DIOCESAN ADVISORY COMMITTEE

SCHEDULE OF DOCUMENTS

1. **Statement of Significance** (St Pauls Bedford TCB Statements of Significance & Need 3.pdf)
2. **Bells subcontractor specification** (241218c bells spec.pdf)
3. **Main contractor's specification** (241099e tower refurb - main contractor spec.pdf)
4. **Summary of possible works to the clock** (Clock Summary (DAC).pdf)
5. **plans as existing** (1077-49-002 Plans as Existing.pdf)
6. **elevations as existing** (1077-49-003 Elevations as Existing.pdf)
7. **elevatins as existns - 2** (1077-49-004 Elevations as Existing.pdf)
8. **Engineer's Calcs** (13871 calcs 1-49_0001.pdf)
9. **Structural Engineer's Report** (24_1218_29092020_AD_0951 - Copy.pdf)
10. **Consulting Engineer's Report** (220909 Hock;ey-dawson report 21405 R1.pdf)
11. **Proposed plans** (1077-49-014G Proposed Plans.pdf)
12. **Elevations proposed** (1077-49-015E Elevations as Proposed.pdf)
13. **Elevations proposed** (1077-49-020E Elevations as Proposed.pdf)
14. **Ringing room joinery** (1077-49-027 Ringing Room Proposed Joinery.pdf)
15. **electrical plan RR and clock** (1077-49-028B Electrical Plans - RR and Clock Platform.pdf)
16. **Electrical plan plenum belfry** (1077-49-029B Electrical Plans - Plenum and Belfry.pdf)
17. **Electrical plan belfry lower and upper** (1077-49-030B Electrical Plans - Belfry (Lower & Upper).pdf)

TO THE CHANCELLOR OF
THE DIOCESE OF ST ALBANS

VIEWED by the St Albans Diocesan
Advisory Committee

St Paul's Church Bedford: Tower, Clock and Bells

Statement of Significance

St Paul's, Bedford is the largest church in the diocese after the Cathedral and Abbey Church of St Alban. St Paul's is a Grade I listed building (the National Heritage List for England) and is designated by the Church Buildings Council as a Major Parish Church and is a member of the Major Churches Network (formerly the Greater Churches Network).

Most of the church fabric dates from the 14th and 15th centuries; the transepts, crossing, spire and north nave aisle being added in the 19th century, when the north wall and porch were moved and rebuilt further out. The chancel or quire was also remodelled at this time, including the introduction of a notable screen by Bodley and altar rails and furnishings by the Bromsgrove Guild.

St Paul's is the Civic Church of the Borough and County of Bedfordshire, set centrally within St Paul's Square, itself within a conservation area in the heart of the town. The church also contains the Mayoral and civic stalls of the borough. Its iconic spire and setting by the River Great Ouse provide the classic view of Bedford.

St Paul's is of significant historical importance, both locally and nationally. John Wesley preached his "Great Assize" sermon here in 1758. St Paul's became the BBC church during the Second World War. The daily service was broadcast from the Trinity Chapel between 1941-5, and the Archbishops of Canterbury and York came to St Paul's to broadcast to the nation and world in a service for the National Day of Prayer in 1941.

While first and foremost a parish church, St Paul's evidentially exercises a substantial extra-parochial ministry to the town, borough and county as well as to the diocese. St Paul's usually hosts the Annual Justice Service for Bedfordshire; services of national commemoration and celebrations as requested by HM Lord Lieutenant and High Sheriff for the County and by the elected Mayor for the Borough; as well as services for a variety of schools and voluntary organisations, both within the county and also for the wider East of England region. St Paul's is also a major venue for diocesan services: in recent years hosting the inauguration service for the Bishop of Bedford in 2012, and the farewell Solemn Choral Evensong for the Archdeacon of Bedford in January 2019.

St Paul's offers a liturgy in the modern Anglo-Catholic tradition, through its regular Parish Eucharist and recently re-established Choral Evensong. The dignified liturgy is enhanced with fine vestments and incense, and also a choir and Director of Music who play a central role in the worship offered at St Paul's. This liturgical and musical tradition is much valued by very many people who attend, either as regular worshippers from the town and beyond, or as visitors to occasional and special services.

St Paul's became a member of the Major Churches Network in May 2019 (the successor of the Greater Churches Network), in recognition of the church's size, and diocesan and national significance within the Church of England and the role it plays within the county and Eastern Region.

Section 2: The significance of the area affected by the proposal.

St Paul's bells have rung out over the town since before the Reformation including for many national and civic occasions in addition to religious services and festivals. Being one of the earliest examples of true harmonic tuning, the current bells are amongst the finest sounding in the country. The bells

and ringers of St Pauls Bedford have been pivotal to the development and advancement of change ringing in the county from the time of its inception in the early 1600s until the present day.

The clock has been a feature of the town landscape since the early 1800s and is of significance; being one of the earliest examples of a public clock equipped with a deadbeat escapement. The familiar sound of the quarter and hour chimes, heard across the town for many decades, are now silent.

The bells and clock are deteriorating and are in need of urgent restoration, and parts of the tower and spire masonry require restoration.

2.1 Identify the parts of the church and/or churchyard which will be directly or indirectly affected by your proposal

The work to be carried out will comprise:

- Essential structural repairs to the tower stonework and brick course between the level of the current ringing room ceiling and bell frame and at the lower levels of the spire.
- Rehanging the 12 bells on one level in a new cast iron and steel frame that is designed to accommodate 14 bells lower in the tower to minimise tower movement and providing options for lighter harmonic rings of eight and ten bells to be rung.
- Possible light tuning of the two 1978 trebles to adjust the 'stretch tuning' as advised by the bell tuner.
- Refurbishment of the obsolete clock drive, winding, and chiming mechanisms, installation of a new clock display case to improve access and visibility, and other works to include cleaning and gilding of the external clock dials and hands.
- Complete refurbishment of the ringing room area including replacement of intermediate floors, provision of safe access to the bells and clock, upgrading the electrical and heating system to modern standards, repair and redecoration of the internal walls, and cleaning and reinstatement of the historic peal boards.
- Installation of an automatically operated sound control mechanism enabling the bells to be heard fully for services and rung more frequently and less obtrusively at other times for practices and visiting ringers.
- Incorporation of training centre facilities to include dumb bells, simulators, and audio-visual equipment.

2.2 Set out the significance of these particular parts

2.2.1 The bells

St Pauls Bedford has a ring of 12 bells with the largest tenor bell weighing just under 29cwt. They were mostly (except for bells 1,2, & 11) cast in 1896 & 1897 by John Taylor and Co of Loughborough and are one of the finest sounding peals in the country, also being one of the earliest examples of true harmonic tuning. The 10th bell was cast and inscribed to commemorate the Diamond Jubilee of Queen Victoria and the 11th bell, inscribed as the Victory Bell, was recast in 1945 to commemorate the end of hostilities and those from the county who perished in WWII. Others of the bells were donated by or commemorate prominent Bedfordians; Thomas Gwyn Elger, Thomas Bull, Sir Frederick Howard, and George Hurst. The two lightest treble bells were cast and added in 1977 to commemorate the present Queen's Silver Jubilee and the Centenary of the Diocese of St Albans.

St Paul's has been pivotal in the development of change ringing in Bedfordshire over the centuries. As early as the 1650s there was an active change-ringing band at Bedford led by Oliver Palmer; this not long after the first ever recorded evidence of change ringing in a sermon entitled "The Devils Banquet" preached by Thomas Adams at the nearby village of Willington in 1614.

Until 1745, St. Paul's possessed five bells, some of which were cast before the Reformation. In 1744 a new ring of eight bells was cast by Thomas Lester of London (Whitechapel) this being the first full octave in the county. These bells remained until the rebuilding of the tower and spire in 1868 when they were rehung and some of them were recast by Mears and Stainbank (Whitechapel).

The Bedford ringing band under one Isaac Hills, and later Charles W Clarke, was at the very forefront of the advancement of change ringing in the county and in founding the Bedfordshire Association of Change Ringers at a meeting held in the vestry on Monday 13 March 1882 chaired by the Vicar, the Revd R E R Watts. The Venerable, The Revd Bathurst, Archdeacon of Bedford. was its first President.

To ensure Bedford remained a centre renowned for the quality of its bells and ringing, consistent with its status as the County town, efforts were made to improve the unsatisfactory tonal quality and ease of ringing the old bells, and also to increase their number to ten. The Vicar, Church Wardens, and Mayor established a committee to invite subscriptions and raise the necessary funds. This led in 1896/7 to the bells being recast and rehung in the original 1868 oak frame designed for only 8 bells, with the two additional bells hung on girders high across the base of the spire, thus creating the first ring of ten bells in the county.

The bells were again rehung in 1930, this time on modern ball bearings by Mears and Stainbank (later Whitechapel Bell Foundry), although the Church architect resisted proposals to replace the aging wooden frame with a more satisfactory cast iron and steel one. During WWII the bells were removed from the tower for safety and stored in the Churchyard, being reinstated in 1945 by Taylors of Loughborough, when the 9th bell (now 11th) was also recast as the WW2 'Victory Bell'. By 1966 the original 1868 fittings, reused in 1930 and 1945, had reached the end of their useful life and the bells were again rehung with new fittings by Taylors of Loughborough, there being insufficient funds to replace the aged frame. So, once again, a remedial rather than full scale restoration was undertaken.

By 1970, under Stephen Ivin's leadership, St Paul's Bedford had one of the strongest and most capable Sunday service bands in the country and proposals to replace the frame were once again considered along with an augmentation to 12 bells. The augmentation, creating the first ring of 12 in Bedfordshire, was finally achieved in 1978 to commemorate the local and national events of the previous year (Silver Jubilee of HM The Queen and Centenary of the Diocese of St Albans), with the new bells being hung alongside the other two trebles on girders high in the base of the spire. Once again, funds were insufficient for a new bell frame and supporting structure to be installed. The new bells and their installation were funded entirely by the bell-ringers of the time.

The walls of the ringing chamber are adorned by many boards recording peals rung to commemorate national and Church events and the notable ringing achievements of the Bedford band. These include a lavish board recording the first peal on ten bells in the county (9/11/1896) presented by George Wells to commemorate his election as Mayor of Bedford for a third term. Another board records the first peal rung in the county on 12 bells (12/3/1978) and also a peal to mark the centenary of the Bedfordshire Association of Change Ringers (13/3/1982). A peal rung by 12 priests of the Church (10/10/1987) is also recorded. The project will include the cleaning and restoration of these valuable historical records.

Further details relating to the bells are provided in section 8.4.

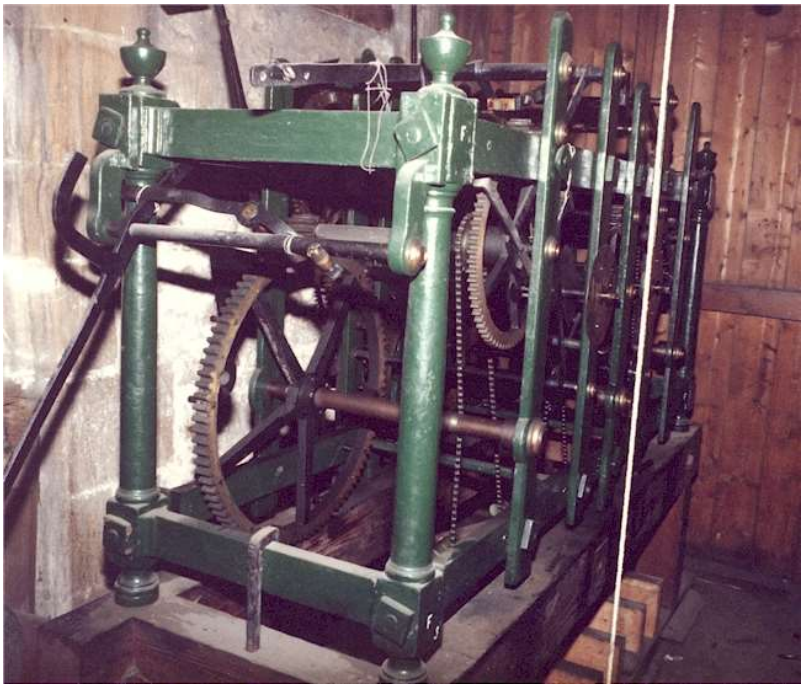
The Bell Chamber (showing the lower and upper frames)

2.2.2 The Clock

The earliest reference to a clock is in an epigram to Richard Marks, parish clerk, who died in 1668/9. It refers to the winding of the clock and three-hourly chimes. Marks had looked after the clock for upwards of 40 years and people of the town relied on "the clock ecclesiastical" for accurate timekeeping. There is further documented reference to the clock and chimes in 1708. John Carter's c.1785 view showed that it had elaborate dials.

The present clock is the largest in north Bedfordshire having four, eight-foot dials. It has a three-train cast iron four-poster mechanism dated 1811, pre-dating the 1867 tower restoration and is an early example of a public clock equipped with a deadbeat escapement. It was made by John Moore & Sons (Handley and Moore) of Clerkenwell, London and was initially installed by local clockmakers John Cavit, Thomas Revis, and Thomas Clare in 1811. It was reconditioned and set up in the new tower by the original makers, by then B.R. and J. Moore, in 1870 at a cost of £122 and there have been various subsequent restorations.

The clock originally played the quarters on two bells, striking the hour on the tenor bell. In 1908 John Bull & Co of Bedford converted it to play the Cambridge quarters (or the Westminster chimes as they later became known). The quarters strike on bells number 6, 7, 8 and 11 whilst the hours are struck on the 12th (Tenor bell). The clock was converted to electric winding in 1959 with an automatic cut-out to prevent over winding. In 2002 a legacy from Winifred Hall enabled the quarter and hour striking mechanism to be reinstated. Unfortunately, this has once again failed and parts of the mechanism are now obsolete.



The Handley and Moore Clock Mechanism

2.2.3 The Tower and Spire

The original tower and spire date from the 14th century. The tower was located on the North side of the nave with narrow arches between the nave and chancel and protruded into the south aisle. There was no north aisle at that time.

In 1867/8 a major reconstruction was undertaken. The tower was rebuilt on the same footprint with its height considerably increased. The spire was dismantled and reconstructed on top of the new tower. The chancel was opened to the body of the church and made usable for worship. Further improvements to the chancel followed in 1878-9, and the north aisle was added in 1884.

3.1 Describe and assess the impact of your proposal on these parts, and on the whole

The townspeople of Bedford and its visitors would benefit by having a fully functioning clock and chimes with restored dials that would be a centrepiece and focal point of a planned heritage development “St Paul’s Square Public Realm” currently in progress to provide walkways & pedestrian linkages from St Paul’s Square to the Cultural Quarter & Riverside.

The Church, local authorities, and people of Bedford would benefit as the project would enable the long-established 400-year long tradition of ringing the bells for religious services (Sundays, weddings, funerals and memorials) and events of local and national significance to continue. Recent examples include the death of HLM the Queen, The Proclamation of King Charles, at the request of people of Ukraine on 1st anniversary of invasion, The High Sherriff’s Valedictory and Justice Services, The Lord Lieutenant’s Service, the Bedford River Festival, the memorial service for Sir Samuel C Whitbread KCVO, and the 80th anniversary of VE Day.

Bell ringers both locally and nationally would benefit as the bells would be much easier and more enjoyable to ring. This would attract significantly more visiting (and fee paying) bell ringers and also enable new (particularly young) ringers to be trained in and enjoy the ancient art and skill of bell ringing; an important part of national heritage as much as the bells themselves. In particular the inclusion of dedicated training facilities in the scheme and adjustable external sound control will enable training to take place more frequently and for longer periods without creating a disturbance; something that is not possible today and therefore limits opportunities for ringers to be trained and practice. It is planned to work with schools and youth groups more extensively to provide opportunities to learn about and experience bell ringing.

It will be possible for community and youth groups and other members of the public, in addition to bell ringers and horological enthusiasts, to safely visit the bell and ringing chambers to see the historic clock, bells, and historic peal boards; thereby providing an educational experience and broadening their heritage awareness. The project includes for video equipment that will enable visitors to the Church and those with accessibility issues to observe the ringing from the Church.

There are a number of people who are unable to attend religious services, often due to sickness or infirmity, and who are reminded of the Church's presence and experience comfort from hearing the clock chimes and the bells being rung.

3.2 Explain how you intend, where possible, to mitigate the impact of the proposed works on the significance of the parts affected and the whole.

The proposals are for a restoration and enhancement of the tower clock and bells. There are no aspects of the proposed works that would negatively impact their significance. The oak and pitch pine bell frame and foundations, by Mears and Stainbank of Whitechapel and dating from 1868, are not listed or considered to be rare or of historic significance. If possible, the timbers will be reused for wall panelling and furnishing the ringing room. The current plenary sound chamber and bell chamber floors are of the same period, constructed when the height of the tower and spire was increased and the old 8 bells installed in 1868. The ringing chamber wall panelling and clock platform / chamber are predominantly match-boarding of a similar period. They are of poor quality with evidence of rot / decay in places, and will be replaced. All of the historic peal boards are to be restored and reinstated.

Statement of Need

1. General information

This should provide an overview of the parish and the current use of the building.

St Paul's is a grade I listed building. It plays a very active role in serving the community and county through its fine liturgy and music tradition that include the choir and bells. It has the status of Major Parish Church in the county town of Bedford and hosts many significant civic and county services; hence also the importance of the bells, the clock and the tower infrastructure.

The church is open daily throughout the weekdays welcoming people of all nationalities and walks of life, ministering to the homeless as well as being a place of heritage on the tourist trail.

The bells are currently rung weekly for the Sunday Eucharist (except the first Sunday of the month) and/or choral evensong, and there is a weekly Monday evening practice. The bells are also rung by request for national, county, and civic occasions and services such as for the recent death of HM the late Queen and for the Lord Lieutenant and High Sherriff's justice services, all held at St Paul's, and for weddings and funerals as required.

On two Sundays each month the ringing is aimed at providing less experienced ringers with an opportunity to ring on 10 and 12 bells and this attracts and average of 18 ringers from across the county. A monthly Monday night advanced practice and 4th Sunday Quarter Peal is specially arranged to enable less experienced and especially younger ringers whom show potential at the Bedfordshire Young Ringers practices, to ring with a more experienced band and develop their skills on higher numbers of bells. In recent years 14 ringers have rung their first quarter peal on 12 bells and two of these young ringers have progressed to become Masters of the Cambridge University Guild and Oxford University Society.

Through this, St Paul's provides an important centre for developing and maintaining the almost 500-year-old tradition, art, and skill of change ringing within the town and county.

However, the bells have become increasingly difficult and challenging to ring, especially for less experienced ringers, and even more so for training novice ringers. Because of this, there are very few requests from visiting ringing bands as there once were, and it is becoming increasingly difficult to sustain the current pattern of regular ringing. There are an increasing number of ringers who avoid ringing at Bedford because of the difficulty in ringing the bells to an acceptable standard.

The church hosts a number of community events, a weekly music, and monthly organ recital, and the huge annual Christmas Tree Festival that attracts 1000s of visitors. These events, and those in the town such as the Bedford River Festival also provide opportunities for visitors to learn about the clock and bells, and to hear the bells being rung.

Members of the public and comgrefation frequently comment on the joy of hearing the bells, in person, often on social media and in other correspondence with the Church. There are a number of people who are unable to attend religious services, often due to sickness or infirmity, and who are reminded of the Church's presence and experience comfort from hearing the bells being rung.

2. What do you need?

Briefly explain your needs (not your proposals). Append any brief for your architect.

- The bells and clock are in need of urgent restoration to prevent them from failing and falling silent within the next few years.
- The clock no longer strikes or keeps time correctly. Key components of the automatic winding mechanism are obsolete and cannot be replaced. The outer faces are in a poor state of repair with flaking paint adversely impacting their appearance in addition to that of the overall Church building.
- The bells are increasingly difficult to manage, especially by learners and inexperienced ringers, so they are less frequently rung. The heaviest eight bells hang in an oak frame at the weakest point of the tower, supported on a badly cracked pine sub-frame resting on stone corbels that are shifting. The lightest bells hang on girders high and spanning the base of the spire, increasing potential for movement.
- Cracked brickwork immediately beneath the bell chamber, a consequence of 1860s building-practice when a layer of ferrous straps was incorporated as a foundation to support the increased height of the tower and spire. This has corroded and expanded cracking and weakening the surrounding masonry. It requires the layers of brickwork and the ferrous straps to be removed and the brickwork replaced to strengthen and stabilize the structure. Additionally, loose stonework at the base of the spire that is falling into the bell frame is in urgent need of repair.
- There is a need to create a ring of bells that will facilitate the easy training and development of new bell ringers so that the heritage and tradition of bell ringing dating back to the C16, and the associated art and skills can be maintained. This will require replacement of the current sound control boarding that has collapsed and is no longer effective so that the bells can be rung for more frequent and extended practices without constituting a nuisance. Also, the provision of additional bells (sharp treble and flat 6^{th}) to create lighter rings of 8 and 10 bells, that are more suitable for less experienced bands, and dedicated modern training facilities to encourage young ringers and facilitate individual development of listening and change-ringing skills.

The initial Requirements Specification as issued to the architect, bell and clock firms is appended.

3. The proposals

Set out what you are proposing to do in order to meet the needs set out in section 2

The work to be carried out will comprise:

- Rehanging the 12 bells on one level in a new cast iron and steel frame that is designed to accommodate 14 bells lower in the tower to minimise tower movement and providing options for lighter harmonic rings of eight and ten bells to be rung by the addition of two bells: a sharp treble and flat 6^{th}.
- Refurbishment of the obsolete clock drive, winding, and chiming mechanisms, installation of a new clock display case to improve access and visibility, and other works to include cleaning and gilding of the external clock dials and hands.
- Complete refurbishment of the ringing room area including replacement of intermediate floors, provision of safe access to the bells and clock, upgrading the electrical system to modern

standards, repair and redecoration of the internal walls, and cleaning and reinstatement of the historic peal boards.
- Installation of an automatically operated sound control mechanism enabling the bells to be heard fully for services and rung more frequently and less obtrusively at other times for practices and visiting ringers.
- Essential structural repairs to the tower stonework and brick course between the level of the current ringing room ceiling and bell frame and at the lower levels of the spire.
- Incorporation of training centre facilities to include dumb bells, simulators, and audio-visual equipment.

4. Why do you need it and why do you need it now?

Justify your proposals by explaining why you can't meet your needs without making changes. Also include anything which may have prompted the proposals

The Bells

Apart from rehanging the bells on new bearings in 1930 and again in 1966, no significant work has been done since their installation in 1896/7. (In 1945, with the exception of the 9th bell that was replaced, the bells were rehung using the same fittings). In recent years the bells have become increasingly difficult to ring, largely due to the unsatisfactory nature of the installation and movement of the dated 1868/96 bell frames with the installation nearing the end of its useful life. The frequent failure and need to replace bearings over recent years (refer to section 7) in some cases more than once, is a likely consequence of movement in the bell frame. As a result, the bells are far less frequently rung by local ringers and there has been a significant decline in the number of visiting bands wishing to ring them. Further, it has been increasingly challenging to recruit, train and develop new bell ringers and maintain the ringing heritage at St Paul's with the bells in their current condition. No new ringers have been taught to ring at St Pauls in recent years.

The bells are no longer well-regarded as they once were, and they are not comparable to those at some other Churches of similar (major parish church) status, with similar rings of bells; for example, Cheltenham Minster, Gt St Mary Cambridge, Bishops Stortford, and All Saints High Wycombe, all relatively recently restored.

Without major restoration, the bells would inevitably require on-going and increasing expenditure that would be progressively less effective and they would deteriorate further. It is likely they would fall silent within a few years.

The heaviest eight bells hang in an oak frame situated part way up the louvres at the weakest point of the tower. The bell frame is supported on a pine sub-frame that is badly cracked and this rests on stone corbels that have shifted and have previously required underpinning. The frame itself has been progressively strengthened with metal tie rods and corner bracing over the years to improve its stability. The lightest four bells are hung high in the base of the spire significantly increasing the potential for tower movement. The bells weigh over 7 tons in total and exert forces of almost 30 tons on the frame and tower when rung together. Additionally, there are deficiencies in the way in which some of the bells are hung (as evidenced by the bell hangers' reports) and some of the ropes (the two trebles in particular) are very heavily drawn on pulleys and runner boards. Although

surprisingly effective when first installed, these are now showing signs of deterioration. This and the long rope draft of the 4 lightest bells increases the difficulty of ringing them, especially for novice and the less experienced ringers.

The project will prevent the bells from further deterioration and falling silent, enabling them to ring out across the town for another 100 years.

The Clock

The clock auto winding and chiming mechanisms are obsolete and no longer serviceable and the drive shaft and gears to the hands are worn and require refurbishment or replacement. Additionally, the external clock dials and hands are showing significant signs of deterioration and will be regilded and painted. An automatic pendulum regulator will ensure the clock remains accurate without manual adjustment, including spring and autumn time changes.

Clockwise Restorations, the Church clock contractors have provided recommendations and an estimate for this work that comprises:

- Removal and safe storage of all chiming hammers, bell cranks and linkages.
- Disconnect and removal of hand drive shafts, bevel gearboxes and removal and safe storage of support beams. All to be labelled for correct replacement.
- Removal of old auto winding system.
- Supply and installation of new auto drives without falling weights
- Installation of above
- Move clock movement and stand to new position in plenary chamber
- Temporary storage of the clock, chiming hammers and hand linkages for duration of the tower and bell work.
- Manufacturer a new hand drive shaft to connect to existing bevel gears and install
- Supply and installation of pendulum regulator. This will keep the clock accurate and automatically perform the hour change in March and October.
- Supply and installation or night silencing
- Dials and hands: removal for repaint and gilding
- Overhaul of the hand gearing while dials are removed
- Return and install, set up the hand gearing and linkages so all four dials are in synchronisation.

It is proposed to reinstate the chiming hammers on the lighter bells (3,4,5,8 or 6,7,8,11) with the respective hour strike on the 8th or 11th bells to avoid the effort and risk of ringing the 29cwt tenor bell up and down 2-3 times weekly, each time the bells are rung. (The clock currently chimes bells 7,8,9,12). Consideration is also being given to the use of electric solenoid chiming hammers to eliminate the need for maintenance of the lengthy mechanical wire linkages.

This much needed work will ensure that the clock and chimes remain a prominent feature of the Bedford town centre for years to come.

The Tower and Spire

Cracked brickwork immediately beneath the bell chamber is a consequence of 1860s building-practice when a layer of ferrous straps was incorporated as a foundation to support the increased height of the tower and spire. This has corroded and expanded cracking and weakening the surrounding masonry. It requires the layers of brickwork and the ferrous straps to be removed and the brickwork replaced to strengthen and stabilize the structure. A detailed investigation was

undertaken by Hockley and Dawson, Consulting Engineers and resultant recommendations made in their subsequent report (enclosed)

Additionally, loose stonework at the base of the spire that is falling into the bell frame is in urgent need of repair. Recently some stonework that fell into the tenor bell pit became wedged between the bell's stay and slider mechanism with the bell in the upright position. It required very considerable effort (3 ringers) to turn the bell over so that the stone could be removed (the only safe way of doing so) with the bell's stay being broken in the process.

Health and Safety

The project will importantly address other needs.

- The only access from the ringing chamber to the bell chamber is via a 5m high steeply inclined almost vertical ladder and via a locked trap door that needs to be unlocked and opened whilst standing at the top of the ladder. Neither the height nor incline of the ladder complies with current safety requirements. Access, that is regularly required for bell, security alarm, and other inspections and maintenance, including by third parties, is a high-risk activity. The scheme will eliminate this issue, providing safe and safety-compliant access to the upper levels of the tower.

- The tower electrical installation has been modified in a piecemeal fashion over the years that would not meet current standards. It will be completely replaced as part of the scheme with low energy led lighting and infra-red space heaters.

- Additional emergency lighting in the event of power failure.

Recruitment & Training

Bells have been rung from English Church towers for many centuries; the oldest dates back to the 1100's. Bell ringing (or campanology) evolved as part of town and village life; the art and science of change ringing dating back to the 16th century when bells were first equipped with wheels that enabled them to be rung 'full circle' and controlled in precise and rhythmical sequences that could be changed with every pull of the rope. This continuously and progressive changing sound that can be heard from Church towers today is a uniquely English tradition that has spread to other parts of the world.

Bell ringing is a team activity that combines physical exercise and coordination with musical and mathematical abilities. This rather unique combination of skills, as much as the bells themselves, is part of our national heritage that needs to be nurtured and preserved for future generations.

A principal objective of the scheme is to significantly improve the potential to recruit, train and develop new, and especially young, bell ringers through outreach to town-centre schools and local youth groups. The incorporation of dedicated training facilities with dumb bells and audio-visual equipment (somewhat similar to other well-established training centres at St Peter Mancroft Norwich, Worcester Cathedral, St Mary le Tower Ipswich, and elsewhere) will enable new recruits to be taught bell handling in a safe and effective manner. It will also enable change-ringing skills to be developed without always requiring an experienced band to ring with. Further, the project will greatly improve the ease of ringing the tower bells and provide options for lighter harmonic rings that are more suitable for the training and development of ringers and for ringing by less

experienced bands. The incorporation of effective external sound control will enable practice on tower bells to be undertaken at any time and for extended periods, without causing a disturbance

5. What is the evidence for the need?

Please explain who has been consulted.

A proposal for rehanging the bells in a new frame was considered in 1896, 1927, 1945, 1966, then in 1978, and again in 2017. The current project is therefore the)hopefully last) of si previous abortive attempts for a complete restoration.

In 2019 the Dorothy H Porter Trust expressed interest in supporting major work to the tower and bells and requested two detailed and costed proposals be obtained for their further consideration.

A detailed request for quotation (RFQ) document was prepared defining the scope and requirements relating to (1) the bells and fittings, (2) fully adjustable external sound control, and (3) the ringing chamber and tower infrastructure including the clock. This was approved by the fabric committee and PCC for issue to two leading bell firms; Taylors of Loughborough and Whites of Appleton, in November 2019. With regard to the bells and fittings, it is proposed to hang the bells on one level lower in the tower to minimise movement, with a foundation and frame of modern design to accommodate 14 bells. This will enable the optional incorporation of an additional two bells to create light diatonic rings of 8 and 10 in addition to the current heavy ring of 12.

Preliminary inspections and consultations with the Church Architect, DAC Bells advisor, and DAC clock advisor took place, consistent with the pre-faculty application requirements and a project was set up on the DAC faculty portal including their comments and suggestions. As such all key stakeholders were consulted and responded positively to the proposed scheme.

An independent structural engineer (Ward Cole) with extensive experience of towers, bells, and bell frames was consulted to conduct a tower survey and provide recommendations. The investigation and report concluded that there was no significant movement of the tower itself when the bells were rung and confirmed the positioning of a new frame for 14 bells should be significantly lower in the tower with the primary foundation beams above, but not central to, the current bell chamber windows.

Both bell firms and their sub-contractors made prior inspection visits and submitted their proposed designs and costs for the new bell frame and support structure, that was approved.

In their inspection report Taylors of Loughborough verified the need for restoration, stating:

> "*The bells are amongst the finest ever cast and tuned by our Company, and they are highly regarded amongst bellringers.*
>
> *The investments made in 1896-7 were certainly a wise choice made by the Churchwardens of the day, however limited funds meant that the bells, although largely recast, were rehung on mainly old style 1868 fittings in the existing bellframe. New main bearings were provided by Mears and Stainbank in 1930 as an interim repair, and by 1966 these bearings and the old timber headstocks were in need of total replacement. Our bells and bell fittings have certainly stood the test of time, and of very considerable use; they still have plenty of good lifespan remaining.*
>
> *Unfortunately, the older bellframe and its supporting infrastructure have not fared so well.*

The founding of a strong band of ringers in the closing years of the 19th century has placed bellringing at St Paul's as very highly rated in the county and country. The present condition of the main bellframe makes maintaining these long-held standards and future training of new recruits very difficult.

Correspondence between the late Mr Stephen Ivin and Mr Paul Taylor on the subject of a large-scale rehanging scheme was first mentioned in our records during 1964.

We agree with the findings within the RFQ document that the bells are becoming noticeably harder to ring, and that the time is now approaching whereby they should be rehung in a new bellframe lower in the tower, thus future proofing the bell installation for the next 150 years and more."

In May 2025 both bell firms submitted revised detailed proposals and firm cost estimates. These are currently under review.

6. How is the proposal contributing to the need for environmental sustainability?

How is it reducing the carbon footprint, contributing to the Church's commitment to be 'net zero carbon' by 2030?

The project will replace existing heating and lighting with low energy led lighting and infra-red space heating.

The project will conserve resources by recycling and/or reusing existing materials wherever practical and where this would not compromise the resultant quality and performance of the completed installation. For example, it is planned for as much as possible of the timber from the 1867 oak bell frame to be repurposed and used for wall panelling, and seating in the ringing room and/or the new clock case. The steel fabricated bell headstocks will be refurbished and reused where possible. It is intended that the redundant bell wheels will be restored and used for the training dumb bells.

Environmental Impact

The clock and bells are a very significant part of the town soundscape dating back five centuries. However, St Paul's Church is located in the centre of a town with increasing residential development, including recent multi-story properties in close proximity to the Church. The existing external sound control boarding, installed in the 1970s, has deteriorated and is no longer effective, and as a result, the bells are loud, especially at the higher levels of the bell chamber louvres.

A resident from one of the new riverside developments has repeatedly complained to the PCC and local authority about the ringing, albeit very limited and not of a duration, frequency, or volume that is legally classed as constituting a nuisance. None the less, this has resulted in protracted and time-consuming correspondence and some precautionary compromise restrictions being agreed. Although there is currently only one such case, there is always the potential for others and preventative measure are always preferrable to retrospective actions.

The automatic external sound control system proposed will enable the bells to be heard clearly when required for services and other appropriate occasions as at present, but will also enable the sound to be very significantly reduced such that additional ringing for training, practices and recreation can take place without causing any disturbance.

7. What other options to meet the need were considered, taking Point 6 and the impact identified in the Statement of Significance into account?

St Pauls Bedford has major Parish Church Status and is the principal Church of Bedfordshire and the north of the Diocese of St Albans.

As such St Pauls hosts a number of civic services and attracts a regular congregation and visitors from a wide area, St Paul's annual operating income on which it is highly dependent is greatly enhanced by a regular program of weekly lunchtime and weekend concerts and an annual Christmas Tree Festival. Tours of the Church that includes the ringing and clock chambers are regularly hosted in conjunction with Bedford Association of Tour Guides through the Bedford Borough tourist information centre.

The Church fabric and interior have been extensively restored and well-maintained through legacies and a number of significant high-profile appeals. Over the past 50 years, extensive repairs to the fabric of the church and its interior have included a major restoration of the building's internal fabric and construction of the west entrance and gallery, repair and repainting of the interior ceilings and carvings, extensive repairs and improvements to the organ, extensive repairs and replacement of badly damaged and weathered stone carved pinnacles along the south side roof, and an extensive refurbishment of the north porch to create a more accessible and welcoming second entrance into the church. Over £2.5m has been raised and spent through successive projects.

The tower fabric, clock, and bells now remain as the most neglected parts, having not received any significant attention since the tower and spire were rebuilt and the clock installed in 1867/8, followed by the new bells in 1896, hung in the old 1868 wooden frame. The project will now complete the work, similarly restoring the tower, clock, and bells to the standard of other parts of the building, consistent with its status as a major parish Church, attracting visitors at the heart of a county town and concluding the major restoration of and improvements to the Church building.

The original replacement of the bells in 1896/7 was a financial compromise resulting in reuse of the 1867 wooden frame and its foundations and a three-staged approach to replacing the original 8 bells in 1896 (1,2,3,6,10 of 10), 1897 (4,5,7,8) and finally in 1945 (9). Subsequent efforts to undertake a full restoration in 1945, 1927/30, 1966, 1977 and 2017 all met with financial constraints and resulted in lesser schemes to maintain the installation and make short term improvements. Ad-hoc expenditure (listed below) for remedial work undertaken by all three major bell firms over the past 25 years and costing more than £25k has delayed the need for restoration but has been largely ineffective.

<u>Bearings</u>

- 5/12 new bearings in 2012 (Whites)
- 6/12 new bearings in 2008 (Whites)
- 7/12 new bearings in 2007 (Whites)
- 8/12 new bearings in 2001 (Taylors)
- 9/12 new bearings in 2001 (Taylors)
- 10/12 new bearings in 2001 (Taylors)
- 12/12 bearings inspected cleaned and repacked with grease in 2001 (Taylors) and 2008 cleaned repacked with grease and bell realigned as it had side-shifted and new pad installed (Whites).

<u>Clappers</u>

- 7/12 2003 (Whitechapel)
- 9/12 2001 replacement WI (Whitechapel)
- 10/12 2003 (Taylors)
- 12/12 2005 WI reforged and bushed (Whitechapel).

Pulleys

- 7/12 2008 (Whites)
- 10/12 2003 new bearings JS

8. Additional Supporting information

8.1 A long history of Civic support and involvement in previous projects.

1668 Earliest recorded evidence of a public clock at St Paul's Bedford, listed in a Church inventory of 1708
1744 The 'new' ring of 8 bells installed funded by public subscription, led by the mayor (John Russell) whose name was inscribed on the tenor (largest) bell.
1745 The Chamberlains of the town corporation paid the ringers of St Michael Cornhill, London to 'open' the new ring of bells.
1811 A new clock installed (the current one) by Moore of Clerkenwell
1830 John Bull & Co (Bedford) contract to maintain the clock
1868 The new (current) tower and spire built and the Church extended funded by public subscription.
1870 The clock reinstalled in the newly build tower by Moore of Clerkenwell, funded by the Church and Corporation.
1896. The Mayor and prominent Bedfordians along with The Vicar and Churchwardens launch an appeal to install a new (the current) ring of bells.

Mr F A Blaydes, Mayor of Bedford
Rev W C W Barker, Rector Milton Earnest (Archdeacon of Bedford)
Mr Thomas Gwyn Elger, Bedford
Sir Frederick Howard, Bedford
Lambert Woodward, Vicar
Thomas Bull. Churchwarden
John Mason Cuthbert, Churchwarden

1897. Five of the new bells are donated / inscribed by

4. Mrs Elger – in memory of Thomas Gwyn Elger
5. Thomas Bull, J.P. – In his 25th year as Churchwarden
6. Sir Frederick Howard – Industrialist (Britannia Ironworks)
7. George Hurst (aged 97) – former Churchwarden and five times Mayor of Bedford, for Queen Victoria's Jubilee
10. LAMBERT WOODARD, VICAR. / J.M. CUTHBERT & T. BULL, CHURCHWARDENS / F.A. BLAYDES, MAIOR.

1940. The bells taken down and stored in the Churchyard for safety

1945 The bells reinstated and the ninth bell recast to commemorate the end of hostilities, jointly funded and inscribed with the names of the Mayor, Vicar, and Churchwardens.

*THE / VICTORY BELL / * * * / CAST BY THOMAS LESTER / 1744 / RECAST FOR VICTORY BY / JOHN TAYLOR OF LOUGHBOROUGH / 1945 / * * * / A. ST. G. COLTHURST, VICAR / F.W. KUHLICKE } / G.A. ROGERS } CHURCHWARDENS / J.A. CANVIN, MAYOR / * * * / NON CLAMOR SED AMOR CANTAT IN AURE DEI*

1966 The bells were rehung with new headstocks, bearings, and other fittings in the existing frame funded primarily by the ringers.

1978 Two new bells added to create the first ring of 12 bells in the county inscribed to commemorate the centenary of the Diocese of St Albans and the Silver Jubilee of HM The Queen.

