1 and 2 – this may require expert advice.
- 8.2.7 Remove dust and dirt from the bell chamber floor and bell frame, paying particular attention to spaces between the bell frame and tower walls.
- 8.2.8 Replace the Perspex sheets in the south and west bell chamber louvres with Galebreaker sheet. (Leave the spire lights as they are).

NB Advice given free of charge and in good faith but no liability accepted.

M D Banks
Bell Consultant to the Derby Diocesan Association of Church Bellringers

FIGURE 1
RINGING ROOM

NORTH

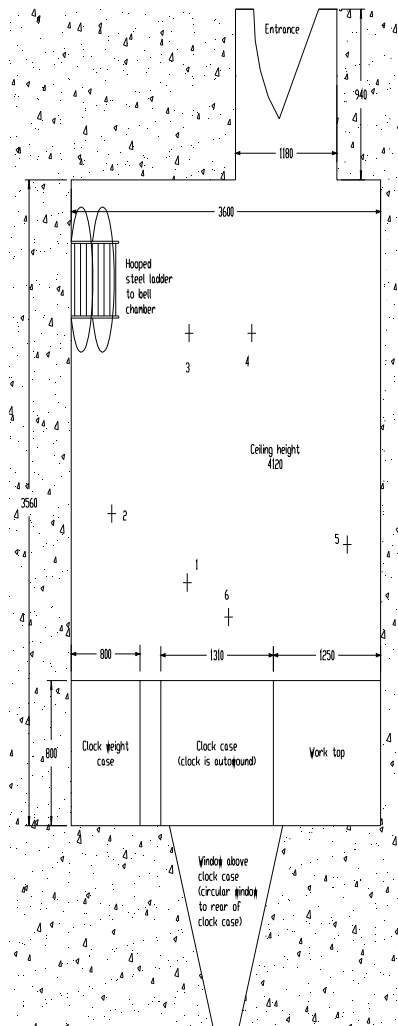


FIGURE 2
BELL CHAMBER

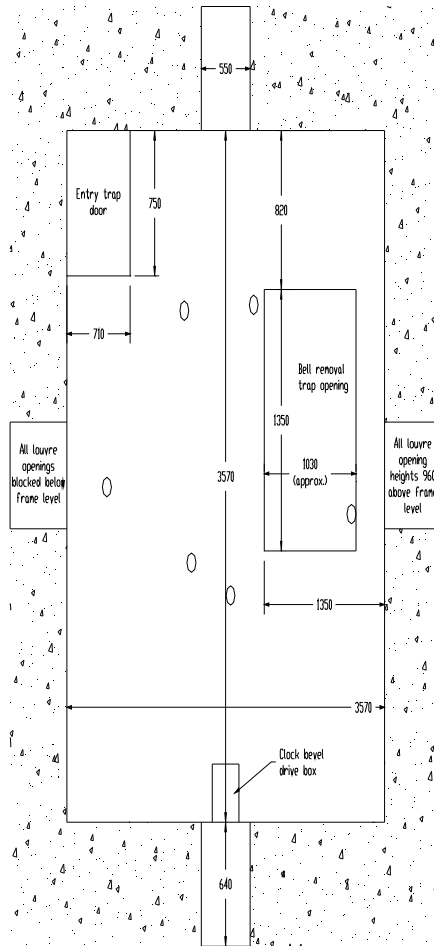
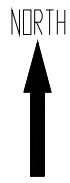
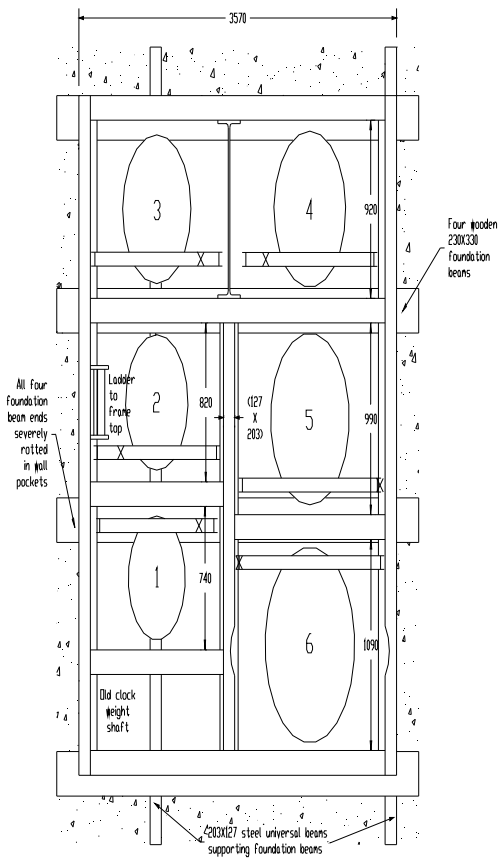


FIGURE 3
BELL FRAME



APPENDIX A

PROPOSAL FOR NEW BELL CHAMBER FLOOR AND IMPROVEMENTS TO BELL INSTALLATION

A1.0 Introduction

Renewal of the bell chamber floor will give the opportunity to:

- provide a safe floor
- reduce bell sound levels in the ringing room
- increase head room under the bell frame to make maintenance easier.
- improve the ringing circle.

