

Derby Diocesan Association of Church Bellringers Consultant's Report	Report no. DDACB 02/003
Inspection of Bell Installation at All Saints, Heath	Issue date: 4/03/003

1.0 Introduction

The inspection was carried out on the 28th of February 2003 and was requested by the PCC in order to provide an independent opinion on the condition of the bell installation to compare with comments and proposals made by Fred Pembleton in his quotation dated 12 May 2001.

The church has a heavy ring of five bells. Heavy rings of five have the dual disadvantage that they are difficult for learners to handle, yet for experienced ringers who can handle the bells they do not provide much of an intellectual challenge for change ringing. A lighter ring of six bells would solve both problems. However the body of this report concentrates on the existing installation and issues relating to a lighter ring of six bells are included in the appendix.

2.0 General

The five bells are housed in a tower at the west end of the church. The church was rebuilt in 1852 and the tower construction appears to be of good quality with no obvious signs of structural weakness. Ringing is carried out from a ringers' gallery reached via a vertical iron ladder. The bell / clock chamber is reached via a spiral staircase in the southwest corner of the tower. The condition of this staircase is very good. The bells are mounted at two levels with the four heaviest bells supported in a low-sided composite frame and the treble in its own wooden frame above. The clock is set above the bell installation and is reached by an iron ladder.

3.0 Bell Chamber

The bell chamber is generally clear of debris but has a coating of sand on most surfaces resulting from natural "weathering" of the stone walls, possibly augmented by building work in the recent past. It is good practice to sweep out the bell chamber on an annual basis (in particular if sand gets into the pulley assemblies it can damage the ball bearings). However the main ball bearings that support the bells are fully sealed and so not prone to contamination.

The bell chamber has louvres on the south, west and north walls, each protected by wire netting which successfully excludes birds. It is recommended that the PCC consider installing "Galebreaker" material in the louver openings. This is a strong, PVC coated, woven polyester sheet with tiny closely spaced holes which allow circulation of air through the tower but exclude wind driven rain. Wind driven rain hastens deterioration of the bell

frames and fittings. (The Derby Diocesan Association of Church Bellringers has bought a roll of this material and can supply any reasonable amount at a cost of £15.65 per metre). The church architect would need to be informed of any intention to fit this material.

The bell chamber has a single electric light which is barely adequate to enable maintenance work to be carried out safely on the bells (replacement of ropes and stays, fitting of muffles to clappers etc). It is recommended that better lighting be installed.

4.0 Bell Installation

4.1 The Bells

All five bells are hung for full circle ringing on ball bearings. Details (taken from “The Church Bells of Derbyshire” by Pat Halls and George Dawson”) are as follows.

Bell No.	Diameter (Ins)	Weight (Cwts)	Approx. Date	Founder
1	31	5-3-10	1883	John Taylor
2	33	7-0-15	1883	John Taylor
3	34.375	8-0-8	1883	John Taylor
4	37.75	10-1-8	1883	John Taylor
5	43.5	14-2-26	1883	John Taylor

The tenor bell (number 5) is tuned to F sharp.

Bells 1,2,3, and 4 retain their canons (cast in loops on top of the bell which facilitate attachment to the headstock). Bell 5 has a flat top which is now modern practice for bell design.

All bells are drilled centrally to take an independent crown staple to support the clapper.

All bells show moderate but tolerable wear at the point of clapper impact on the sound bow. None of the bells has been quarter turned about the vertical axis to present an unworn surface to the clapper.

4.2 Frames (see figure 1)

Bells 2,3,4 and 5 are supported in a low sided composite frame sitting on foundation beams which are obscured by the bell chamber floor boards. This frame is largely constructed from wood and cast iron and is a tight fit in the tower. Bells 2,4 and 5 are supported by cast iron frame sections on their wall side and wooden frame sections on their inside. Wooden frame members support Bell 3 on both sides. Use of cast iron has provided more space to enable larger bells to be installed than would be possible with an all-wood construction.

