ALL SAINTS CHURCH, FINDERN - FEASIBILITY STUDY INTO RESTORATION TO FULL CIRCLE RINGING AND AUGMENTATION

Introduction

This study has been carried out to scope what is possible for full circle ringing and augmentation at All Saints, Findern. It is important to stress that this study does not in any way replace the need for professional involvement in the project by the church architect, commercial bell hangers or others – it provides a foundation for productive discussion with them and to help the PCC to crystallise its requirements.

Current Status

There are two bells hung for full circle ringing. The second bell was cast by Daniel Hedderly in 1704 and is his oldest known bell – for this reason the bell is on the Schedule of Bells for Preservation. The bells hang in a three bell wooden frame with wooden headstocks and plain bearings.
The bells are rung from the base of the tower and when first installed, ringers stood in the northeast and southwest corners. Subsequent installation of the organ in the ringing room has banished the ringers to a tiny space at the west end with poor rope falls and no elbowroom for full circle ringing. The bells are now (enthusiastically) swing chimed.
A ladder gives access to a clock room containing an electric clock and the drives to clock faces on the north and west walls. This room has virtually no natural lighting nor ventilation, there being only a small trefoil window in the south wall.
A further ladder gives access to the bell chamber which is formed in the base of the stone pyramid spire. The bell frame grillage beams feed the bell dynamic loads into the main tower structure just below the base of the spire.

Proposals

Two proposals for full circle ringing are explored in the attached appendix, one augments to three bells and the other installs a new ring of six bells. Both assume the organ remains in place and so the clock room becomes the ringing room but with its floor replaced by a new sound proofed floor installed 1 metre lower down the tower. A false ceiling is installed at a height of 3.66 metres above the new floor to attenuate the sound of the bells in the ringing room. The existing clock is repositioned so as not to interfere with the ringers and the ropes.

The available height inside the tower to accommodate the rise and fall of the bell ropes limits the maximum bell wheel diameter and hence the maximum possible bell size. This bell size is equivalent to:

- an additional bell to bring the current ring of two up to three bells, or
- the tenor bell of a light ring of six.

Recommended Proposal

A new six-bell installation is recommended and is shown in Figure 3.
Since building works access may require the temporary removal of the glass and mullion from the west window, it is assumed that this level of work on the tower would be done only once for the foreseeable future. The satisfaction derived from a six-bell installation for both listeners and ringers far outweighs that of a three-bell installation and so for the benefit of current and future generations the recommended proposal is to install a new ring of 6 bells hung for full circle ringing. It is probable that the existing two bells cannot be used as part of the new ring but they can be sold through the Keltec Trust and the money raised put towards the cost of the new installation.

Next Steps

- PCC to decide if it wishes to explore the options further.
- If so obtain quotations from three professional bell hangers for both options – this will determine (at no cost to the PCC) what is to be done, who will do it and how much it will cost. It is quite possible that the bell hangers will have better solutions

Note, involvement of the church architect and application for a faculty would follow much later.

Assistance

The DDA bell consultants have considerable experience of assisting PCCs with bell restoration. **This is provided free of charge.** They can:

- Critically appraise candidate bell hanger technical proposals.
- Advise on fundraising locally and nationally.
- Make a grant from the DDA Bell Repair Fund.
- Assist with the faculty application.
- Liase with the church architect on technical issues.
- Provide back up volunteer assistance to bell hangers when on site if no locals come forward.
- Train new bell ringers.

The DDA played a major part in recent bell restorations at Ashover, Bamford, Bradbourne, Wormhill, Lullington, Church Gresley and Ripley. Assistance is currently being given to Stanton in the Peak, Brackenfield, Hartington, Scarcliffe and Bonsall.

Advice given in good faith, no liability accepted.

Report prepared by

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Mike Banks

Bell Consultant to Derby Diocesan Association
of Church Bellringers

APPENDIX – DESCRIPTION OF PROPOSALS

1.0) Summary of Proposals

1.1) Install a new bell and new fittings in the vacant pit of the existing wooden frame, retain the existing two bells – provide new fittings to enable them to be rung full circle — ring from the clock room with lowered floor.

1.2) Install 6 new bells in a new metal frame – ring from the clock room with lowered floor – sell the existing two bells.

2.0) Issues Common to Both Proposals

2.1) Why More Than Two Bells?

From the bell ringer's point of view:

on two bells only 2 changes are possible:	1,2
	2,1
on three bells, 6 changes are possible:	1,2,3
	2,1,3
	2,3,1
	3,2,1
	3,1,2
	1,3,2

on six bells, 720 changes are possible!

