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Unloss otherwise stated photographs are attributable to the author	

Unless otherwise stated, photographs are attributable to the author

Executive Summary

Bond's Mill Gatehouse is a Grade II listed building constructed in 1940 as a two-storey World War II pillbox. Located on the north bank of the Stroudwater canal across the water from Bond's Mill, the Gatehouse adjoins the car park of the Stonehouse Park industrial park.

The sequence of events that led to the construction of the building in this location took place over a long period of time, however the actual building of the pillbox was achieved in a few short months following the invasion of France and the low Countries in 1940 by Nazi Germany and a fear that Britain would be next.

Since the Medieval period, the Stroud area had been known for its fine-quality wool. Sheep thrived in the Cotswold landscape and the rivers coming off the hills provided fast-flowing water to power the cloth and other mills along the river Frome as it made its way towards the river Severn. However, the cost of land transport to larger markets prompted calls for the river to be made navigable. Eventually the Stroudwater canal was built as a cut to the Frome in the second half of the eighteenth century. Shortly followed by the Thames and Severn canal, the country had its first east-west transport link.

The Great Western railway was constructed under a century later and the results of industrialisation and modernisation took their toll on the textile industry of the south-west with the mill ceasing production in the mid-1930s.

As the threat of war loomed, the mill stood empty. Gloucestershire was seen as a safer location for 'shadow' factories that could manufacture vital parts for Britain's defence industry as back-up for established factories closer to London. Thus, the mill became one of these shadow factories with another being constructed close by.

As an invasion seemed increasingly likely, plans were drawn up to protect key towns and cities that saw 'stop-lines' being constructed to halt the enemy until further help could arrive. Stop-line Green, introduced to protect Bristol, utilised the Stroudwater for part of its route. The value of the shadow factories to the war effort is demonstrated by the number of pillboxes constructed close to them, with the two-storey pillbox at the heart. Now branded as the gatehouse to the mill, since the war the building has been used to hold the controls for the 1990s hydraulic bridge (replaced), as a cycle repair shop, as office space and most recently as a visitor centre for the Cotswold Canal Trust.

Acknowledgements:

I am extremely grateful to the organisations listed on p. 28 for their assistance, but particularly to the Stonehouse History group for their support and materials provided during the creation of this workbook.



Location of Site

Bond's Mill Gatehouse (postcode GL10 3RF) is located on the north bank of the Stroudwater canal at National Grid Reference SO7933705256, approximately one mile east of Junction 13 of the M5 motorway on the A419 towards Stroud, Gloucestershire (see Figure 2 below). It is also approximately one mile south of the small town of Stonehouse.



Figure 2: Approximate location of Bond's Mill Gatehouse © Crown copyright and database rights 2023 Ordnance Survey (100025252)

The gatehouse is situated between two light industrial areas with a car park separating it from a main road and a further industrial estate (see Figures 3 and 4 right). To the south of the canal lies Bond's Mill (not a listed building), today home to a number of small businesses.

There is currently a large engineering project underway to restore the Stroudwater canal and infrastructure. Further information can be obtained at the following website <u>https://www.cotswoldcanals.net/cotswold-canals-route</u>.



Figure 3: Bond's Mill Gatehouse location between two industrial areas

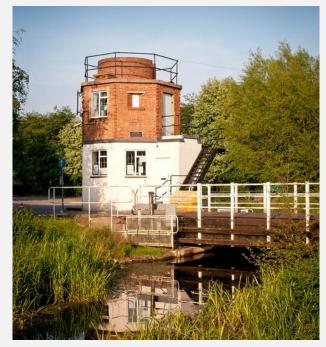


Figure 4: Bond's Mill Gatehouse canal-side location

Ordnance Survey maps (Figures 5 to 8 below), demonstrate the increasing urbanisation of the area over the past 140 years. There are plans to redevelop the area to the north of the Bristol Road, which includes the demolition of the Hoffman bearing factory discussed later.