Bell 1, the treble bell, is supported in its own wooden frame above bells 2 and 5.

Visually the frames appear to be structurally sound. There are no signs of rot in any of the wooden sections and the metal sections appear not to be compromised by rusting. To be more certain of the integrity of the frames, a dial gauge was used to measure frame movement whilst each bell was rung. (It is difficult to quantify movement by eye and use of sensitive measuring equipment is the only sure way to assess movement). Figure 2 shows the points at which measurements were taken, all being in the horizontal direction. In his quotation, Fred Pembleton casts doubt on the strength of the cast iron frames supporting bells 5 and 4 and so measurements at "A" and "B" address this concern. He also doubts the integrity of the upper frame foundation beam wall fixings and so measurements at "D" and "E" were taken to address this concern. In addition measurements were taken at station "C" since movement in the wooden frame set between bells 2 and 3 will impose an unwanted side load on the bearings of bell 5. The table below gives the results.

Bell Being Rung	Measuring Station	Movement (mm)
5	A	+/-0.3
4	B	+/-0.2
3	C	+/-0.15
2	C	+/-0.075
1	D	+/-0.02
1	E	+/-0.02

These results are commendably small and show the frames are very stable at the key points measured.

Direct attachment of the frame to the wall at point "C" contributes to the small movements observed here and removes any tendency for applying significant side loads to the tenor bearings. The section of wooden frame between bells 3 and 4 is attached in an identical manner. It is not good practice to stiffen a frame in this way but the job appears to have been done some time ago in a competent manner with no sign of subsequent distress to the adjacent stonework.

This generally good state of affairs can be preserved for future generations by:

- Check tightening of all screwed fittings including all tie bars in the wooden frames.
- Removing all rust from the metal frame sections and metal fittings with a wire brush and then painting with a coat of red oxide, a coat of primer and a top gloss coat of paint.
- Give the wooden frame sections a coat of Cuprinol wood preservative (or creosote)

4.3 Main Wheels

These are in acceptable condition and adequately attached to the headstocks. The metal work is structurally sound but would benefit from derusting and painting as detailed for the frame above.

There is some evidence of slight delamination of the plywood sides of the rims but this is to be expected with wheels of this age and is acceptable. The wheels could be treated with Cuprinol as for the frame above.

4.4 Headstocks

All are made from wood and all are in good condition with the exception of the minor points below.

The headstock on bell 2 is rubbing on the frame side and so the “go” of the bell will be compromised when swinging through its upper 180 degrees of rotation. This may be more pronounced during very damp weather. Material should be removed from the end of the headstock with a wood chisel to restore freedom of movement.

The same may be true, but to a lesser extent, for bell 3 which rubs slightly and the same remedial action should be taken.

There is no evidence of rot or damage from wood boring insects however all headstocks would benefit from an application of Cuprinol.

4.5 Main Bearings

Self-aligning ball bearings are fitted to each bell and they are sealed for life and require no further lubrication. It is rare for ball bearings to fail and when they do it takes a long time before complete failure occurs. Incipient failure of a ball bearing is preceded by “rumble” which can be felt by placing your hand on the bearing housing as the bell rings. ***(WARNING: this can be a very hazardous procedure and should not be attempted by inexperienced personnel)***. One bearing on each of the bells was checked and all appeared to be free from “rumble”.

The wheel-side bearing housing on the tenor however moves in the direction of bell swing by a just perceptible amount and it is recommended that the associated nuts / bolts are check tightened.

4.6 Clappers

All are fitted with independent crown staples and are in excellent condition.

4.7 Stays and Sliders

All show signs of wear but are in serviceable condition.

4.8 Ground Pulleys

All are in serviceable condition but the pulleys for bell 4 will benefit from attention in the near future. One pulley wheel is rubbing on the side plate and the resulting friction will marginally affect the “go” of the bell. Both pulley wheels require reprofiling. If this is beyond the capabilities of local skills then a replacement assembly could be purchased from a bell hanger.