A2.0 Ringing Room Sound Level Reduction

Current sound paths which need to be addressed are:

- ceiling rope holes
- gaps around the trap doors
- the old clock weight shaft
- gaps around the edge of the bell chamber floor
- gaps caused by rotting of the bell chamber floor boards.

The basic approach is to place an acoustic barrier between the ringers and the bells which is made from dense materials and has all gaps efficiently sealed. Control of sound through rope holes can be achieved by filling the void penetrated by the rope(s) with sound absorbing material.

A3.0 Increased Headroom Under Bell Frame

This will be achieved by placing the new floor lower down the tower. However a ringing room minimum ceiling height of 3,7 metres is recommended as an essential safety requirement since in the event that a ringer is lifted upwards following breaking of a stay, he/she still has an opportunity to let go of the rope before colliding with the ceiling. The current ceiling height is 4,1 metres and so there is scope to position the new floor a maximum of 0,4 metres below the position of the existing floor.

A4.0 Improved Ringing Circle (Figure A2)

The major problems with the existing rope circle are:

- ropes 2,1 and 6 are in a straight line making rope sight difficult,
- ropes 2 and 5 are too close to the walls,
- rope 6 is too close to rope 1 and too close to the clock case.

In an ideal situation there should be a clear space of 600mm around each rope to allow for loss of rope control by a learner and to give space for an

instructor to stand with the ringer. Since the bells are relatively close to the ringing room ceiling, the opportunity to alter rope positions really only occurs along the axis of swing of the bells. The biggest opportunity is to replace the single frame pulleys on bells 5 and 6 with double pulleys which enable their ropes to be drawn sideways. (All other bells are already fitted with double pulleys). With the ceiling height reduced to 3,7 metres, the sallies of bells 4,5 and 6 will pass completely through the new floor at backstroke. For this reason it is preferable that these ropes fall vertically from their frame pulleys. Also the rope from the treble passes through one of the foundation beams making it difficult to reposition. However since the sally from bell 2 will not pass completely through the new floor, this rope can be drawn sideways by means of a floor-mounted pulley.

A5.0 Recommended Bell Chamber New Floor Construction (Figure A1)

It is recommended that the new floor should be of double skin construction, i.e. wooden joists clad top and bottom with 22mm tongue and groove boards, and set at a height above the ringing chamber floor of no less than 3,7 metres. (NB Any affect on the auto-wind mechanism for the clock needs to be checked since the new floor will not only be lower but will also completely sever the old clock weight shaft). As shown in figure A1 the joists are best run in a north/south direction to give maximum clearance for the bell ropes and their floor/ceiling bosses. The joist ends could be supported on full width galvanised steel angle sections positioned within the thickness of the floor and fixed to the north and south walls by chemical anchors. The edges of the floor should be sealed against the walls by a 50mm cement or mortar fillet.

The entry trap door in the northwest corner should employ 22mm tongue and groove boarding in its construction and should be completely sealed against the floor surface by a rubber seal around its edge. It should be hinged on its north or west side.

There must be provision for a bell removal path, as shown in figure A1, but since this may only be used once every 100 years or so it is not necessary to incorporate a proper trap door. Double skin construction must be maintained but all that is necessary is to use easily removed 22 mm tongue and groove boarding and supporting trimmers all held in place by (stainless steel?) wood screws. It would be advantageous to seal the gaps round the edges of the removable boards with silicon rubber or similar.

Those voids between joists which are penetrated by bell ropes should be filled with glass or rock wool, taking care to leave adequate clearance around the ropes to prevent contamination of the sallies as they pass through. Rope bosses will be fitted to both skins.

It may be necessary to fit vertical rope guides in the bell chamber to the ropes of bells 4,5 and 6 since their sallies will pass right through the new floor.

A new access ladder to the frame top could be fitted in the southwest corner.

FIGURE A1
SUGGESTED NEW
BELL CHAMBER
FLOOR
CONSTRUCTION

NORTH

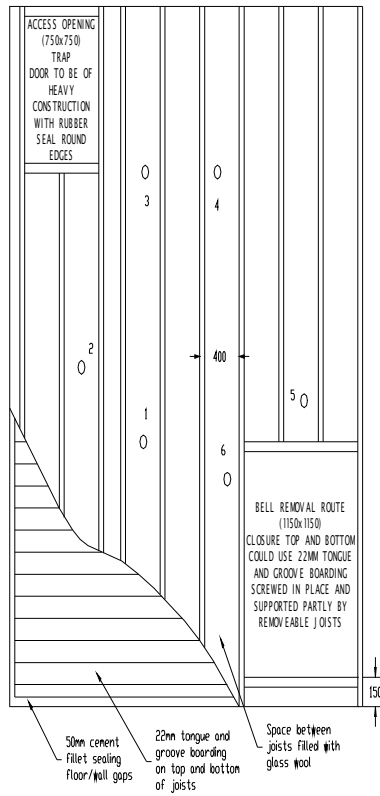


FIGURE A2
IMPROVED ROPE
CIRCLE IN RINGING
ROOM

NORTH