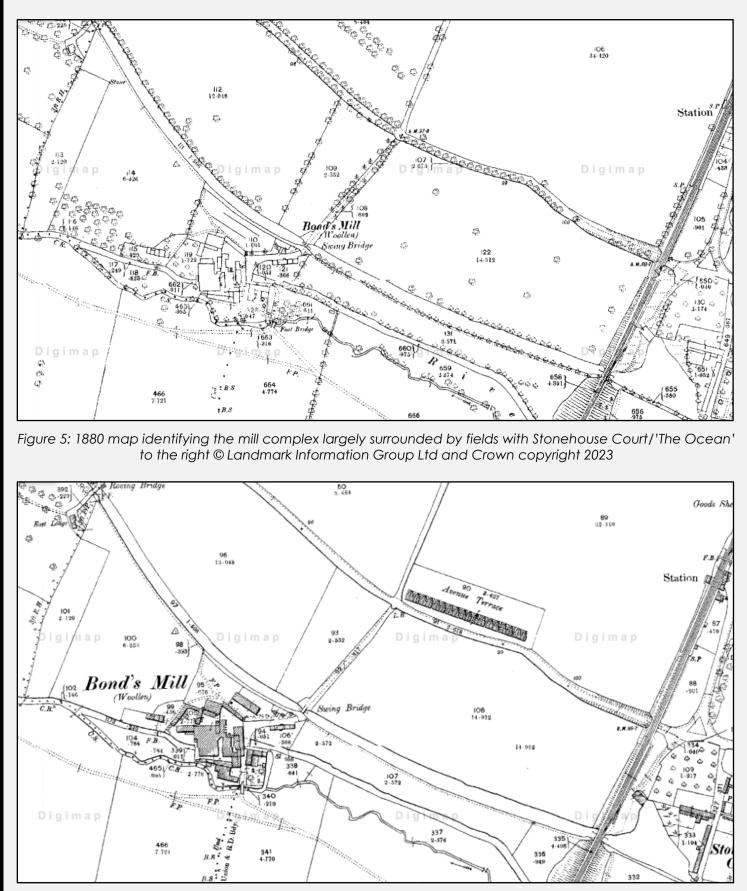


Figure 6: 1900 map – Avenue Terrace built – the start of urbanisaiton © Landmark Information Group Ltd and Crown copyright 2023

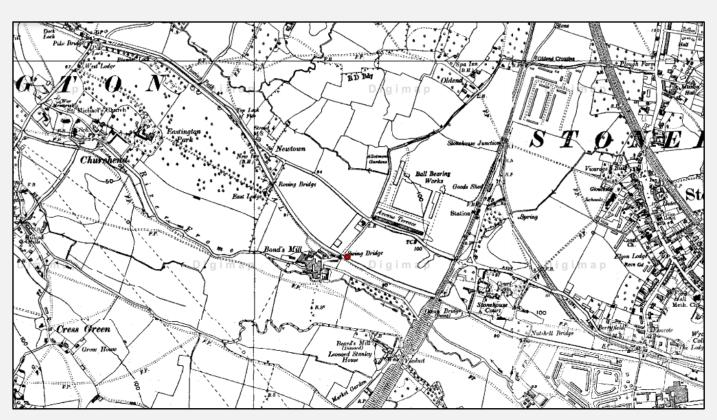


Figure 7: 1950 map - ball bearing factory identified © Landmark Information Group Ltd and Crown copyright 2023



Figure 8: Bond's Mill in today's built-up landscape© Crown copyright and database rights 2023 Ordnance Survey (100025252)

Architectural Form

Bond's Mill Gatehouse is of regular octagonal form with an entrance porch attached to the south-western elevation. Listed as an adapted version of a Type 24 pillbox, it substantially differs from this type (which is hexagonal).

The ground floor of the building is constructed of prefabricated shuttered reinforced concrete sections, now painted externally. There are no obvious signs of reinforcement (no rust marks show on the paint) however this appears to have been an issue historically (see page 21). The doorway opens into this porch whose floor level is the same as that of the main body of the building.

At ground floor level, windows are all uPVC double-glazed units to which security bars have been installed internally. The concrete section joints have been bonded roughly together with cement and interior elevations are painted.

The floors and ceiling are also constructed from prefabricated concrete sections, both are tile clad, those on the floor being made of carpet. No historic fittings remain. Ground and upper floor align smoothy on each elevation however a lead flashing has been added between the two floors.

The upper floor of the building is now reached via a steel stairway painted black with timber steps. The upper-floor doorway has a concrete architrave with a metal door containing integral steel grille, the whole protected by thick plastic sheeting.