The pulley wheels on bell 3 would benefit from reprofiling.

5.0 Recommendations For Existing Installation

The following recommendations should be followed should the PCC decide to retain the existing installation. They come generally under the heading of “good house-keeping”.

5.1 Sweep the bell chamber clear of sand and set up an annual cleaning party.

5.2 Consider installation of “Galebreaker” in the louvres, the DDA can provide help.

5.3 Improve the lighting in the bell chamber.

5.4 Frames.

- As a precaution, check tighten all screwed fittings including the bolts / nuts holding the wheel-side bearing for the tenor and the wooden frame tie bars.
- Remove all rust from the metal frame sections and metal fittings with a wire brush and then paint with a coat of red oxide, a coat of primer and a top gloss coat of paint.
- Give the wooden frame sections a coat of Cuprinol wood preservative (or creosote).

5.5 Main wheels.

- Derust metal fittings and give three coats of paint – red oxide, undercoat and gloss top coat.
- Treat wood with Cuprinol or creosote.

5.6 Headstocks.

- Remove material from the end of bell 2 headstock to prevent rubbing on the frame.
- Ditto bell 3.
- Derust metal fittings and give three coats of paint – red oxide, undercoat and gloss top coat.
- Treat wood with Cuprinol or creosote.

5.7 Pulleys.

- Reprofile the pulleys for bells 4 and 3.
- Reset pulley wheel for bell 4 so that it runs freely.
- Alternatively consider purchase of a new pulley assembly from a bell hanger.

6.0 Conclusions

- The installation is in a serviceable condition and needs only “good house-keeping” actions to ensure this continues to be the case for the foreseeable future.
- Despite the above comments, the heavy weight makes them difficult bells for learners to ring and this drags down efforts to create and maintain a competent band of ringers. The fact that there are only five bells limits the number of possible changes to 120 and so they are not an attractive proposition for experienced ringers. It is strongly recommended that the PCC seriously considers the installation of a lighter ring of 6 bells since this will give learners more confidence and offers 720 possible changes for experienced ringers. Discussion of the ways forward for achieving this is given in the appendix to this report.

Please note, all advice in this report is given in good faith, but no liability is accepted.

Mike Banks, Bell Consultant to the DDA.