2002 The clock chimes restored after 30 years of silence thanks to a legacy of Winifred Hall. (They have since failed again)

8.2 A long history of ringing for local civic and national events

- Traditionally, the ringers were paid to ring on public "ringing days" throughout the year – anniversary of the monarch's accession, monarch's birthday, Oak Apple Day, 5th November etc
- Until the mid C19 bells were commonly rung for Parliamentary election victories, and to announce the arrival and departure of notable persons (who paid the ringers)
- St Paul's bells were rung in July 1834 to mark the emancipation of the slaves in the West Indies – a day marked by prayers, speeches, ringing and a "band of music parading the public streets"
- The Bedfordshire Association of Church Bell Ringers was formed at a meeting at St Paul's on 13 March 1882
- Many historic boards hang on the ringing chamber wall recording peals rung for events of national and local significance: e.g.
    - 9/11/1896; First peal on the 10 bells rung for the election of George Wells Esq JP, 3rd time mayor of Bedford (who presented the peal board)
    - 22/6/1897; For the Diamond Jubilee of Queen Victoria. (Peal board presented by J Bull Esq, 25 years Churchwarden)
- Recent events:
    - Death of HM the Queen
    - Proclamation of King Charles III
    - Coronation of King's Charles III
    - Memorial Service for Samuel Whitbread
    - Civic Services (Annually): Lord Lieutenant, High Sheriff's Justice Service,
    - 1st anniversary of the Ukraine Invasion (requested by the Ukraine Community)
    - Other Local and National: River Festival, London Olympics, Christmas Tree Festival etc.

8.3 St Pauls Bedford TC&B Project Summary of Costs and Funding Status (Sept 2025)

		£
General Building Works Preparation (inc H&S measures, protection, scaffolding, etc.)		£38,730.00
Clock and Bells Sub Contract Supervision		£16,600.00
Steelwork		£74,156.00
Stonemason		£19,080.00
Carpenter and General Construction Work		
Roof deck:	£10,745.00	
Plenum Floor and Walls	£11,010.00	
Ringing Chamber Ceiling	£5,400.00	
Clock Deck	£36,950.00	
Carillion relocation	£460.00	
Ringing Room Floor	£37,990.00	
Total Carpenter and General Construction Work		£102,555.00
Electrical Works		£24,662.00
Decorating		£25,800.00
Site clearance		£9,910.00
Project Management and General Services		£42,125.00
Sub Total		£353,618.00
Bells - see below		£281,000.00
Additional Bells		£35,000.00
Clock - see below		£57,400.00
Professional Fees		£20,736.00
Total before VAT		£747,754.00
VAT		£149,550.80
Total Inc Additional Bells		£897,304.80
Total Exc. Additional Bells and VAT thereon		**£855,304.80**
Contingency (exc. additional bells) at 10%		£85,530.48
Total with contingency (exc. additional bells)		£940,835.28
Current Funding Status (September 2025)		
Initial funding (DHPT funding to cover costs of pre-contract work)		£31,388.00
Grants		£280,000.00
Sponsorship (12 Sponsors)		£122,500.00
Other Donations and Gift Aid		£44,973.00
Underwriting from Friends of St Paul's Church		£100,000.00
Underwriting from the Dorothy Hall Porter Trust		£300,000.00
Total funding (exc. Pre-contract funding)		**£847,473.00**
Of which cash currently in bank		£178,859.00
Funding Currently Required (exc. Contingency, exc. Additional bells)		**£7,831.80**
Funding Currently Required (with contingency, exc. Additional bells)		**£93,362.28**

In addition, the additional flat 6th bell is expected to be funded in full from a legacy

Clock

Clock Essential Works	£25,000.00
Removal of the clock mechanism and drive shafts and strike hammers	
Complete restoration of the clock and its auto winding and strike mechanisms	
Relocation / reinstallation of clock mechanism to new platform and display cabinet	
Reconnection of refurbished drive shafts and hour/quarter strike hammers	
Clock Enhancements (Options)	£32,400.00
Restoration of the clock faces, gold gilt numerals and dials	
Incorporation of pendulum regulator and night silencing mechanism	
Clock Total	£57,400.00

Bells

Removal and Rehanging	£186,000.00
Removal of existing bellframe and bells and their fittings	
Construction and installation of new 14 bell frame on one level lower in the tower	
Refurbishment or replacement of all bell fittings	
Rehanging the bells in the new frame	
Retuning bells 1 & 2	
Manufacture and fit automatically operated external sound control mechanism	£40,000.00
Training centre dumb bells and audiovisual equipment	£55,000.00
Bells Total	£281,000.00

Current Grant and other major funding sources

- Dorothy Hall Porter Trust - £232,000
- The Friends of St Paul's - £20,000
- Beds & Herts Historic Churches Trust - £20,000
- Mrs B L Robinson Trust - £10,000
- Bedfordshire Charitable Trust - £10,000
- Bedford District Bell Restoration Fund - £10,000
- Bedfordshire Association of Church Bell Ringers - £8,000
- The Gale Family Trust - £2,000
- Private sponsorship of individual bells - £128,750
- The Friends of St Paul's (Howbury Hall Auction) - £15,306
- Howbury Hall Open Gardens Event - £2,000
- Southill Park House Open Days - £1,980

8.4 Details of the Bells

Bell ***Inscription***

1. 655 161 / [*Blank*]

   Waist: 1977 / JUBILEE OF HER MAJESTY QUEEN ELIZABETH II / GOD SAVE THE QUEEN

   Opposite: 19 (*Taylors' rectangular mark*) 77

2. 655 150 / [*Blank*]

   Waist: 1977 / THE CENTENARY OF THE DIOCESE OF ST ALBANS / GLORY TO GOD IN THE HIGHEST

   Opposite: 19 (*Taylors' rectangular mark*) 77

3. JOHN TAYLOR & CO. + FOUNDERS + LOUGHBOROUGH + 1896 + / *(vine border)*

4. JOHN TAYLOR & CO + FOUNDERS + LOUGHBOROUGH + 1896 + / *(vine border)*

5. RECAST BY JOHN TAYLOR & CO. + LOUGHBOROUGH + 1896 + / *(vine border)*

6. JOHN TAYLOR & CO. * FOUNDERS * LOUGHBOROUGH * 1897 * / (*vine border*)

   On original headstock, a plate inscribed (now removed): GIVEN TO THE GLORY OF GOD A.D. 1896. FREDERICK HOWARD, KNIGHT

7. ✠ TO THE GLORY OF GOD ✠ ✠ / (*large vine border all round*)

   Waist: THOMAS BULL, ESQ. J.P. / IN THE TWENTY-FIFTH YEAR OF HIS / HOLDING THE OFFICE OF CHURCHWARDEN / GIVES THIS BELL / 1897

   Opposite: (*Taylor's circular mark*)

8. GIVEN FOR THE GLORY OF GOD. * A.D. 1896 * / (*large vine border all round*)

   Waist: FREDERICK HOWARD Knight

   Opposite: (*Taylor's circular mark*)

9. [132 inside crown] / ✠ TO THE GLORY OF GOD ✠ ✠

   Waist: GEORGE HURST, ESQ J.P. / A FORMER CHURCHWARDEN / AND FIVE TIMES MAYOR OF BEDFORD / (THE LAST TIME BEING IN 1887 / THE JUBILEE YEAR OF H.M. QUEEN VICTORIA) / GIVES THIS BELL IN COMMEMORATION / OF THE SIXTIETH YEAR / OF HER MAJESTY'S REIGN / AND OF HIS NINETY-SEVENTH BIRTHDAY / ON FEBRUARY 10, 1897

   Opposite: (*Taylor's circular mark*)

10. JOHN TAYLOR AND CO. ✠ FOUNDERS ✠ LOUGHBOROUGH ✠ 1897 ✠ / (*large vine border all round*)

11. 327 / *(floral border all round)*

    *Waist: THE / VICTORY BELL / * * * / CAST BY THOMAS LESTER / 1744 / RECAST FOR VICTORY BY / JOHN TAYLOR OF LOUGHBOROUGH / 1945 / * * * / A. ST. G. COLTHURST, VICAR / F.W.*

*KUHLICKE } / G.A. ROGERS } CHURCHWARDENS / J.A. CANVIN, MAYOR / * * * / NON CLAMOR SED AMOR CANTAT IN AURE DEI*

12. TO THE GLORY OF GOD ✠ A.D. 1896 ✠ / (*large oak leaf border*)

Waist: THIS BELL WAS RECAST BY / JOHN TAYLOR OF LOUGHBOROUGH. / LAMBERT WOODARD, VICAR. / J.M. CUTHBERT & T. BULL, CHURCHWARDENS / F.A. BLAYDES, MAIOR. / AT THE SAME TIME TWO TREBLES BEING / ADDED TO THE OLD RING OF EIGHT.

Bell	***Founder and date***	***Diameter***	***Hz***	***Note***	***Weight***
1.	John Taylor & Co., 1977	26”	1738	A	5-0-10
2.	John Taylor & Co., 1977	26⅞”	1544	G	5-0-14
3.	John Taylor & Co., 1896	27½”	1456	F#	5-3-2
4.	John Taylor & Co., 1896	29”	1302	E	6-0-11
5.	John Taylor & Co., 1896	31⅛”	1156.5	D	7-0-8
6.	John Taylor & Co., 1897	32”	1088.5	C#	7-0-26
7.	John Taylor & Co., 1897	35”	968	B	8-1-11
8.	John Taylor & Co., 1896	38¼”	867.5	A	11-0-0
9.	John Taylor & Co., 1897	42¼”	771	G	14-1-25
10.	John Taylor & Co., 1897	44¼”	725	F#	15-1-4
11.	John Taylor & Co., 1945	47⅝”	649.5	E	19-2-11
12.	John Taylor & Co., 1896	55”	578	D	28-3-6

SPECIFICATION

FOR

REPLACEMENT OF BELL FRAME
And
ANCILLIARY WORKS

ST. PAULS CHURCH

BEDFORD, BEDFORDSHIRE

Michael Dales Partnership Limited
65 Hermitage Road,
Hitchin,
Hertfordshire,
SG5 1DB

SPECIFICATION
of
WORKS TO BE DONE AND MATERIALS TO BE USED
in connection with the
REPLACEMENT OF BELL FRAME
And
ANCILLIARY WORKS
at
St. Paul's Church
Bedford
Bedfordshire.

AUGUST 2024

1.00 PRELIMINARIES

1.01 The Employer is St. Paul's PCC
c/o Steve Stanford
St. Paul's Church,
Bedford
Bedfordshire.

1.02 The Architect is the Michael Dales Partnership Limited
65 Hermitage Road, Hitchin, Hertfordshire, SG5 1DB.
Telephone Number 01462 230803.

1.03 The works will be inspected by and are to be carried out to the satisfaction of the Architect.

The works to be carried out are shown and described in this specification and the following drawings:
1077/49-002 – Plans as Existing
1077/49-003 – Elevations as Existing
1077/49-004 – Elevations as Existing
1077/49-014F – Plans as Proposed
1077/49-015D – Elevations as Proposed
1077/49-020C – Elevations as Proposed
1077/49-024A – Sections A-A & B-B
1077/49-025A – Pendulum Cupboard
1077/49-026A – Clock Mechanism Cupboard
1077/49-027 – Ringing Room Proposed Joinery
1077/49-028A – Electrical Plans – Ringing Room and Clock Platform
1077/49-029A – Electrical Plans – Plenum and Bellframe
1077/49-030A – Electrical Plans – Belfry (Lower & Upper)

And the Structural details and calculations prepared by Cox Clifford Partnership ref. 13871 calcs 1-49_0001.

The Contractor is advised to visit the site prior to the submission of his Tender to inspect the building, the means of access and the site conditions and the scope of the works as described or can be reasonably inferred. No claims for extras will be accepted arising from the contractor's failure to do so.

The Contractor will be required to ensure that all activities related to this building contract are strictly confined within the boundaries of the site.

Externally the Contractor is to make a compound using security fencing to protect the public from the works and the works from the public.

The main body of the church will remain in use during the works.

The contractor shall allow to liaise with the Church Administrator and Architect over the program and timing of the works to ensure safe access for public

The contractor shall also liaise with the Church administrator of over working times /quiet times to enable church life to continue as well as is practical.

The Contractor shall ensure that the security of the works is maintained at all times during the works. This shall include for liaising closely with the Church Administrator over the timing of the working day in order that all security protocols for the building can be maintained.

The Contractor shall allow in his tender for any inconvenience, uneconomic working in respect of the above. The Contractor should allow for shorter working days in relation to hot work and to setting times in relation to lime mortar and lime-wash.

1.04 The form of Contract under which the works are to be executed will be the JCT Minor Works form of Building Contract 2016.

Tenders are to remain open for acceptance for a period of not less than 90 days from the date fixed for the submission of tenders.

The following are the Clause numbers and headings of the Conditions of the Contract and the Contractor is to allow in his Tender for observing the full text of each Condition.

4th recital	Base date will be the tender date.
Clause 4.2	Shall be completed to show the Employer is not a contractor
5th recital	Shall be completed to show that the project is not notifiable under CDM Regulations.
6th recital	Shall be deleted to show no framework agreement exists.
7th recital	Shall be completed to show that collaborative working applies.

Shall be completed show Health and Safety applies
Shall be completed to show that cost savings applies
Shall be completed to show that sustainable development applies.
Shall be completed to show that performance indicators shall not apply.
Shall be completed to show that notification of disputes shall apply.

Article 7 Arbitration: shall not apply.

Clause 1.1 Shall be completed to show 14 days and commencement of works.

Clause 2.2. Shall be completed to indicate that the works will be commenced and shall be completed by the dates shown on the Form of Tender.

Clause 2.8 Shall be completed show the sum of £400.00 per week.

Clause 2.10 Shall be completed to show a rectification period of 12 months.

Clause 4.3 Shall be completed to show 95%.

Clause 4.3 Shall be completed to show 97.5%.

Clause 4.3 and 8 Shall be completed to show Nil.

Clause 4.3 and 8 Shall be completed to show 15%

Clause 5.3. Shall be completed to show that the contractor shall indemnify the Employer in the sum of not less than £10,000.000.00.

Clause 5.4A and C Shall be deleted.

Clause 5.4B of the contract shall apply.

The Employer, Contractor and any Sub-Contractor shall produce evidence to the Architect to show that the insurances referred to in the contract have been taken out and are in force at all material times.

All existing structures, contents, also the works and unfixed materials and goods (except Contractor's sheds, plant, tools and equipment) shall be at the sole risk of the Employer as to the loss or damage by the perils listed in the Contract. The Employer shall maintain insurance against those risks, including any necessary demolition and removal of any debris, for the full reinstatement value concerned plus 15% for fees.

1.05 The Contractor must Indemnify the Employer against all liabilities, loss, claim, expense or proceedings whatsoever, in respect of damage to the Church arising out of the negligent use of blow lamps, lead burning torches, welding equipment and any other apparatus. The Contractor must also cause any sub- Contractor to maintain insurance against all liability of the aforesaid risks

Contract to be executed underhand.

The Employer, Contractor and any Sub-Contractor shall produce evidence to the Architect to show that the insurances referred to in the contract have been taken out and are in force at all material times.

In addition to the above the following precautions are also to be put into force:

a) Where any temporary external tower scaffolding or platforms are used it is essential that they are dismantled at the end of each working day.

b) All lower level access ladders to permanent scaffolding are to be removed from the site or locked in the Church (if agreed with Employer) at the end of each working day.

c) The lowest platform of any scaffolding must be a minimum of 4 metres above ground level.

d) A secure compound a min of 4.5m high in corrugated iron sheet with a lockable access door is to be maintained around any scaffolding outside the existing building and shall comply with the current requirements of Ecclesiastical Insurance Group. (see appendix)

1.06 Tendering Procedure: Competitive tenders will be invited based upon this Specification. When considering the tenders submitted the Employer will take into account the dates quoted for commencement and completion of the works in addition to the tender sum.

The Employer does not bind himself to accept the lowest or any Tender. No remuneration will be paid for the preparation of Tenders.

The bell work contract is anticipated as to be a nominated sub-contract to a main contractor for rest of the works proposed in the tower and the contractor shall take allowance for this in his tender.

In addition to tendering for the bell work the contractor is invited to tender for the wider contract as main contractor should he choose to.

1.07 Programme. The contractor's suggested programme for the works is to be submitted with his tender, and may be taken into account by the Employer when considering which tender to accept. The subsequently agreed programme will form part of the contract documents.

During the course of the Works, the programme shall be regularly marked up to show the actual progress of works for inspection by the Architect.

Similarly, within fourteen days after the signing of the Contract the Contractor shall submit to the Architect a priced copy of this Specification with each item priced to show the cost of the work described. This priced copy of the Specification will not be treated as a Bill of Quantities but will be used for assessing the value of work in progress and as a guide to the cost of any variations.

Two copies of any drawings (not counting any certified copy of the contract drawings) will be issued to the Contractor free of charge. Extra copies will be issued on request but will be charged to the Contractor.

1.08 Do not scale from the drawings. All dimensions should be checked on site or with the Architect. Any significant discrepancies should be notified to the Architect.

1.09 The Contractor is required to present his Application for Payment in the following manner:

Spec Item	Detail	Cost in Priced Spec.	% complete	Valuation

1.10 The Contractor will be required to provide proper on-site supervision of the Works throughout the whole period of the Contract by the employment of a Site Foreman, (or other suitable person). The Foreman shall not be removed from the site or replaced without the written consent of the Architect.

The Architect and PCC bells advisor will make frequent inspections of the work in progress. The Contractor is to notify the Architect if he is to be off-site or if he wishes to seek payments for un-installed work -off site.

1.09 The words "supply", "provide", or "provide and fix", in this Specification are to be taken to assume that the Contractor will include all the labour and materials required to complete the operation described.

The work "approved" is to be taken to mean approved by the Architect.

1.10 The Contractor is to provide everything necessary in the way of materials, tools, plant and labour and access for the proper and complete execution of the Works involved in the Contract according to the **intent and meaning of the drawings and this Specification providing that this can be reasonably inferred from either.**

The absence of a description of work or materials or fittings or an Estimated Cost in the priced copy of this Specification submitted by the Contractor in compliance with Clause 1.07 shall not vitiate the requirements of this Clause providing it can be reasonably inferred from either the drawings or the specification.

1.11 The quality of materials and products to be used for the works shall not be less than described in the appropriate British or European Standard Specification.

Where work is shown, or described, to be in accordance with a Code of Practice the Contractor shall ensure that the recommendations of the Code of Practice are complied with in all respects.

Workmanship shall in all cases be in accordance with the best methods recognised throughout the trade.

1.12 Materials and work likely to deteriorate if left exposed must be kept undercover and/or protected.

Similarly, the Contractor shall protect completed works to prevent damage by following trades.

1.13 The Contractor shall accept delivery of all materials to the site and shall ensure that they are of the quality and quantity specified, in proper condition at the time of delivery and properly stored until fixed.

1.14 Where appropriate, the Contractor shall be responsible for serving the Notices on the Local Authority when work on site is commenced and at the appropriate times as the Works proceed and upon completion. Where appropriate, the Contractor will be required to obtain a Notice of Satisfactory Completion of the Works from the Local Authority. Where appropriate the Contractor shall also be responsible for the service of any other Statutory Notices required as a result of him carrying out the Works. The Contractor shall pay all charges due in respect of same. Where appropriate the contractor shall make all necessary arrangements with the highway authority if road closures are required and pay all relevant charges in relation to same.

1.15 The Contractor may make use of the Employer's power and water supplies in carrying out the works.

1.16 The Contractor shall attend upon, cut away for and make good after all trades and domestic and Nominated Sub-Contractors.

1.17 The Contractor is to provide such secure site office and storage accommodation and toilet facilities for the use of the site staff and operatives as requires and is to pay all rates and charges due in respect of any temporary buildings erected for the Works.

1.18 Upon completion of the Works the Contractor shall leave the whole of the Works clean and in proper condition. The Contractor shall clear away all temporary buildings and re-instate any area of the site affected by same.

1.19 The Contractor shall be responsible for checking any dimensions on the site and shall advise the Architect of any discrepancies found.

1.20 **Include the sum of £8,000.00 of the cost of the works for Contingencies to be used in whole or in part as directed by the Architect. The whole or any part of the Contingency sum not so used shall be deducted at the settlement of the Accounts.**

1.21 HEALTH AND SAFETY

The Contractor shall ensure that he, his employees, sub-contractors and visitors to the site at all times observe the relative standards and codes of practice for health and safety where building work is carried out.

In particular, where work is carried out on scaffolding at high level industrial safety helmets in line with current COP are to be worn, masks are worn where dust is being created and ear defenders where noise is generated. Appropriate protective clothing shall be worn.

All visitors to the site are to be provided with safety helmets should they require them.

1.22 The Contractor shall allow for observing the full implications of the Employer's health and safety policy together with current requirements for CDM Regulations. The Contractor shall note that all CDM documentation must be completed before the issue of a Final Certificate.

COVID 19 - The contractor shall allow for observing all the government and diocesan Covid 19 guidance in place at the time their tender is submitted. Any changes to that advice to be reviewed at the appropriate time and the contract details to be adjusted accordingly at the architect's discretion.

1.29 FIRE PRECAUTONS

Take all necessary precaution to prevent nuisance to public on and off site from smoke, dust, rubbish and other causes.

The contractors shall provide and maintain on site appropriate fire extinguishers for the duration of the works.

1.30 The Contractor is to take all reasonable measures to prevent loss or damage by fire. All workmen should be shown the location of fire extinguishers in the church and are to be told where telephones can be found in the event of an emergency. Additionally, operatives should be equipped with a mobile phone. Where work involving the use of blow-lamps, lead burning torches or any other flame producing apparatus it should be carried out under close supervision. 2 No. 2 gallon water type extinguishers should be kept in close proximity to the apparatus. All parts of the Church fabric where a heating process has been carried out must be given a final inspection two or three hours after work has ceased for the day. The Contractor should make due allowance within his tender for shortened working days where this applies.

The Employer shall notify the local police and fire brigade and the church's insurers that works will be on site.

1.31 **Smoking is prohibited on the site**.

1.32 The playing of radios during the working day will not be permitted except with the express permission of the Employer's representative and shall be kept turned off during site inspections and services. Radios must be turned off if requested by the Architect, Employer or member of the public. Operatives should bear in mind the purpose of the building and churchyard and, behave appropriately at all times.

1.33 Any electrical contractor shall have **N.I.C.E.I.C Approved Contractor Status**. Any temporary electrical wiring should comply with N.I.C.E.I.C. Regulations and should be disconnected at the end of each working day. All waste material should be removed from the site at the earliest opportunity. Where any fittings are specified, and they arrive in packaging, the packaging should be removed outside the Church and disposed of. No bonfires or disposal of packaging or waste material should be carried out on site.

1.34 The storage of inflammable materials shall be outside the Church and well away from the building.

INSURANCE:

Depending upon the type and extent of the 'hot work' it may be prudent to notify Insurers of the work and seek their approval of safety precautions put in place.

PROTECTION

Every effort is to be made to prevent damage to existing building fabric, internal or external, fences, walls, gates, paving, trees and shrubs and other features which are to remain in position during the execution of the works.

The Contractor shall provide and fix all and any necessary temporary casings, boards, sheets etc. to ensure this.

The Contractor, sub-Contractors and all operatives must bear in mind that the Church will remain in use during the works. The church administrator who will acquaint the Foreman with any need to stop work during a service or funeral.

The Contractor shall make due allowance within his tender for the inconvenience caused by stoppages in work to accommodate services etc. Where unscheduled services are required- funerals etc. – the contractor shall use his best offices to redirect labour or re-schedule to minimise disruption to the program. Should significant delays or series of delays occur the contractor may seek to off-set costs though the normal contract procedures.

1.35 AUTHORITY

All works will have been approved by the Diocesan Advisory Board and have received a Faculty prior to work commencing on site. Where special or urgent circumstances occur the contractor shall advise the architect who will enquire whether a licence may be required to proceed.

Where day work is carried out, each time-sheet and invoice is to be signed by the Foreman as correct and is to refer to the Architect's Instruction for the work. Day works only to be carried out with authority of architect.

Completed day-work sheets will only be considered for acceptance if submitted with ten working days.

All additional works or variations shall be valued at rates comparable with those used in the tender process.

Where work is to be carried out and is to be concealed a minimum of 24 hours' notice is to be given to the Architect in order that an opportunity for an inspection may occur.

1.36 THE WILDLIFE AND COUNTRYSIDE ACT 1981 AND CONSERVATION (NATURAL HABITATS ETC) REGULATIONS 1994

This Act gives very full protection to bats because of their special requirements for roosting. It is illegal not only to intentionally kill, injure or handle any bat, but also intentionally damage or destroy or obstruct access to any place that a bat uses for shelter or to disturb a bat whilst it is occupying such a place. In this context "damage" means make worse for a bat and so includes

such operations as chemical treatment of timbers. The Act provides defences so that building, maintenance or remedial operations can be carried out in places used by bates.

It is important that all contractors and subcontractors under this specification and contract notify the Bats Conservation Trust. Their Contact details are 0845 1300 228 email enquiries@bats.org.uk so they can decide if the building is inhabited by bats. Failure to comply with this Act could render the Contractor liable for heavy fines.

No work is to proceed without written confirmation from the Architect.

NOTE: No organochlorine woodworm killers are to be used where bats are in evidence. Synthetic pyrethroid insecticides such as permethrin and cypermethrin can be permitted if used by an approved timber treatment.

1.37-1.40 not utilised

1.40 GENERAL PROCEDURES

1.40.1 Where materials and work are not fully specified, they are to be carried out using materials fit for the purpose, in line with current standards and wherever possible match existing materials in type, texture, colour, size and quality.

1.4.2 Tenders are to remain open for acceptance for a period of not less than 90 days from the date fixed for the submission of tenders.

2.00 TRADE PRELIMINARIES AND PREAMBLES

2.1.0 EXCAVATOR AND CONCRETOR - None proposed.

2.2.0 DRAINLAYER - None proposed.

The contractor shall take reasonable steps to ensure that any drains within the scaffold zone or under routs for heavy vehicles are protected from compaction as far as is practical.

2.3.0 BRICKLAYER – None proposed

2.4.0 STONEWORK: - None proposed

2.6.0 CARPENTER AND JOINER

2.6.01 Where softwood is specified for carpentry it is to be GS or MGS Swedish 5ths or 1st or 2nd common Hemlocks to BS 4978.

2.6.2 Where softwood is specified for joinery it is to be unsorted quality Swedish or Russian Redwood. Where softwood joinery is to receive a stain or clear finish the timber shall be selected for clear faces and shall be kept clean and free from marks until treated.

2.6.3 Hardwood is to be European Oak from a Certificated source.

2.6.4 Plywood is to be BS 1455 with grade 2 veneers and WBP bonding.

2.6.5 Blockboard is to be to BS 3444 with Grade 1 veneers and BR bonding.

2.6.6 Timber described as "Tanalised" is to be vacuum/pressure impregnated with Tanalith 'C' preservative carried out strictly in accordance with the Code of Practice No.2 issued by Hicksons Timber Impregnation Company (GB) Limited. Timber must be machined to its final dimensions before treatment.

2.6.7 Timber stored on site is to be stacked to allow free circulation of air around the timbers and is to be kept clear of the ground and protected from the weather.

2.15.0 ELECTRICIAN –

Electricity is available on site for the contractor to use.

2.15.1 All electrical installation is to be carried out by a specialist Sub-Contractor who has NICEIC Approved Contractor status.

2.15.2 The whole of any installation is to comply with N.I C.E.I.C. recommendations, the requirements of the Council for the Care of Churches and is to be earthed to satisfy the requirements of the Electricity Board. No wiring of any sort is to be installed in the cavities of the external walls.

Where wiring is specified to be behind wall plaster it is to be protected with PVC conduit properly chased into brickwork or blockwork and fixed in position.

Where wiring is specified to be located in the thickness of structural timber work, the timber members are to be drilled along the line of the neutral axis to allow for the passage of wiring.

2.15.3 Upon completion, the Contractor will be required to test the whole of any electrical installation, (including the earthing of same) and to provide certificates to show that the whole system is satisfactory.

2.15.4 Allow for paying any electricity charges due in respect of this Contract.

2.15.5 Where any work specified or existing work is not in accordance with electrical regulations or best practice, the Architect is to be notified before commencement.

2.17.0 PAINTER AND DECORATOR-

2.17.1 All steelwork is to be galvanised and/or painted off site to minimise corrosion.

2.18.1 TEMPORARY SERVICES

2.18.2 SCAFFOLDING

Amy scaffolding should be constructed as independent free-standing structures wherever possible and only tied to the building, where approved by the Architect. All horizontals are to be plastic capped at ends to protect the building and personnel.

Putlocks are to be kept clear of the face of the building where possible and any scaffolding close to the building should be lagged to prevent damage to the stone-work or other fabric.

External scaffold - The Contractor is to include for supplying a fixed metal or 18mm plywood hoarding to a height of 4.5 metres the base of each scaffolding standing on the ground together with a vandal proof access gate. The ply must have close butted joints and be fixed to 75 x 100 timbers with 100 annular ring shank nails or tamper proof screws. The gate shall be of solid construction in a flush frame with a minimum of 3 steel hinges with pin burred over.

A Yale type latch shall be fitted to the gate and when the site is unattended, the gate shall be secured with heavy duty bar secured to door and frame with bolts through. the locking bar must conceal the bolt heads. A heavy duty shacked padlock to at least BS EN 12320 security grade 4 shall be used.

The inside of the scaffold shall be flood lit angled in and up through the scaffold operated by photoelectric cell for illumination at night.

The scaffold should follow the contour of the ground and leave no gaps. The scaffold should be extended higher over plinths etc.

Where scaffolding is to be erected off a roof the Contractor is to check that the roof structure is adequate for the purpose of increased loading and is also to make adequate provision for the protection of the roof structure from mechanical damage and is to make good any damage caused at directly.

Scaffolders should take due notice of other directions within this specification relating to insurance, ladders, health and safety etc.

The scaffold will be protected by an alarm system installed in accordance with the NSI COP for the design and installation of scaffold alarms systems NCP 115

The system will include an audible alarm system linked to a permanently monitored call centre conforming to BS5979 or BS EN 50518. The alarm system is to be approved by EIG the churches insurers.

NOTE
The Contractor and Employer shall liaise over the collation of information regarding scaffold protection and the Employer shall be responsible for submitting same to EIG to ensure metal theft cover is maintained for the duration of the works.

2.18.3 PROTECTION

In general. Provide all necessary temporary fences, hoardings, screens, planked foot ways, guard rails as may be necessary for protecting the public, users of the building, and statutory bodies and to enable the satisfactory completion of the works.

Provide all necessary temporary protection to all parts of the building from damage by inclement weather.

In order to avoid delays due to cold weather the Contractor is to take the following precautions where appropriate:

a) Protect stone from rain and frost by stacking clear of ground and completely covering with waterproof sheet.
b) Store cement and lime in on raised dry platform.
c) Do not use frozen materials
d) Chemical accelerators, retardants or anti-freeze additives are not to be used.
e) Keep finished work covered for at least three days after completion.

2.18.4 ORGAN

The proposed works are unlikely to generate internal dust in the area of the church organ.
However,
The PCC shall liaise with the organ builders in advance of the contractor's start on site to enquire whether the organ builders require the organ to be protected from dust and advise the architect accordingly.

The Employer shall be directly responsible for any costs incurred by the organ builders or works required by the organ builders in covering, uncovering or facilitating the use of the organ during the works

2.18.5 ACCOMMODATION

The Contractor is to provide any temporary sheds, offices, mess rooms etc. as he may require for site operatives and as required under Health & Safety Legislation. Huts are to be sited in positions agreed with the Architect and shall be removed from the site before the works are deemed to have been completed.

The Contractor may use a dedicated narthex wc for general use by the workforce providing the contractor maintains them in a clean condition at all times.

2.18.6 WATER AND ELECTRICITY

The Contractor may use the Employer's water and electricity subject to agreement on connections with Church Warden, Vicar and Architect.

2.18.6 CLEANING

Where any works have affected the interior of the church the contractor shall carry out a thorough clean of the area or areas affected to return them to a level of cleanliness comparable with the remainder of the building.

Where works have been carried out externally the contractor shall clean the area and reinstate any areas of hard or soft landscaping to a condition comparable with their original state.

3.0 SCHEDULE OF WORKS

3.1.0 GENERAL REQUIREMENTS and REMOVALS

Allow for initial on-site pre-contract meeting with the architect, main contractor, clock contractor and PCC representatives to clarify and finalise the scope, responsibilities, scheduling, and communication channels for the site work and safety / site protection measures.

3.1.01 Provide and maintain all necessary scaffolding, access towers, ladders lifting equipment, safety barriers, tools and protective materials etc. specific to enabling the works to the bells and frame to be safely assessed, executed and inspected within the upper part of the tower.

Provide all necessary ladders, guard rails, kick boards, gates and trap doors etc.

3.1.02 Assume the general contractor will provide access to the ceiling of the crossing, removal of Faith craft ceiling artwork and opening of trap and the temporary guarding of the trap.

Bells firm to allow for providing all other guarding to upper traps and for liaising with main contractor in respect of same

Allow for liaising with main contractor over day to day working.

3.1.03 Allow to liaise with main contractor over all necessary protective materials, barriers, etc. to ensure the safe transition of all materials out of and into the tower to ensure that the finishes etc to internal walls and floors and external landscaped areas are protected from damage.

3.1.04 Supply all necessary pallets etc to facilitate the carrying of bells to and from the church together with such lifting machinery as is required.

3.1.05 Provide main contractor and architect with risk assessments and method statement in respect all works as appropriate in advance of carrying out works .

3.1.06 Assume main contractor will provide protection to crossing floor, side of the chancel screen together with dust sheets.; along the route to the west doors and protection of same.

3.1.07 Assume main contractor will lift and set aside the wooden dais in the crossing floor and return same.

3.1.08 Assume main contractor will provide boards and soft protection to memorial slabs in crossing floor and on the route out of the west doors together with any protection of glass doors deemed required.

3.1.09 Assume main contractor will return crossing ceiling artwork on completion.

.

Assume the clock contractor will dismantle and remove the clock and disconnect the four clock dial drive bars and timber bearers spanning the ringing chamber in advance of the bell work commencing

3.1.10 Supply and fix all steel work, lifting gear, hoists etc. to enable bells, fittings and frame to be removed safely to the ground. Liaise with contractor in this respect to avoid unnecessary duplication of provision,

Dismantle the bell fittings and clock hammers., Remove and lower these and bells to ground floor. Ensure the clock hammers and any of the bell fittings that will be reused are clearly and appropriately labelled.

(Main contractor will dismantle frame, support structures and corbels and remove from site once bells are clear of the tower.)

Note bells are to set on pallets in north aisle until for minimum of two weeks or such time as they are to go to the works. Timing to be agreed with architect and PCC

3.1.11 (assume main contractor to remove all existing belfry floor structure after bells removed) .

3.1.12 (assume main contractor will remove all unwanted materials from site.)
Note: The bell frame, foundation beams, and floorboards, may be retained to be sawn into planks by others for reuse in other parts of the project, or sold. Allow for their removal from site as an optional extra.

3.1.13 Before commencing any new works Bell founders to check all critical dimensions and advise architect of any discrepancies found.

3.1.14 (assume clock contractor will disconnect clock and remove drive bars, timber bearers prior to the bell firm attend.)

3.2.00 BELLS

3.2.01 When appropriate, allow to transport the bells and their fittings from church to the bell firms workshop ensuring bells are insured kept safe until they are returned to the church.

3.2.02 Allow for liaising with the tower captain/PCC bells advisor on the condition of the bells and for agreeing any 'additional ' or alternative work before proceeding

Generally allow for all work required to the bells including but not limited to the following:

Weighing, measuring dimensions and tonal analysis of the bells as received. (With the possible exception of the trebles it is assumed that the bells do not require tuning

Sandblasting and cleaning bels to remove scale or vertgris

Assessing and advising on the soundbow thickness due to clapper wear for
turning as required.
Light machining of the inner and out crown to ensure a flat surface parallel to the lip of the bell

Enlarging existing centre holes to enable clapper adjustment
Voicing bells to establish optimum clapper positions

To Balance centre and turn bells to present unworn surface to clapper, drilling crowns for new support bolts where needed.

Allow to assemble and hang each bell with its fittings (headstock, bearings, wheel, clapper /crown staple and stay) in the works to assess and record its dynamic performance. The swing times of the bell and clapper, and the clapper strike time to be recorded and adjusted as necessary prior to shipment to provide a smoothy graded swing time and clapper strike time profile across the ring.

3.2.03 Provide optional extra over costs for the addition of an extra treble (light) and flat sixth bells (This to be provided outside your overall tender figure.)

3.2.04 Provide optional extra over costs for the tuning of the existing treble and 2nd bells and also for their recasting / replacement. If replacing/recasting the bells to be cast to the same profile and aligned tonally and dynamically with the others. (This to be provided outside your overall tender figure.)

3.2.06 Provide optional extra over costs for recasting / replacing the 11th bell with the same profile as the 1896/7 bells. (This to be provided outside your overall tender figure.)

3.3.00 BELL FRAME

3.3.01 Supply and fix all structural steel work for new frame and supports to same.

Steel foundation girders to be equipped with anti-drag cleats at their ends to anchor into the tower wall when grouted in, and fitted with cross-bracing as required to prevent lateral movement.

Allow to identify all necessary pockets in tower stonework to receive same. Wall pockets to be cut and formed by main contractor's mason to bell hanger's specification.

Provide materials and cast concrete padstones to pockets as required.

Foundation girders to be grouted into tower walls to bell firms specification.

3.3.02 Provide and construct new cast iron and steel bell frame for 14 bells as required with cast iron frame-sides with machined bases and bearing tables. Secure frame sides to steel grillage as appropriate. Secure cleated ends of grillage within wall sockets as recommended by structural engineer.

The bell frame to be designed to accommodate 14 bells on one level or alternatively 13 bells on one level with the flat 6th above to provide the optimum rope circle, taking into account the clock platform and ringing room layout and minimising the need to draw ropes. The bell frame design should aim to minimise the difference in maximum horizontal loading force between the E-W and N-S direction with consideration given to providing the tenor bell with independent frame sides to minimise its possible impact on adjacent bells in the frame.

3.3.03 All steelwork is to be hot-dip galvanised. Powder coat steel X ends paint frame sides with three coats of high-quality exterior grade paint.

3.3.04 Supply and fix 200 x 50 on rolled steel angle wall plates to face of tower to carry ends of floor-boards. Plates to be resin anchored to tower wall with 12mm stainless steel threaded rod and washered nuts and bolts. In addition dpm is to be trapped on the back face to give added protection to the timber. Cut back studding after fixing.

3.3.05 Supply and lay 75mm thick loose timber boarded floor in the flanges of the lower primary UB and on the wall plates. Allow to rebate as required. The floorboard rebate to be L shaped (not tongue and grooved) to facilitate their easy removal.

3.3.06 Allow to frame up section of floor and supply and construct hinged access section of floor for access. Hatch to be of sandwich construction with sound insulation core and draft stripped.

3.4.00 RINGING FITTINGS

3.4.01 Supply and fix all necessary fittings to suit the bells and new frame, retaining and refurbishing existing fittings or providing new replacements as appropriate.

This to include:
Headstocks: Clean, refurbish and reuse the existing headstocks (preferred) or provide a graded set of new cast iron headstocks all of the same design, as appropriate. The headstocks to be fitted with new steel gudgeons turned in true alignment and equipped with new heavy duty double row self-aligning ball-bearings in enclosed cast iron dust-proof housings to allow end-float, and high-grade grease. The headstocks to be provided with clapper slots sufficient to allow for clapper centre adjustment and fitted with external adjustment screws. (If a mix of refurbished and new headstocks is proposed, the latter should be of the same pattern and design as those that are retained)

Insulation pads for fitting between bells and headstocks.

Galvanised steel supporting bolts nuts, locknuts and insulation washers, with shaped washers or lindapter cups to fit the inner profile of the bell head. washers.

Independent cast-iron crown staple units each with a ‘maintenance -free’ stainless steel clapper pin.

Machined and profiled ductile SG iron clappers to suit each bell. These to be provided with a machined bush of suitable material resiliently mounted ber at its point of swing, and a lubricator or greasing point. These Tenor and 11th clappers to have dry ash timber shafts. The clappers and staples to be of optimum dimensions to provide an accurately graded clappering swing time profile across the ring.