To the listener outside the church, three bells sound three times better than two and six bells sound significantly (one hundred and twenty times?) better than three.
In order to ring changes it is essential to hang the bells for full circle ringing since this is the only way to achieve accurate striking. Also, the volume of sound is much greater since the clapper strikes the bell harder.

Change ringing on two bells is not really viable and so conversion of just two bells to full circle ringing is not cost effective. The only benefit would be that the bells sound louder. For this reason the options presented are for three and six bell installations.

It takes a new ringer about 1 – 3 months to learn how to handle a bell for full circle ringing. Having learned how to ring a bell, learning the art of change ringing is a considerable intellectual challenge and on six (or more) bells can literally take a lifetime to master. Change ringing is an absorbing team activity for people of all ages and can form an important focal point for both the church and the village.

2.2) Requirements

The key technical requirements for full circle ringing are:

- ringing floor sufficiently far below bell frame pulley to prevent sally from entering the pulley during ringing
- at least 3.66 metres of headroom to prevent injury to a ringer carried upwards in event of a stay breaking
- approximately 0.6 metre free radial space around each ringer
- good diffused lighting in ringing room –at least two sources of artificial light plus safety light in event of power failure
- good ventilation (and preferably heating during winter)
- some acoustic isolation of ringing room from the bells – a sound level of 68 - 72 dB(A) is ideal
- very good acoustic isolation of ringing room from the organ below
- safe and easy access to ringing room
- clock mechanism in unobtrusive position
- bell loads fed into tower no higher than existing
- sufficient space under bells to allow easy maintenance
- unobstructed entry to bell chamber

2.3) Bells

The notes of each of the existing bells are not currently known and so the author is not able to properly specify the size and weight of a 3rd bell to augment the ring to 3 bells. Professional bell hangers will do this when quotations are invited. However for the purposes of this study the assumptions made in the following table are good enough.

For the new ring of 6 bells the data in the table is accurate since identical Taylor bells are to be fitted at Holy Trinity, Stanton in Peak.

CONFIGURATION	BELL #	BELL DIA. (mm)	WHEEL DIA. (mm)
Existing ring of 2	1	572	1310
	2	641	1380
Additional 3rd	3	720	1460
New ring of 6	1	470	1206
	2	495	1232
	3	533	1270
	4	559	1296
	5	622	1359
	6	699	1436

If the existing two bells were to be used as part of a ring of three, or part of a ring of six, they would almost certainly benefit from a degree of retuning to better match their new neighbours. However since bell 2 is scheduled for preservation it is unlikely that English Heritage will permit any extensive retuning. It is probable that they can be used as part of a ring of three but their tonal quality may ruin a ring of six in which

the other bells will be tuned to modern standards. For this reason the option for six bells assumes all bells are new. Professional bell hangers will be able to advise more fully.
It will be highly desirable to remove the cast-in crown staples from the existing bells. These are wrought iron loops which form the pivot for the clappers and can cause cracking in the crown of the bell. Modern independent crown staples and new clappers would replace them.
For ease of mounting, the canons (cast loops on top of the bell) should be removed from bell 1. English Heritage will not allow their removal from bell 2.

2.4) Ringing Room

Full circle ringing requires a certain minimum distance between the bells and the ringing room floor.

In full circle ringing the bell is swung through 360 degrees from an upright-to-upright position by means of a rope acting around the circumference of a large wheel attached to the bell. A pulley wheel on the bell frame provides additional control over the rope movement. During the course of ringing the rope is wound alternately on and off the wheel causing it to rise and fall. Towards the lower end of the rope there is a woollen woven-in section (the sally) which provides a handgrip for the ringer. It is important that the sally does not enter the pulley wheel when the rope is wound fully upwards by the bell wheel. It is this requirement that sets the minimum possible distance between the bells and ringing room floor.

It is unlikely that the current position of the organ can be significantly changed and the lateral space at the rear is insufficient to allow full circle ringing to be carried out in safety. For these reasons ringing can only be carried out from a level above the organ. The new ringing floor, as noted above, must be positioned sufficiently below the bell pulley to prevent entry of the sally into the pulley. Figure 1 shows the required position which is about 1 metre below the current floor level and coincidentally occurs at the apex of the main arch and the west window. If it is positioned any lower the sound path for the rear organ pipes into the nave may be adversely affected.

The design of the floor needs careful consideration since it also acts as a sound barrier to the organ. It is suggested that a conventional timber structure be employed (joists with 22 mm tongue and groove boarding) with careful attention to sealing around the edges. Install, just below this, a heavy, structurally independent ceiling comprising 22mm tongue and groove boards fixed under separate joists and sealed around the edges. Fill the space between with high density Rockwool to prevent reverberation in this space. Reduce reverberation in the ringing room by installing a fitted carpet.