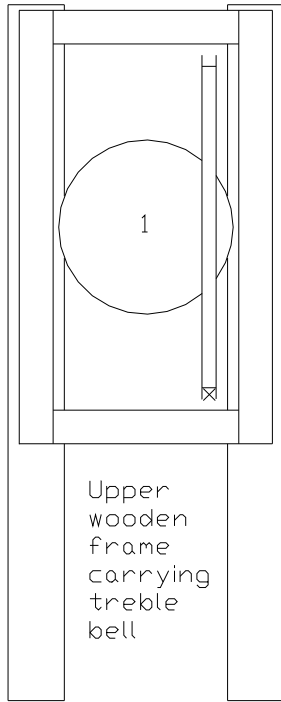
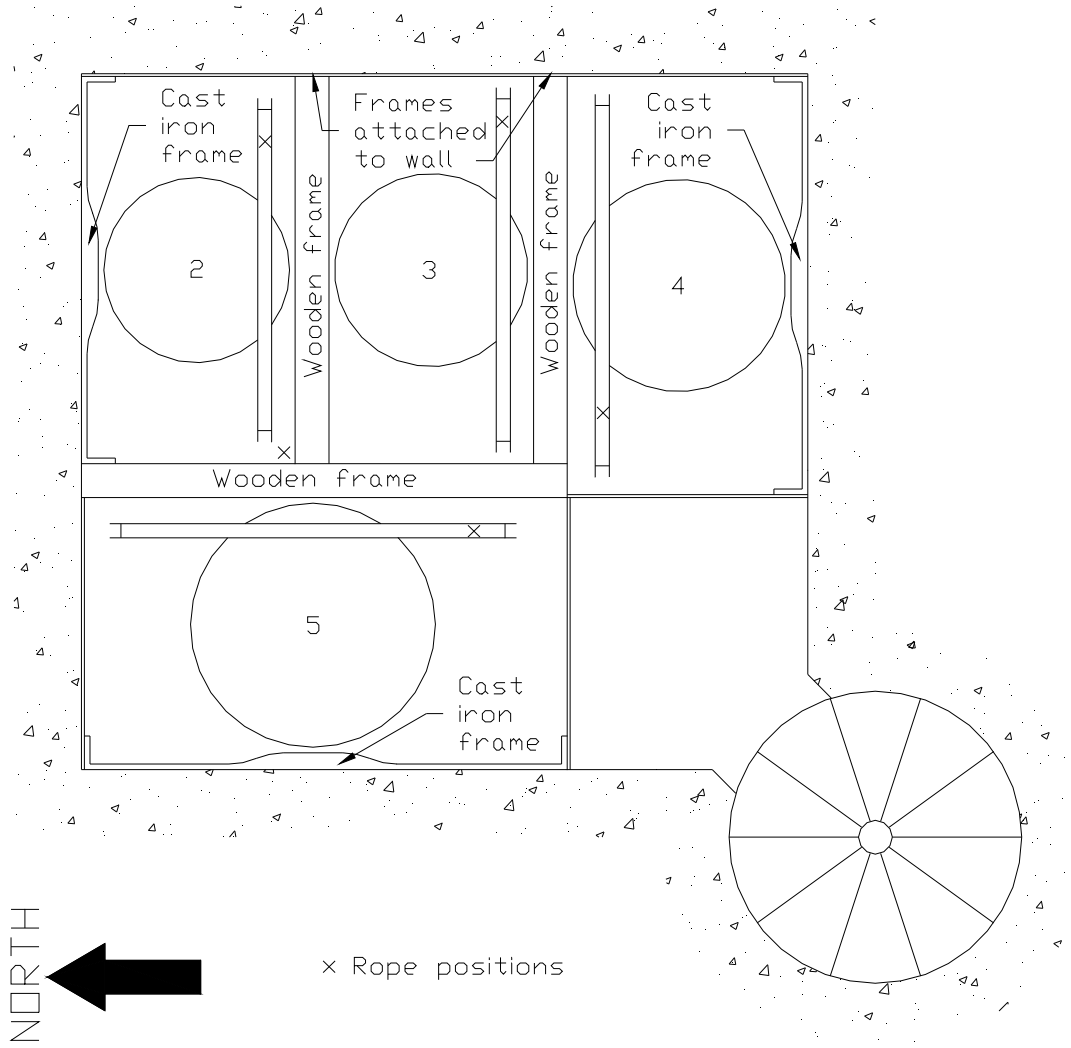