Wheels: Re-size as necessary and refurbish by re-soling, re-shrouding and fitting new garter hole bobbins to the existing wheels or alternatively provide suitably sized all new hardwood wheels for all bells. The wheels to be fitted with steel angle braces, and constructed using stainless steel rim screws and galvanised fixings.

Hardwood single or double pulley units as required with hardwood or hard-wearing nylon sheaves, each running on two "sealed for life" heavy duty ball races and mounting spindles and fixed to the frame with galvanised steel brackets. Ropes should be minimally drawn on double pulleys as necessary to achieve an optimum rope circle in the ringing room. Provide additional

guide pulley units and timber flapping boards (to reduce lateral rope movement) in the plenary chamber as required, keeping these to a minimum with a preference for ropes being drawn on the pulley units under the wheels.

Slider centre pins with facilities to take up wear at the pivot and to prevent the sliders from lifting.

Air-dried straight grain ash stays, ash steam-bent sliders, and hardwood runner boards.

Ceiling bosses, designed to keep rope noise to a minimum, and rope bosses as required for the floors above the ringing chamber. The ringing chamber ceiling bosses to be of cast iron or anodised aluminium and those in other floors to be of hardwood or cast nylon.

A set of best quality flax bell ropes with close-woven pure wool sallies and hard wearing prestretched polyester top-ends.

3.4.02 All timber fittings to be treated with bat-friendly insecticide/preservative and all non-galvanised metal ringing fittings painted with three coats of high quality zinc-rich primer and industrial standard exterior grade gloss paint.

3.4.03 Allow to assemble the bell-frame and install the bells with all their fittings in the works prior to despatch and for the bell and clapper swing and strike time to be verified.

3.4.04 Allow to overhaul and as necessary adapt the clock hammers and chiming hammer for the 10th bell and their respective check springs such that they can be fitted to the new bell frame. This to be quoted as a separate item. Note: Consideration is being given to using bells 6,7,8,11 or 3,4,5,8 as clock bells rather than bells 7,8,9,12 as at present and also moving the chiming hammer to one of the lighter bells convenient to the existing rope position. This to be quoted separately as an option. Consideration is also being given to replacing the mechanical chiming hammers with electrically operated solenoid hammers. This option should also be quoted separately.

3.5.00 REHANGING

3.5.01 Transport all the bells and their fittings and the clock hammers from Works to the Church.

3.5.02 Allow for bells to be placed on pallets in north aisle where they may be viewed by the public before installation for a minimum period of two weeks.

3.5.03 Liaise with main contractor prior to travelling to the Church with all necessary tools and lifting equipment. Reinstate the protective materials and barriers and install the necessary lifting equipment.

3.5.04 Hoist the bells into the Tower and hang them, complete with their fittings, in the new bell frame, firmly bolting the self-aligning ball bearings to the bearing tables.

Create new rope-ways to provide the optimum ringing circle in the ringing chamber, fit the flapping boards, bosses and bell ropes, set up the clappers for even clappering with laser timing meter, adjust the handstroke and backstroke sets, test-ring the bells both singly and "in peal" with the local ringers and leave them in good order for full-circle ringing following any required final adjustments.

Fit up and set the clock and chiming hammers to their respective bells. The appointed clock contractor to reconnect these to the clock mechanism.

Test-ring the bells both singly and "in peal" with the local ringers and make any adjustments required. Leave the bells in good order for full-circle ringing.

3.5.05 In liaison with main contractor clean the bell chamber, sound void and ringing chamber and transport all debris away from site.

3..6.0 SOUND CONTROL

3.6.01 Take down existing sound control boarding and remove from site.

3.6.02 Check/take dimensions for each window aperture.

Remove the existing ferrous weldmesh bird proof netting. Replace this with 304 grade stainless steel weldmesh netting with ½"x½" max size apertures, to the inside of the louvred openings.

Include for a layer of weather resistant permeable black Galebreaker (M90 or equivalent) secured on to a treated hardwood multi-sectioned baton framework attached to the stonework with stainless steel fixings. Ensure the lower edge of the Galebreaker overlaps the lower louvre such that rainwater run-off drains to the outside.

3.6.03 For each window opening (2 per side), manufacture a full-size timber sound baffle consisting of a treated hardwood frame, double-skin 25mm marine-grade plywood covers and acoustic mineral wool insulation between. The top section of each baffle to incorporate a hinged opening hopper-type door. All timber to be treated with bat-friendly insecticide/preservative and the exterior painted matt-black. All hinges and fixings to be of corrosion resistant stainless steel.

Make suitable provision for the internal drainage pipes from the spire floor to discharge through the louvres to the outside.

Ensure the installation is fully sound-proofed, applying a sufficient amount of rot-free sound insulation sealant to all edges/gaps between the framework and stonework and with the boarding. Install suitable weather-resistant seals to the inner surface of the hopper lids to ensure they are sound-tight.

Fit a mechanism to open the 4 hatches from the ringing room. Ideally the hatches should be fitted with IP55 rated electrically operated linear low voltage (24V) actuators and confirmatory limit switches connected to a control panel in the ringing room with individual operation and position indicators for each louvre.

Assume the main contractor will fit a new stainless steel hinged trapdoor into the refurbished spire floor. Allow to provide and fit IP55 rated electrically operated linear low voltage (24V) actuator(s) and confirmatory limit switches as required connected to a control panel in the ringing room linear actuator(s) as required and for their manual disconnection to allow alternative means of opening.

Test ring the bells to assess the effectiveness of the sound control mechanism. Make any adjustments necessary and leave in good order so that the external sound level of the bells can be adjusted from the ringing chamber by remote independent operation of the 8 hatches and the spire ceiling trapdoor.

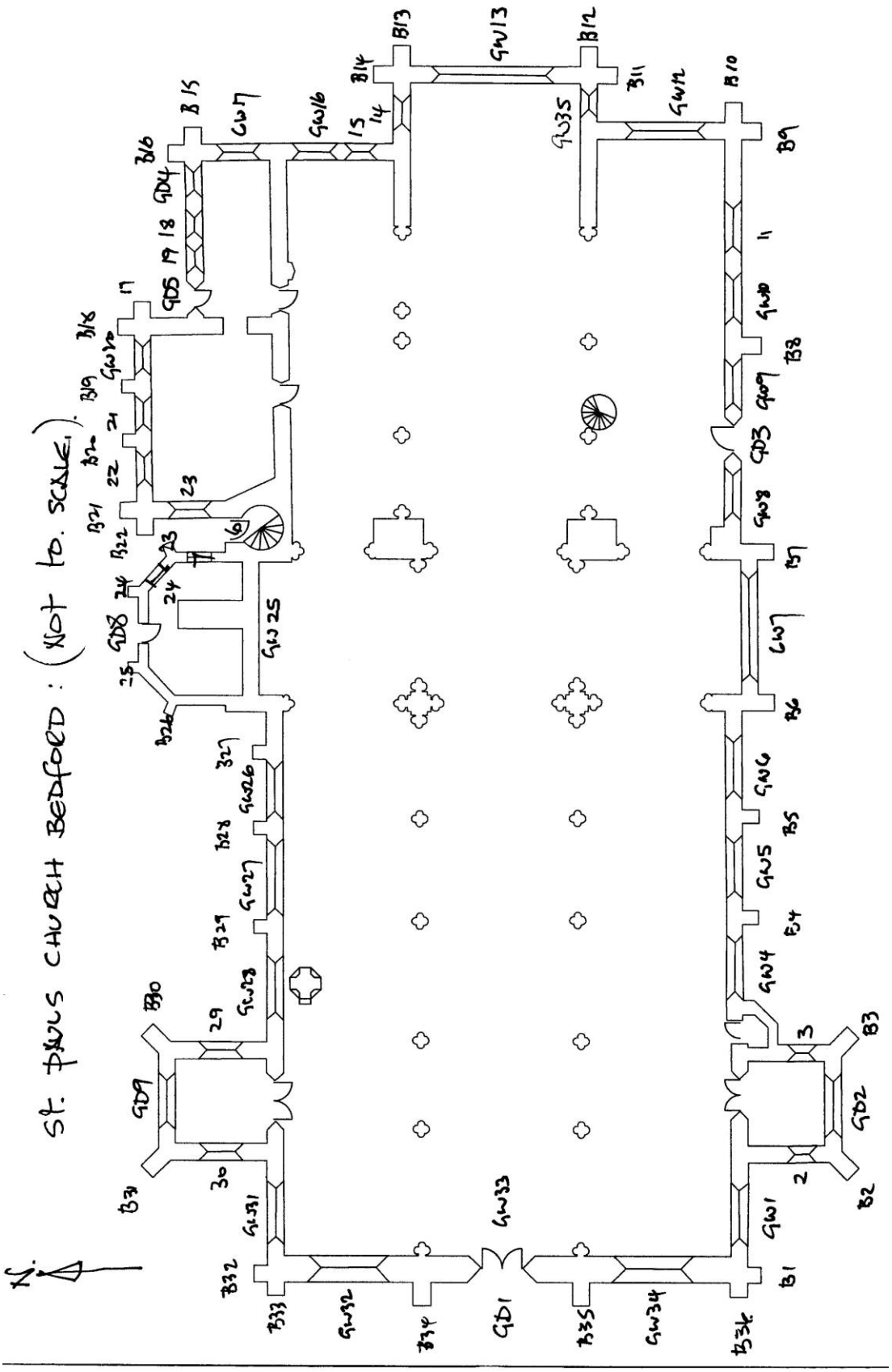
3..7.00 Allow for twelve months after the completion of works, carry out a free inspection and maintenance/service visit.

3.8.00 Dumbells and associated works

Quote separately for:

Provide a set of 8 dumbbells with appropriate fittings to be installed in the plenary sound chamber. These to be weighted and hung to, as near as possible, emulate the dynamics of a real tower-bell. The dumb bells to be mounted in a frame (or frames) centrally so not to obstruct the tower bell ropes, with the ropes hanging inside and clear of the tower-bell rope circle. A rope guide to be fitted in the ringing room at a suitable height. and a pulley system installed so that the ropes can be neatly raised clear of the ringing circle when not in use. If the wheels and other fittings of the front 8 bells are not to be refurbished, it is envisaged that they could be used for the dumbbells. Allow for the provision of suitable position sensing, sound, and computing equipment such that the bells can be used individually or together. For individual use, a separate screen and set of headphones is envisaged for each bell. Allow to liaise with the main contractor to provide a central (round or octagonal) console to house the computer and video equipment and for the electrical and sound system installation.

Further details of the design and installation to be negotiated and finalised prior to order confirmation.


ST. PAULS CHURCH BEDFORD : (NOT TO SCALE)
N.
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
B17
B18
B19
B20
B21
B22
B23
B24
B25
B26
B27
B28
B29
B30
B31
B32
B33
B34
B35
GD1
GD2
GD3
GD4
GD5
GD6
GD7
GD8
GD9
GW1
GW2
GW3
GW4
GW5
GW6
GW7
GW8
GW9
GW10
GW11
GW12
GW13
GW14
GW15
GW16
GW17
GW18
GW19
GW20
GW21
GW22
GW23
GW24
GW25
GW26
GW27
GW28
GW29
GW30
GW31
GW32
GW33
GW34
GW35
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Checklist (check and tick as appropriate)

Any church seeking cover for external metal theft, while scaffolding is erected, must complete, sign and return this checklist to Ecclesiastical before work commences. We will then advise you if we are able to provide any cover for your church.

Scaffolding Specification

(a) The scaffolding will be fully enclosed by minimum 18mm exterior grade plywood sheeting or steel sheeting hoarding to a minimum height of 4.0 metres. Yes ☐ No ☐
PLEASE NOTE ORIENTED STRAND BOARD (OSB) IS NOT AN ACCEPTABLE FORM OF HOARDING.

Comments

(b) All joints of the plywood or steel sheeting facing will be tightly butted to prevent tools being used to prise them apart. Yes ☐ No ☐

Comments

Fixing

(c) 100mm annular ring shank nails at 150mm centres will be used to fix the plywood boards to the timber frame. Tamper proof screws may be used as an alternative. Yes ☐ No ☐

Comments

(d) The bottom of the hoarding will follow the contour of the ground leaving no gaps between the hoarding and the ground. Yes ☐ No ☐

Comments

(e) Where the hoarding abuts a building, the plywood or steel sheeting will be cut to match closely the contours of the building to prevent any gaps being formed. Yes ☐ No ☐

Comments

Checklist (check and tick as appropriate)

Intruder detection

Yes ☐ No ☐

(j) The scaffolding will be protected by a scaffolding alarm system installed in accordance with the NSI Code of Practice for the design, installation and maintenance of scaffolding alarm systems NCP 115.

IF YOU CURRENTLY HAVE AN APPROVED ROOF PROTECTION SCHEME INSTALLED, THIS MAY BE TEMPORARILY EXTENDED TO PROTECT THE SCAFFOLDING AS AN ALTERNATIVE TO INSTALLING A SEPERATE SCAFFOLDING ALARM SYSTEM. IF YOU DECIDE TO DO SO, SIMPLY ASK YOUR ALARM INSTALLER TO CONFIRM TO US DIRECTLY IN WRITING QUOTING YOUR POLICY NUMBER AND GO TO (n) BELOW.

Comments

(k) The system will be installed and maintained by a company on the official list of recognised firms of the NSI or SSAIB inspectorate bodies and must also appear on the local police force list of compliant companies. Yes ☐ No ☐

Comments

(l) The system will combine notification locally by an instantaneous audible device activation together with notification to a permanently manned alarm receiving centre conforming to BS 5979 or BS EN 50518 via a minimum Grade 2 alarm transmission system under BS EN 50136. The system must be designed to utilise combined PIR detectors and cameras to detect unauthorised movement. Images from devices must be reviewed by the manned alarm receiving centre and action taken if unlawful activity is identified. Yes ☐ No ☐

Comments

(m) A copy of the scaffolding alarm system design proposal will be sent to Ecclesiastical for approval. The specification must include confirmation by the alarm company that, either sub-contractors will not be used, or specify the extent to which sub-contractors will be used where appropriate. Yes ☐ No ☐

Comments

(n) The scaffolding will be protected by extending our approved roof protection system. Yes ☐ No ☐ N/A ☐

If yes, please name your roof protection system installer:

SPECIFICATION

FOR

REPLACEMENT OF BELL FRAME
And
ANCILLARY WORKS
(main contractor)

ST. PAULS CHURCH

BEDFORD, BEDFORDSHIRE

Michael Dales Partnership Limited
65 Hermitage Road,
Hitchin,
Hertfordshire,
SG5 1DB

SPECIFICATION
of
WORKS TO BE DONE AND MATERIALS TO BE USED
in connection with the
REPLACEMENT OF BELL FRAME
And
ANCILLARY WORKS
at
St. Paul's Church
Bedford
Bedfordshire.

OCTOBER 2025

1.00 PRELIMINARIES

1.01 The Employer is St. Paul's PCC
c/o Steve Stanford
St. Paul's Church,
Bedford
Bedfordshire.

1.02 The Architect is the Michael Dales Partnership Limited
65 Hermitage Road, Hitchin, Hertfordshire, SG5 1DB.
Telephone Number 01462 230803.

1.03 The works will be inspected by and are to be carried out to the satisfaction of the Architect.

The works to be carried out includes:

Rehanging the bells in a new cast iron and steel frame that is designed to accommodate bells lower in the tower to minimise tower movement and providing options for lighter harmonic rings of eight and ten bells to be rung.

Refurbishment of the obsolete clock drive, winding, and chiming mechanisms, installation of a new clock display case to improve access and visibility, and other works to include cleaning and gilding of the external clock dials and hands.

Refurbishment of the ringing room area including removal of the current clock chamber and platform, replacement of intermediate floors, provision of safe access to the bells and clock, upgrading the electrical system to modern standards, repair and redecoration of the internal walls, and cleaning and reinstatement of the historic peal boards.

Installation of an automatically operated sound control mechanism enabling the bells to be heard fully for services and rung more frequently and less obtrusively at other times for practices and visiting ringers.

Training facilities by means of dumb bells, simulators, and audio-visual equipment, enabling a long-established traditional art form and science to be more easily accessible to more people and continued into the future.

General masonry repairs to spire base and ringing room brickwork

Works are shown and described in this specification and the following drawings:.

1077/49-002 – Plans as Existing
1077/49-003 – Elevations as Existing
1077/49-004 – Elevations as Existing
1077/49-014G – Plans as Proposed
1077/49-015E – Elevations as Proposed
1077/49-020E – Elevations as Proposed
1077/49-027 – Ringing Room Proposed Joinery
1077/49-028B – Electrical Plans – Ringing Room and Clock Platform
1077/49-029B – Electrical Plans – Plenum and Bellframe
1077/49-030B – Electrical Plans – Belfry (Lower & Upper)

And the Structural details and calculations prepared by Cox Clifford Partnership ref. TBC.

The Contractor is advised to visit the site prior to the submission of his Tender to inspect the building, the means of access and the site conditions and the scope of the works as described or can be reasonably inferred. No claims for extras will be accepted arising from the contractor's failure to do so.

The Contractor will be required to ensure that all activities related to this building contract are strictly confined within the boundaries of the site.

Externally the Contractor is to make a compound using security fencing to protect the public from the works and the works from the public.

The main body of the church will remain in use during the works.

The contractor shall liaise with the Church Administrator and Architect and the main sub-contractors over the program and timing of the works to ensure safe access for public

The contractor shall also liaise with the Church administrator of over working times /quiet times to enable church life to continue as well as is practical.

The Contractor shall ensure that the security of the works is maintained at all times during the works. This shall include for liaising closely with the Church Administrator over the timing of the working day in order that all security protocols for the building can be maintained.

The Contractor shall allow in his tender for any inconvenience, uneconomic working in respect of the above. The Contractor should allow for shorter working days in relation to hot work and to setting times in relation to lime mortar and lime-wash.

The employer shall provide as much advance notice of funerals or other services hat may disrupt the working day in order that the contractors have the opportunity to adjust break times or deploy men to other sites. The contractors shall use their best endeavours to mitigate for disruptions to the work program.

1.04 The form of Contract under which the works are to be executed will be the JCT Intermediate form of Building Contract 2024.

Tenders are to remain open for acceptance for a period of not less than 90 days from the date fixed for the submission of tenders.

The following are the Clause numbers and headings of the Conditions of the Contract and the Contractor is to allow in his Tender for observing the full text of each Condition.

4th recital	Base date will be the tender date.
Clause 4.2	Shall be completed to show the Employer is not a contractor
5th recital	Shall be completed to show that the project is not notifiable under CDM Regulations.
6th recital	Shall be deleted to show no framework agreement exists.
7th recital	Shall be completed to show that collaborative working applies. Shall be completed show Health and Safety applies Shall be completed to show that cost savings applies Shall be completed to show that sustainable development applies. Shall be completed to show that performance indicators shall not apply. Shall be completed to show that notification of disputes shall apply.
Article 7	Arbitration: shall not apply.
Clause 1.1	Shall be completed to show 14 days and commencement of works.
Clause 2.2.	Shall be completed to indicate that the works will be commenced and shall be completed by the dates shown on the Form of Tender.
Clause 2.8	Shall be completed show the sum of £400.00 per week.
Clause 2.10	Shall be completed to show a rectification period of 12 months.
Clause 4.3	Shall be completed to show 95%.
Clause 4.3	Shall be completed to show 97.5%.

Clause 4.3 and 8 Shall be completed to show Nil.

Clause 4.3 and 8 Shall be completed to show 15%

Clause 5.3.	Shall be completed to show that the contractor shall indemnify the Employer in the sum of not less than £10,000.000.00.

Clause 5.4A and C Shall be deleted.

Clause 5.4B of the contract shall apply.

The Employer, Contractor and any Sub-Contractor shall produce evidence to the Architect to show that the insurances referred to in the contract have been taken out and are in force at all material times.

All existing structures, contents, also the works and unfixed materials and goods (except Contractor's sheds, plant, tools and equipment) shall be at the sole risk of the Employer as to the loss or damage by the perils listed in the Contract. The Employer shall maintain insurance against those risks, including any necessary demolition and removal of any debris, for the full reinstatement value concerned plus 15% for fees.

1.05 The Contractor must Indemnify the Employer against all liabilities, loss, claim, expense or proceedings whatsoever, in respect of damage to the Church arising out of the negligent use of blow lamps, lead burning torches, welding equipment and any other apparatus. The Contractor must also cause any sub- Contractor to maintain insurance against all liability of the aforesaid risks

Contract to be executed underhand.

The Employer, Contractor and any Sub-Contractor shall produce evidence to the Architect to show that the insurances referred to in the contract have been taken out and are in force at all material times.

In addition to the above the following precautions are also to be put into force:

a) Where any <u>temporary</u> external tower scaffolding or platforms are used it is essential that they are dismantled at the end of each working day.

b) All lower level access ladders to permanent scaffolding are to be removed from the site or locked in the Church (if agreed with Employer) at the end of each working day.

c) The lowest platform of any scaffolding must be a minimum of 4 metres above ground level.

d) A secure compound a min of 4.5m high in corrugated iron sheet with a lockable access door is to be maintained around any scaffolding outside the existing building and shall comply with the current requirements of Ecclesiastical Insurance Group. (see appendix)

1.06 Tendering Procedure: Competitive tenders will be invited based upon this Specification. When considering the tenders submitted the Employer will take into account the dates quoted for commencement and completion of the works in addition to the tender sum.

The Employer does not bind himself to accept the lowest or any Tender. No remuneration will be paid for the preparation of Tenders.

The bell work contract and the clock work contractors are named sub-contractors to a main contractor for the works described in the tower and the contractor shall make allowance for this in his tender.

1.07 Programme. The contractors' suggested programmes for the works are to be agreed with the with the architect and employer and may be taken into account by the Employer when considering which tender to accept. The subsequently agreed programme will form part of the contract documents.

During the course of the Works, the programme shall be regularly marked up to show the actual progress of works for inspection by the Architect.

Similarly, within fourteen days after the signing of the Contract the Contractor shall submit to the Architect a priced copy of this Specification with each item priced to show the cost of the work described. This priced copy of the Specification will not be treated as a Bill of Quantities but will be used for assessing the value of work in progress and as a guide to the cost of any variations.

Two copies of any drawings (not counting any certified copy of the contract drawings) will be issued to the Contractor free of charge. Extra copies will be issued on request but will be charged to the Contractor.

1.08 Do not scale from the drawings. All dimensions should be checked on site or with the Architect. Any significant discrepancies should be notified to the Architect.

1.09 The Contractor is required to present his Application for Payment in the following manner:

Spec Item Detail Cost in Priced Spec. % complete Valuation

1.10 The Contractor will be required to provide proper on-site supervision of the Works throughout the whole period of the Contract by the employment of a Site Foreman, (or other suitable person). The Foreman shall not be removed from the site or replaced without the written consent of the Architect.

The Architect will make frequent inspections of the work in progress. The Contractor is to notify the Architect if he is to be off-site or if he wishes to seek payments for un-installed work -off site.

1.09 The words "supply", "provide", or "provide and fix", in this Specification are to be taken to assume that the Contractor will include all the labour and materials required to complete the operation described.

The work "approved" is to be taken to mean approved by the Architect.

1.10 The Contractor is to provide everything necessary in the way of materials, tools, plant and labour and access for the proper and complete execution of the Works involved in the Contract according to the **intent and meaning of the drawings and this Specification providing that this can be reasonably inferred from either.**

The absence of a description of work or materials or fittings or an Estimated Cost in the priced copy of this Specification submitted by the Contractor in compliance with Clause 1.07 shall not

vitiate the requirements of this Clause providing it can be reasonably inferred from either the drawings or the specification.

1.11 The quality of materials and products to be used for the works shall not be less than described in the appropriate British or European Standard Specification.

Where work is shown, or described, to be in accordance with a Code of Practice the Contractor shall ensure that the recommendations of the Code of Practice are complied with in all respects.

Workmanship shall in all cases be in accordance with the best methods recognised throughout the trade.

1.12 Materials and work likely to deteriorate if left exposed must be kept undercover and/or protected.

Similarly, the Contractor shall protect completed works to prevent damage by following trades.

1.13 The Contractor shall accept delivery of all materials to the site and shall ensure that they are of the quality and quantity specified, in proper condition at the time of delivery and properly stored until fixed.

1.14 Where appropriate, the Contractor shall be responsible for serving the Notices on the Local Authority when work on site is commenced and at the appropriate times as the Works proceed and upon completion. Where appropriate, the Contractor will be required to obtain a Notice of Satisfactory Completion of the Works from the Local Authority. Where appropriate the Contractor shall also be responsible for the service of any other Statutory Notices required as a result of him carrying out the Works. The Contractor shall pay all charges due in respect of same. Where appropriate the contractor shall make all necessary arrangements with the highway authority if road closures are required and pay all relevant charges in relation to same.

1.15 The Contractor may make use of the Employer's power and water supplies in carrying out the works.

1.16 The Contractor shall attend upon, cut away for and make good after all trades and domestic and Nominated Sub-Contractors.

1.17 The Contractor is to provide such secure site office and storage accommodation for the use of the site staff and operatives as requires and is to pay all rates and charges due in respect of any temporary buildings erected for the Works. The contractor may make use of a dedicated wc facility at the west on the church providing the contractor maintains it in a clean condition at all times.

1.18 Upon completion of the Works the Contractor shall leave the whole of the Works clean and in proper condition. The Contractor shall clear away all temporary buildings and re-instate any area of the site affected by same.

1.19 The Contractor shall be responsible for checking any dimensions on the site and shall advise the Architect of any discrepancies found.

1.20 **Include the sum of £10,000.00 of the cost of the works for Contingencies to be used in whole or in part as directed by the Architect. The whole or any part of the Contingency sum not so used shall be deducted at the settlement of the Accounts.**

1.21 HEALTH AND SAFETY

The Contractor shall ensure that he, his employees, sub-contractors and visitors to the site at all times observe the relative standards and codes of practice for health and safety where building work is carried out.

In particular, where work is carried out on scaffolding at high level industrial safety helmets in line with current COP are to be worn, masks are worn where dust is being created and ear defenders where noise is generated. Appropriate protective clothing shall be worn.

All visitors to the site are to be provided with safety helmets should they require them.

1.22 The Contractor shall allow for observing the full implications of the Employer's health and safety policy together with current requirements for CDM Regulations. The Contractor shall note that all CDM documentation must be completed before the issue of a Final Certificate.

COVID 19 - The contractor shall allow for observing all the government and diocesan Covid 19 guidance in place at the time their tender is submitted. Any changes to that advice to be reviewed at the appropriate time and the contract details to be adjusted accordingly at the architect's discretion.

1.29 FIRE PRECAUTONS

Take all necessary precaution to prevent nuisance to public on and off site from smoke, dust, rubbish and other causes.

The contractors shall provide and maintain on site appropriate fire extinguishers for the duration of the works.

1.30 The Contractor is to take all reasonable measures to prevent loss or damage by fire. All workmen should be shown the location of fire extinguishers in the church and are to be told where telephones can be found in the event of an emergency. Additionally, operatives should be equipped with a mobile phone. Where work involving the use of blow-lamps, lead burning torches or any other flame producing apparatus it should be carried out under close supervision. 2 No. 2 gallon water type extinguishers should be kept in close proximity to the apparatus. All parts of the Church fabric where a heating process has been carried out must be given a final inspection two or three hours after work has ceased for the day. The Contractor should make due allowance within his tender for shortened working days where this applies.

The Employer shall notify the local police and fire brigade and the church's insurers that works will be on site.

1.31 **Smoking is prohibited on the site**.

1.32 The playing of radios during the working day will not be permitted except with the express permission of the Employer's representative and shall be kept turned off during site inspections

and services. Radios must be turned off if requested by the Architect, Employer or member of the public. Operatives should bear in mind the purpose of the building and churchyard and, behave appropriately at all times.

1.33 Any electrical contractor shall have **N.I.C.E.I.C Approved Contractor Status**. Any temporary electrical wiring should comply with N.I.C.E.I.C. Regulations and should be disconnected at the end of each working day. All waste material should be removed from the site at the earliest opportunity. Where any fittings are specified, and they arrive in packaging, the packaging should be removed outside the Church and disposed of. No bonfires or disposal of packaging or waste material should be carried out on site.

1.34 The storage of inflammable materials shall be outside the Church and well away from the building.

INSURANCE:
Depending upon the type and extent of the 'hot work' it may be prudent to notify Insurers of the work and seek their approval of safety precautions put in place.

PROTECTION
Every effort is to be made to prevent damage to existing building fabric, internal or external, fences, walls, gates, paving, trees and shrubs and other features which are to remain in position during the execution of the works.

The Contractor shall provide and fix all and any necessary temporary casings, boards, sheets etc. to ensure this.

The Contractor, sub-Contractors and all operatives must bear in mind that the Church will remain in use during the works. The church administrator who will acquaint the Foreman with any need to stop work during a service or funeral.

The Contractor shall make due allowance within his tender for the inconvenience caused by stoppages in work to accommodate services etc. Where unscheduled services are required- funerals etc. – the contractor shall use his best offices to redirect labour or re-schedule to minimise disruption to the program. Should significant delays or series of delays occur the contractor may seek to off-set costs though the normal contract procedures.

1.35 AUTHORITY
All works will have been approved by the Diocesan Advisory Board and have received a Faculty prior to work commencing on site. Where special or urgent circumstances occur the contractor shall advise the architect who will enquire whether a licence may be required to proceed.

Where day work is carried out, each time-sheet and invoice is to be signed by the Foreman as correct and is to refer to the Architect's Instruction for the work. Day works only to be carried out with authority of architect.

Completed day-work sheets will only be considered for acceptance if submitted with ten working days.

All additional works or variations shall be valued at rates comparable with those used in the tender process.

Where work is to be carried out and is to be concealed a minimum of 24 hours' notice is to be given to the Architect in order that an opportunity for an inspection may occur.

1.36 THE WILDLIFE AND COUNTRYSIDE ACT 1981 AND CONSERVATION of HABITATS and SPECIES REGULATIONS 2010

This Act gives very full protection to bats because of their special requirements for roosting. It is illegal not only to intentionally kill, injure or handle any bat, but also intentionally damage or destroy or obstruct access to any place that a bat uses for shelter or to disturb a bat whilst it is occupying such a place. In this context "damage" means make worse for a bat and so includes such operations as chemical treatment of timbers. The Act provides defences so that building, maintenance or remedial operations can be carried out in places used by bates.

It is important that all contractors and subcontractors under this specification and contract notify the Bats Conservation Trust. Their Contact details are 0845 1300 228 email enquiries@bats.org.uk so they can decide if the building is inhabited by bats. Failure to comply with this Act could render the Contractor liable for heavy fines.

No work is to proceed without written confirmation from the Architect.

NOTE: No organochlorine woodworm killers are to be used where bats are in evidence. Synthetic pyrethroid insecticides such as permethrin and cypermethrin can be permitted if used by an approved timber treatment. Only timber treatments which appear on HM Gov website as acceptable may be utilised.

https://www.gov.uk/government/publications/bat-roosts-insecticides-and-timber-treatments/timber-treatment-products-suitable-for-use-in-or-near-bat-roosts

1.37-1.40 not utilised

1.40 GENERAL PROCEDURES

1.40.1 Where materials and work are not fully specified, they are to be carried out using materials fit for the purpose, in line with current standards and wherever possible match existing materials in type, texture, colour, size and quality.

1.4.2 Tenders are to remain open for acceptance for a period of not less than 90 days from the date fixed for the submission of tenders.

2.00 TRADE PRELIMINARIES AND PREAMBLES

2.1.0 EXCAVATOR AND CONCRETOR - None proposed.

2.2.0 DRAINLAYER - None proposed.

The contractor shall take reasonable steps to ensure that any drains within the scaffold zone or under routs for heavy vehicles are protected from point loads as far as is practical.

2.3.0 BRICKLAYER – Bricks shall be well burnt stock bricks approved by the architect and bedded in lime mortar to match the existing in the location into which the bricks are being built.

2.4.0 STONEWORK: All conservation work shall be in accordance with the guidance of English Heritage Technical Guidance

Bed to be approved by Architect, but generally:
Horizontal in plain walling
At right angles to wall face in cornices and other projecting stones.
New stones shall be not less than 100mm in depth from the face of the wall.
Projecting stones to be cut out to at least twice the depth of their overhang.
The lines of all mouldings, curves and angles etc. are to be worked out of the solid as directed.
No angle, mitre joints will be permitted.
Detailed carving where required in new work, is to be done either on the ground or in position as directed by the stone carvers.

Old carved work is to be reincorporated were possible, and soundly and properly keyed and cramped into the new stone as appropriate.

Where new stone is being inserted the size of the new stone is to match the size and scale of the original. Several smaller stones are not to be substituted for an original large stone.

Where different types of stones are incorporated in the same area of the wall, stone replacement is to match the type and colour of that which is being removed. The exact requirements are to be agreed on site with the Architect.

All stonework is to be carried out by a qualified stonemason experienced in the repair of historic buildings.

2.4.1 Mortar mixes –

NOTE
LIME MORTAR SHALL BE USED FOR MASONRY AND BRICKWORK REPAIRS ONLY.

ALL STEELWORK SHALL BE SET ON OR IN PORTLAND CEMENT BASED CONCRETE TO THE ENGINEER'S SPECIFICATION.

2.4.2 stonework:

The mortar for all walling shall generally be assumed to be 3 parts sand to one part NHL 3.5 lime with water. The mix should be left for a day to mature before use.

No mortar should be mixed or used when the temperature is below 4 degrees or is likely to fall below 4 degrees.

The lime putty can be obtained ready for use from:

1) Rose of Jericho Ltd., 01935 83903

2) St. Astier 0800 783 9014

3) The Traditional lime Co. 01242 525444

4) Hirst Conservation Materials Ltd, Laughton, Sleaford, Lincs, NG34 0HE. Tel: 01529 7517.

5) Singleton Birch, Melton Ross Quarries, Barnetby, Nth Lincs Tel: 01935 815290

Or any other quality source.

The sand shall be clean sharp pit sand. Type and source to be agreed with the Architect, to give a good match to that which exists in the areas of work, before full work commences. On no account should soft builder's sand be used. Agree with the Architect the exact mix before work starts.

The sand should be from a local source where possible.

All stone is to be thoroughly wetted before jointing takes place.

Dense and impervious mortar is to be avoided.

A coarse texture of joints is required and this should be obtained by stippling the surface of the mortar before it finally sets with a stiff brush or scraping with a trowel, to show up the grit in the mix. The surface of the wall must be kept clean as the work proceeds. On no account should ribbon pointing be used.

Precautions must be taken to prevent rapid evaporation and the development of a milky white colour. Spraying down fresh pointing the day after it has been placed will allow the mortar to take in some water which helps to prevent rapid evaporation.

A lime putty mortar is to be used for re-pointing and jointing in ashlar work. The lime putty is to be purchased from an approved source of supply. The lime putty is mixed with stone dust or sand in the proportion 6:2: (stone dust: lime). The type of stone dust or sand is to be agreed with the Architect before work commences.

2.4.2 JOINTING

New mortar joints are to match the thickness of the existing as far as possible. Where new joints are formed in random or rubble walling the new joints are to reflect the overall appearance of the existing walling.

2.4.3 RE-POINTING

All areas of re-pointing shall be treated by raking out the joints to a minimum depth of 50mm (2"). Loose dust and debris shall then be blown from the joints by an air pump before proceeding.

Where dense and impervious mortar is found this is to be removed only where significant damage will not be caused to adjacent stonework. Contractor to agree typical situations with architect before proceeding.

Thoroughly wet all surfaces and clean before new mortar is bedded in but avoid saturation and water run-off on the wall surface. In narrow joints the mortar shall be rammed home by a narrow tamping tool. Any hollow or loose areas shall be grouted prior to re-pointing.

Where small stones are evident in the surface of the wall, and deep raking would cause them to be unsettled, the depth of raking out may be reduced to a minimum of 25mm.

NO MECHANICAL OR ELECTRICAL EQUIPMENT IS TO BE USED FOR REMOVING MORTAR FROM EXISTING WALLING

2.4.4 SAMPLE AREA

A sample area of pointing, approximately 1m x 1m, is to be prepared by the contractor for approval by the Architect before any significant pointing or re-pointing generally is commenced.

The new panel is to be in/against the recently repaired section of the wall and shall be completed and approved by the architect at least three weeks in advance of pointing commencing.

2.4.5 TIES AND CRAMPS

Any ties and cramps found necessary during the work shall be of Delta metal, cuprous bronze or other approved non-ferrous material.

2.5.00

2.6.0 CARPENTER AND JOINER

2.6.01 Where softwood is specified for carpentry it is to be GS or MGS Swedish 5ths or 1st or 2nd common Hemlocks to BS 4978.

2.6.2 Where softwood is specified for joinery it is to be unsorted quality Swedish or Russian Redwood. Where softwood joinery is to receive a stain or clear finish the timber shall be selected for clear faces and shall be kept clean and free from marks until treated.

2.6.3 Hardwood is to be European Oak from a Certificated source.

2.6.4 Plywood is to be BS 1455 with grade 2 veneers and WBP bonding.

2.6.5 Blockboard is to be to BS 3444 with Grade 1 veneers and BR bonding.

2.6.6 Timber described as "Tanalised" is to be vacuum/pressure impregnated with Tanalith 'C'

preservative carried out strictly in accordance with the Code of Practice No.2 issued by Hicksons Timber Impregnation Company (GB) Limited. Timber must be machined to its final dimensions before treatment.

2.6.7 Timber stored on site is to be stacked to allow free circulation of air around the timbers and is to be kept clear of the ground and protected from the weather.

2.15.0 ELECTRICIAN –
Electricity is available on site for the contractor to use.

2.15.1 Any electrical installation is to be carried out by a specialist Sub-Contractor who has NICEIC Approved Contractor status.

The whole of any installation is to comply with **N.I C.E.I.C.** recommendations, the requirements of the **Council for the Care of Churches** and is to be earthed to satisfy the requirements of the Electricity Board. No wiring of any sort is to be installed in cavities of the external walls. **Historic/masonry walls shall not be chased to accommodate wiring.**

Where wiring is specified to be behind wall plaster it is to be protected with PVC conduit fixed in position.

Where wiring is specified to be located in the thickness of structural timber work, the timber members are to be drilled along the line of the neutral axis to allow for the passage of wiring.

Where wiring can be concealed in studwork walls opportunity should be taken to do so.

All surface firing is to be neatly aligned and clipped.

2.15.2 Upon completion, the Contractor will be required to test the whole of any electrical installation, (including the earthing of same) and to provide certificates to show that the whole system is satisfactory.

2.15.3 Allow for paying any electricity charges due in respect of this Contract.

2.15.4 Where any work specified or existing work is not in accordance with electrical regulations or best practice, the Architect is to be notified before commencement.

2.17.0 PAINTER AND DECORATOR-

2.17.1 All steelwork is to be galvanised or painted off-site for maximum access and to minimise corrosion. Any non-galvanised or non-stainless fixings to be agreed with architect.

2.17.2 All painting of existing wall surface shall be with Classidur Modern plus2 in selected colours.

2.17.3 All other paint or decorative material shall be to the appropriate British Standard.

2.18.1 TEMPORARY SERVICES

2.18.2 SCAFFOLDING

Amy scaffolding should be constructed as independent free-standing structures wherever possible and only tied to the building, where approved by the Architect. All horizontals are to be plastic capped at ends to protect the building and personnel.

Putlocks are to be kept clear of the face of the building where possible and any scaffolding close to the building should be lagged to prevent damage to the stone-work or other fabric.

External scaffold at ground level - The Contractor is to include for supplying a fixed metal or 18mm plywood hoarding to a height of 4.5 metres the base of each scaffolding standing on the ground together with a vandal proof access gate. The ply must have close butted joints and be fixed to 75 x 100 timbers with 100 annular ring shank nails or tamper proof screws. The gate shall be of solid construction in a flush frame with a minimum of 3 steel hinges with pin burred over.