Entry to the ringing room will be via a ladder and trap door in the southwest corner. This trap also needs careful acoustic design, ideally of heavy construction, possibly counter balanced, and with rubber ‘P’ sealing strip around the edges.

A false ceiling should be fitted in the ringing room at a height of 3.66 metres above the floor. This height provides safe headroom should an inexperienced ringer be carried upwards following breakage of a stay. It will also create an intermediate

chamber between the ringing room and the bell chamber which will attenuate, to an acceptable level, the sound levels of the bells in the ringing room.

Lighting should comprise two fluorescent tubes with a safety light in event of power failure. There should be a double power point for a fan heater or similar.

An electric ventilation fan should be installed in a way which does not compromise any of the acoustic control features described above.

2.5) Clock

The current electric clock mechanism clearly replaced an earlier, much more bulky, weight driven mechanical clock in about 1978. The wooden frame which once supported the old clock occupies a considerable space and must be removed. This will require the electric clock to be remounted on the large cross beam which supports the drive shafts to the clock faces.

2.6) Access for Building Works

There is insufficient space either side of the organ to allow a bell to pass. The space available will also provide an unwelcome challenge for the passage of bell frame sections and timber flooring items which will put the organ at risk of damage. Other access points would be via the bell chamber louvres or the west window. It is suggested that the best solution would be to temporarily remove the glass and mullion from the west window and use this opening as the primary route for materials.

3.0) The Options

3.1) Three Bells Rung Full Circle in Existing Wooden Frame (Figure 2)

In this option a new bell augments the existing two bells and so represents the minimum recommended conversion to full circle ringing. The two old bells have their cast-in crown staples removed and are fitted with new independent crown staples and new clappers. Bell 1 has its canons (the loops on top) removed. After consultation with English Heritage the permissible degree of retuning for bell 2 is established and the other two bells tuned for minimum compromise with bell 2. New fittings for all three bells are provided (headstocks, wheels, ball bearings, stays, pulleys, sliders). Ringing takes place from the modified clock room as described in section (2).

The integrity of the existing wooden frame is unknown. What can be seen of it appears to be sound but critical parts such as the grillage beams (which support the frame and feed the bell dynamic loads into the tower) are buried in pigeon droppings which does not bode well for what appears to be a pine frame. The whole frame must be cleaned thoroughly to permit a detailed inspection. The Derby Diocesan Association of Church Bellringers Bell Consultants can then carry out limited remedial work on the bell fittings to permit frame movement to be measured with the bells rung full circle.

This option can only be considered viable if the above inspections/tests indicate the frame to be sound.

3.2) Install Six New Bells in a New Metal Frame (Figure 3)

This is the recommended option since it realises the full potential of the tower for full circle ringing. Fewer, larger bells are not possible since (with the organ in its current position) there is insufficient height in the tower to accommodate the rise and fall of the ropes on larger wheels. Option (3.1) commits to all the changes necessary to the clock room plus temporary removal of the west window. There is, therefore, a strong argument to be made for "doing the job only once" and installing the best option of six bells for the benefit of present and future generations.

This proposal removes the existing bells, wooden frame and bell chamber floor. (The two bells could be sold through the Keltec Trust to offset the cost of the new installation). A new metal frame is installed carrying six new bells with new fittings. A new bell chamber floor is installed below the frame.

The six new bells proposed are a close fit in the bell chamber and it would be beneficial for a stonemason to locally relieve the walls adjacent to the wheels and stays of the 3rd and 4th bells. Professional bell hangers may have better layouts.