FIGURE 1 BELL
FRAME LAYOUT
AT ALL SAINTS
HEATH



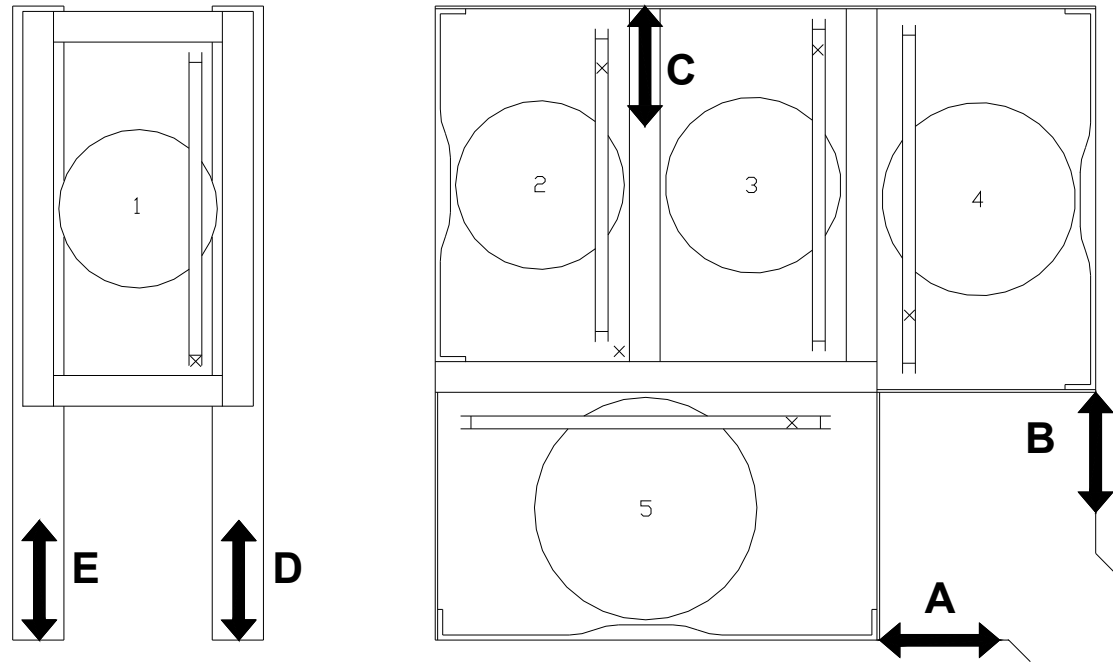


FIGURE 2 FRAME MOVEMENT MEASURING STATIONS

APPENDIX INSTALLATION OF SIX BELLS

It is assumed that the existing ring of five bells is made into a ring of six by removing the existing tenor bell (number 5), retaining the existing front four bells and augmenting these by the addition of two new trebles. It may, for instance, require substantial retuning of existing bell 2 in order to create a ring of six bells tuned to the major key of Ab. The author is not privy to a tonal analysis of the existing bells and so cannot comment as to whether this proposal is possible. (Bell 2 would need to have sufficient thickness to allow for substantial retuning).

If successful, the result will be a tenor bell which is $4\frac{1}{2}$ cwts lighter than the existing tenor bell and a treble bell which is about $1\frac{3}{4}$ cwts lighter than the existing treble bell. These bells will be of a good weight for novice ringers to learn on.

Given that at least one of the existing front four bells may require substantial retuning it is safe to assume that all of them will require retuning to some degree, if only to bring them closer to modern standards of (Simpson) tuning. This requires all bells to be removed from the tower. Having crossed this line it makes good sense to remove the canons, quarter turn (to present an unworn surface to the clappers), and mount on new metal headstocks with new bearings. This will require new wheels and new clappers. Having gone this far there is no point in trying to retain parts of the existing bell frames and so installation of a new two tier frame is the only sensible course of action. In other words a six bell installation will involve all new components, other than reuse of existing bells 1,2,3 and 4, as recommended by Fred Pembleton.

Next Moves

- The PCC must decide whether in principle it wishes to install a lighter ring of six bells.
- Two more quotations should be obtained from other bell hangers (see attached list).
- Use the Consultant to the Diocesan Association of Church Bellringers to advise on the quotations.

It is not necessary to involve the Church Architect in any of the above actions.

LOCAL BELLHANGERS

1) Hayward Mills Associates,
Unit 1, Palin Street,
Radford,
Nottingham,
NG7 5AD
Tel 0115 9788388
Fax 0115 9789233

2) Eayre & Smith Ltd.,
45 Blanch Croft,
Melbourne,
Derby,
DE73 1GG
Tel 01332 864266
Fax 01332 865444

3) John Taylor Bellfounders Ltd.
The Bellfoundry,
Loughborough,
Leicestershire,
LE11 1AR,
Tel 01509 212241
Fax 01509 263305