A Yale type latch shall be fitted to the gate and when the site is unattended, the gate shall be secured with heavy duty bar secured to door and frame with bolts through. the locking bar must conceal the bolt heads. A heavy duty shacked padlock to at least BS EN 12320 security grade 4 shall be used.

The inside of the scaffold shall be flood lit angled in and up through the scaffold operated by photoelectric cell for illumination at night.

The scaffold should follow the contour of the ground and leave no gaps. The scaffold should be extended higher over plinths etc.

Where scaffolding is to be erected off a roof the Contractor is to check that the roof structure is adequate for the purpose of increased loading and is also to make adequate provision for the protection of the roof structure from mechanical damage and is to make good any damage caused at directly.

Scaffolders should take due notice of other directions within this specification relating to insurance, ladders, health and safety etc.

The scaffold will be protected by an alarm system installed in accordance with the NSI COP for the design and installation of scaffold alarms systems NCP 115

The system will include an audible alarm system linked to a permanently monitored call centre conforming to BS5979 or BS EN 50518. The alarm system is to be approved by EIG the churches insurers.

NOTE
The Contractor and Employer shall liaise over the collation of information regarding external scaffold protection and the Employer shall be responsible for submitting same to EIG to ensure metal theft cover is maintained for the duration of the works.

2.18.3 PROTECTION

Provide all necessary temporary fences, hoardings, screens, planked foot ways, guard rails as may be necessary for protecting the public, users of the building, and statutory bodies and to enable the satisfactory completion of the works.

Provide all necessary temporary protection to all parts of the building from damage by inclement weather.

In order to avoid delays due to cold weather the Contractor is to take the following precautions where appropriate:

a) Protect stone from rain and frost by stacking clear of ground and completely covering with waterproof sheet.
b) Store cement and lime in on raised dry platform.
c) Do not use frozen materials
d) Chemical accelerators, retardants or anti-freeze additives are not to be used.
e) Keep finished work covered for at least three days after completion.

2.18.4 ORGAN

The proposed works may generate internal dust in the area of the church where the organ is located.

The PCC shall liaise with the organ builders in advance of the contractor's start on site to enquire whether the organ builders require the organ to be protected from dust and advise the architect accordingly.

The Employer shall be directly responsible for any costs incurred by the organ builders or works required by the organ builders.

2.18.5 ACCOMMODATION

The Contractor is to provide all necessary temporary sheds, offices, mess rooms etc. as he may require for site operatives and as required under Health & Safety Legislation. Huts are to be sited in positions agreed with the Architect and shall be removed from the site before the works are deemed to have been completed.

2.18.6 WATER AND ELECTRICITY

The Contractor may use the Employer's water and electricity subject to agreement on connections with Church Warden, Vicar and Architect.

2.18.6 CLEANING

Where any works have affected the interior of the church the contractor shall carry out a thorough clean of the area or areas affected to return them to a level of cleanliness comparable with the remainder of the building.

Where works have been carried out externally the contractor shall clean the area and reinstate any areas of hard or soft landscaping to a condition comparable with their original state.

3.0 SCHEDULE OF WORKS

NOTE All general waste material is to be removed externally and is not to be lowered down via the crossing with the exception of redundant steel work or other large elements that would be difficult to remove across the transept roof.

3.1.0 GENERAL REQUIREMENTS and REMOVALS

3.1.01 Provide and maintain all external scaffolding necessary to facilitate the works together with internal access towers etc, ladders etc. to enable the works to be safely assessed, executed and inspected.

Provide all necessary ladders, guard rails, kick boards, gates and trap doors to said scaffolds.

NOTE Bell founders will provide their own 'work specific' access equipment within the tower.

Allow for liaising regarding same.

3.1.02 Where external scaffolds are utilised, provide and maintain security enclosures to base of scaffolds to comply with Ecclesiastical insurance guidelines as described previously.

Allow for extending the church's roof alarm system onto the scaffold and for providing the recommended emergency intruder lighting specified previously and for removing same on completion.

Allow for protection of the lead roof and parapet of the north transept from mechanical damage by the transportation of materials and equipment in and out of the tower.

3.1.03 Allow for liaising with named sub-contractors over day to day working and access arrangements and the adjustment of any scaffold or access equipment.

3.1.04 Liaise with bell firm to allow for supplying all necessary protective materials, barriers, pallets etc. to ensure the safe transition of all bell related material out of and into the tower to ensure that the finishes etc to internal walls and floors and external landscaped areas are protected from damage.

3.1.05 Allow for discharging all legal requirements in terms of health and safety obligations and protocols to ensure that the works proceed in a safe and organised way. Carry out any statutory notifications required.

3.1.06 Provide and maintain board protection to crossing side of the chancel screen together with dust sheets to same.

3.1.07 Allow for liaising with bell firm to for providing all hoists and pulleys and temporary steelwork and lifting gear to enable materials to be safely hoisted into tower and within tower to avoid duplication of equipment.

3.1.08 Provide and maintain osb board and soft cushioning protection to memorial slabs in crossing floor.

3.1.09 Provide and maintain protection to floor finishes and doors between tower and west doors.

3.1.10 Provide access to underside of crossing ceiling, remove 'Faithcraft' art work to ground level, box in plywood case and store in south aisle.

3.1.11 Open up tower access hatch for bell founders and to facilitate the general works**. Provide and maintain safe guarding of the tower trap at all times.**

3.1.13 Before commencing any new works check all critical dimensions and advise architect of any discrepancies found.

3.1.14 Allow to remove and reinstate protective materials and coverings from the tower crossing and nave and leave in clean and tidy order and close and reopen trap between removal of bells and frame and return of same.

3.1.15 Allow for dismantling all redundant structures from within the tower and removing all unwanted material and fixtures/fittings/furnishings from site. (Employer will have removed all retained material furnishings to safe storage prior to commencement.)

3.1.15a Allow for transporting the dismantled bell frame and other major timbers to Southill Sawmill for sawing in to planks. (Assume cost of de-nailing, sawing and return of timber planks will be outside the current tender)

3.1.16 At an appropriate time allow to remove the largest wooden stair ladder from the tower and for it to be set aside in the church for collection by another church.

3.1.17 Allow for the removal of all rubbish and waste material from site and pay all tipping charges

3.2.00 BELLS

3.2.01 Allow a prime cost sum of £320,000.00. for installation of new bell frame and refurbished bells, sound attenuation and belfry floor together with ancillary works by specialist cub-contractor as per the supplementary bells specification.

Allow for liaising closely with bell foundry contractor in the installation works and in the adjustment of fabric to accommodate rope runs etc.

Allow for profit and attendance upon same.

3.3.00 CLOCK

3.3.01 Allow a prime cost sum of £57,000.00 for works to clock by specialist contractor.

Allow for liaising with same over removal and installation of same.

3.3.02 Allow for profit and attendance upon same.

3.4.00 STEELWORK

3.4.01 Supply and fix all steelwork and CONCRETE PADS etc as specified by engineer.
(For avoidance of doubt – this does not include work for the new bell frame or its support steelwork and concrete work which will be provided and installed by the bell firm .)

Allow for hoisting steelwork into position and for securing with all nuts and bolts etc. as required.

Allow for all steelwork to be hot-dip galvanised prior to delivery.

Allow for shuttering and casting concrete pad stones as specified by engineer.

3.4.02 Allow for supply and fix of all steel gantries, access decks, stairs, grillage floors, handrails etc as shown on architect's drawings. Architect to have opportunity examine basic details before finalised.

All steel to be hot-dip galvanised. All nuts and bolts and washers to be galvanised or stainless steel. All fixings to masonry to be agreed with architect – to be stainless steel studding in resin.

3.5.00 STONEMASON

3.5.01 Allow a provisional sum of £5000.00 for sundry LIME BASED masonry repairs/repointing to internal base of spire. Works to be agreed with architect once bells and frame have been removed. Works to be carried out before new frame and bells are returned.

3.5.02 At high level in present ringing chamber, allow for carefully cutting out three courses of brickwork, 215mm deep to remove embedded rusting ferramenta. Once ferramenta has been removed, allow for rebuilding to same bond in stock bricks and lime mortar. Works to be done in 1m lengths one side of the tower at a time to engineers direction. Replacement bricks to be of a size to match existing.

3.5.03 Allow for cutting back existing redundant bell frame stone corbels and dressing flush to wall face.

Note - Contractor to assume that the corbels contain stainless steel pins. These are to be cut back to flush to stone face and left smooth.

3.5.04 Allow for neatly cutting pockets only in masonry for new steelwork (including for bell firms steelwork) to engineer's/bell firms specification.

3.5.06 In window apertures of belfry – allow to carefully build up with 150mm 7.3n dense concrete block walls between the window reveals. **Lime mortar** for all joints must be used. Provide instal ss/galvanised frame ties fixed with ss screws into joints between stones of the reveal. Block wall to extend up half the distance to springing of the arch.

3.6.05 CARPENTER AND JOINER

3.6.1 Roof deck:

Allow to strip waterproof covering from existing 'roof-deck' over bells and dispose of same.

Allow for all deck cover boards to be inspected for decay or failure.

Assume that boards are to be removed and disposed of. Actual level of replacement to be agreed with architect on site.

Allow for inspection of supporting roof frame with architect.

3.6.1.1 Allow a provisional sum of £1000.00 for strengthening measures to be agreed on site.

3.6.1.2 Allow for replacement of roof deck with 2 layers of 18mm thick wbp ply sandwich construction with 100mm sound insulation with 150 and 150 x 38 tanalised s/w intermediate bearers and 55 x 50 once chamfered tanalised softwood kerb at perimeter. All fixings to be with ss screws.

3.6.1.3 Supply and fix new two-layer mineral felt roof membrane to roof deck. Membrane to be suppled and installed by specialist installer providing 20year warranty.

3.6.1.4 From existing/or reformed drainage point in deck supply and fix new 75mm black pvc rainwater goods to drain through belfry outside face of tower via louvres. Details to be agreed on site with architect.

3.6.1.5 Allow a provisional sum of £250.00 for ancillary works in relation to same.

3.6.1.6 Supply and form 1000 x 750mm access trap door from belfry operated on electrical solenoid located in ringing chamber with illuminated spur for access and for sound control. Trap to have raised kerb with felt dressed up and over to eliminate water from deck entering.

Trap be of same construction of deck as previously specified and draft stripped on all edges

3.6.17 Allow an additional 2 days of carpenter's time for sundry works.

3.6.2 PLENUM FLOOR AND WALLS

3.6.2.1 Form plenum floor with joists set into web of steel beams as per engineer's details. Joists to be nogged out at max 2m centres with full depth noggins. **(joists to be left loose until rope positions are agreed with bell firm).**

3.6.2.2 Supply and fix 200x50 C24 tanalised wall plates, rein anchored to wall face as per engineer's details. Back face of timber is to be protected by layer of dpm.

Allow for increasing studding connections either side of window openings as per engineer's details.

3.6.2.3 In window openings allow to double joists to support low section of stud walling as shown.

Supply and build in stud walling in arch-shaped sections to be slid into position. Back face to be 12mm wbp ply., 100 x 50 studs at 400 centres shaped on top edges to follow arch.
100 x 50 sole plate.
1 layers of 12mm wbp ply to top edge bent over studs to form top plate.

Secure sections into arch heads and secure with stainless steel screws and plugs to wall and base. Once in position – supply and fix wbp ply cover face fixed to finish 10mm behind reveal with stainless steel screws and cups.

3.6.2.4 Allow to form bell trap in floor as per engineer's detail.

Within trap joists are to be set on galvanised joist hangers and left unfixed to enable the trap to be reopened when access is required.

3.6.2.5 Supply and fix 140 x 21 square edged floor tanalised s/w boards penny jointed and secured with ss screws. Boards to be set out from centre of hatch. (**boards to be left loose until position of rope routes/floor bosses is agreed with bell firm).**

Liaise with bellfounders over fixing of bell rope floor bosses.

Boards to be cut on line of hatch opening and secured over hatch with ss cups and washers.

3.6.3 RINGING CHAMBER CEILING

3.6.3.1 On underside of plenum chamber ceiling supply and fix 140 x 12.5 wrot square edged oak boards, penny jointed between runs. Boards to be secured with stainless steel screws and cups in a regular pattern once rope routes are agreed.
Boards to ceiling and hatch to be set out from centre of hatch.

On underside of hatch allow to cut boards on line of hatch.

3.6.4.2 On timber deck beneath clock supply and 25mm deep stainless steel tray to prevent any oil from clock workings soaking into timber deck .

3.6.4.3 Form trap in floor to facilitate pendulum swing as directed by clock manufacturer. Form apron to same with wbp ply between upper floor and ceiling boards.

3.6.4.4 Supply and frame up case for clock in oak with 90 x 40 head and sole plates, 40 x 40 wall mounted frames and central mullion and corner posts. Doors to be frameless glass with simple ss handles. Side cheeks to be let in to oak frame and secured with oak beads.

3.6.4.5 Similarly in ringing chamber frame up for pendulum cabinet and provide fixed glass sides and two pair of frameless glass doors at high and low level as shown on architect's drawings.

3.6.4.6 Allow to form black shadow gab on all wall abutments with vertical cover battens.
Allow to finish all joinery with lime wax polished out to sheen. Allow for all timbers fixed to external wall to be dpm backed.

3.6.4.7 Allow a provisional sum of £300.00 for sundry beads and battens.

3.6.4.8 Allow an additional 5 days of additional Joiners time for ancillary works as directed by the architect.

3.6.5.0 CARILLON

3.6.5.1 Arrange for the redundant carillon to lifted from it's present position and located on raised timber deck in corner of plenum space as directed by architect. Carillon to be set on 100x 50 spreaders with 18mm s/w boards.

3.6.6.0 RINGING FLOOR

3.6.6.1 Supply and construct new cabinets and seats for ringing chamber as shown on architect's drawings.

3.6.6.2 Frame up with soft wood to create seats as per architect's drawings with boxed bases and lift up seating on straight runs.

Supply and fix v-jointed tonged and grooved oak boards at low level with 150 torus skirting board to all seats and not seated areas including under pendulum cabinet doors. All boards to be mitred at corners.

Form backs to seats with as per below- with raking back to 90mm deep top rail.

3.6.6.4 Supply and lift up seats to be 35mm _min) thick with projecting rounded nose and ss piano hinge. Seats to be held open by pairs of heavy duty lift-open stays.

Allow for seats to be oak and for them to be stripped ready for waxing as previously described.

3.6.6.5 Supply and fix 1 no seat end as previously described.

3.6.6.6 Panelling.: Supply and fix panelling on all walls to a height of 1200 mm to all external walls (this will appear as seat back over seats) and return into door reveal to tower. Panelling to be set on tanalised battens screw fixed to wall with ss screws and plastic rawl-plugs. Battens fixed to wall must have dpm stapled to back face.

Supply and fix top nosing scribed to wall face.

Allow to liaise with sawmill in milling down oak frame to produce useable boards/beads where practical.

3.6.6.7 Ringers platforms. Supply and fix 4 new ringer's platforms to match the existing. Platforms to be constructed in oak and to hand holds cut into sides.

3.7.00 ELECTRICIAN

3.7.01 Assess existing supply and advise on adequacy and recommendations for upgrading to meet proposed demand if required in tender submission.

3.7.02 Allow for making such temporary connections and disconnections as necessary to enable the works to proceed and to maintain electrical services for the Employer in the remainder of the building.

3.7.03 Carefully strip out all redundant electrical fittings, services, cabling and conduits and remove from site.

3.7.04 Adapt and extend electrical installation to provide the following facilities, as indicated on the architect's drawings:

Ringing room:

- 11 no. 20W aluminium grey wall-mounted up & down box lights (4000k 1230lm) with clear glass diffusers: https://www.greenbrook.co.uk/led-wall-u-d-light-gry-al-4k-1230lm
- 2 no. 3W LED non-maintained wall-mounted 3 hour emergency light (min. 120lm).
- 4 no. switched double wall sockets (50% with twin USB outlets).
- 1 no. 2-gang light switch to operate: wall-mounted light fittings to ringing room and LED light strips to ringing room windows separately.
- 1 no. 1-gang light switch to operate access platform lighting.
- 1 no. Jalite AAA photoluminescent fire exit sign near north door (location to be agreed with the architect).

Access platform level:

- 1 no. 8W integrated LED downlights (4000k min. 700lm) with 5 year warranty.
- 1 no. 3W LED non-maintained 3 hour emergency downlight (min. 140lm).
- 6 no. approx. 1.14m lengths of 12V SMD 5050 LED strip lights (4000k) as specified for ringing room set behind 25 x 25mm painted tanalised s/w battens, to illuminate windowsills.
- 1 no. 3-gang light switch to operate light fittings within belfry.
- 3 no. 1.5kW Flexel EcoSun TH high output space heaters, mounted approx. 3m high (exact locations to be agreed with architect on site), to be operated by remote controls.

Plenum space:

- 3 no. 30W Ledkia Bathen outdoor aluminium LED wall lamps in black (3000k 2200lm): https://www.ledkia.com/uk/buy-outdoor-led-wall-lights/112738-30w-bathen-outdoor-aluminium-led-wall-lamp.html
- 2 no. 10W Ledkia Bathen outdoor aluminium LED wall lamps in black (3000k 770lm):
- 2 no. 3W LED non-maintained wall-mounted 3 hour emergency lights (min. 120lm).
- 3 no. switched double wall sockets (1 no. with twin USB outlets).

Lower belfry:

- 1 no. 20W aluminium grey wall-mounted up & down box lights (4000k 1230lm) with clear glass diffuser.
- 1 no. 3W LED non-maintained wall-mounted 3 hour emergency light (min. 120lm).
- 1 no. switched double wall socket.

Upper belfry:

- 4 no. 20W aluminium grey wall-mounted up & down box lights (4000k 1230lm) with clear glass diffusers.
- 1 no. 3W LED non-maintained wall-mounted 3 hour emergency light (min. 120lm).
- 1 no. switched double wall socket.

All to be installed in accordance with the manufacturer's instructions.

3.7.05 Allow for arranging/liaising with Openreach in respect of the installation/extension of a phone line to the tower and the installation of a master socket within the pendulum cupboard for the later provision of a wi-fi router (to be arranged by the Employer). Allow for consulting the architect in respect of proposed cable routes prior to installation.

3.8.00 DECORATOR

3.8.01 Clean down the brickwork to the walls, remove old wall fixings, repoint any missing joints or holes that need filling.

Wash down walls with sugar soap and leave ready for redecoration.

Where brickwork has been painted previously or repaired allow for it to be redecorated with two coats of ClassidurModernplus2 in selected colour chosen by architect.

3.8.02 Oak joinery is to be rubbed down and coated with two coats of lime wax.

3.8.03 Allow to supply and lay high quality underlay and Rhino boot carpet throughout ringing chamber.

3.8.04 Wash down spandrel walls in crossing and redecorated with Classidur modernplas2 in selected colour.

3.8.05 Allow a provisional sum of £3000.00 for conservation work to peal boards as directed by architect.

3.8.06 Fix only peal boards as directed by architect/employer. Fixings to be with stainless screws into plastic plugs. Where practical use existing holes. Where practical new holes to be in to existing masonry bed joints.

3.9.00 CLEARAWAY

3.9.00 Remove all remaining scaffold or access equipment and reinstate any external landscape or internal fabric to a condition no less that when the works started.

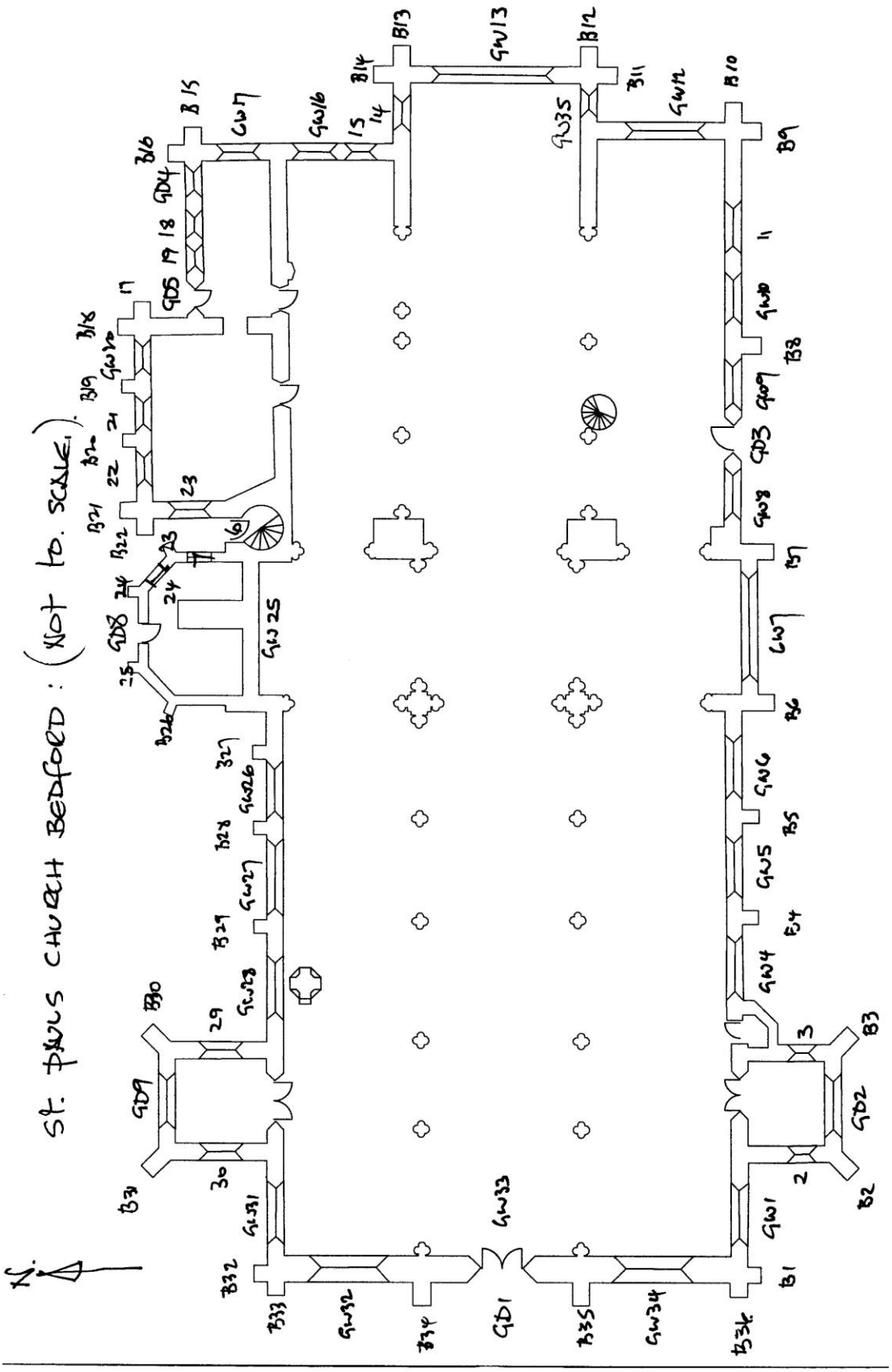
3.9.02 Return the Faithcraft ceiling decoration to crossing ceiling of tower.

3.9.03 Allow a provisional sum of £3000.00 for remedial works as directed by architect.

3.9.03 Remove protective sheeting from chancel screen and crossing and nave floors etc.

3.9.04 Reinstate dais to crossing and its furniture.

3.9.05 Carry out a thorough clean of the works and traffic routes used by contractor through the church. Make good to any damage caused internally or externally.


St. Pauls Church Bedford : (Not to scale)

Checklist (check and tick as appropriate)

Any church seeking cover for external metal theft, while scaffolding is erected, must complete, sign and return this checklist to Ecclesiastical before work commences. We will then advise you if we are able to provide any cover for your church.

Scaffolding Specification

(a) The scaffolding will be fully enclosed by minimum 18mm exterior grade plywood sheeting or steel sheeting hoarding to a minimum height of 4.0 metres. Yes ☐ No ☐
PLEASE NOTE ORIENTED STRAND BOARD (OSB) IS NOT AN ACCEPTABLE FORM OF HOARDING.

Comments

(b) All joints of the plywood or steel sheeting facing will be tightly butted to prevent tools being used to prise them apart. Yes ☐ No ☐

Comments

Fixing

(c) 100mm annular ring shank nails at 150mm centres will be used to fix the plywood boards to the timber frame. Tamper proof screws may be used as an alternative. Yes ☐ No ☐

Comments

(d) The bottom of the hoarding will follow the contour of the ground leaving no gaps between the hoarding and the ground. Yes ☐ No ☐

Comments

(e) Where the hoarding abuts a building, the plywood or steel sheeting will be cut to match closely the contours of the building to prevent any gaps being formed. Yes ☐ No ☐

Comments

Checklist (check and tick as appropriate)

Intruder detection Yes ☐ No ☐

(j) The scaffolding will be protected by a scaffolding alarm system installed in accordance with the NSI Code of Practice for the design, installation and maintenance of scaffolding alarm systems NCP 116.

IF YOU CURRENTLY HAVE AN APPROVED ROOF PROTECTION SCHEME INSTALLED, THIS MAY BE TEMPORARILY EXTENDED TO PROTECT THE SCAFFOLDING AS AN ALTERNATIVE TO INSTALLING A SEPERATE SCAFFOLDING ALARM SYSTEM. IF YOU DECIDE TO DO SO, SIMPLY ASK YOUR ALARM INSTALLER TO CONFIRM TO US DIRECTLY IN WRITING QUOTING YOUR POLICY NUMBER AND GO TO (n) BELOW.

Comments

(k) The system will be installed and maintained by a company on the official list of recognised firms of the NSI or SSAIB inspectorate bodies and must also appear on the local police force list of compliant companies. Yes ☐ No ☐

Comments

(l) The system will combine notification locally by an instantaneous audible device activation together with notification to a permanently manned alarm receiving centre conforming to BS 5979 or BS EN 50518 via a minimum Grade 2 alarm transmission system under BS EN 50136. The system must be designed to utilise combined PIR detectors and cameras to detect unauthorised movement. Images from devices must be reviewed by the manned alarm receiving centre and action taken if unlawful activity is identified. Yes ☐ No ☐

Comments

(m) A copy of the scaffolding alarm system design proposal will be sent to Ecclesiastical for approval. The specification must include confirmation by the alarm company that, either sub-contractors will not be used, or specify the extent to which sub-contractors will be used where appropriate. Yes ☐ No ☐

Comments

(n) The scaffolding will be protected by extending our approved roof protection system. Yes ☐ No ☐ N/A ☐

If yes, please name your roof protection system installer:

Summary of potential works to the St Pauls Bedford clock, dated 14/5/20

Overview

The clock dates from 1811, predating the present tower (1867 by Palgrave). It is the largest clock in north Bedfordshire with four, eight foot dials. The maker was John Moore and Sons of Clerkenwell, London. The movement has a deadbeat escapement. In 1908 John Bull & Co of Bedford converted the clock to play the Cambridge quarters (or the Westminster chimes as they later became known, when used for Big Ben). The quarters strike on bells number 6, 7, 8 and 11 whilst the hours are struck on the 12th (Tenor bell). The clock was converted to electric winding in 1959 with an automatic cut-out to prevent over winding. In 2002, thanks to a legacy by Winifred Hall, the quarter chimes and hour striking mechanisms were restored after nearly thirty years of silence. The clock had a major overhaul during 2008.

It is proposed to rehang the bells in a frame on one level, and reorder the ringing room as per the Request for Quotation 2 - v2. The new bell frame will likely be situated lower in the tower than at present to minimise possible tower movement and the rope circle will likely be larger and require more space in the ringing chamber than at present. Additionally a new ringing room ceiling will be installed at a lower level.

Removal of the bells will require the mechanism that drives the clock hands to be dismantled. At the same time it is proposed to take the opportunity to carry out other improvement works to the clock as set out below. Depending on the design and layout of the bell frame, it will probably be necessary to relocate the clock mechanism from its current position to the NW corner of the tower and dependent on the level of the new ringing chamber ceiling, to install the clock mechanism at a different level in a new intermediate chamber between the ringing chamber and bells or possibly on a new purpose built platform within the ringing chamber. In either case the clock mechanism would be installed in a purpose built display case (possibly similar to that recently installed at St Andrews Biggleswade) to facilitate improved viewing and easier access conditions than at present.

In order to create more space in the ringing chamber it is proposed to dismantle the current oversized clock cupboard on the N wall and some if not all of the platform that currently supports the clock mechanism, as both will become redundant.

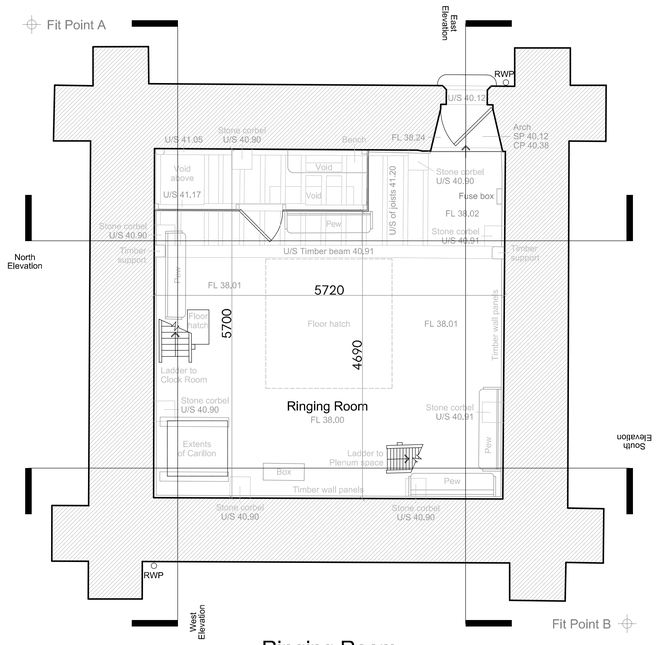
Potential scope of work

Item No.	Description	Essential or Optional
	Essential or highly recommended clock works required for the bells project	
1	Removal and safe storage of all chiming hammers, bell cranks and linkages.	E
2	Disconnect and removal of hand drive shafts, bevel gearboxes and removal and safe storage of support beams. All to be labelled for correct replacement.	E
3	Removal of old auto winding system.	E

4	Supply and installation of new auto drives without falling weights	E/O
5	Installation of above	E
6	Move clock movement and stand to NW corner (possibly on a newly constructed platform or on a new intermediate floor)	E
7	If clock is to be removed for safe keeping, i.e. dismantled and removed from the tower, then additional work required	O
8	Storage of the clock, chiming hammers and hand linkages would be additional cost	O
9	Manufacturer a new hand drive shaft to connect to existing bevel gears and install.	
10	Return chiming hammers and install to new position of bells	E
10b	Replace mechanical hammers with electric solenoid operated hammers	O

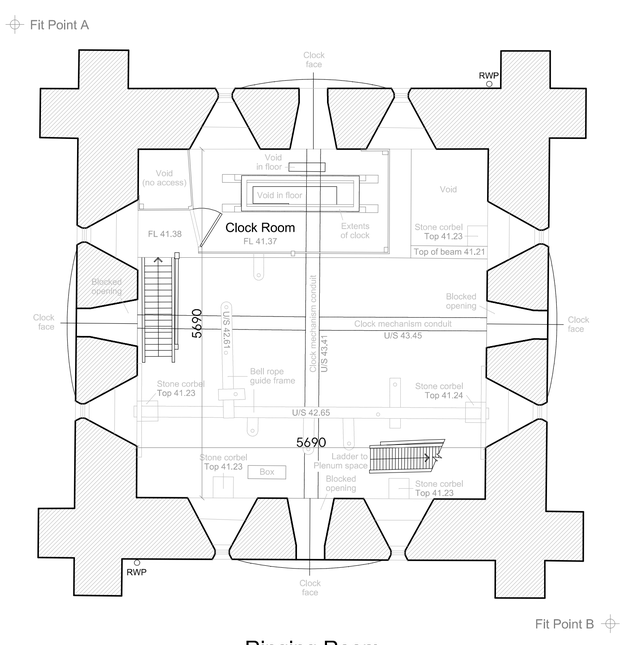
Optional advised / suggested work by the clock engineer

11	Supply of pendulum regulator. This will keep the clock accurate and automatically perform the hour change in March and October.	O
12	Installation of regulator	O
13	Supply and installation or night silencing	O
14	Dials and hands: removal for repaint and gilding.	O
15	Hand gearing overhaul while dials are off.	O
16	Return and install, set up the hand gearing and linkages so all four dials are in synchronisation	O
17	While the clock mechanism is removed, assess it and report on any work required.	O