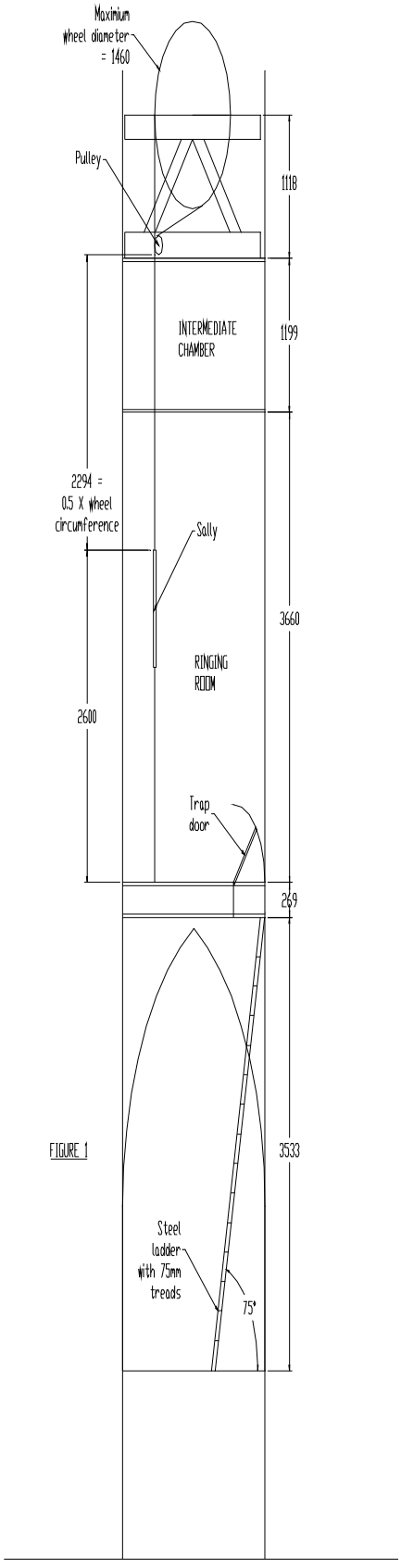

Maximum
wheel diameter
= 1460
Pulley
1118
INTERMEDIATE
CHAMBER
1199
2294 =
0.5 X wheel
circumference
Sally
3660
RINGING
ROOM
2600
Trap
door
269
3533
Steel
ladder
with 75mm
treads
75°

FIGURE 1

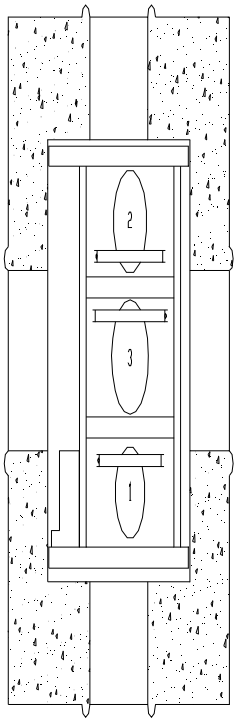
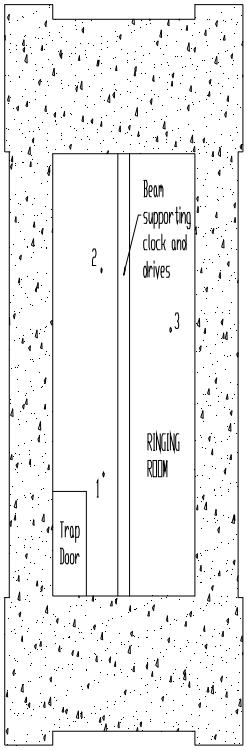


FIGURE 2 - OPTION (3.1)
THREE BELL INSTALLATION



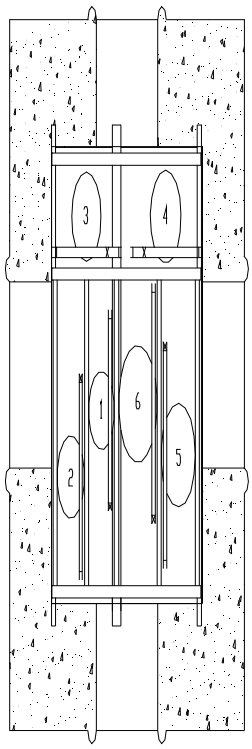
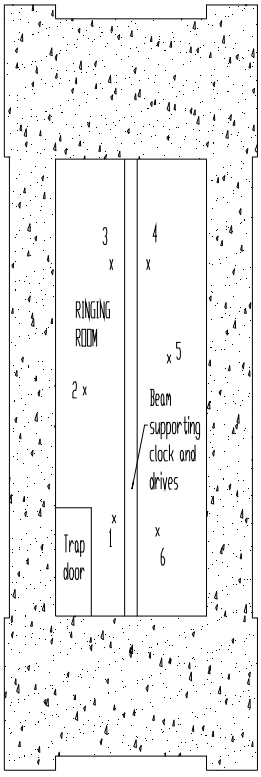


FIGURE 3 - OPTION (3.2)
NEW RING OF SIX BELLS



LOCAL BELLHANGERS

1) Hayward Mills Associates,
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NG7 5AD
Tel 0115 9878388
Fax 0115 9789233

2) Eayre & Smith Ltd.,
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Melbourne,
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Fax 01332 865444

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

4) Fred Pembleton
Pembletons (Bellhangers & Engineers)
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