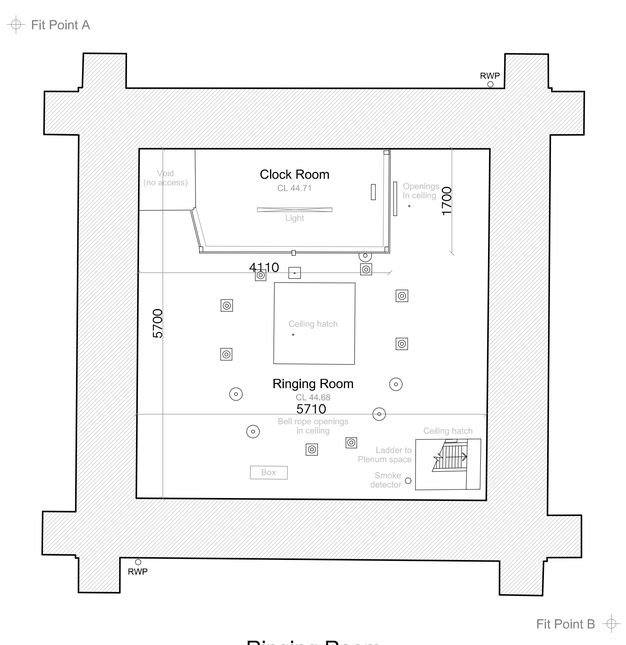
Ringing Room

Floor Plan @ Floor Level



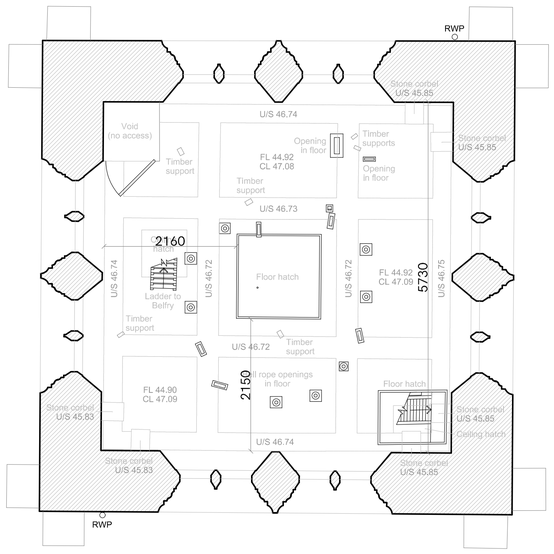
Ringing Room

Floor Plan @ Clock Room Level



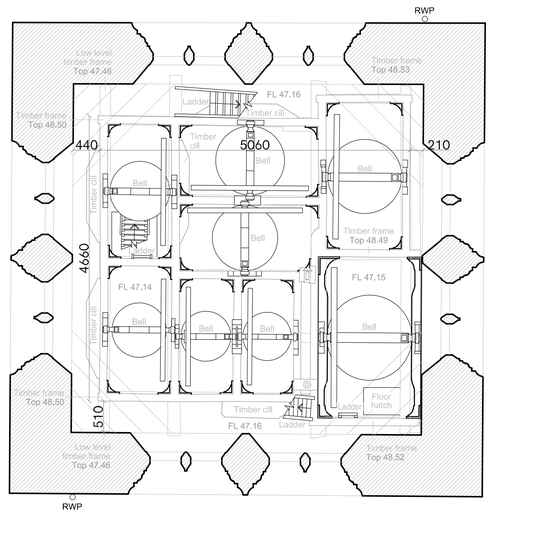
Ringing Room

Ceiling Plan



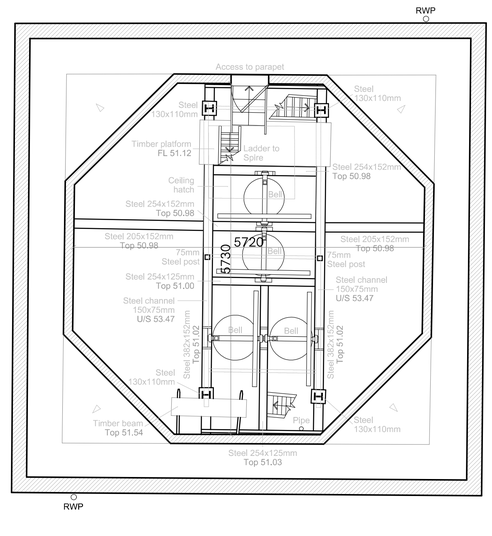
Plenum Space

Floor Plan



Belfry

Floor Plan @ Lower Level

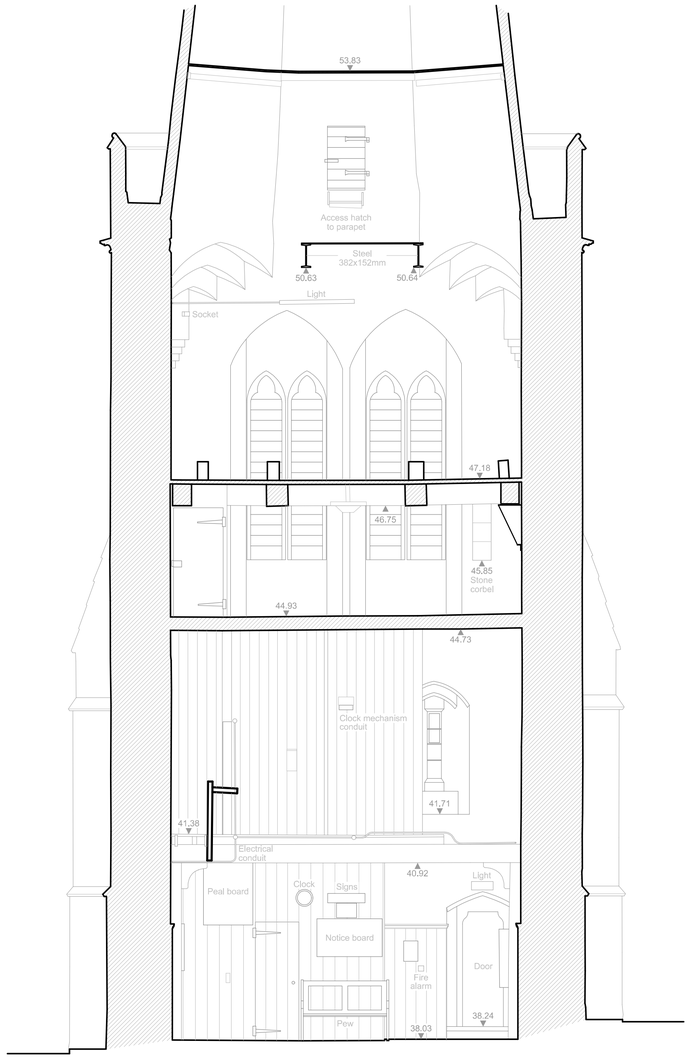


Belfry

Floor Plan @ Upper Level

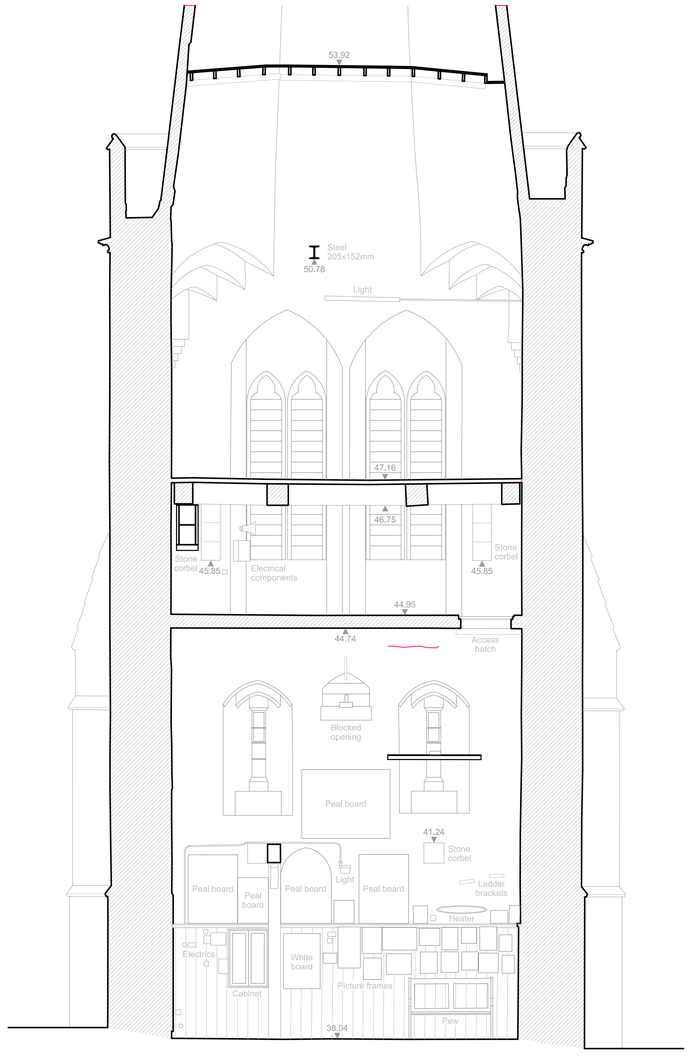
1:50

1077/49-002
MICHAEL DALES PARTNERSHIP LIMITED
01582 881210 | 01494 372210 | WWW.MDALES.UK



North Internal Elevation

Datum Line 36.00m



East Internal Elevation

Datum Line 36.00m

1:50

0mm 1000 2000 3000 4000 5000

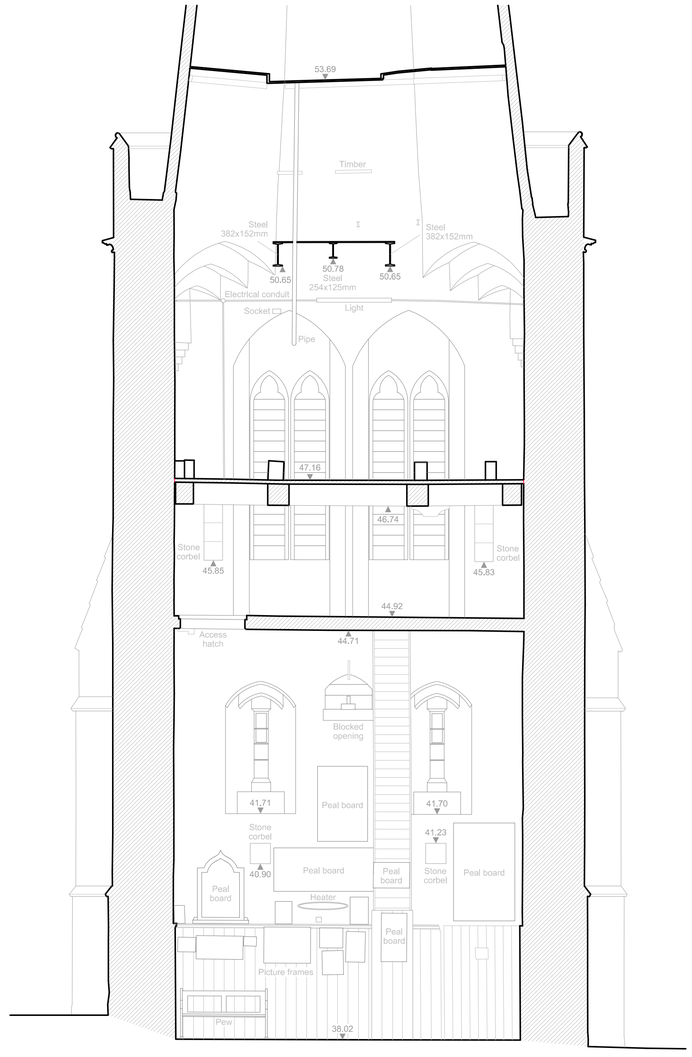
A1

ST. PAUL'S CHURCH, BEDFORD - TOWER

MAY 2022

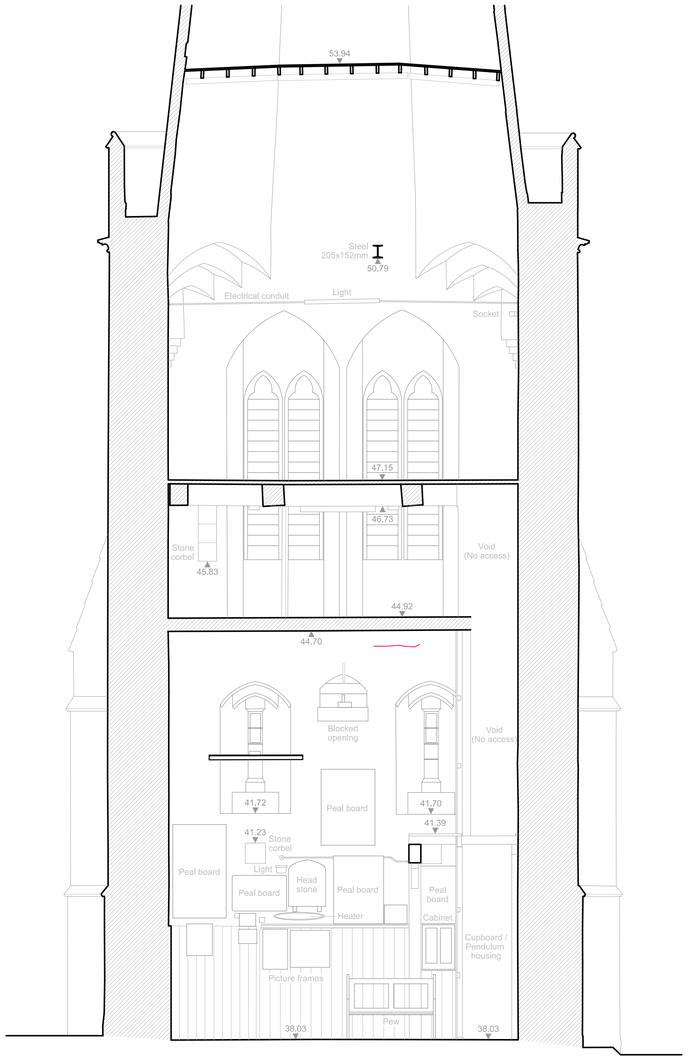
1077/49-003

MICHAEL DALES PARTNERSHIP LIMITED
01582 881210 | 01494 372210 | WWW.MDALES.UK



South Internal Elevation

Datum Line 36.00m



West Internal Elevation

Datum Line 36.00m

1:50

0mm 1000 2000 3000 4000 5000

A1

ST. PAUL'S CHURCH, BEDFORD - TOWER

MAY 2022

1077/49-004

MICHAEL DALES PARTNERSHIP LIMITED
01582 881210 | 01494 372210 | WWW.MDALES.UK

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
St Pauls Church	13871	1
	Design By: cjc	Date: Sep-24

Project

Two new floor areas are to be installed into the bell tower at the above requiring structural members to be designed, refer Architects Drawings for details

Codes

BS6399: Part 1:1996 & Part 3:1998 Loadings for Buildings
BS5950-1:2001 Structural Use of Steelwork in Building
BS5628-1:2005 Code of Practice for the use of Masonry
BS5268-2:2002 Structural Use of Timber
BS8110-1:1997 Structural Use of Concrete

Plan Loads

Roof - Pitched			**Roof - Flat**		
Imposed	0.6kN/m²		Imposed & Access	0.75kN/m²	
Storage	0.25kN/m²				**0.75kN/m²**
		0.85kN/m²	Flat		
Pitched			Waterproofing	0.52kN/m²	
Tiles	0.7kN/m²		Joists	0.13kN/m²	
Felt/battens	0.05kN/m²		Ceiling	0.15kN/m²	
Rafters	0.15kN/m²				**0.8kN/m²**
Insulation	0.01kN/m²				
Ceiling	0.15kN/m²				
		1.06kN/m²			

Floors - Timber			**Ground Floor - Concrete**		
Imposed	2.5kN/m²		Imposed	1.5kN/m²	
		1.5kN/m²			**1.5kN/m²**
Boarding	0.20kN/m²		Beam & Block	2.70kN/m²	
Joists	0.13kN/m²		75mm Screed	1.80kN/m²	
Ceiling	0.15kN/m²		Insulation & Finishes	0.15kN/m²	
		0.48kN/m²			**4.65kN/m²**

Block Wall 100mm (on elevation) - **1.6kN/m²**
Brick Wall (on elevation) - **2.4kN/m²**
Timber Stud (100mm) Plasterboard both sides (on elevation) - **0.4kN/m²**

Dimensions

Dimensions referred to in the calculations are design dimensions only and not the overall length beam length

The Contractor to confirm dimensions and details on site prior to work commencing and materials being ordered.

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project: St Pauls Church	Job Ref: 13871	Calculation Sheet No: 2
	Design By: cjc	Date Sep-24

Steelwork

- Steelwork Grade S355, unless noted otherwise
- Bearings - Generally min 150mm, unless noted otherwise
- Steelwork in cavities and below ground to be painted with three coats of bitumen paint.
- Steel Posts to be taken down to top of foundation unless noted otherwise
- Where steel beams are specified in pairs, beams to be bolted together with M12 bolts and spacers @ max 600c/c's
- All steelwork to be delivered to site shot blasted to BS:4232 second quality and painted with one coat of prefabrication primer 25 microns minimum DFT and one coat of high build zinc phosphate post fabrication primer minimum 50 microns DFT
- All bolts to be Grade 8.8 and bright zinc plated unless noted otherwise

Concrete Floors

Steel Beams supporting concrete floors to be temporarily propped until concrete infill has gone off

Padstones

Where required are specified as concrete, where engineering bricks are specified use Class B (min compressive strength 50N/mm^2)

Masonry

Brick and Block Mortar

Mortar Designation III (to BS 5628-1:2005) U.N.O.

Block Strengths (unless noted otherwise)

For Timber First Floor	For Concrete Ground and First Floor
7.3N/mm2 below ground	10N/mm2 below ground
3.6N/mm2 ground to first floor	7.2N/mm2 ground to first floor
3.6N/mm2 first floor to roof	3.6N/mm2 first floor to roof

Wall ties

Stainless steel wall ties and centres to be fixed in accordance with Building Regulation requirements.

Where new openings are formed in existing cavity walls stainless steel ties are to be added adjacent to the openings tying the two leaves together.
Helical remedial wall ties at 225mm centres vertically fixed between both leaves in accordance with manufacturers recommendations.

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project: St Pauls Church	Job Ref: 13871	Calculation Sheet No: 3
	Design By: cjc	Date Sep-24

Timber

All Timber is to be Strength Class C24, unless noted otherwise
Double Joists to be provided under stud partitions, bolted together with M12 Bolts and washers @ max 600c/c
Where rafters are notched over structural stud walls or wall plates, the rafter is to be birdsmouthed and nailed to the top plate U.N.O.
Wallplates strapped down to wall at 1.2m centres with galvanised straps in accordance with Building Regulation requirements.
Lateral restraint straps to be fixed to walls and floor/ceiling/rafters at 1.8m centres in accordance with Building Regulation requirements.
Notching and drilling of Joists to be in accordance with NHBC Requirements.

Foundations

Ground Bearing Pressure

100kN/m^2 has been assumed unless noted otherwise

Depths

All mass concrete foundations to be taken to minimum depths as agreed / required by the approved Building Inspector based on local site conditions before the concrete is poured

Concrete Strip Footings and Pad foundations (unless noted otherwise)

To be constructed using concrete specifications conforming to BS8500 as follows - C20/25 Strength Class / GEN3

DC-1 design chemical class
20mm max aggregate
S3 Consistancy Class or as agreed with main contractor to suit placing

Raft Foundation

To be constructed using concrete specifications conforming to BS8500 as follows - C28/35

DC-1 design chemical class
20mm max aggregate, 300kg/m^3 min cement content
0.6 max w/c ratio
S2 Consistancy Class or as agreed with main contractor to suit placing

Ground Beams

To be constructed using concrete specifications conforming to BS8500 as follows - C28/35

DC-1 design chemical class
20mm max aggregate, 300kg/m^3 min cement content
0.6 max w/c ratio
S2 Consistancy Class or as agreed with main contractor to suit placing

Reinforcement fy - 500N/mm2

Cover 40mm to all Reinforcement unless noted otherwise.

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
St Pauls Church	13871	4
	Design By: cjc	Date: Sep-24

Timber Frame External Walls:

1 Read with Architects drawings and specifications for details of DPC's, waterproof membranes, insulation, fire protectin, finishes, etc.

2 Timber frame construction should generally be in accordance with Timber Frame Construction' (ISBN 1900510 32 4) by TRADA Technology Ltd (Tel: 01494 569 600) and all relevant British Standards and Codes of Practice.

3 Timber to be strength class C24 unless stated otherwise and stress graded to BS4978. All timber to be pressure impregnated with approved preservative. Cut ends to be site treated to manufacturers requirements.

4 Timber studs for framing external walls to be 150mm x 50mm size (unless shown otherwise on drawings). Studs are to be doubled up at all corners and underneath the ends of all beams and trusses and either side of the openings. All doubled up studs are to be fixed together with M12 Bolts and threaded bars located at 450mm c/c vertical.

5 Timber frame wall comprise studs at 400mm c/c, unless stated otherwise with top and bottom plates and noggins at third height points. All plates 75mm thick. Plywood sheathing to be provided in accordance with Note 8 and where indicated on the drawings. Fixings for stud and panel assembly to be minimum 3.75mm dia. 75mm long nails. Sole plate to be fixed/strapped down to beams, walls, floor slab, etc. (as appropriate) at maximum 600mm c/c.

6 Unless shown otherwise lintels are to comprise minimum 2 No. 150mm x 50mm C24. All lintels are to be supported with 1 No. cripple stud each side (for clear openings less than 1500mm) and 2No. Cripple studs for openings in excess of 1500mm.

7 Plywood sheathing to be Douglas Fir faced COFT (or equivalent) exterior grade. Unless stated otherwise the plywood is to be a minimum 12.0mm thick. Plywood sheets are to be fixed to the external face of the studs, plates and noggins as appropriate.

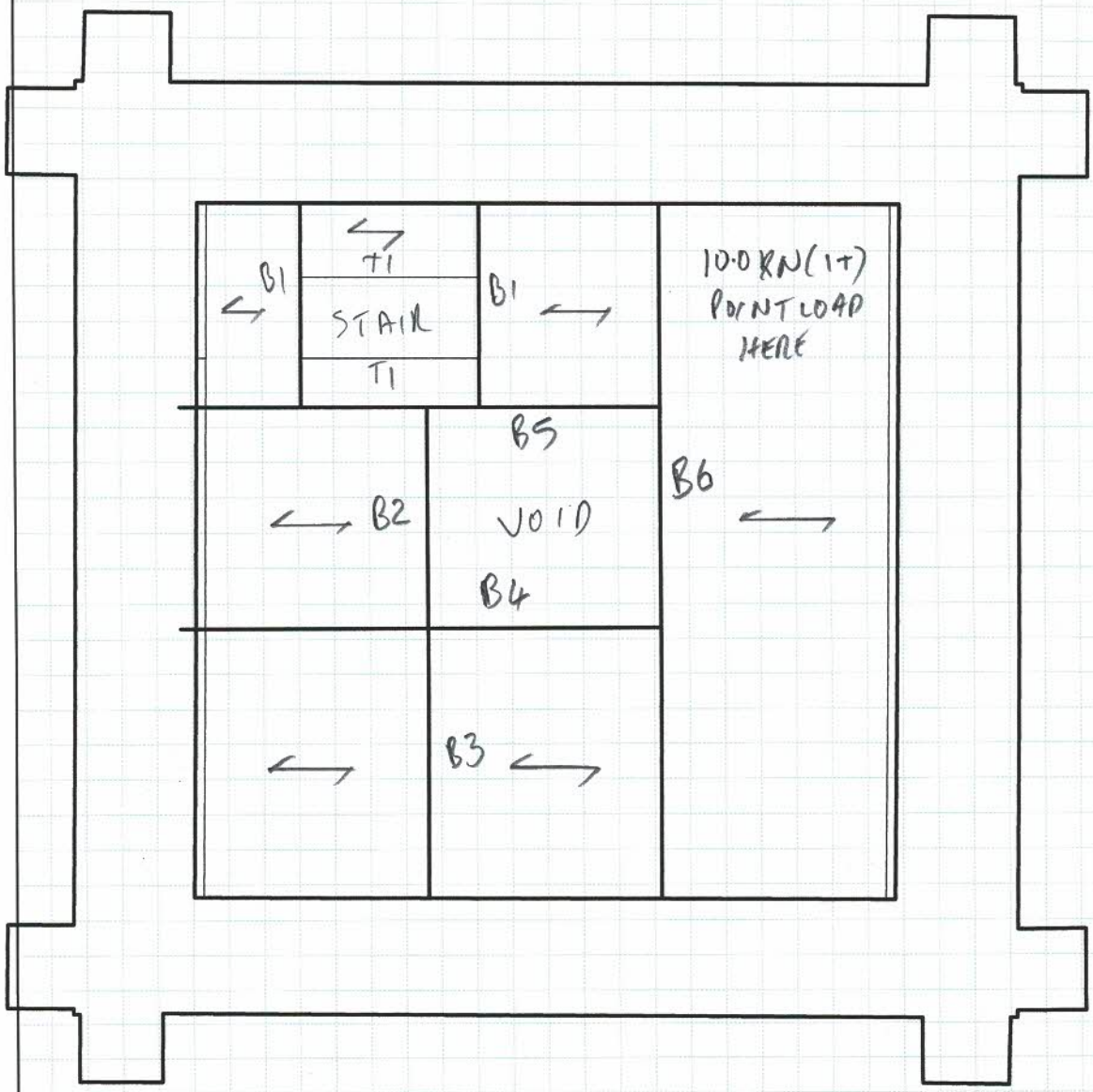
8 End studs to be fixed/tied to existing masonry walls with resin anchored 8mm dia. stainless steel studs or threaded bars at 450c/c vertically. (Minimum 90mm penetrration into brick or blockwork, minimum 150mm for stonework) Where abutting new walls, provide ties/straps at 450c/c. Where steel posts are built in, fix stud either side of post with bolts or shot fired fixings at 450c/c vertical.

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
ST PAULS CHURCH	13871	5
	Design by: CJC	Date: SEP 24



PLAN ON RINGING ROOM

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
ST PAULS CHURCH	13871	6
	Design by: CJC	Date: SEP 24

Span = 2.0m (max)

live load = 2.5 kN/m²

dead " = 0.48 " /"

Provide joists @ 400 c/cs

refer page 7

use 50 x 200 C24 @ 400 c/cs

FLOOR JOIST DESIGN.

50x200 C24 @ 400 c/cs

---

check for 10.0kN point load over 2 joists

Joists fail in bending

∴ provide 2No 50x200 joists @ 400 c/cs

refer page 8

AREA FOR 10.0 kN POINT LOAD

2 No 50 x 200 C24 Bolt together with M12 bolts @ 400 c/cs

T1

by inspection use 2No 50 x 200 C24

STAIR TRIMMER T1

2No 50x200 C24 Bolt together with M12 bolts @ 400 c/cs

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~4886~~ 7
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TBL1Id 1 @ Level 1

Summary Design Data

Design Cases Covered	1.0 L1, 1.0 D1 + 1.0 L1
Deflection Cases Covered	1.0 L1, 1.0 D1 + 1.0 L1
Section Size	b = 50, h = 200, 200x50 in Strength Class C24
Section Properties (cm^2,cm^3,cm)	Area 100, Zx 333.3, Zy 83.3, rx 5.77, ry 1.44
Specification	1 : Internal use in continuously heated building Long term loading
Integrated Design Critical Case	: Dead Plus Live (Serviceability)
Member Details	F = 0.0 kN, L = 2.0 m, Lx = 2.0 m, Ly = 2.0 m, Lex = 1.0 Lx, Ley = 1.0 Ly Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2.K_3.K_{7x}.K_8.\sigma_m$	1.00 x 1.00 x 1.05 x 1.00 x 7.50	7.84 N/mm²
$\sigma_{my.adm} = K_2.K_3.K_{7y}.K_8.\sigma_m$	1.00 x 1.00 x 1.17 x 1.00 x 7.50	8.78 N/mm²
$\sigma_{c.adm} = K_2.K_3.K_4.K_8.\sigma_c$	1.00 x 1.00 x 1.14 x 1.00 x 1.90	2.17 N/mm²
$\tau_{adm} = K_2.K_3.K_8.\tau$	1.00 x 1.00 x 1.00 x 0.71	0.71 N/mm²
$E = K_2.E_{mean}$	1.00 x 10800	10800.0 N/mm²

Axial Load with Moments Check

Critical Design Location	X = 1.000		
$\sigma_{mx.a} = Mx/Zx$	0.760 / 333.33≤ 7.84	2.28 N/mm²	OK
$\sigma_{mx}/\sigma_{mx.adm}$	2.28/7.84	0.291	OK

Shear and Bearing Check

Critical Design Location	X = 0.000		
$\tau_a = 1.5$ Fv / Area	1.5 x 1.52 / 100≤ 0.71	0.23 N/mm²	OK
$\sigma_{cax} = Fvx / (b.Bx)$	1.52 / (50 x 75)≤ 2.17	0.41 N/mm²	OK

Deflection Check (Shear Deflection Not Included)

Critical Load Case 003 : Dead Plus Live (Serviceability)

$\delta = \delta_m$	In-span 0.88≤ L/333	0.88 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~887~~ 8
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TBL1Id 1 @ Level 1

Summary Design Data

Design Cases Covered	1.0 L1, 1.0 D1 + 1.0 L1
Deflection Cases Covered	1.0 L1, 1.0 D1 + 1.0 L1
Section Size	b = 100, h = 200, 200x100 in Strength Class C24
Section Properties (cm²,cm³,cm)	Area 200, Zx 666.7, Zy 333.3, rx 5.77, ry 2.89
Specification	1 : Internal use in continuously heated building Long term loading, 2 pieces of softwood
Integrated Design Critical Case	: Dead Plus Live (Serviceability)
Member Details	F = 0.0 kN, L = 2.0 m, Lx = 2.0 m, Ly = 2.0 m, Lex = 1.0 Lx, Ley = 1.0 Ly Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2.K_3.K_{7x}.K_8.\sigma_m$	1.00 x 1.00 x 1.05 x 1.00 x 7.50	7.84 N/mm²
$\sigma_{my.adm} = K_2.K_3.K_{7y}.K_8.\sigma_m$	1.00 x 1.00 x 1.13 x 1.00 x 7.50	8.46 N/mm²
$\sigma_{c.adm} = K_2.K_3.K_4.K_8.\sigma_c$	1.00 x 1.00 x 1.14 x 1.00 x 1.90	2.17 N/mm²
$\tau_{adm} = K_2.K_3.K_8.\tau$	1.00 x 1.00 x 1.00 x 0.71	0.71 N/mm²
$E = K_2.E_{mean}$	1.00 x 10800	10800.0 N/mm²

Axial Load with Moments Check

Critical Design Location	X = 1.000		
$\sigma_{mx.a} = Mx/Zx$	3.260 / 666.67≤ 7.84	4.89 N/mm²	OK
$\sigma_{mx}/\sigma_{mx.adm}$	4.89/7.84	0.624	OK

Shear and Bearing Check

Critical Design Location	X = 0.000		
$\tau_a = 1.5\ Fv / Area$	1.5 x 4.02 / 200≤ 0.71	0.30 N/mm²	OK
$\sigma_{cax} = Fvx / (b.Bx)$	4.02 / (100 x 75)≤ 2.17	0.54 N/mm²	OK

Deflection Check (Shear Deflection Not Included)

Critical Load Case 003 : Dead Plus Live (Serviceability)

$\delta = \delta_m$	In-span 1.60≤ L/333	1.60 mm	OK

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project: ST PAULS CHURCH	Job Ref: 13871	Calculation Sheet No: 9
	Design by: CJC	Date: SEP24

STEEL BEAM DESIGN

B1.

span = 1.7m

live load = 2.5 x 1.5 = 3.75 kN/m
dead " = 0.48 x 1.5 = 0.72 " /"

refer pages 10 to 12
use 203 x 102 x 23 UB

203x102 x23 UB

B2

span = 1.85 m

live load = 2.5 x 2.0 = 5.0 kN/m
dead " = 0.48 x 2.0 = 1.0 " /"

refer pages 13 to 15
use 203x102x23 UB

B2
203x102 x23 UB

B3

span = 2.3m
loads as B2

refer pages 16 to 18
use 203 x 102 x 23 UB

B3
203x102 x23 UB

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~9999~~ 10
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	1.700	0.000	0.000

Member Properties

Member 1
M ... ... 203x102 UB 23 [S 275]
A 29.39E-4 Ix 2106E-8 Iy 164.8E-8 J 7.02E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
D1 UDLY -000.720 (kN/m)
L1 UDLY -003.750 (kN/m)

Member 1 - MasterFrame Pro Loads
D1 D 077.010 (kN/m³)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 0 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : [redacted] 1/
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))									
Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.01	0.00	2	0.00	0.00	0.01	0.00

Member Forces (001 : Dead plus Live (Ultimate))						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	6.226	0.000	2.646	0.184
	2	0.000C	-6.226	0.000	@ 0.850	@ 0.850

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	6.226	0.000	2	0.000	6.226	0.000
Total	0.000	12.452	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	3.188	0.000	2	0.000	3.188	0.000
Total	0.000	6.375	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	3.992	0.000	2	0.000	3.992	0.000
Total	0.000	7.984	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

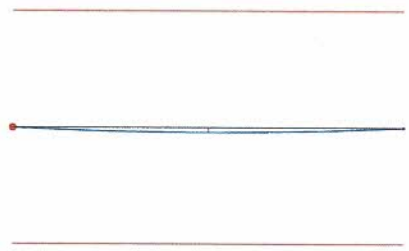
Job Ref : 13871
Sheet : [illegible] 12
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
D1 UDLY -000.720               ( kN/m )
L1 UDLY -003.750               ( kN/m )
```



Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1 2	0.000C 0.000C	6.226 -6.226	0.000 0.000	2.646 @ 0.850	0.118 @ 0.850

Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 275, 0, 2.65, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	6.229 / 181.051 =	0.034	OK

Moment Capacity Check Mc

Fv/Pv	0.002 / 181.051 =	0	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 234.1≤1.2 x 275 x 207.26 =	64.378 kN.m	
MA/Mc	2.644 / 64.378 =	0.041	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x2+.5x3+.15x2)/3 ≥ 0.44	0.925	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 1.7 =	1.7 m	
λ = Le/ryy	1.7 / 2.37	71.73	OK
v = Fn (x,Le,ryy,λ)	22.482, 1.7, 2.37, 71.73	0.902	Table 19
λ_{LT}= u.v.λ.√βw	0.89 x 0.902 x 71.73√ 1	57.59	
pb = Fn (py,λ_{LT})	275, 57.59	219.23 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 219.23≤ 64.378 =	51.322 kN.m	
MA/(Mb/m_{LT})	0.925•2.645 / 51.322	0.048	OK

Deflection Check - Load Case 2

Deflection Limits (Internal Beams)	In-spanδ ≤ 1700/360 = 4.7 mm Live (Case 2)	0.09 mm	OK
	In-spanδ ≤ 1700/250 = 6.8 mm D+L (Case 3)	0.12 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 13
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)

Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)

Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)

Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	1.850	0.000	0.000

Member Properties

Member 1

```
M  ...  ...          203x102 UB 23 [S 275]
 A 29.39E-4           Ix 2106E-8          Iy 164.8E-8          J 7.02E-8
 E 205.0E6            G 78.85E6
```

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1

```
D1 UDLY -001.000              ( kN/m )
L1 UDLY -005.000              ( kN/m )
```

Member 1 - MasterFrame Pro Loads

```
D1 D     077.010              ( kN/m³)
```

Nodal Loading and Support Conditions

NODE 1

```
UT Rs 1 1 1 1 0 0
```

NODE 2

```
UT Rs 0 1 0 0 0 0
```

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 14
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))

Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.02	0.00	2	0.00	0.00	0.02	0.00

Member Forces (001 : Dead plus Live (Ultimate))

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	8.988	0.000	4.157	0.343
	2	0.000C	-8.988	0.000	@ 0.925	@ 0.925

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	8.988	0.000	2	0.000	8.988	0.000
Total	0.000	17.976	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	4.625	0.000	2	0.000	4.625	0.000
Total	0.000	9.250	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	5.759	0.000	2	0.000	5.759	0.000
Total	0.000	11.519	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

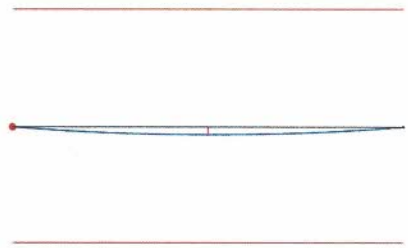
Job Ref : 13871
Sheet : ~~4~~ 15
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
D1 UDLY -001.000               ( kN/m  )
L1 UDLY -005.000               ( kN/m  )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1 2	0.000C 0.000C	8.988 -8.988	0.000 0.000	4.157 @ 0.925	0.220 @ 0.925

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 275, 0, 4.16, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	8.99 / 181.051 =	0.050	OK

Moment Capacity Check Mc

Fv/Pv	0.002 / 181.051 =	0	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 234.1≤1.2 x 275 x 207.26 =	64.378 kN.m	
MA/Mc	4.155 / 64.378 =	0.065	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x3+.5x4+.15x3)/4 ≥ 0.44	0.925	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 1.85 =	1.85 m	
λ = Le/ryy	1.85 / 2.37	78.06	OK
v = Fn (x,Le,ryy,λ)	22.482, 1.85, 2.37, 78.06	0.889	Table 19
λ_{LT}= u.v.λ.√βw	0.89 x 0.889 x 78.06√ 1	61.73	
pb = Fn (py,λ_{LT})	275, 61.73	208.89 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 208.89≤ 64.378 =	48.900 kN.m	
MA/(Mb/m_{LT})	0.925•4.156 / 48.9	0.079	OK

Deflection Check - Load Case 2

Deflection Limits (Internal Beams)	In-spanδ ≤ 1850/360 = 5.1 mm Live (Case 2)	0.18 mm	OK
	In-spanδ ≤ 1850/250 = 7.4 mm D+L (Case 3)	0.22 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 16
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	2.300	0.000	0.000

Member Properties

Member 1
M ... ... 203x102 UB 23 [S 275]
A 29.39E-4 Ix 2106E-8 Iy 164.8E-8 J 7.02E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
D1 UDLY -001.000 (kN/m)
L1 UDLY -005.000 (kN/m)

Member 1 - MasterFrame Pro Loads
D1 D 077.010 (kN/m³)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 0 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~4835~~ 17
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))									
Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.04	0.00	2	0.00	0.00	0.04	0.00

Member Forces (001 : Dead plus Live (Ultimate))						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	11.174	0.000	6.425	0.820
	2	0.000C	-11.174	0.000	@ 1.150	@ 1.150

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	11.174	0.000	2	0.000	11.174	0.000
Total	0.000	22.349	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	5.750	0.000	2	0.000	5.750	0.000
Total	0.000	11.500	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	7.160	0.000	2	0.000	7.160	0.000
Total	0.000	14.321	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

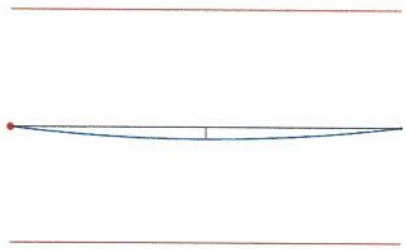
Job Ref : 13871
Sheet : ~~17~~ 18
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
D1 UDLY -001.000               ( kN/m  )
L1 UDLY -005.000               ( kN/m  )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)	
1	1 2	0.000C 0.000C	11.174 -11.174	0.000 0.000	6.425 @ 1.150		0.525 @ 1.150	

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 275, 0, 6.42, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	11.176 / 181.051 =	0.062	OK

Moment Capacity Check Mc

Fv/Pv	0.002 / 181.051 =	0	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 234.1≤1.2 x 275 x 207.26 =	64.378 kN.m	
MA/Mc	6.424 / 64.378 =	0.100	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x5+.5x6+.15x5)/6 ≥ 0.44	0.925	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 2.3 =	2.3 m	
λ = Le/ryy	2.3 / 2.37	97.05	OK
v = Fn (x,Le,ryy,λ)	22.482, 2.3, 2.37, 97.05	0.848	Table 19
λ_{LT}= u.v.λ.√βw	0.89 x 0.848 x 97.05√ 1	73.25	
pb = Fn (py,λ_{LT})	275, 73.25	180.56 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 180.56≤ 64.378 =	42.268 kN.m	
MA/(Mb/m_{LT})	0.925•6.424 / 42.268	0.141	OK

Deflection Check - Load Case 2

Deflection Limits (Internal Beams)	In-spanδ ≤ 2300/360 = 6.4 mm Live (Case 2)	0.42 mm	OK
	In-spanδ ≤ 2300/250 = 9.2 mm D+L (Case 3)	0.53 mm	OK

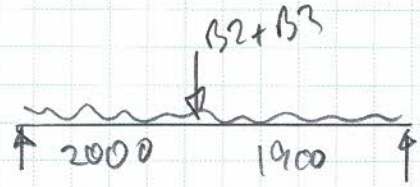
THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project: ST PAULS CHURCH	Job Ref: 13871	Calculation Sheet No: 19
	Design by: CJC	Date: SEP 24

B4



span = 3.9m

Point load from B2 + B3 LL = 10.4 kN
DL = 2.5 kN

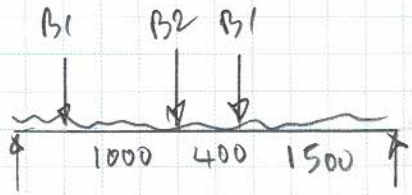
nom udl of 1.0 kN/m D+L

refer pages 20 to 22

use 203 x 102 x 23 UB

B4
203x102
x23 UB

B5



Point loads B1 LL = 3.2 kN
DL = 0.8 kN
B2 LL = 4.6 kN
DL = 1.2 kN

nom udl as B4

refer pages 23 to 25

use 203 x 102 x 23 UB

B5
203x102
x23 UB

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 20
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	3.900	0.000	0.000

Member Properties

Member 1
M ... ... 203x102 UB 23 [S 275]
A 29.39E-4 Ix 2106E-8 Iy 164.8E-8 J 7.02E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm^2	Density kN/m^3
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
D1 UDLY -001.000 (kN/m)
L1 UDLY -001.000 (kN/m)
L1 PY -010.400 2.000 (kN,m)
D1 PY -002.500 2.000 (kN,m)

Member 1 - MasterFrame Pro Loads
D1 D 077.010 (kN/m^3)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 0 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~620~~ 21
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))

Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.23	0.00	2	0.00	0.00	0.24	0.00

Member Forces (001 : Dead plus Live (Ultimate))

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	16.280	0.000	25.925	8.073
	2	0.000C	-16.796	0.000	@ 2.000	@ 1.950

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	16.280	0.000	2	0.000	16.796	0.000
Total	0.000	33.076	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	7.017	0.000	2	0.000	7.283	0.000
Total	0.000	14.300	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	10.626	0.000	2	0.000	10.957	0.000
Total	0.000	21.583	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

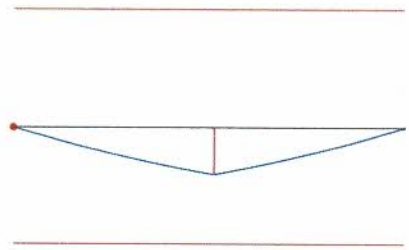
Job Ref : 13871
Sheet : 22
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
D1 UDLY -001.000               ( kN/m  )
L1 UDLY -001.000               ( kN/m  )
L1 PY   -010.400 2.000         ( kN,m  )
D1 PY   -002.500 2.000         ( kN,m  )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 / End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	16.280	0.000	25.925 @ 2.000	5.242 @ 1.950
	2	0.000C	-16.796	0.000		

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 275, 0, 25.93, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	16.799 / 181.051 =	0.093	OK

Moment Capacity Check Mc

Fv/Pv	10.494 / 181.051 =	0.058	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 234.1≤1.2 x 275 x 207.26 =	64.378 kN.m	
MA/Mc	25.922 / 64.378 =	0.403	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x14+.5x25+.15x15)/26≥0.44	0.859	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 3.9 =	3.9 m	
λ = Le/ryy	3.9 / 2.37	164.56	OK
v = Fn (x,Le,ryy,λ)	22.482, 3.9, 2.37, 164.56	0.722	Table 19
λ_{LT}= u.v.λ.√βw	0.89 x 0.722 x 164.56√ 1	105.73	
pb = Fn (py,λ_{LT})	275, 105.73	115.48 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 115.48≤ 64.378 =	27.033 kN.m	
MA/(Mb/m_{LT})	0.859•25.928 / 27.033	0.824	OK

Deflection Check - Load Case 2

Deflection Limits (Internal Beams)	In-spanδ ≤ 3900/360 = 10.8 mm Live (Case 2)	3.67 mm	OK
	In-spanδ ≤ 3900/250 = 15.6 mm D+L (Case 3)	5.24 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 23
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	3.900	0.000	0.000

Member Properties

Member 1
M ... ... 203x102 UB 23 [S 275]
A 29.39E-4 Ix 2106E-8 Iy 164.8E-8 J 7.02E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
D1 UDLY -001.000 (kN/m)
L1 UDLY -001.000 (kN/m)
L1 PY -004.600 2.000 (kN,m)
D1 PY -001.200 2.000 (kN,m)
D1 PY -000.800 1.000 (kN,m)
D1 PY -000.800 2.400 (kN,m)
L1 PY -004.600 1.000 (kN,m)
L1 PY -004.600 2.400 (kN,m)

Member 1 - MasterFrame Pro Loads
D1 D 077.010 (kN/m³)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 0 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~823~~ 24
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))									
Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.27	0.00	2	0.00	0.00	0.26	0.00

Member Forces (001 : Dead plus Live (Ultimate))						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	20.439	0.000	25.764	8.851
	2	0.000C	-18.497	0.000	@ 2.000	@ 1.950

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	20.439	0.000	2	0.000	18.497	0.000
Total	0.000	38.936	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	9.381	0.000	2	0.000	8.319	0.000
Total	0.000	17.700	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	13.259	0.000	2	0.000	12.023	0.000
Total	0.000	25.283	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

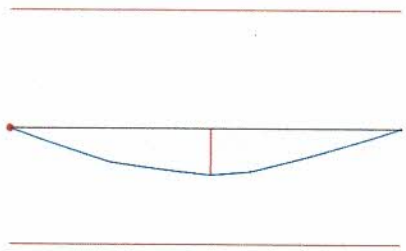
Job Ref : 13871
Sheet : /[illegible] 25
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
D1 UDLY -001.000               ( kN/m  )
L1 UDLY -001.000               ( kN/m  )
L1 PY   -004.600 2.000         ( kN,m  )
D1 PY   -001.200 2.000         ( kN,m  )
D1 PY   -000.800 1.000         ( kN,m  )
D1 PY   -000.800 2.400         ( kN,m  )
L1 PY   -004.600 1.000         ( kN,m  )
L1 PY   -004.600 2.400         ( kN,m  )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1 2	0.000C 0.000C	20.439 -18.497	0.000 0.000	@ 25.764 2.000	@ 5.728 1.950

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 275, 0, 25.76, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	20.439 / 181.051 =	0.113	OK

Moment Capacity Check Mc

Fv/Pv	5.325 / 181.051 =	0.029	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 234.1≤1.2 x 275 x 207.26 =	64.378 kN.m	
MA/Mc	25.76 / 64.378 =	0.400	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x18+.5x25+.15x16)/26≥0.44	0.897	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 3.9 =	3.9 m	
λ = Le/ryy	3.9 / 2.37	164.56	OK
v = Fn (x,Le,ryy,λ)	22.482, 3.9, 2.37, 164.56	0.722	Table 19
λ_{LT}= u.v.λ.√βw	0.89 x 0.722 x 164.56√ 1	105.73	
pb = Fn (py,λ_{LT})	275, 105.73	115.48 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 115.48≤ 64.378 =	27.033 kN.m	
MA/(Mb/m_{LT})	0.897•25.766 / 27.033	0.855	OK

Deflection Check - Load Case 2

Deflection Limits (Internal Beams)	In-spanδ ≤ 3900/360 = 10.8 mm Live (Case 2)	4.16 mm	OK
	In-spanδ ≤ 3900/250 = 15.6 mm D+L (Case 3)	5.73 mm	OK

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

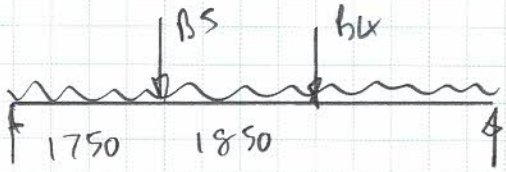
t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project: ST PAULS CHURCH	Job Ref: 13871	Calculation Sheet No: 26
	Design by: CJC	Date: SEP 24

B6

203x203 x 60 UC.

Span = 5.9m



Point Loads B4 LL = 7.3 kN
DL = 3.7 kN

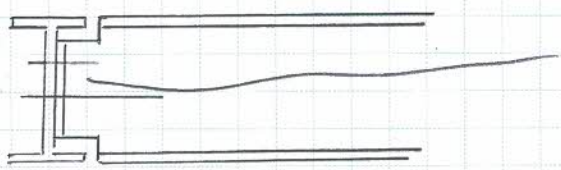
B5 LL = 8.3 kN
DL = 3.7 kN
+ 10.0 kN DL.

udl live load = 2.5 x 2.0 = 5.0 kN/m
dead " = 0.48 x 2.0 = 1.0 " "

refer pages 27 to 29

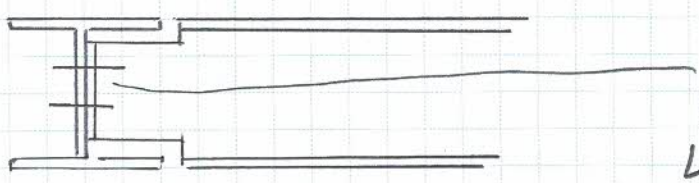
use 203 x 203 x 60 UC

B1/B5, B2/B5, B2/B4, B3/B4



10mm MS plate
6mm fw
4 NO M16 G.8 bolts

B4/B6, B5/B6



10mm MS plate
6mm fw
4 NO M16 G.8 bolts

CONNECTIONS

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~1~~ 27
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	5.900	0.000	0.000

Member Properties

Member 1
M ... ... 203x203 UC 60 [S 275]
A 76.37E-4 Ix 6127E-8 Iy 2068E-8 J 47.23E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
D1 UDLY -001.000 (kN/m)
L1 UDLY -005.000 (kN/m)
L1 PY -003.700 1.750 (kN,m)
D1 PY -013.700 1.750 (kN,m)
D1 PY -003.700 3.600 (kN,m)
L1 PY -007.300 3.600 (kN,m)

Member 1 - MasterFrame Pro Loads
D1 D 077.010 (kN/m³)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 0 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : [illegible] 28
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))									
Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.69	0.00	2	0.00	0.00	0.65	0.00

Member Forces (001 : Dead plus Live (Ultimate))						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	53.826	0.000	85.043	33.077
	2	0.000C	-47.330	0.000	@ 2.889	@ 2.889

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	53.826	0.000	2	0.000	47.330	0.000
Total	0.000	101.156	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	20.198	0.000	2	0.000	20.302	0.000
Total	0.000	40.500	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	35.561	0.000	2	0.000	30.907	0.000
Total	0.000	66.468	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

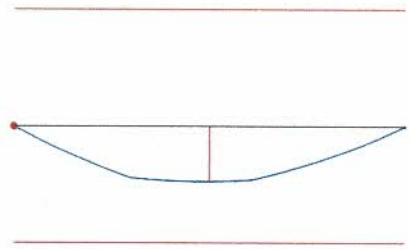
Job Ref : 13871
Sheet : /~~28~~ 29
Made by : cjc
Date : 25 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010                ( kN/m³ )
D1 UDLY -001.000                 ( kN/m )
L1 UDLY -005.000                 ( kN/m )
L1 PY   -003.700 1.750           ( kN,m )
D1 PY   -013.700 1.750           ( kN,m )
D1 PY   -003.700 3.600           ( kN,m )
L1 PY   -007.300 3.600           ( kN,m )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 / End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	53.826	0.000	85.043 @ 2.889	16.255 @ 2.889
	2	0.000C	-47.330	0.000		

Classification and Properties (BS 5950: 2000)

Section (59.95 kg/m)	203x203 UC 60 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	7.25, 17.11, 275, 0, 85.04, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	53.826 / 325.09 =	0.166	OK

Moment Capacity Check Mc

Fv/Pv	0.875 / 325.09 =	0.003	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 656.1≤1.2 x 275 x 584.68 =	180.428 kN.m	
MA/Mc	85.006 / 180.428 =	0.471	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x68+.5x85+.15x59)/85 ≥ 0.44	0.924	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 5.9 =	5.9 m	
λ = Le/ryy	5.9 / 5.2	113.46	OK
v = Fn (x,Le,ryy,λ)	14.042, 5.9, 5.2, 113.46	0.696	Table 19
λ_{LT}= u.v.λ.√βw	0.847 x 0.696 x 113.46√ 1	66.84	
pb = Fn (py,λ_{LT})	275, 66.84	196.19 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	656.1 x 196.19≤ 180.428 =	128.722 kN.m	
MA/(Mb/m_{LT})	0.924•85.043 / 128.722	0.611	OK

Deflection Check - Load Case 3

Deflection Limits (Internal Beams)	In-spanδ ≤ 5900/360 = 16.4 mm Live (Case 2)	9.59 mm	OK
	In-spanδ ≤ 5900/250 = 23.6 mm D+L (Case 3)	16.26 mm	OK

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

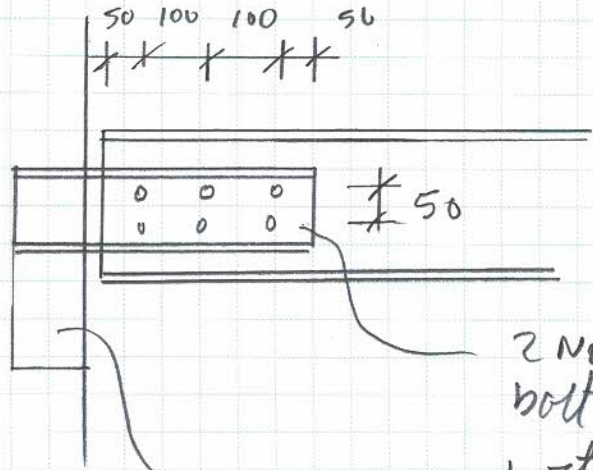
Project: ST PAULS CHURCH	Job Ref: 13871	Calculation Sheet No: 30
	Design by: CJC	Date: SEP 24

BEARINGS

B1, B3, B4 + B5

max reaction = 20.4 kN

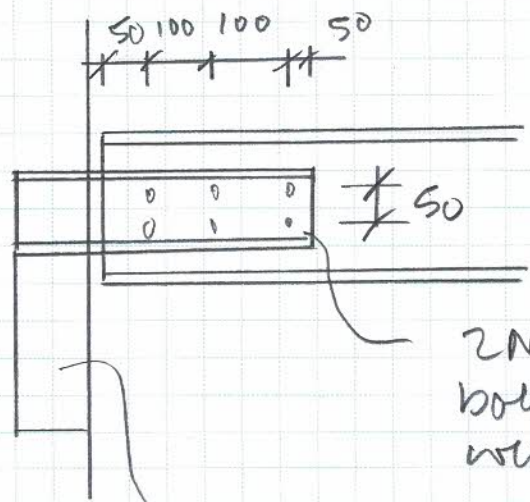
∴ provide support for beam thus



2 No 50 x 100 PFC bolt to web of UB with 6 No M12 bolts

300 x 100 x 150 deep concrete padstone

B6



2 No 50 x 100 PFC bolt to web of UC with 6 No M16 bolts

450 x 100 x 225 deep concrete padstone

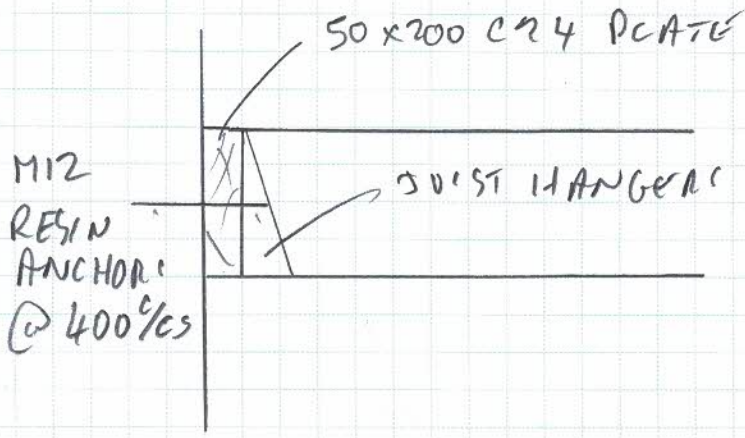
THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

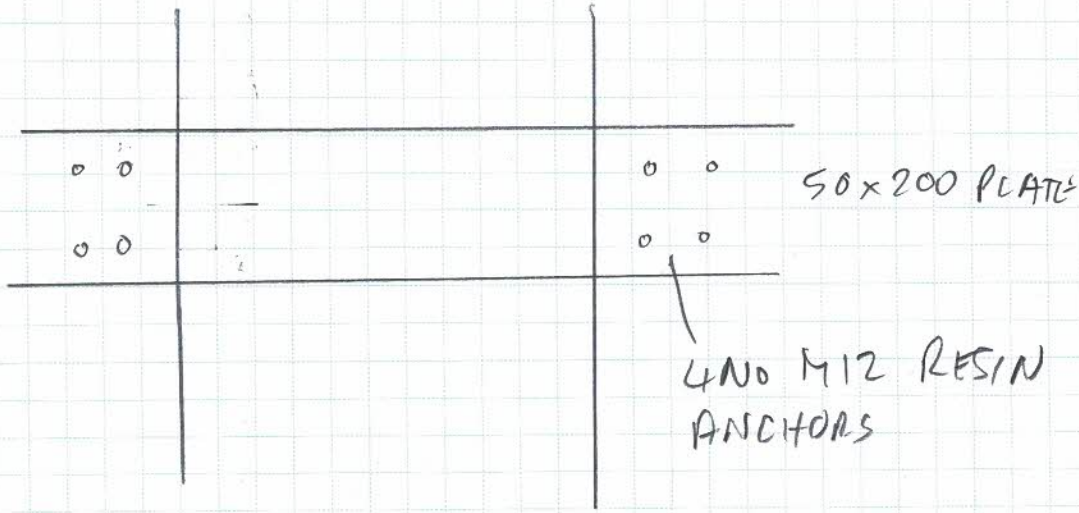
t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
ST PAULS CHURCH	13871	31
	Design by: CJC	Date: SEP 24

SUPPORT TO FLOOR JOISTS



DETAIL AT OPENINGS



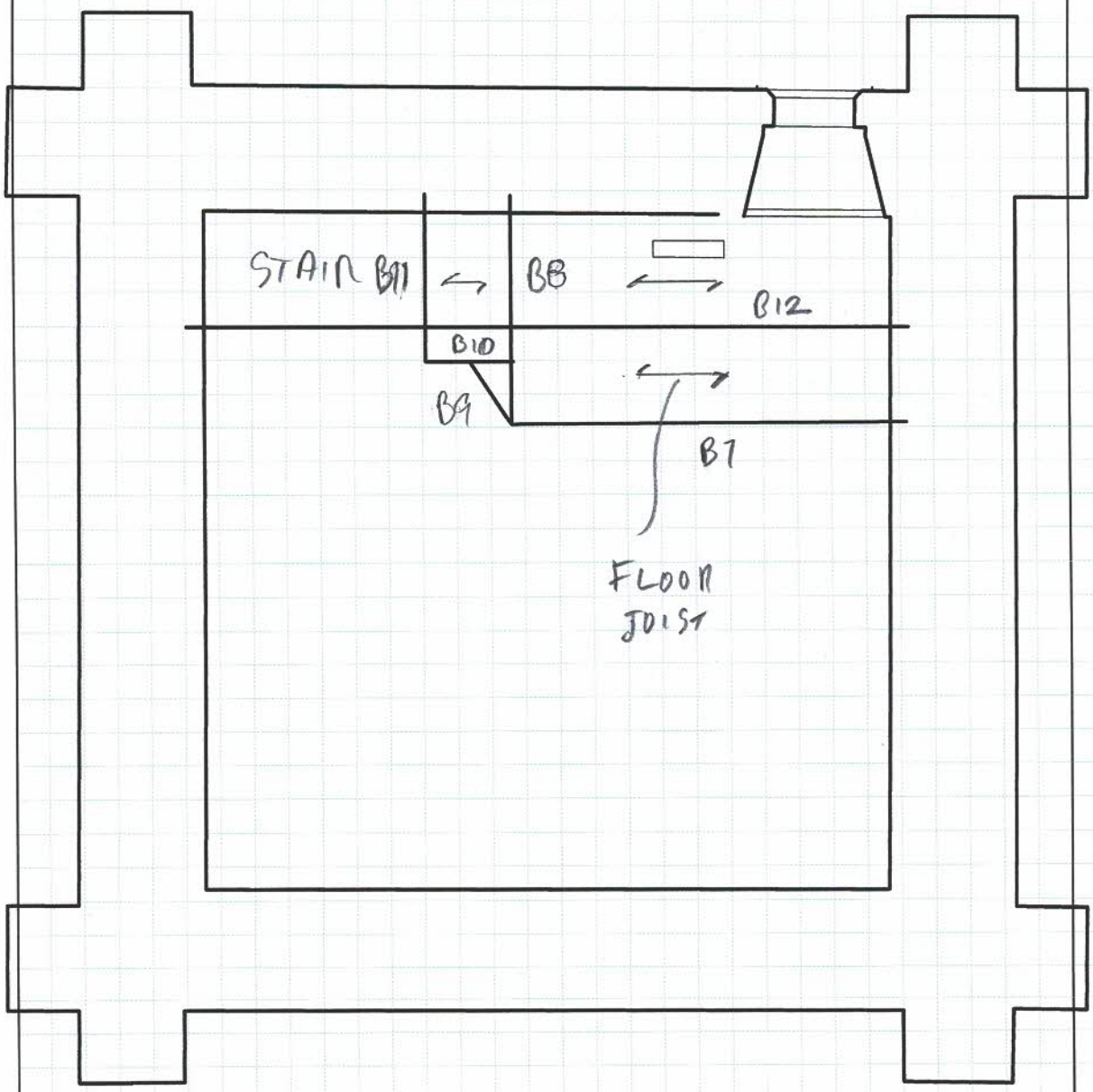
THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
ST PAULS CHURCH	13871	32
	Design by: CJC	Date: SEP 24

PLAN ON LOWER RINGING ROOM FLOOR



THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
ST PAULS CHURCH	13871	33
	Design by: CJC	Date: SEP 24

Span = 3.2 m (max)

live load = 2.5 kN/m²

dead " = 0.48 " / "

refer page 34

use 50 x 200 C24 @ 400 c/c

LOWER RINGING ROOM FLOOR JOIST 50x200 C24 @ 400 c/s

B7

span = 3.2 m

Is edge trimmer to floor

design for norm udl of 1.0 kN/m D+L

refer page 35

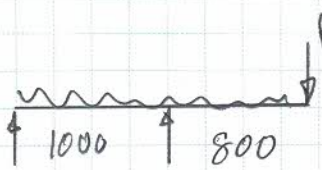
use 200 x 75 PFC

BEAM DESIGN

B7

200 x 75 PFC.

B8



Point load from B7 DL = 1.6 kN

LL = 2.0 kN

udl LL = 2.5 x 3.9/2 = 4.9 kN/m

DL = 0.48 x 3.9/2 = 0.9 " / "

refer pages 36 - 39

use 203 x 102 x 23 UB

B8

203x102 x23 UB

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 34
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterKey : Timber Design
Axial Load With Moment Design to BS 5268 : Part 2
Member TBL1Id 1 @ Level 1

Summary Design Data

Design Cases Covered	1.0 L1, 1.0 D1 + 1.0 L1
Deflection Cases Covered	1.0 L1, 1.0 D1 + 1.0 L1
Section Size	b = 50, h = 200, 200x50 in Strength Class C24
Section Properties (cm^2,cm^3,cm)	Area 100, Zx 333.3, Zy 83.3, rx 5.77, ry 1.44
Specification	1 : Internal use in continuously heated building Long term loading
Integrated Design Critical Case	: Dead Plus Live (Serviceability)
Member Details	F = 0.0 kN, L = 3.2 m, Lx = 3.2 m, Ly = 3.2 m, Lex = 1.0 Lx, Ley = 1.0 Ly Bearing length B 75, Distance to Bearing 150 mm

Grade and Admissible Stresses (Strength Class C24)

$\sigma_{mx.adm} = K_2.K_3.K_{7x}.K_8.\sigma_m$	1.00 x 1.00 x 1.05 x 1.00 x 7.50	7.84 N/mm²
$\sigma_{my.adm} = K_2.K_3.K_{7y}.K_8.\sigma_m$	1.00 x 1.00 x 1.17 x 1.00 x 7.50	8.78 N/mm²
$\sigma_{c.adm} = K_2.K_3.K_4.K_8.\sigma_c$	1.00 x 1.00 x 1.14 x 1.00 x 1.90	2.17 N/mm²
$\tau_{adm} = K_2.K_3.K_8.\tau$	1.00 x 1.00 x 1.00 x 0.71	0.71 N/mm²
$E = K_2.E_{mean}$	1.00 x 10800	10800.0 N/mm²

Axial Load with Moments Check

Critical Design Location	X = 1.600		
$\sigma_{mx.a} = Mx/Zx$	1.945 / 333.33≤ 7.84	5.84 N/mm²	OK
$\sigma_{mx}/\sigma_{mx.adm}$	5.84/7.84	0.745	OK

Shear and Bearing Check

Critical Design Location	X = 0.000		
$\tau_a = 1.5$ Fv / Area	1.5 x 2.432 / 100≤ 0.71	0.36 N/mm²	OK
$\sigma_{cax} = Fvx / (b.Bx)$	2.432 / (50 x 75)≤ 2.17	0.65 N/mm²	OK

Deflection Check (Shear Deflection Not Included)

Critical Load Case 003 : Dead Plus Live (Serviceability)

$\delta = \delta_m$	In-span 5.76≤ L/333	5.76 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

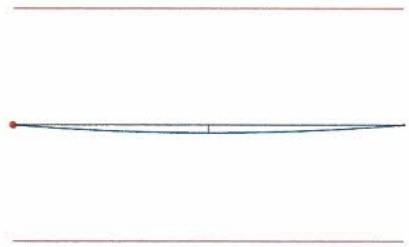
Job Ref : 13871
Sheet : 35
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³)
D1 UDLY -001.000               ( kN/m )
L1 UDLY -001.000               ( kN/m )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1 2	0.000C 0.000C	5.316 -5.316	0.000 0.000	4.253 @ 1.600	0.757 @ 1.600

Classification and Properties (BS 5950: 2000)

Section (23.4 kg/m)	200x75 PFC 23.4 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6, 25.17, 275, 0, 4.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	5.32 / 198 =	0.027	OK

Moment Capacity Check Mc

Fv/Pv	0.002 / 198 =	0	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 227≤1.2 x 275 x 196.3 =	62.425 kN.m	
MA/Mc	4.25 / 62.425 =	0.068	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x3+.5x4+.15x3)/4 ≥ 0.44	0.925	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 3.2 =	3.2 m	
λ = Le/ryy	3.2 / 2.38	134.45	OK
v = Fn (x,Le,ryy,λ)	14.8, 3.2, 2.38, 134.45	0.665	Table 19
λ_{LT}= u.v.λ.√βw	0.956 x 0.665 x 134.45√ 1	85.42	
pb = Fn (py,λ_{LT})	275, 85.42	152.95 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	227 x 152.95≤ 62.425 =	34.720 kN.m	
MA/(Mb/m_{LT})	0.925•4.25 / 34.72	0.113	OK

Deflection Check - Load Case 3

Deflection Limits (Internal Beams)	In-spanδ ≤ 3200/360 = 8.9 mm Live (Case 2)	0.34 mm	OK
	In-spanδ ≤ 3200/250 = 12.8 mm D+L (Case 3)	0.76 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 36
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	1.000	0.000	0.000
3	1.800	0.000	0.000				

Member Properties

Members 1-2
M ... ... 203x102 UB 23 [S 355]
A 29.39E-4 Ix 2106E-8 Iy 164.8E-8 J 7.02E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm²	Density kN/m³
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
L1 UDLY -004.900 (kN/m)
D1 UDLY -000.900 (kN/m)

Members 1-2 - MasterFrame Pro Loads
D1 D 077.010 (kN/m³)

Member 2
L1 UDLY -004.900 (kN/m)
D1 UDLY -000.900 (kN/m)
L1 PY -002.000 0.800 (kN,m)
D1 PY -001.600 0.800 (kN,m)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 1 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : 37
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))

Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	0.01	0.00	2	0.00	0.00	-0.02	0.00
3	0.00	-0.46	-0.04	0.46					

Member Forces (001 : Dead plus Live (Ultimate))

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	-2.657	0.000		0.082
	2	0.000C	-12.074	-7.365		@ 0.610
2	2	0.000C	12.973	-7.365		0.059
	3	0.000C	0.000	0.000		@ 0.323

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	-2.657	0.000	2	0.000	25.047	0.000
Total	0.000	22.390	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	-0.718	0.000	2	0.000	11.538	0.000
Total	0.000	10.820	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))

Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	-1.795	0.000	2	0.000	16.243	0.000
Total	0.000	14.447	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

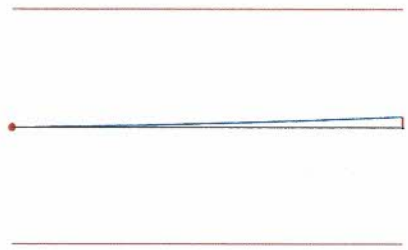
Job Ref : 13871
Sheet : ~~1832~~ 38
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³)
L1 UDLY -004.900               ( kN/m )
D1 UDLY -000.900               ( kN/m )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	-2.657	0.000		0.054
	2	0.000C	-12.074	-7.365		@ 0.600

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 355]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 355, 0, 7.37, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Moment Capacity Check Mc

Fv/Pv	12.074 / 233.721 =	0.052	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	355 x 234.1≤1.2 x 355 x 207.26 =	83.106 kN.m	
MA/Mc	-7.365 / 83.106 =	0.089	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x1+.5x3+.15x5)/7≥0.44	0.485	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 1 =	1 m	
λ = Le/ryy	1 / 2.37	42.19	OK
v = Fn (x,Le,ryy,λ)	22.482, 1, 2.37, 42.19	0.96	Table 19
λ_{LT}= u.v.λ.√βw	0.89 x 0.96 x 42.19√ 1	36.05	
pb = Fn (py,λ_{LT})	355, 36.05	337.34 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 337.34≤ 83.106 =	78.972 kN.m	
MA/(Mb/m_{LT})	0.485•7.365 / 78.972	0.045	OK

Deflection Check - Load Case 3

Deflection Limits (Internal Beams)	In-spanδ ≤ 1000/360 = 2.8 mm Live (Case 2)	0.03 mm	OK
	In-spanδ ≤ 1000/250 = 4 mm D+L (Case 3)	0.05 mm	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~1038~~ 39
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

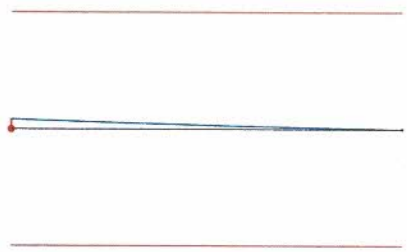
BB

Beam & Beam-Portion
Member SBL1Id 2 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010                ( kN/m³ )
L1 UDLY  -004.900                ( kN/m  )
D1 UDLY  -000.900                ( kN/m  )
L1 PY    -002.000 0.800          ( kN,m  )
D1 PY    -001.600 0.800          ( kN,m  )
```



Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
		Member Forces in Load Case 1 and Maximum Deflection from Load Case 3				
2	2 3	0.000C 0.000C	12.973 0.000	-7.365 0.000		@ 0.039 0.323

Classification and Properties (BS 5950: 2000)

Section (23.07 kg/m)	203x102 UB 23 [S 355]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.47, 31.37, 355, 0, 7.37, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Moment Capacity Check Mc

Fv/Pv	12.973 / 233.721 =	0.056	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	355 x 234.1≤1.2 x 355 x 207.26 =	83.106 kN.m	
MA/Mc	-7.365 / 83.106 =	0.089	OK

Equivalent Uniform Moment Factor mLT

m_{LT}	Cantilever	1	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 0.8 =	0.8 m	
λ = Le/ryy	0.8 / 2.37	33.76	OK
v = Fn (x,Le,ryy,λ)	22.482, 0.8, 2.37, 33.76	0.974	Table 19
λ_{LT}= u.v.λ.$\sqrt{\beta w}$	0.89 x 0.974 x 33.76$\sqrt{}$ 1	29.25	
pb = Fn (py,λ_{LT})	355, 29.25	355 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	234.1 x 355≤ 83.106 =	83.106 kN.m	
MA/(Mb/m_{LT})	1•7.365 / 83.106	0.089	OK

Deflection Check - Load Case 3

Cantileverδ ≤ Span/360	0.46≤ 800 / 360	0.46 mm	OK

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

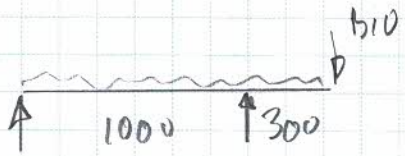
Project: ST PAULS CHURCH	Job Ref: 13871	Calculation Sheet No: 40
	Design by: CJC	Date: SEP 24

B9+10

By inspection use 200 x 75 PFC

B9+10

B11.



Point load from B10. LL = 0.5 kN (Non)
DL = 0.5 kN

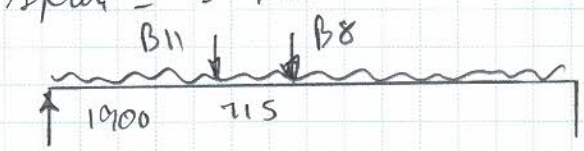
udl LL = 2.5 x 1.3 = 3.3 kN/m
DL = 0.48 x 1.3 = 0.6 " / "

refer pages 41 to 44
use 200 x 75 PFC

B11

200 x 75 PFC

B12.



Point loads
B8 LL = 11.5 kN
DL = 4.7 kN
B11 LL = 3.4 kN
DL = 1.4 kN

nom udl of 1.0 kN/m D+L

refer pages 45 - 47
use 203 x 203 x 46 UC

B12

203 x 203 x 46 UC

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~7040~~ 41
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	1.000	0.000	0.000
3	1.300	0.000	0.000				

Member Properties

Members 1-2
M ... ... 200x75 PFC 23.4 [S 355]
A 29.9E-4 Ix 1963E-8 Iy 170.0E-8 J 11.1E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm^2	Density kN/m^3
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
L1 UDLY -003.300 (kN/m)
D1 UDLY -000.600 (kN/m)

Members 1-2 - MasterFrame Pro Loads
D1 D 077.010 (kN/m^3)

Member 2
L1 UDLY -003.300 (kN/m)
D1 UDLY -000.600 (kN/m)
L1 PY -000.500 0.300 (kN,m)
D1 PY -000.500 0.300 (kN,m)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 1 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~#21~~ 42
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))									
Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	0.00	0.00	2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00					

Member Forces (001 : Dead plus Live (Ultimate))						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	2.481	0.000	0.478	0.000
	2	0.000C	-3.961	-0.740	@ 0.380	@ 0.000
2	2	0.000C	3.433	-0.740		0.000
	3	0.000C	0.000	0.000		@ 0.000

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	2.481	0.000	2	0.000	7.394	0.000
Total	0.000	9.875	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	1.352	0.000	2	0.000	3.438	0.000
Total	0.000	4.790	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	1.579	0.000	2	0.000	4.790	0.000
Total	0.000	6.369	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~42~~ 43
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
L1 UDLY -003.300               ( kN/m  )
D1 UDLY -000.600               ( kN/m  )
```

Member Forces in Load Case 1

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	2.481	0.000	0.478	0.000
	2	0.000C	-3.961	-0.740	@ 0.380	@ 0.323

Classification and Properties (BS 5950: 2000)

Section (23.4 kg/m)	200x75 PFC 23.4 [S 355]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6, 25.17, 355, 0, 0.74, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Moment Capacity Check Mc

Fv/Pv	3.961 / 255.6 =	0.015	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	355 x 227≤1.2 x 355 x 196.3 =	80.585 kN.m	
MA/Mc	-0.74 / 80.585 =	0.009	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x0+.15x0)/1 ≥ 0.44	0.59	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 1 =	1 m	
λ = Le/ryy	1 / 2.38	42.02	OK
v = Fn (x,Le,ryy,λ)	14.8, 1, 2.38, 42.02	0.919	Table 19
λ_{LT}= u.v.λ.√βw	0.956 x 0.919 x 42.02√ 1	36.91	
pb = Fn (py,λ_{LT})	355, 36.91	334.71 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	227 x 334.71≤ 80.585 =	75.978 kN.m	
MA/(Mb/m_{LT})	0.59•0.74 / 75.978	0.006	OK

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

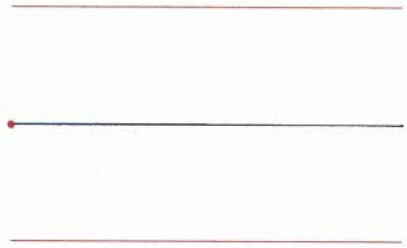
Job Ref : 13871
Sheet : ~~43~~ 44
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 2 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010              ( kN/m³ )
L1 UDLY  -003.300              ( kN/m  )
D1 UDLY  -000.600              ( kN/m  )
L1 PY    -000.500 0.300        ( kN,m  )
D1 PY    -000.500 0.300        ( kN,m  )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
2	2 3	0.000C 0.000C	3.433 0.000	-0.740 0.000		@ 0.000 0.323

Classification and Properties (BS 5950: 2000)

Section (23.4 kg/m)	200x75 PFC 23.4 [S 355]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6, 25.17, 355, 0, 0.74, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1		

Moment Capacity Check Mc

Fv/Pv	3.433 / 255.6 =	0.013	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	355 x 227≤1.2 x 355 x 196.3 =	80.585 kN.m	
MA/Mc	-0.74 / 80.585 =	0.009	OK

Equivalent Uniform Moment Factor mLT

m_{LT}	Cantilever	1	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 0.3 =	0.3 m	
λ = Le/ryy	0.3 / 2.38	12.61	OK
v = Fn (x,Le,ryy,λ)	14.8, 0.3, 2.38, 12.61	0.991	Table 19
λ_{LT}= u.v.λ.$\sqrt{\beta w}$	0.956 x 0.991 x 12.61$\sqrt{}$ 1	11.94	
pb = Fn (py,λ_{LT})	355, 11.94	355 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	227 x 355≤ 80.585 =	80.585 kN.m	
MA/(Mb/m_{LT})	1•0.74 / 80.585	0.009	OK

Torq Deflection Check - Load Case 0

The Cox Clifford Partnership
Cloud 4a408
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Job Ref : 13871
Sheet : 45
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

MasterFrame Data File
Loading Cases and Load Combination

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D1	Dead Load
Load Group L1	Live Load

Load Case 001 : Dead plus Live (Ultimate)
Load Combination + 1.00 UT + 1.40 D1 + 1.60 L1

Load Case 002 : Live Only (Serviceability)
Load Combination + 1.00 UT + 1.00 L1

Load Case 003 : Dead Plus Live (Serviceability)
Load Combination + 1.00 UT + 1.00 D1 + 1.00 L1

The Nodal Co-ordinates

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000	2	5.900	0.000	0.000

Member Properties

Member 1
M ... ... 203x203 UC 46 [S 275]
A 58.73E-4 Ix 4571E-8 Iy 1551E-8 J 22.15E-8
E 205.0E6 G 78.85E6

Member Loading

Member Self Weight Density Load Included in Load Group D1, defined by Modulus of Elasticity

E kN/mm^2	Density kN/m^3
>= 200.00	77.01
>= 20.00	24.00
>= 2.00	10.00

Member 1
D1 UDLY -001.000 (kN/m)
L1 UDLY -001.000 (kN/m)
L1 PY -003.400 1.900 (kN,m)
D1 PY -001.400 1.900 (kN,m)
D1 PY -004.700 2.615 (kN,m)
L1 PY -011.500 2.615 (kN,m)

Member 1 - MasterFrame Pro Loads
D1 D 077.010 (kN/m^3)

Nodal Loading and Support Conditions

NODE 1
UT Rs 1 1 1 1 0 0
NODE 2
UT Rs 0 1 0 0 0 0

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

Job Ref : 13871
Sheet : ~~45~~ 46
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Nodal Deflections Selected Cases (003 : Dead Plus Live (Serviceability))									
Node	Nodal Def. (mm and Degrees)				Node	Nodal Def. (mm and Degrees)			
	δ X →	δ Y ↑	ΦZ ↗	δ XY		δ X →	δ Y ↑	ΦZ ↗	δ XY
1	0.00	0.00	-0.31	0.00	2	0.00	0.00	0.29	0.00

Member Forces (001 : Dead plus Live (Ultimate))						
Member No.	Node End1 End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	30.204	0.000	60.619	15.269
	2	0.000C	-24.734	0.000	@ 2.615	@ 2.827

Members ordered by parts of physical members. Member numbers in Italic are part of the preceeding regular member number.

Support Reactions Selected Cases (001 : Dead plus Live (Ultimate))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	30.204	0.000	2	0.000	24.734	0.000
Total	0.000	54.938	0.000				

Support Reactions Selected Cases (002 : Live Only (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	11.658	0.000	2	0.000	9.142	0.000
Total	0.000	20.800	0.000				

Support Reactions Selected Cases (003 : Dead Plus Live (Serviceability))							
Node	Support Reactions (kN and kN.m)			Node	Support Reactions (kN and kN.m)		
	Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)		Rx→ (kN)	Ry↑ (kN)	Mz↗ (kN.m)
1	0.000	19.909	0.000	2	0.000	16.361	0.000
Total	0.000	36.270	0.000				

The Cox Clifford Partnership
11 Place Farm House
Place Farm Way, Monks Risborough
Bucks., HP27 9JQ
Tel: (01844) 274472

Cloud 4a408

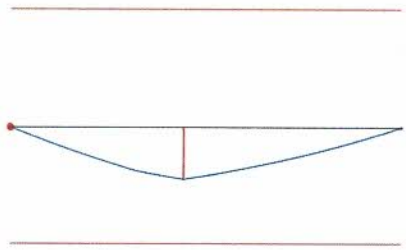
Job Ref : 13871
Sheet : 47
Made by : cjc
Date : 26 September 2024 / Ver. 2024.08.15
Checked :
Approved :

Beam & Beam-Portion
Member SBL1Id 1 @ Level 1 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D1 + 1.6 L1

```
D1 D      077.010                ( kN/m³ )
D1 UDLY -001.000                 ( kN/m  )
L1 UDLY -001.000                 ( kN/m  )
L1 PY   -003.400 1.900           ( kN,m  )
D1 PY   -001.400 1.900           ( kN,m  )
D1 PY   -004.700 2.615           ( kN,m  )
L1 PY   -011.500 2.615           ( kN,m  )
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 / End2	Axial Force (kN)	Shear Force (kN)	Bending Moment (kN.m)	Maximum Moment (kN.m @ m)	Maximum Deflection (mm @ m)
1	1	0.000C	30.204	0.000	60.619 @ 2.615	13.458 @ 2.827
	2	0.000C	-24.734	0.000		

Classification and Properties (BS 5950: 2000)

Section (46.1 kg/m)	203x203 UC 46 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	9.25, 22.33, 275, 0, 60.61, 0	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1		

Shear Capacity Check

Fvx/Pvx	30.204 / 241.402 =	0.125	OK

Moment Capacity Check Mc

Fv/Pv	12.805 / 241.402 =	0.053	Low Shear
Mc = py.Sxx≤1.2 py.Zxx	275 x 497.4≤1.2 x 275 x 449.87 =	136.785 kN.m	
MA/Mc	60.614 / 136.785 =	0.443	OK

Equivalent Uniform Moment Factor mLT

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x40+.5x56+.15x32)/61 ≥ 0.44	0.845	Table 18

Lateral Buckling Check Mb

Le = 1.0 L	1 x 5.9 =	5.9 m	
λ = Le/ryy	5.9 / 5.14	114.79	OK
v = Fn (x,Le,ryy,λ)	17.71, 5.9, 5.14, 114.79	0.754	Table 19
λ_{LT}= u.v.λ.√βw	0.847 x 0.754 x 114.79√ 1	73.26	
pb = Fn (py,λ_{LT})	275, 73.26	180.54 N/mm²	Table 16
Mb = Sxx.pb≤ Mc	497.4 x 180.54≤ 136.785 =	89.802 kN.m	
MA/(Mb/m_{LT})	0.845•60.616 / 89.802	0.570	OK

Deflection Check - Load Case 3

Deflection Limits (Internal Beams)	In-spanδ ≤ 5900/360 = 16.4 mm Live (Case 2)	8.14 mm	OK
	In-spanδ ≤ 5900/250 = 23.6 mm D+L (Case 3)	13.46 mm	OK

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

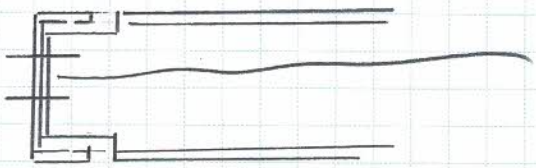
11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project:	Job Ref:	Calculation Sheet No:
ST PAULS CHURCH.	13871	4B
	Design by: CJC	Date: SEP 24

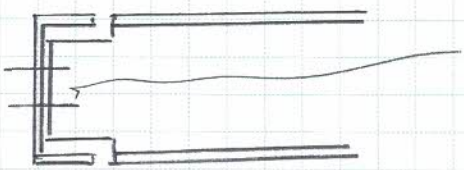
CONNECTIONS

B7/B8



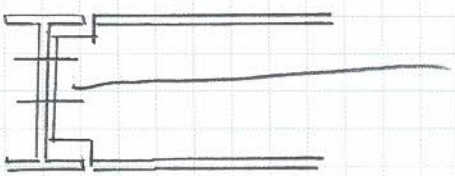
10mm MS plate
6mm fw
M12 8.8 bolts

B10/B11



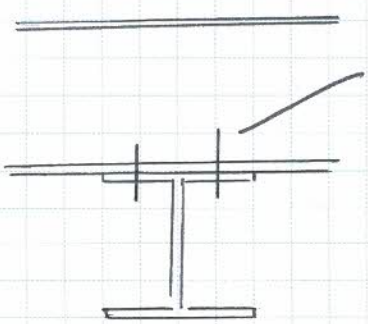
10mm MS plate
6mm fw
M12 8.8 bolts

B10/B8



10mm MS plate
6mm fw
M12 8.8 bolts

B8/B12, B11/B12



M12 8.8 bolts.

THE COX CLIFFORD PARTNERSHIP
CONSULTING STRUCTURAL ENGINEERS

11 Place Farm House
Place Farm Way
Monks Risborough
Buckinghamshire HP27 9JQ

t 01844 274472
f 01844 273051
e mail@cox-clifford.co.uk
www.cox-clifford.co.uk

Project: ST PAULS CHURCH	Job Ref: 13871	Calculation Sheet No: 49
	Design by: CJC	Date: SEP 24

BEARINGS

B6

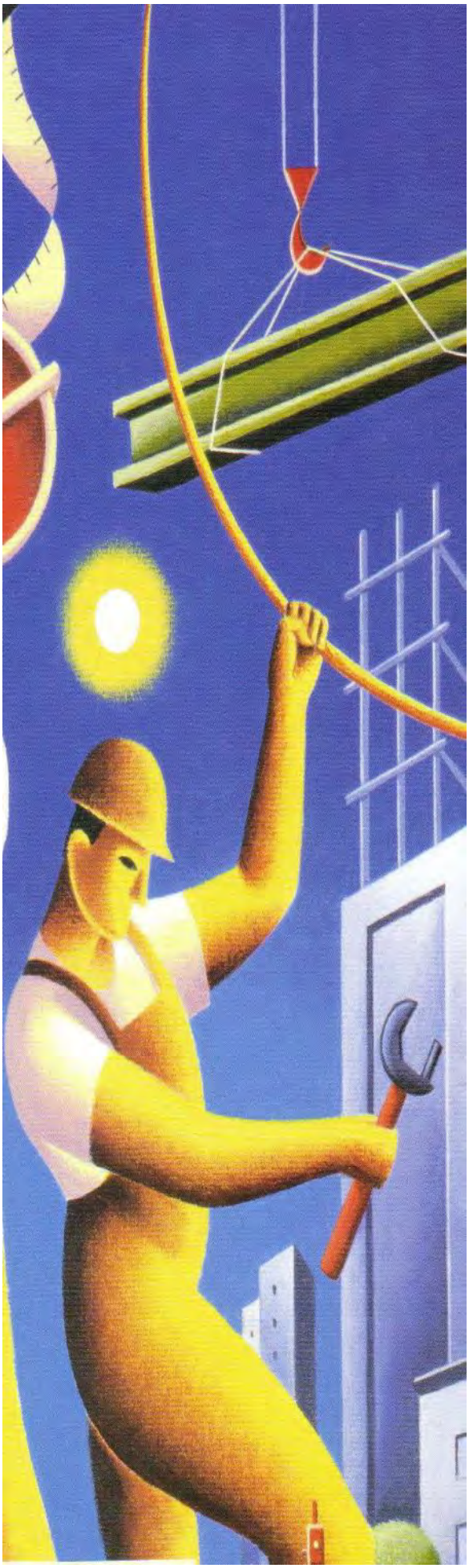
as B3, 4 + 5 on page 30

B7, 8 + 11

use same as above but no packstone req'd

SUPPORT TO FLOOR JOISTS

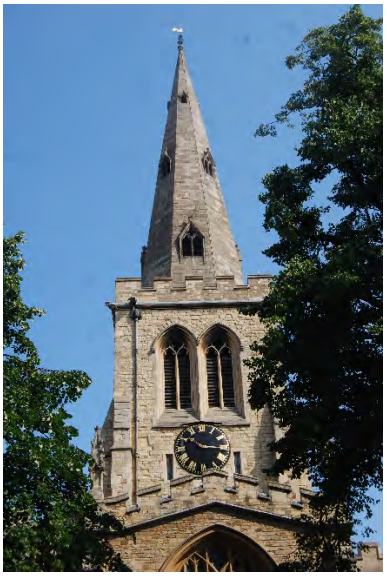
· as page 31



STRUCTURAL REPORT

Client: St Paul's Church Bedford, PCC

Project: Structural Inspection of the Tower



Job No. : 24/1218

Date : September 2020

Engineer : **A DEMPSTER BSc CEng MIStructE MICE**

WARD COLE
consulting engineers

Unit 16 Byron Business Centre
Duke Street
Hucknall
NG15 7HP
Tel 0115 950 4645

REPORT OF A STRUCTURAL INSPECTION OF THE TOWER AT THE CHURCH OF ST PAUL, BEDFORD

1.00 INTRODUCTION:

1.01 At the request of Steve Stanford, on behalf of the PCC, the church was visited on Tuesday 11th August 2020 for the purposes of carrying out a visual structural inspection of the tower, both internally and externally. It is proposed to rehang the existing twelve bells for full circle ringing at one level in a new metal frame and augment them by adding two bells at the same level to attain lighter diatonic rings of eight and ten bells. Advice had been sought on the feasibility of these proposals.

1.02 Details within this report are confined to the structural aspects as detailed in paragraph 1.01 above. The report does not constitute a full building survey and excludes certain items such as those listed below.

a) The decorative condition of the tower.

b) The condition of the tower with respect to dampness, dry rot, timber infestation and the like.

c) The condition of services.

d) The condition of roof, floor, wall and ceiling coverings.

1.03 No testing of materials, monitoring, breaking out or long-term investigation has been undertaken. We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the structure is free from defect.

1.04 The central tower and octagonal spire are of coursed stone masonry construction. The tower was originally constructed in the 14th Century and the spire was rebuilt in 1868. The church is listed Grade I and a copy of the listing is given below.

“C14, steeple and transepts C19 (steeple rebuilt 1868 by Palgrave and Street). A few good brasses and monuments. John Wesley preached his "Great Assize" sermon here in 1758. The largest and most prominent church in Bedford.”

2.00 EXTERNAL OBSERVATIONS:

The following observations were carried out from church roof level.

2.01 North Elevation Wall:

This wall contains two large louvre window openings at belfry level, with a clock face below. To each side of the clock face are two small, glazed window openings giving light to the ringing chamber. There is a door opening to the east of the elevation giving access into the ringing chamber from the north transept roof.

Although there is evidence of minor weathering, the masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement.

2.02 West Elevation Wall:

This wall contains two large louvre window openings at belfry level, with a clock face below. To each side of the clock face are two small, glazed window openings giving light to the ringing chamber.

Although there is evidence of minor weathering, the masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement.

2.02 South Elevation Wall:

This wall contains two large louvre window openings at belfry level, with a clock face below. To each side of the clock face are two small, glazed window openings giving light to the ringing chamber.

Although there is evidence of minor weathering, the masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement.

2.02 East Elevation Wall:

This wall contains two large louvre window openings at belfry level, with a clock face below. To each side of the clock face are two small, glazed window openings giving light to the ringing chamber.

Although there is evidence of minor weathering, the masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement.

3.00 INTERNAL OBSERVATIONS:

3.01 Ringing Chamber:

The walls are of exposed masonry construction which has been painted in the past. They are partly obscured by partial timber panelling close to floor level, a number of peal boards and a clock case adjacent to the north elevation wall.

Just below ceiling level, there is a section of brickwork, where minor horizontal cracking has occurred to some of the bed joints. The writer commented on this following a site visit to the church on 20th August 2003 and recommended that the cracking should be monitored for ongoing movement. This cracking does not appear to have worsened significantly since then.

The remaining exposed masonry appears to be in generally fair condition, with no evidence of any significant cracking, recent or ongoing movement.

3.02 Sound Deadening Chamber (Between the Ringing Chamber and the Belfry):

The walls at this level are of exposed stone masonry construction which has been painted at some time in the past. Close to the corners in each of the elevations are two stone masonry corbels which support the existing lower timber bell frame foundation beams. Following movement noted to these corbels with the bells ringing full circle in, and prior to, 2003, some of them have been secured to the main elevations with resin anchored dowel bars.

The masonry which is exposed appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement.

3.03 Belfry:

The walls at this level are of exposed stone masonry construction which has been painted at some time in the past. The masonry appears to be in generally fair condition, consistent with its age, with no evidence of any significant cracking, recent or ongoing movement.

There is a ring of twelve bells at this level, tenor weight 28cwt 3qr 6lb, hung on two tiers for full circle ringing. The heaviest eight bells are hung at a lower level in a timber frame supported on corbels as noted above. The lightest four bells are hung at higher level in a metal frame supported on steel foundation beams which are built into the tower walls.

4.00 OBSERVATIONS WITH THE BELLS RINGING FULL CIRCLE:

4.01 Due to restrictions imposed as a result of the Coronavirus Pandemic, it was not possible for all the bells to be rung full circle during the site visit. Some of the heaviest bells, swinging in each direction, were rung, singly and together so that the effects of this could be observed on the tower walls. It can be confirmed that, in all cases, there was no evidence of any significant tower sway, nor of any significant differential movement between the bell frame members and the tower walls.

During the writer's previous visit in 2003, the eight heaviest bells were rung full circle and, at that time, although some movement of the corbels supporting the lower bell frame foundation beams was noted, there was no evidence of any significant tower sway. The loose corbels were stabilised in accordance with recommendations made at the time.

5.00 PROPOSALS:

5.01 It is proposed to rehang the existing twelve bells for full circle ringing, at one level, in a new metal frame supported on a grillage of steel foundation beams built into the tower walls. At the same time, it is proposed to augment them by adding two bells, an additional treble and a flat sixth, for full circle ringing to achieve lighter diatonic rings of eight and ten bells. Plans of these proposals have been submitted by Whites of Appleton Ltd. and John Taylor and Company. These plans are shown in Appendix A to this report.

The primary foundation beams will be positioned at a level just above the tops of the window openings in the ringing chamber, avoiding placing them immediately above the window openings themselves.

6.00 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS:

6.01 Externally, although some minor weathering is evident, the tower masonry appears to be in generally fair condition, with no evidence of any significant cracking, recent or ongoing movement or other structural distress.

6.02 Internally, with the exception of the minor horizontal cracking to the brickwork coursing just below ringing chamber ceiling level, there is no evidence of any significant recent or ongoing movement or other structural distress.

It was suggested, following the inspection carried out in August 2003, that the horizontal cracking noted above may be due to corrosion of embedded ironwork in the brickwork. This could be investigated when the pockets are formed for the new bell frame foundation beams and any necessary remedial work can be carried out.

6.03 Subject to 6.04 below, it is considered that both the proposals put forward by Whites of Appleton Ltd. and John Taylor and Company are viable and will not cause any adverse effects on the tower structure. There is no evidence of any significant tower sway when the existing twelve bells are rung full circle and, in view of the fact that the new installation will be lower in the tower, the horizontal effects of the bells ringing will actually reduce.

6.04 It is of paramount importance that no differential movement is allowed to occur between the ends of the new steel bell frame foundation beams and the walls into which they are built. It is therefore recommended that the foundation beam ends are built into pockets formed in the walls of the tower and surrounded with good quality, well compacted, ordinary Portland cement concrete mixed with just enough water to make it workable. Under no circumstances should lime based concrete or lime mortared masonry be used to surround the foundation beam ends. It should be noted that ordinary Portland cement concrete inhibits corrosion and also allows a good load transfer between the ends of the foundation beams and the tower walls when the bells are rung full circle.

FOR AND ON BEHALF OF WARD COLE

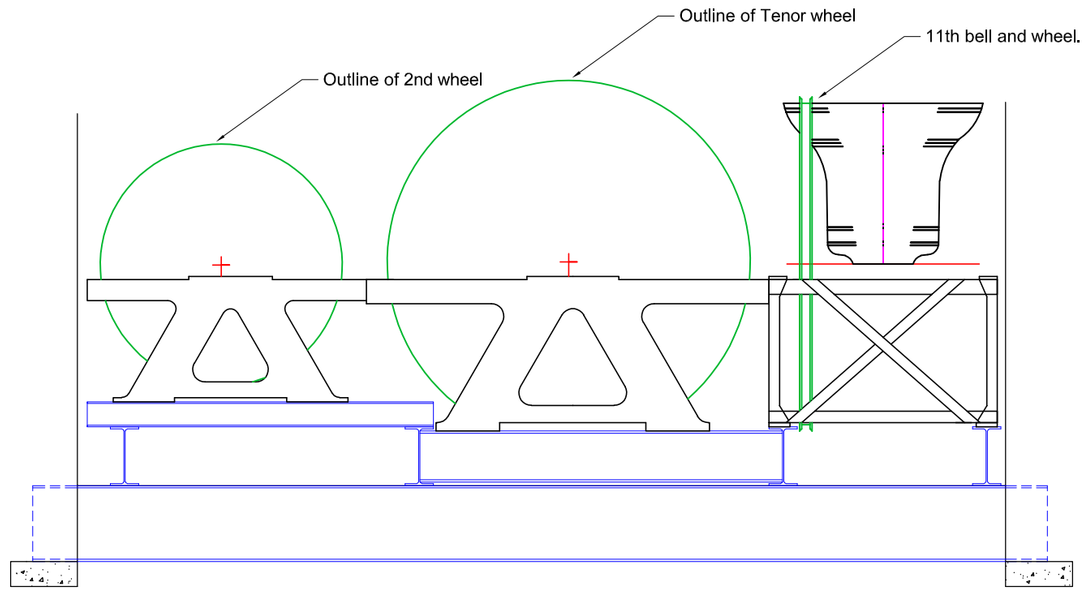
A DEMPSTER, B.Sc., C.Eng. M.I.Struct.E. M.I.C.E.

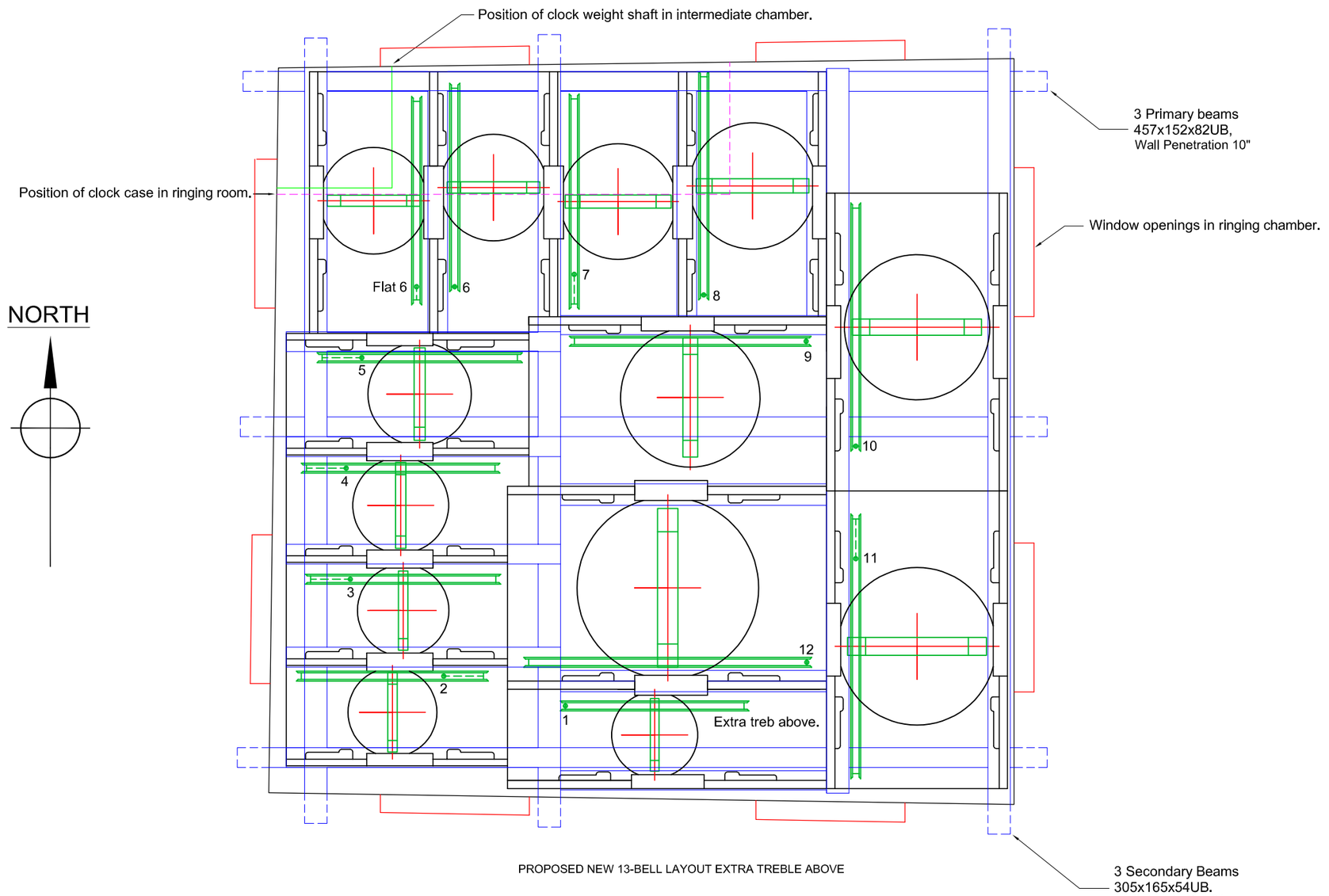
APPENDIX A

Proposed Bell Frame Details

Whites of Appleton Ltd.

John Taylor and Co.





NORTH

PROPOSED NEW 13-BELL LAYOUT EXTRA TREBLE ABOVE

Note:
All dimensions must be checked on site
and not scaled from this drawing

All modifications on CAD only

Client

Bedford.

Drawing Title

Bell Frame
Proposals

Whites of Appleton Ltd.
Church Bellhangers
Appleton Abingdon
Oxon OX13 5JJ
Tel: 01865-862549
Fax: 01865-864969

SCALE

NOT TO SCALE

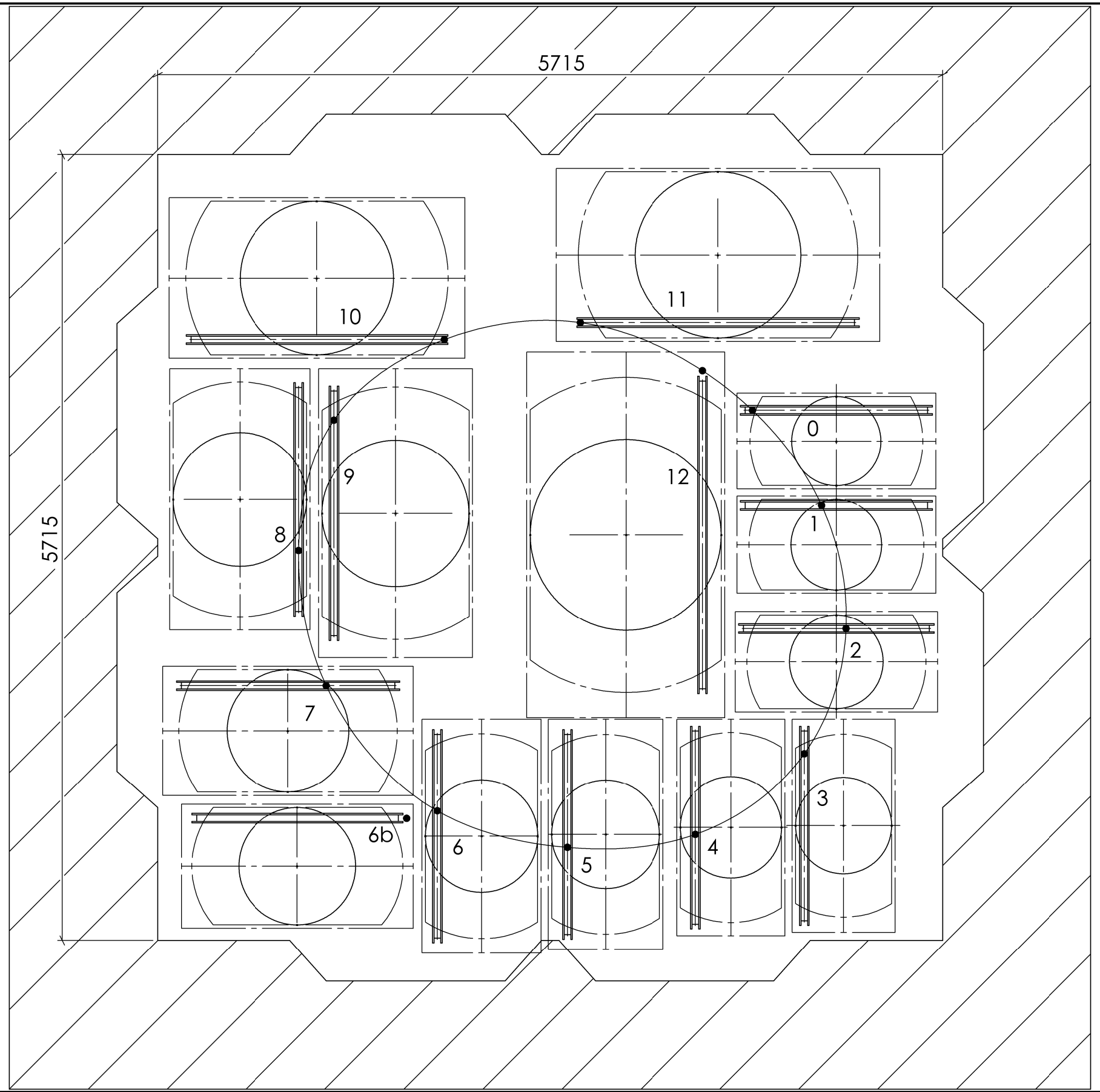
DATE

10/09/2020

DRAWN

J.A.H

Dwg. No.



NOTES

3 No. PRIMARY BEAMS RUNING NORTH - SOUTH DUE TO WINDOW OPENINGS HIGH IN RINGING CHAMBER

4 No. SECONDARY BEAMS RUNNING EAST - WEST

CLOCK TO MOVE TO CORNER BEHIND 10TH ROPE ON NORTH WALL.

	BELL MASS (kg)	
Bell No.	E-W	N-S
0	254	
1	259	
2	260	
3		293
4		310
5		359
6		367
6b	371	
7	424	
8		559
9		735
10	777	
11	996	
12		1463
TOTAL	3341	4087

JOHN TAYLOR & Co.

The Bellfoundry, Freehold Street, Loughborough LE11 1AR
Tel: (01509) 212241 Fax: (01509) 263305

Email: office@taylorbells.co.uk

DO NOT SCALE DRAWING

WEIGHT:

SCALE:1:33.33

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:

DEDICATION/LOCATION

BEDFORD ST PAUL

DATE 4/9/20

DRAWN MJS

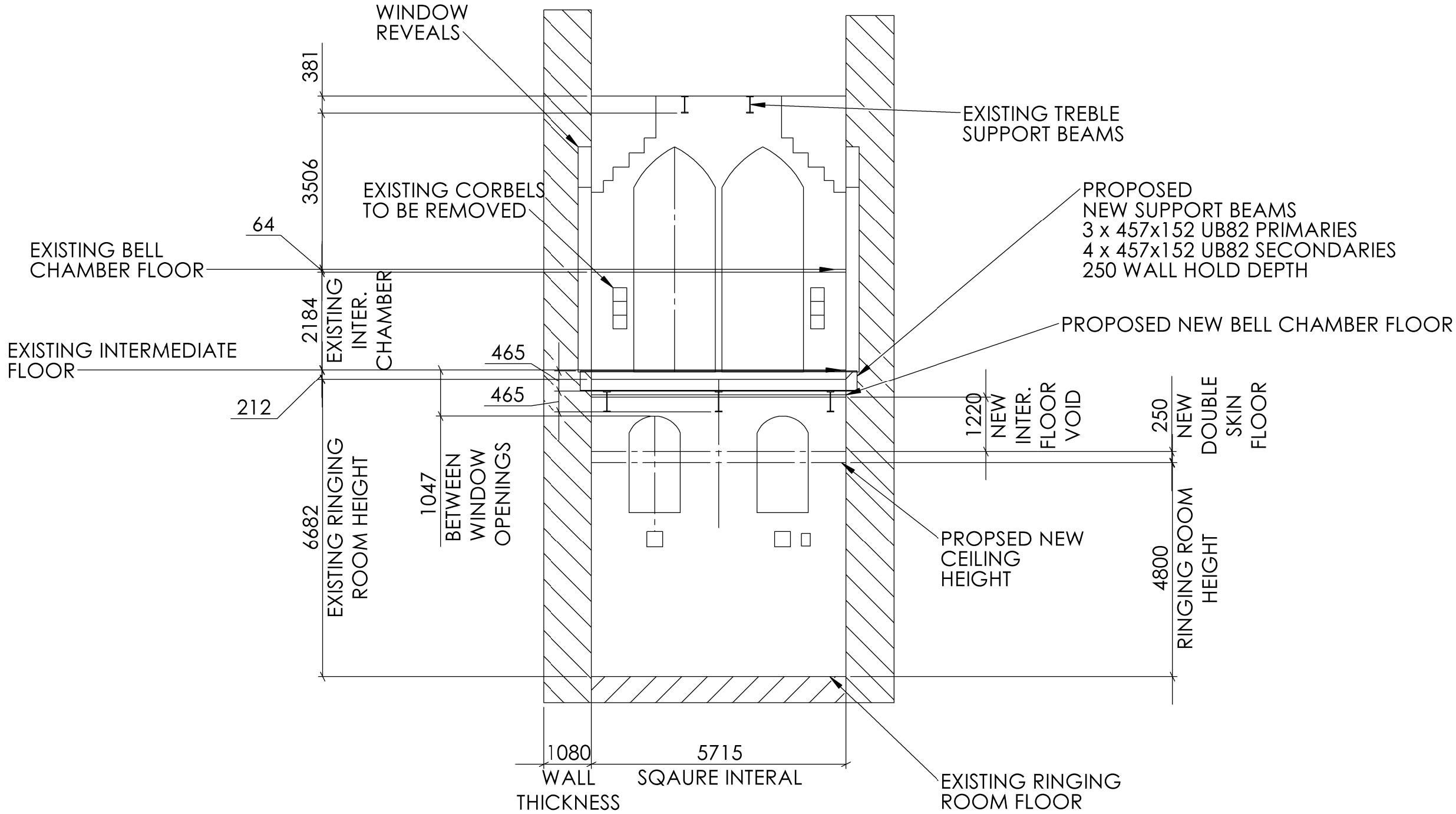
SHEET 1 OF 1

TITLE:

LAYOUT FOR 12 + 2

DWG NO.

A3



JOHN TAYLOR & Co.

The Bellfoundry, Freehold Street, Loughborough LE11 1AR
Tel: (01509) 212241 Fax: (01509) 263305
Email: office@taylorbells.co.uk

DO NOT SCALE DRAWING

WEIGHT:

SCALE:1:100

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:

DEDICATION/LOCATION
CHURCH OF ST PAUL - BEDFORD

DATE 22/9/20
DRAWN MJS

SHEET 1 OF 1

TITLE:
CENTRAL TOWER ELEVATION

DWG NO.
A3

5 Birtley Courtyard
Bramley
Surrey
GU5 0LA

Tel: 01483 548784
Email:
admin@hockleyanddawson.co.uk

HOCKLEY & DAWSON
CONSULTING ENGINEERS

21405
St Pauls
St Pauls Square
Bedford

Cracking to Tower.

Circumferential cracking is evident in the ringing chamber of the tower at high level approximately 4 courses below the ringing chamber ceiling. Cracking follows the entire internal perimeter of the square tower and expresses itself between over two and three bed joints in various locations. The tower is constructed with brick and stone masonry forming substantial, solid thick walls. The masonry is bonded with a hard mortar which may or may not be cementitious. It will need to be laboratory tested to establish its constituents and strength.
There is no visible cracking to the external stone masonry.

A small area of brickwork immediately adjacent to the ladder leading to the sounding chamber was removed between the two horizontal bed joint cracks to reveal, as anticipated, rusting iron straps, built in we assume as bed joint reinforcement.
These are now decaying and expanding thus causing the bed joint deformation.
The straps are laid in the bed joints in slightly different depths from the internal face of the wall. The opening up was not expanded to establish if there are any straps beyond those located as this would require a much larger hole and some form of temporary work it was felt to be beyond the current scope of the investigations.
Given but the straps appear to be only on the inside face of the tower along with the distress caused by them, which in normal circumstances would be considered to be the dry face and therefore at least likely to be sufficiently damp to cause decay to the iron or ferrous elements we feel it is

not prudent to ignore the defect but to include the careful removal of the straps as part of the forthcoming tower works.

This would need to be carried out in an under-pinning type sequence to ensure that the tower remain stable throughout.

It would be prudent with the proper equipment in place to enlarge the hole and investigate if there are further straps deeper in the masonry.

Initial opening up with the removal of one break showing the decaying strap in the stop bed joint.

Expanding opening up with asddditional brick removed from the course below showing the strap in the lower bed joint

5 Birtley Courtyard
Bramley
Surrey
GU5 0LA

Tel: 01483 548784
Email:
admin@hockleyanddawson.co.uk

Photograph of a section of the strap remove from the bed joint.

Conclusion.

The decay of the ferrous straps is causing distress to the masonry. The distress will become progressive as the straps decay and expand.

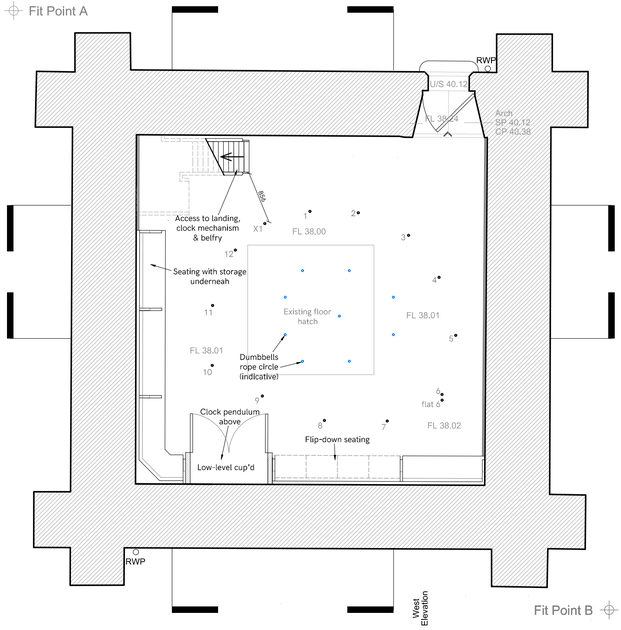
It is assumed that the straps were installed to enhance the lateral restraint of the tower.

We feel that the straps should be removed using an under-pinning type sequence and replaced with plain brickwork and mortar.

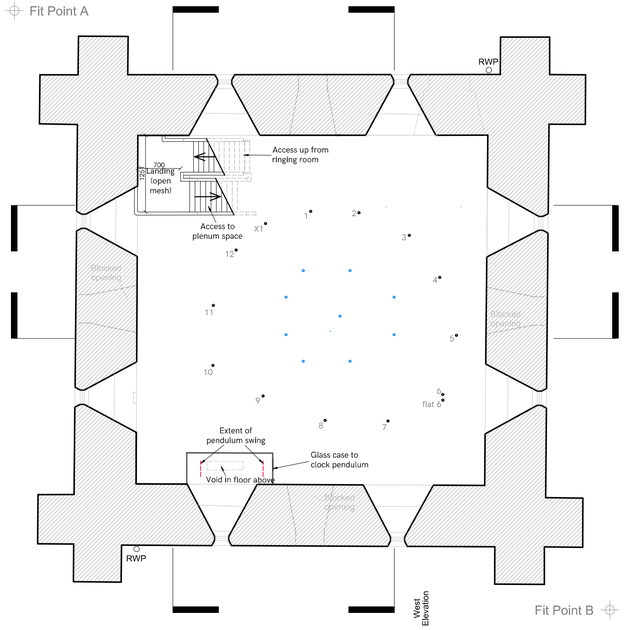
The proposed lowered ceiling can be detailed to provide additional lateral restraint to the tower in both directions thus nullifying the need for the straps if in fact there was the need in the first place.

Hockley and Dawson

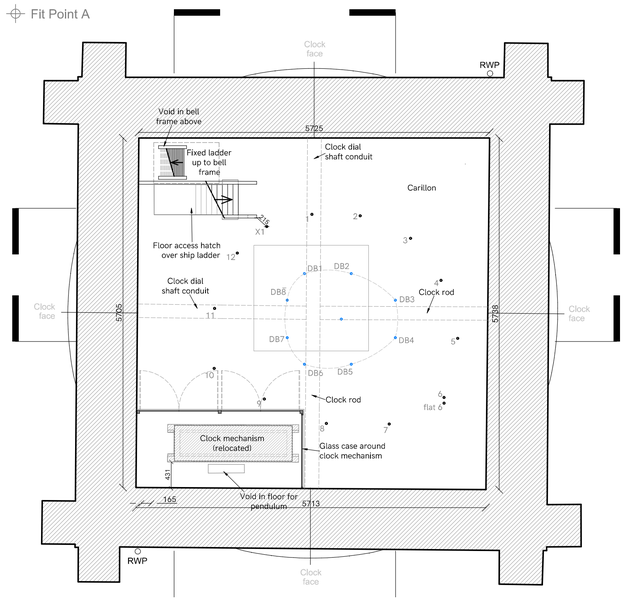
July 2022.



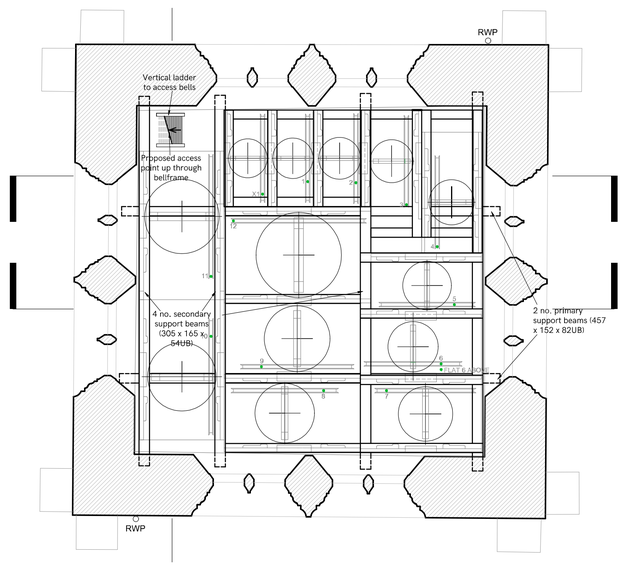
1:50 RINGING ROOM LOWER FLOOR PLAN AS PROPOSED (A-A)



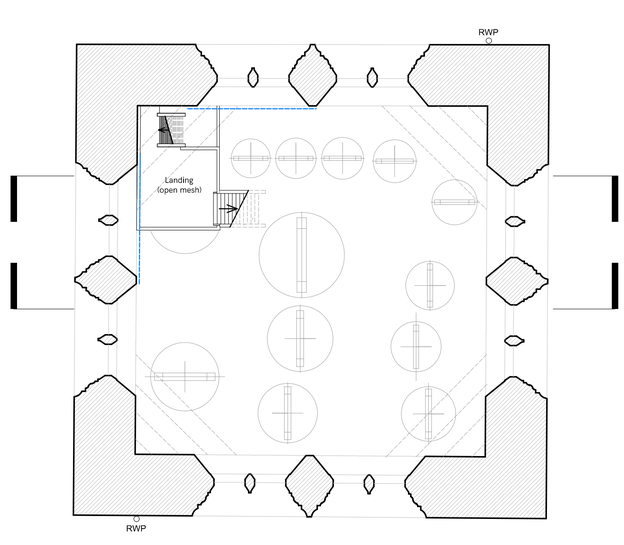
1:50 RINGING ROOM UPPER FLOOR PLAN AS PROPOSED (B-B)



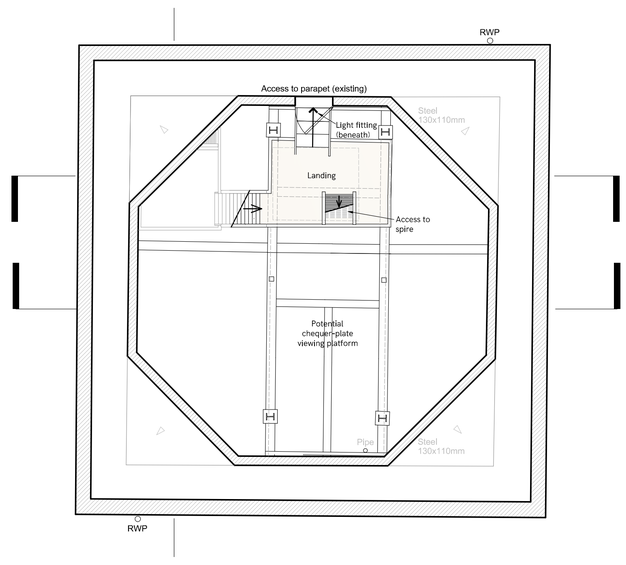
1:50 PLENUM FLOOR PLAN AS PROPOSED (C-C)



1:50 BELFRY LOWER FLOOR PLAN AS PROPOSED (D-D)



1:50 BELFRY FLOOR PLAN AS PROPOSED (E-E)



1:50 BELFRY UPPER FLOOR PLAN AS PROPOSED (F-F)

A1

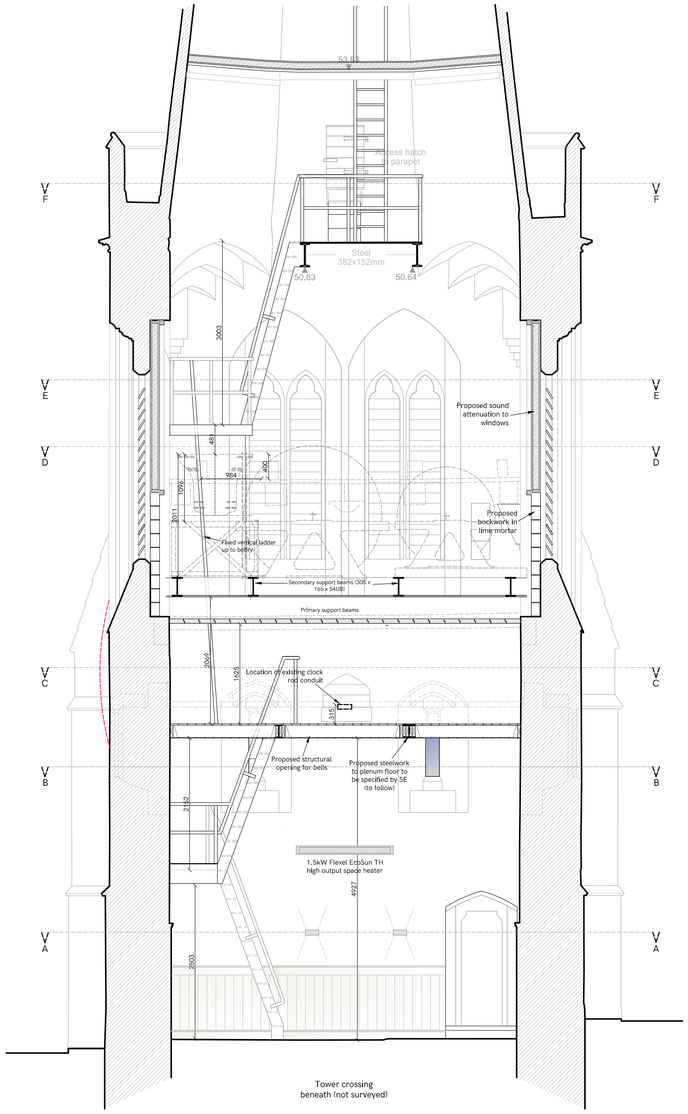
ST. PAUL'S CHURCH, BEDFORD - TOWER

OCTOBER 2025

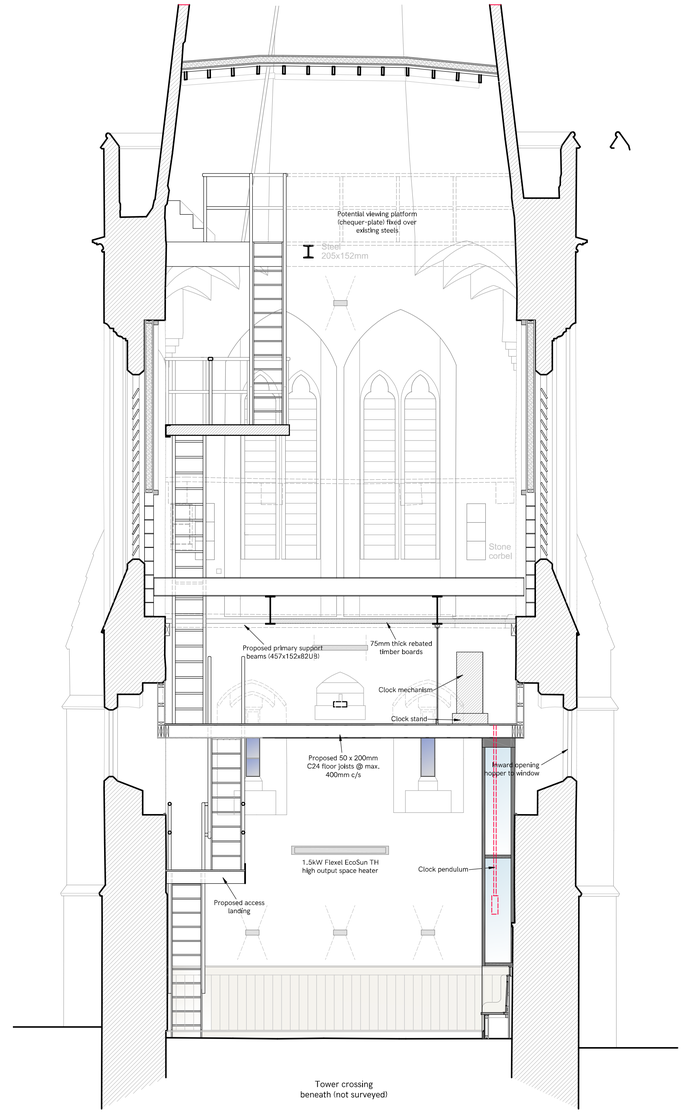
1077/49-014G

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK

mdp ARCHITECTS



1:50 NORTH SECTION/ELEVATION AS PROPOSED



1:50 EAST SECTION/ELEVATION AS PROPOSED

A1

ST. PAUL'S CHURCH, BEDFORD - TOWER

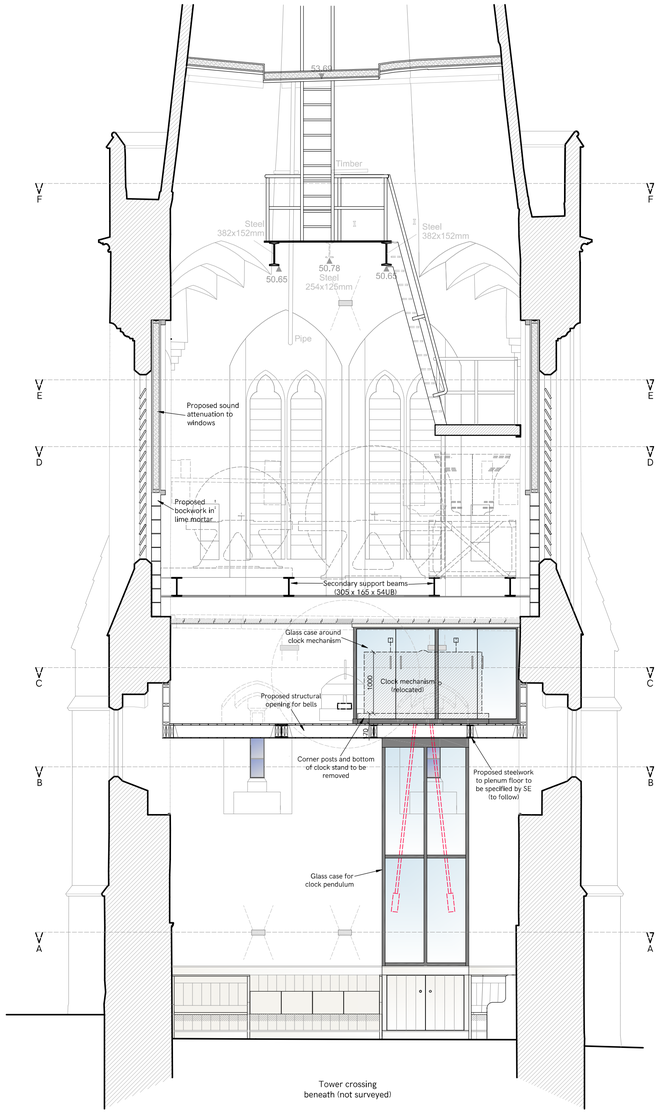
OCTOBER 2025

1077/49-015E

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK

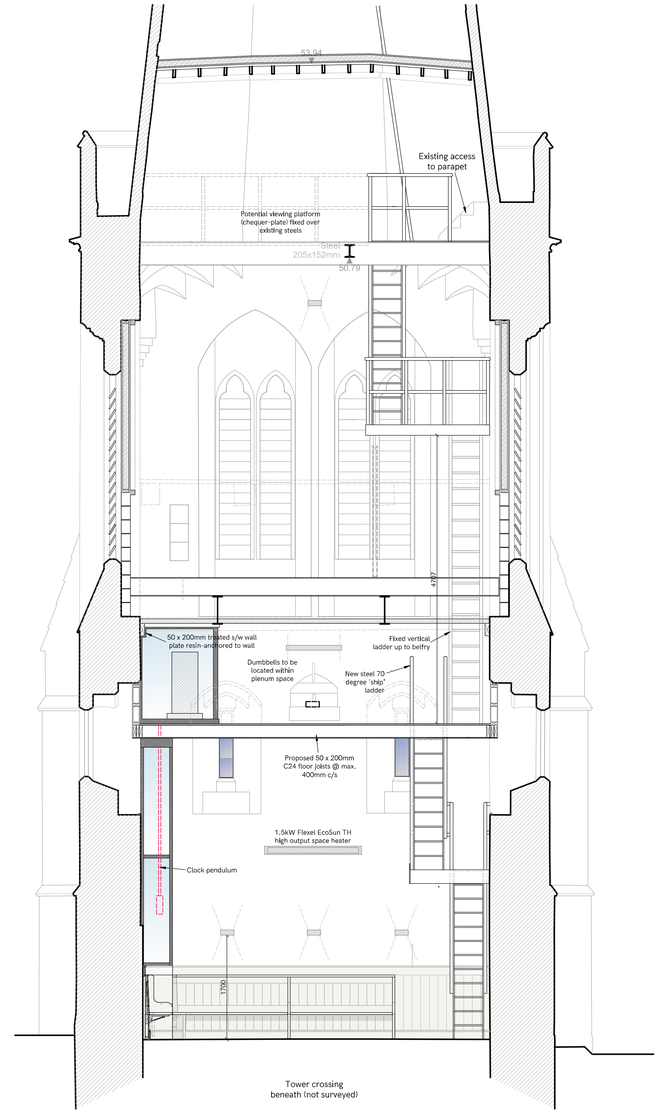
mdp ARCHITECTS

NOTE | DO NOT SCALE THIS DRAWING
ALL DIMENSIONS ARE TO BE CHECK ON SITE



1:50 EAST SECTION/ELEVATION AS PROPOSED

0mm 1000 2000 3000 4000 5000



1:50 SOUTH SECTION/ELEVATION AS PROPOSED

0mm 1000 2000 3000 4000 5000

A1

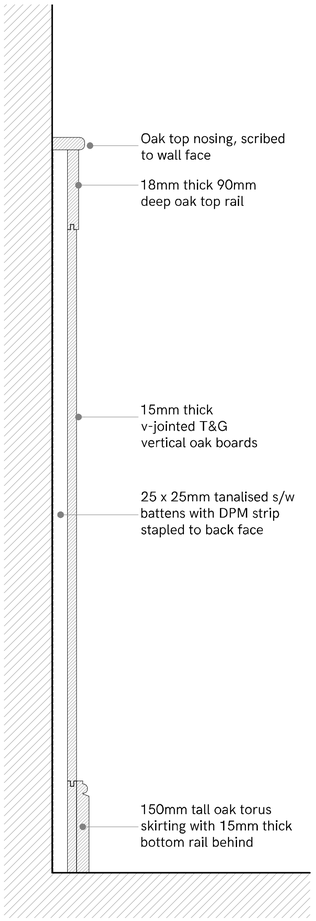
ST. PAUL'S CHURCH, BEDFORD - TOWER

OCTOBER 2025

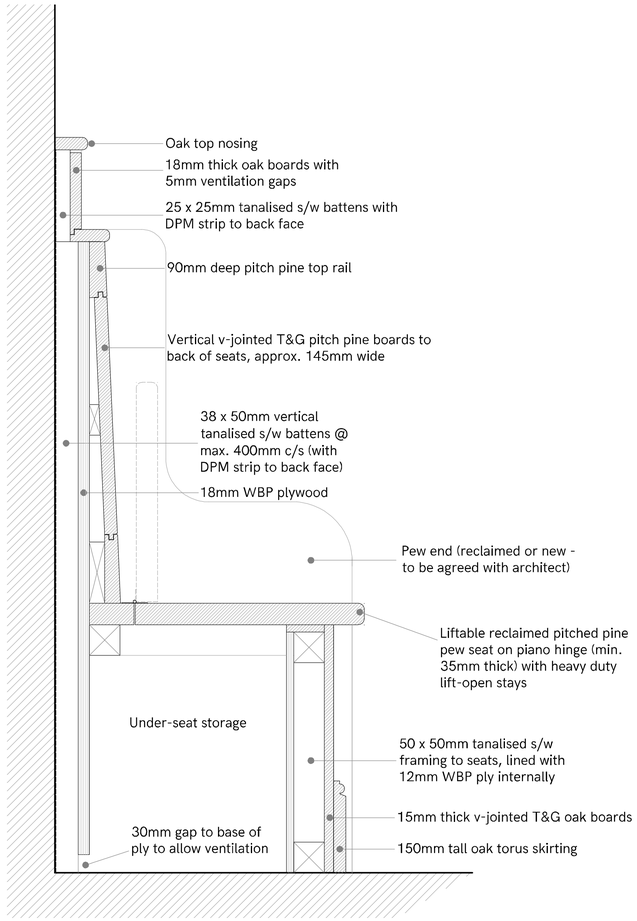
1077/49-020E

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK

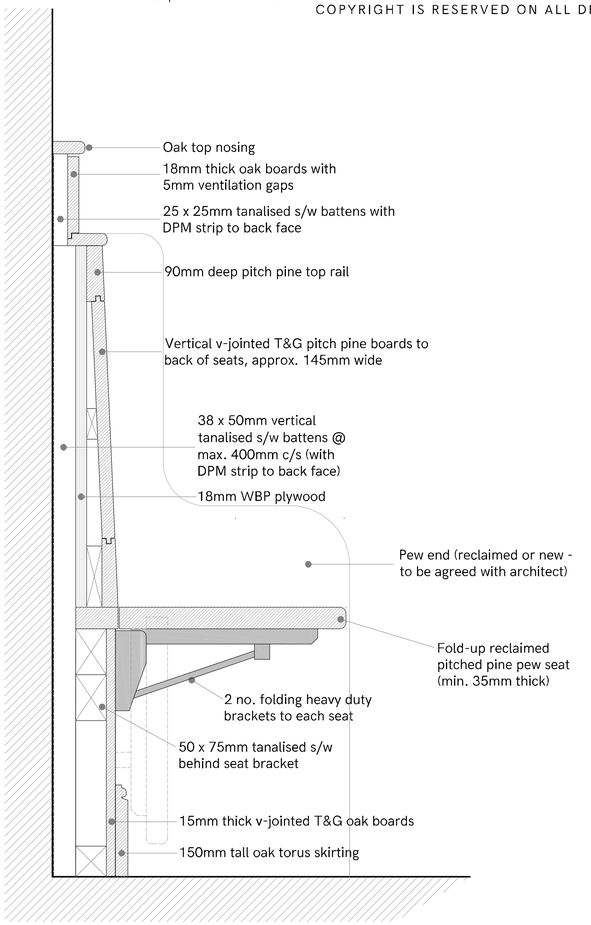
mdp ARCHITECTS



1:5 SECTION THROUGH PROPOSED DADO

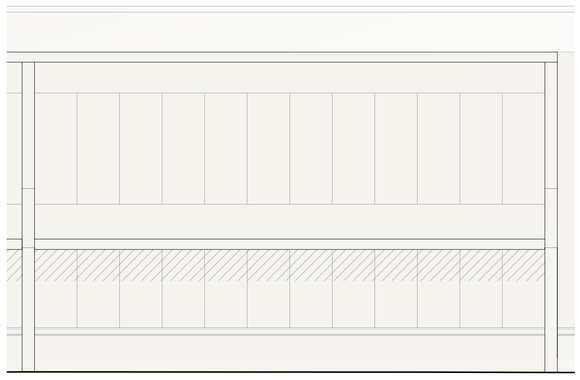


1:5 SECTION THROUGH PROPOSED SEATING (WITH STORAGE)

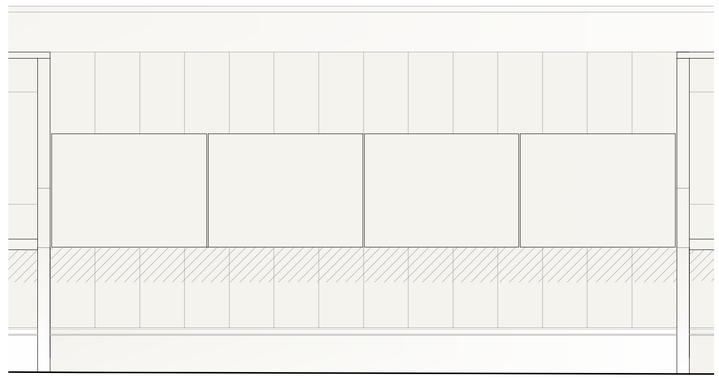


1:5 SECTION THROUGH PROPOSED FOLD-UP SEATS

1:10 PROPOSED DADO IN ELEVATION



1:10 PROPOSED SEATING IN ELEVATION



1:10 PROPOSED SEATING IN ELEVATION

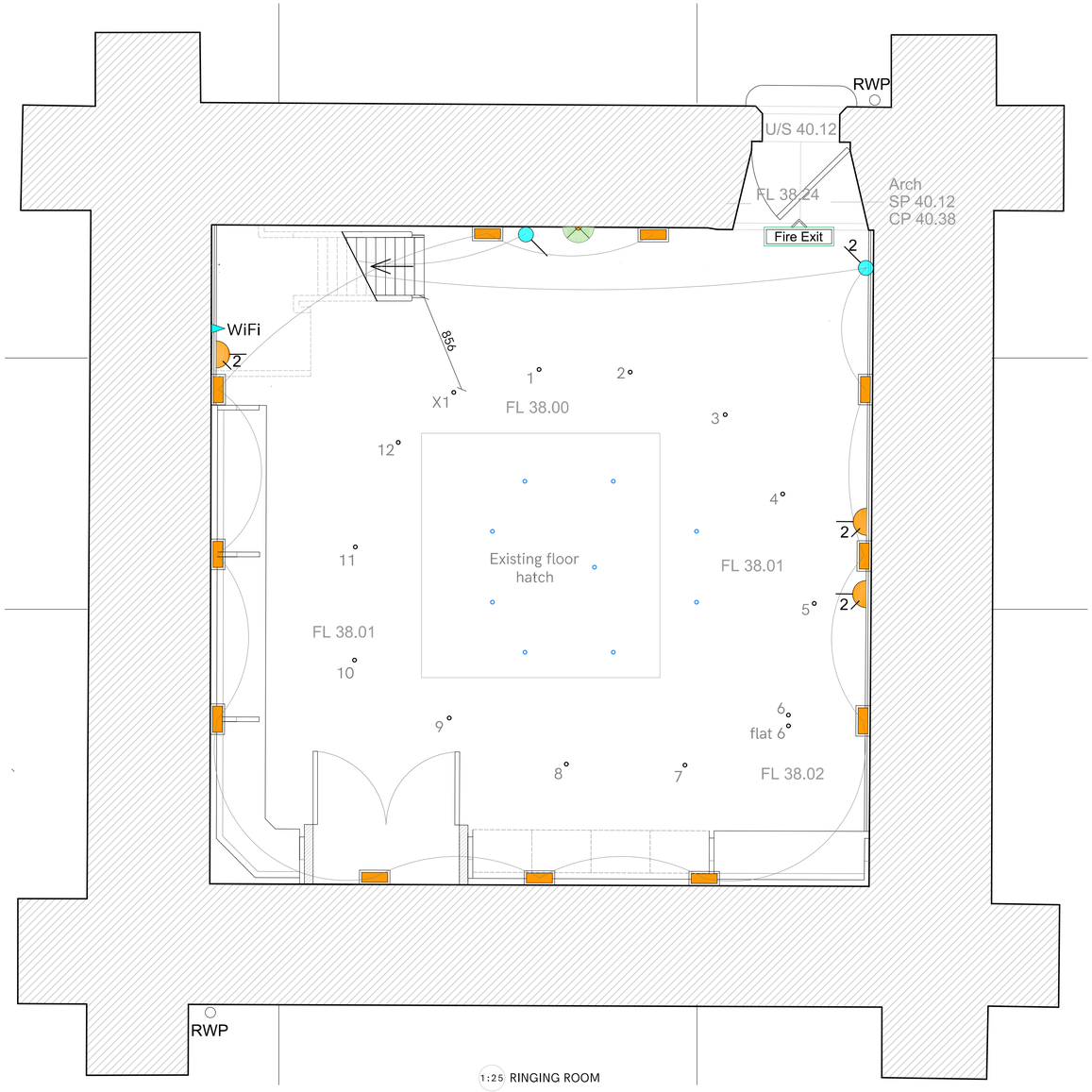
A1

ST. PAUL'S CHURCH, BEDFORD - TOWER (RINGING ROOM)

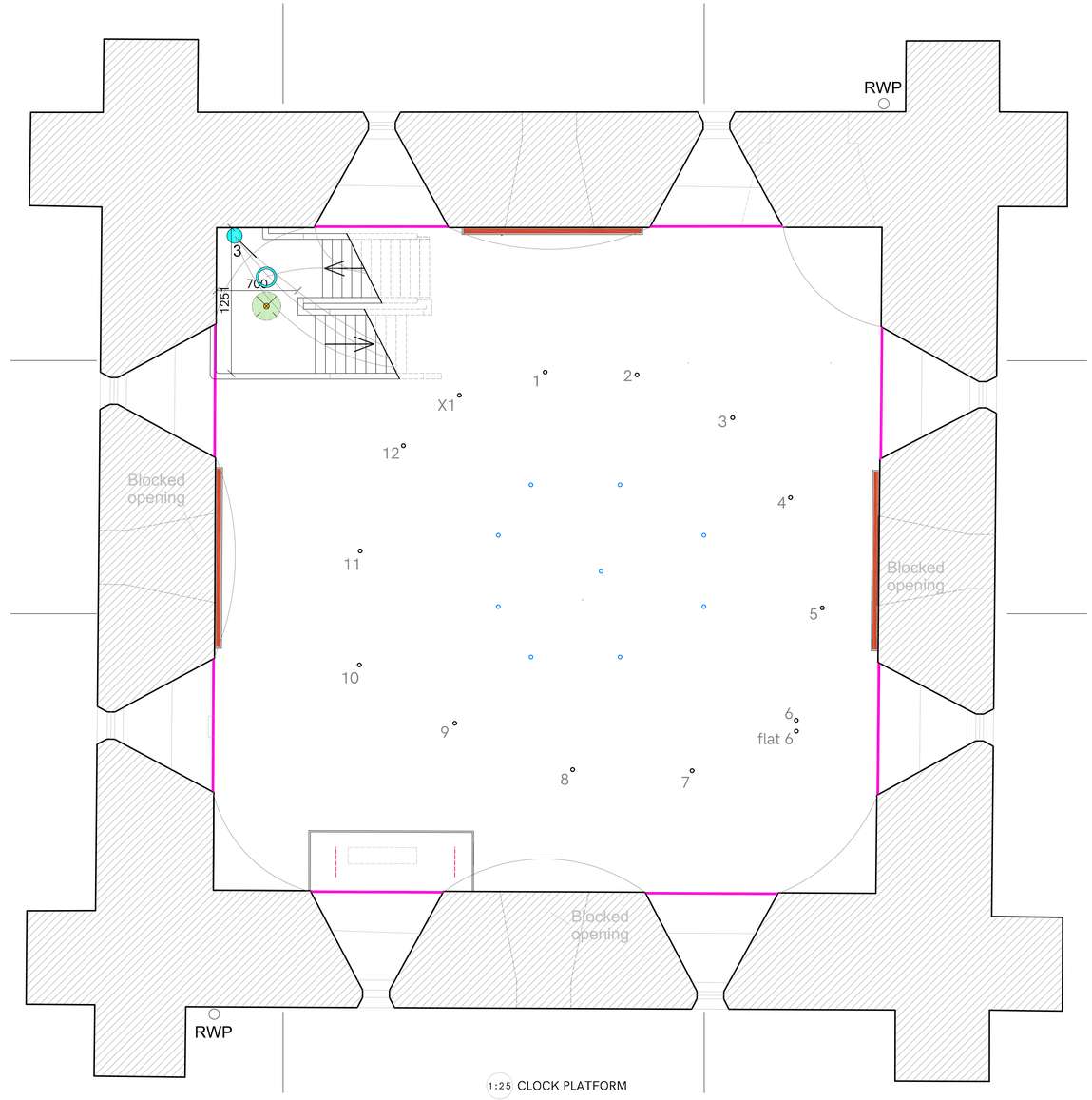
OCTOBER 2024

1077/49-027

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK
mdp ARCHITECTS



1:25 RINGING ROOM



1:25 CLOCK PLATFORM

	1 gang light switch
3	3 gang light switch
2	Switched double wall socket (50% with twin USB outlets)
WiFi	Wi-Fi router
	20W wall-mounted up & down box lights 4000k 1230lm (aluminium grey)
	8W Integrated LED Downlight - 4000k min 700Lm with 5yr warranty
	30W Ledkia Bathen aluminium LED wall lamp (black) 3000k 2200lm

	10W Ledkia Bathen aluminium LED wall lamp (black) 3000k 770lm
	12V SMD 5050 LED strip lights, in natural white (4000k) with 60 LEDs p/metre & 900 lumens p/metre, fixed into 90-degree angled aluminium tracks with clear diffusers.
	3W LED non-maintained 3 hour emergency downlight min 140lm
	3W LED non-maintained wall-mounted 3 hour emergency light 120lm
Fire Exit	Jalite AAA photoluminescent fire exit sign
	1.5kW Flexel EcoSun TH high output space heater, mounted 3m high

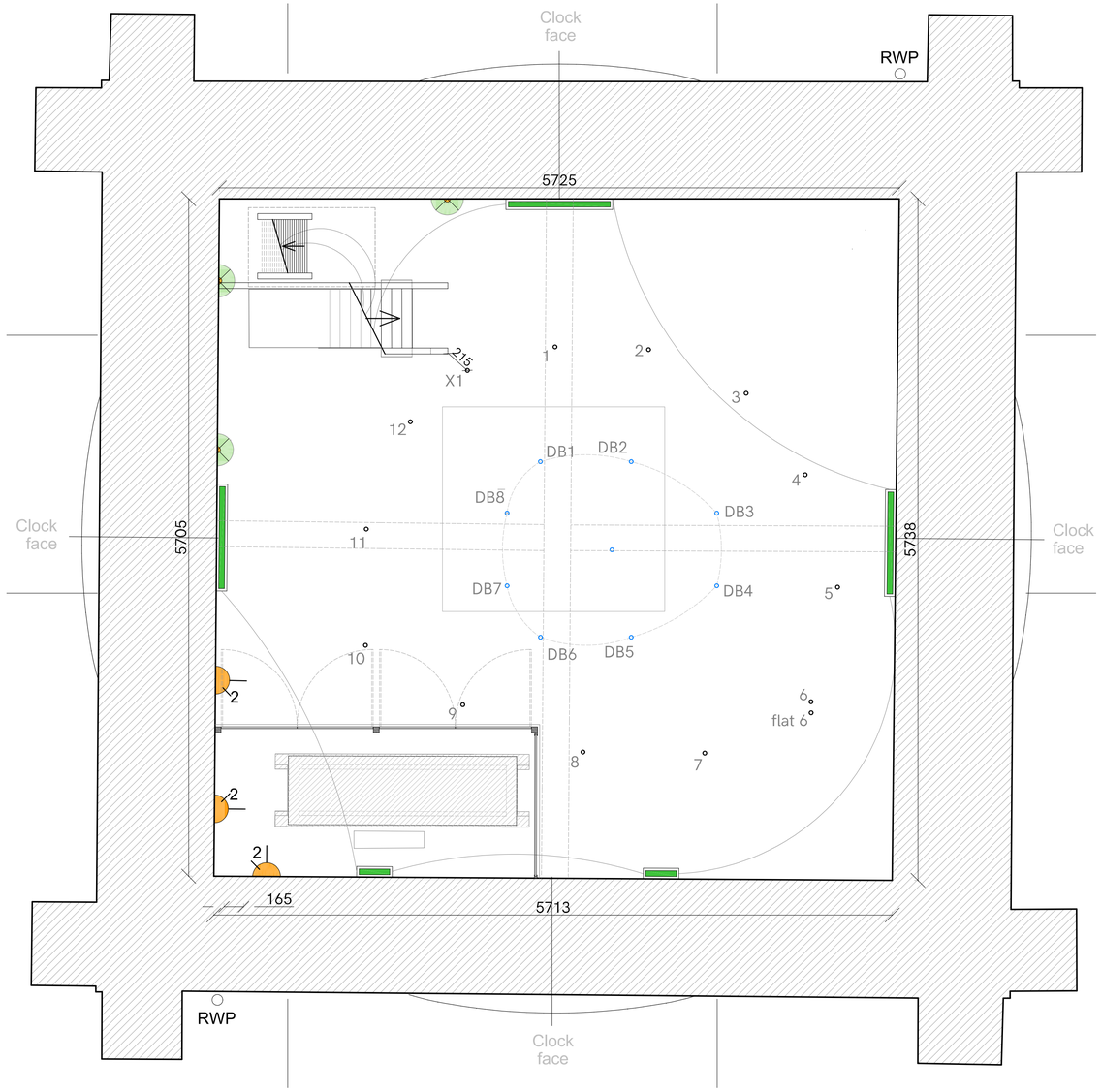
A1

ST. PAUL'S CHURCH, BEDFORD - TOWER - PROPOSED ELECTRICAL PLANS

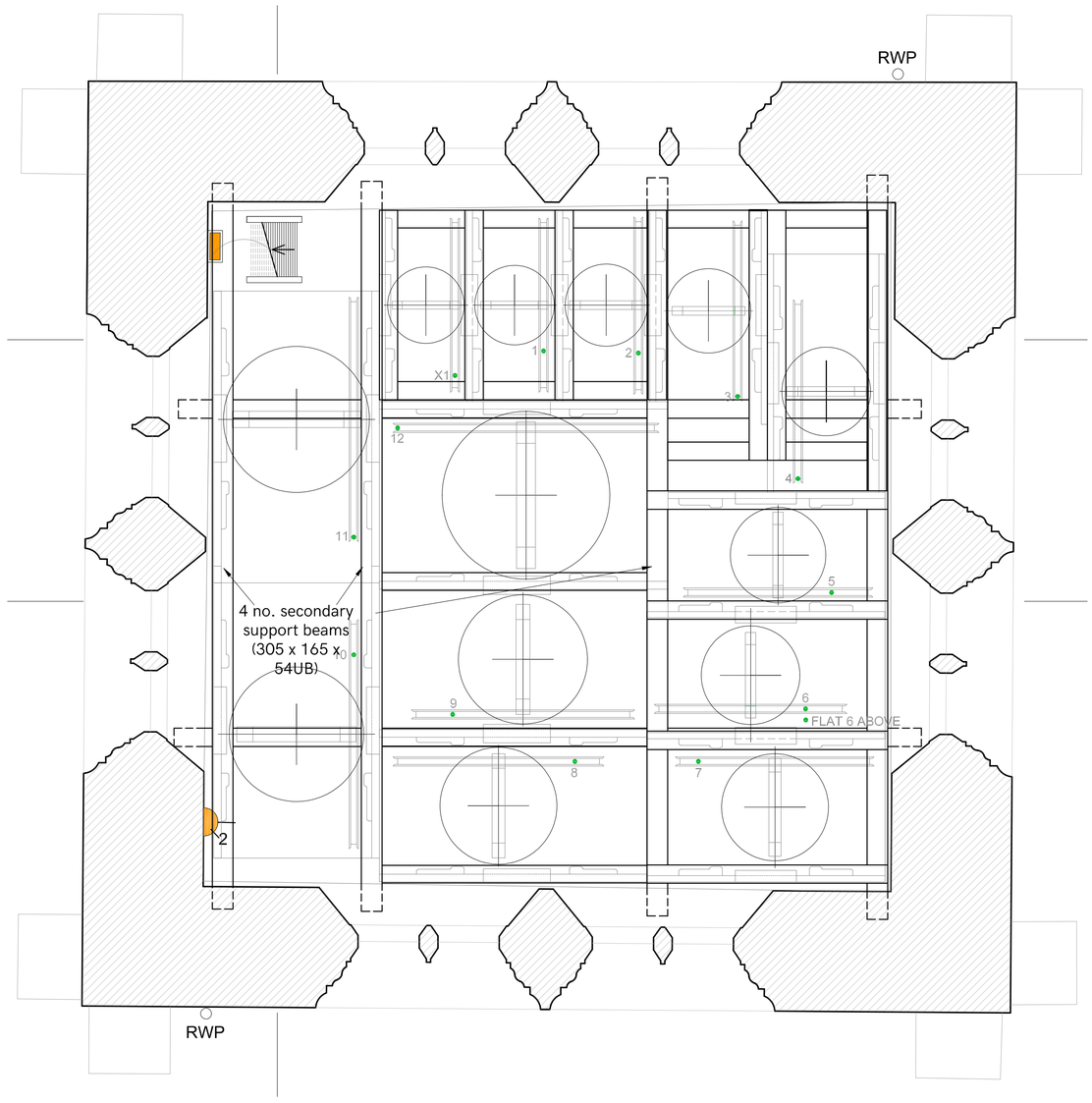
OCTOBER 2025

1077/49-028B

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK
mdp ARCHITECTS



1:25 PLENUM FLOOR



1:25 BELFRAME

	1 gang light switch
3	3 gang light switch
2	Switched double wall socket (50% with twin USB outlets)
WiFi	Wi-Fi router
	20W wall-mounted up & down box lights 4000k 1230lm (aluminium grey)
	8W Integrated LED Downlight - 4000k min 700Lm with 5yr warranty
	30W Ledkia Bathen aluminium LED wall lamp (black) 3000k 2200lm

	10W Ledkia Bathen aluminium LED wall lamp (black) 3000k 770lm
	12V SMD 5050 LED strip lights, in natural white (4000k) with 60 LEDs p/metre & 900 lumens p/metre, fixed into 90-degree angled aluminium tracks with clear diffusers.
	3W LED non-maintained 3 hour emergency downlight min 140lm
	3W LED non-maintained wall-mounted 3 hour emergency light 120lm
Fire Exit	Jalite AAA photoluminescent fire exit sign
	1.5kW Flexel EcoSun TH high output space heater, mounted 3m high

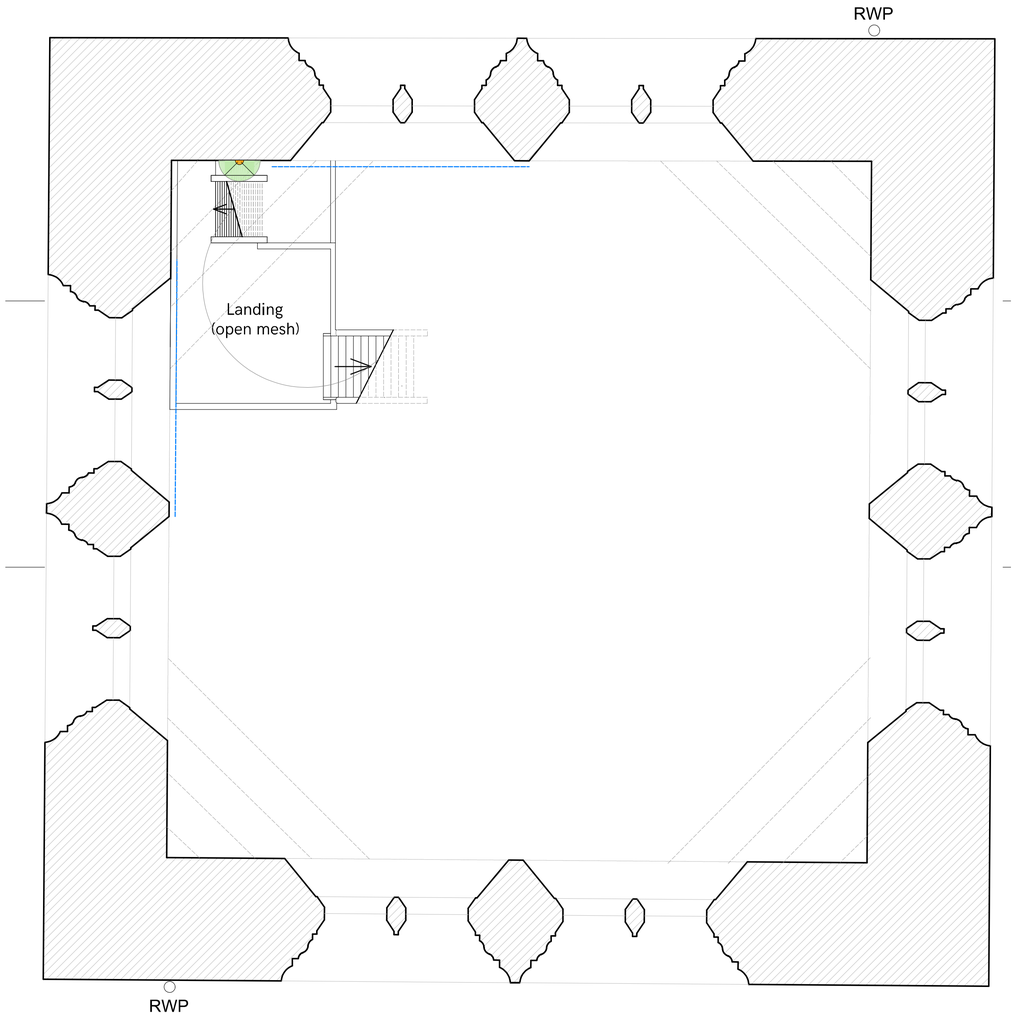
A1

ST. PAUL'S CHURCH, BEDFORD - TOWER - PROPOSED ELECTRICAL PLANS

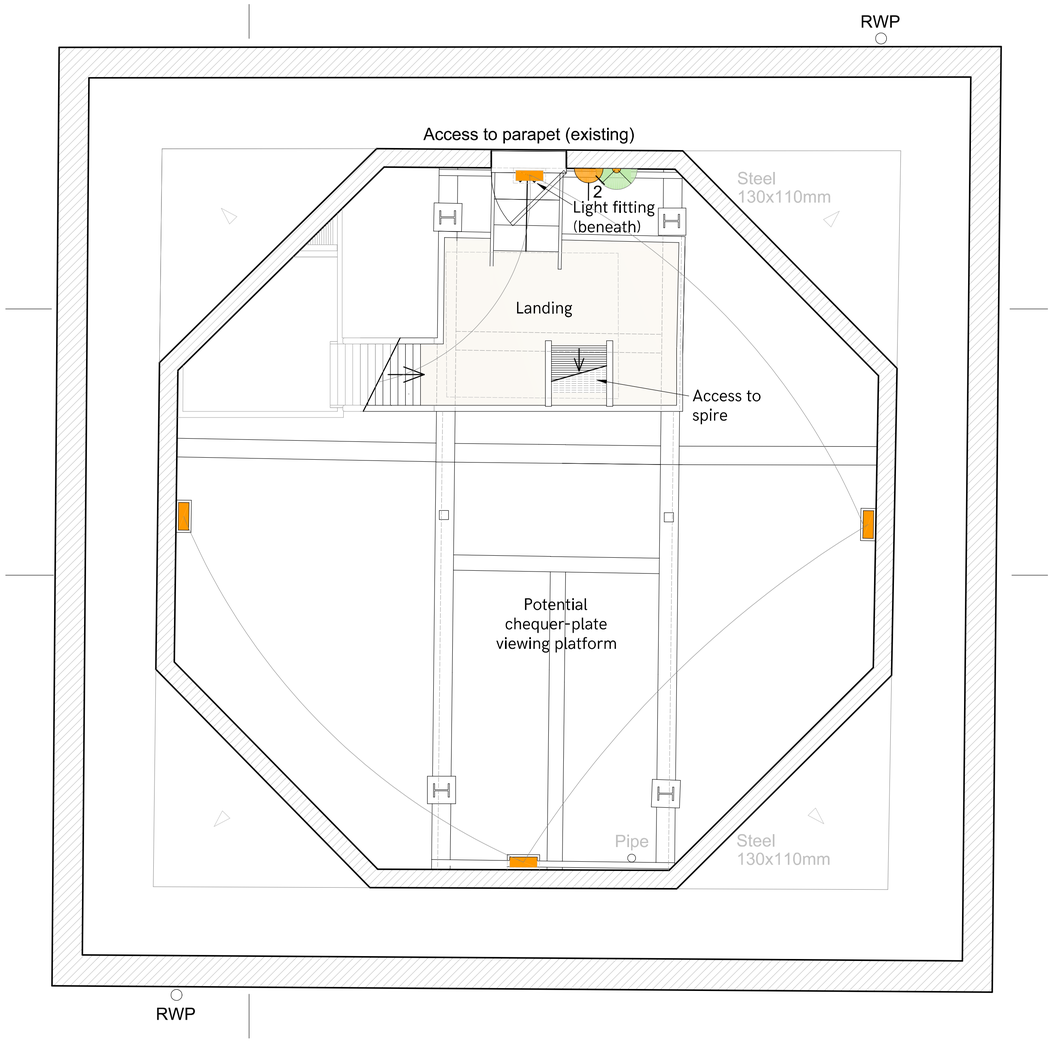
OCTOBER 2025

1077/49-029B

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK
mdp ARCHITECTS



1:25 BELFRY (LOWER)



1:25 BELFRY (UPPER)

	1 gang light switch
3	3 gang light switch
2	Switched double wall socket (50% with twin USB outlets)
WiFi	Wi-Fi router
	20W wall-mounted up & down box lights 4000k 1230lm (aluminium grey)
	8W Integrated LED Downlight - 4000k min 700Lm with 5yr warranty
	30W Ledkia Bathen aluminium LED wall lamp (black) 3000k 2200lm

	10W Ledkia Bathen aluminium LED wall lamp (black) 3000k 770lm
	12V SMD 5050 LED strip lights, in natural white (4000k) with 60 LEDs p/metre & 900 lumens p/metre, fixed into 90-degree angled aluminium tracks with clear diffusers.
	3W LED non-maintained 3 hour emergency downlight min 140lm
	3W LED non-maintained wall-mounted 3 hour emergency light 120lm
Fire Exit	Jalite AAA photoluminescent fire exit sign
	1.5kW Flexel EcoSun TH high output space heater, mounted 3m high

A1

ST. PAUL'S CHURCH, BEDFORD - TOWER - PROPOSED ELECTRICAL PLANS

OCTOBER 2025

1077/49-030B

MICHAEL DALES PARTNERSHIP LIMITED
01462 230803 | 01494 257270 | WWW.MDALES.UK
mdp ARCHITECTS