This floor is constructed in red clay brick using English bond. At each corner, the bricks are uncut and project in a cogged pattern. There have been multiple repairs to the brickwork on most elevations; repairs have not been matched to the original bond.

Three original embrasures remain at this level. Two of these are single glazed but obscured widows, one now contains a uPVC double-glazed unit. All three have concrete lintels. The two post-war larger windows at this level have concrete architraves, uPVC double-glazed units and have had security bars installed internally.

Internally the walls are clad in softwood panels which have been painted.

A prefabricated concrete panel, which functions as the roof/upper floor ceiling, projects around the upper level. Internally, this is now clad in ceiling tiles.

A circular machine gun emplacement with opening, also constructed of brick in English bond in its original form (this area was not surveyed but photographs provided), occupies most of the roof.

There are steel railings around the roof level, now painted black.

Architectural Significance

Bond's Mill has been listed building at Grade 2 for its rarity and completeness. The few other double storey pillboxes that exist are of other designs and constructed mainly of brick, no other being seen that was constructed with a difference in materials between storeys.¹

Although the pillbox has been altered in the post-war years to enable reuse, it is largely complete, and the original embrasures help identify its original use.

It was also listed for its representative value illustrating 'a key point on a former stop line, defending road and canal and two armaments factories'². This pillbox appears less reinforced and robust than the extant surrounding pillboxes and it is felt that its height was to provide increased visibility across the area where the shadow factories were located, with the surrounding pillboxes being built more strongly (see Figure 27) to withstand attack and keep the enemy at bay.

Twentieth century military architecture has largely been unprotected and left to be vandalised, subject to erosion or demolition. Six of the 16 original Stroudwater pillboxes have already been destroyed. However, there is some hope that the surviving structures will be preserved for future generations. Completion of the 'Defence of Britain' project in 2002 has initiated other research studies by the Council for British Archaeology³ with this aim.

¹ 'Two Storey and Tower Pillbox Designs', <u>http://www.pillbox-study-group.org.uk/advanced-pillbox-</u>

designs/part-2-o-z/two-storey-tower-pillbox-designs/ (consulted March 2023)

² 'The Gatehouse at Bond's Mill', https://historicengland.org.uk/listing/the-list/listentry/1399861?section=official-list-entry (consulted February-April 2023)

³ 'Defence of Britain Archive', <u>https://archaeologydataservice.ac.uk/archives/view/dob/ (consulted</u> April 2023)

Survey and Measured Drawings

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Survey Methodology

Prior to site visit

- Site and location well-known prior to survey, therefore an initial risk assessment could be performed off-site and documented
- Site was known to be octagonal (aside from the entrance porch), therefore outline sketches could be prepared to save time for measurement during survey
- Access and permission to survey was arranged with Cotswold Canals Trust at a suitable time for the leaseholders
- Survey day assistance was requested from family member
- Initial building research conducted

Shortly prior to site visit

- Surveying equipment assembled
- Phone fully charged
- Vehicle was checked to ensure it was charged

Survey day

- Checked weather and forecast and selected appropriate clothing and footwear
- Parked next to the property to lesson risk of third-party incident
- Survey assistant briefed on-site
- H&S risks re-evaluated on-site
- Outside of property photographed first using tripod and spirit level
- Analysis of building fabric was performed, probable changes from the original noted
- Ground and upper floor level interior measurements were taken as running dimensions at chest height (heights were done using extending rod/metal tape/laser measurer)
- Diagonals at both levels were measured to be able to plot the correct shape of the building
- Sill depth, floor-to-sill height, window head heights and door openings were also taken (running dimensions as appropriate, sills measured to sealed unit).
- As much work as possible was done from ground level, upper floor level was measured from top of steps
- Window inset and estimate of sealed units taken (to aid determination of wall thickness)
- Horizonal datum identified
- Outside was measured horizontally and vertical measurements from the datum noted
- Areas not accessible noted

The survey was completed in afternoon however a few external measurements were double-checked in a follow-up visit.

Equipment Used

The following equipment was used during the surveying of Bond's Mill:



Health and Safety Risk Assessment

The below table captures risks identified when undertaking the survey at Bond's Mill Gatehouse:

Identified Risk	Potential Severity if Occurs	Likelihood of Occurrence	Worst Outcome	Risk
Personal security whilst on site	High	Low	Death, life- changing injury	Low-risk area. On-site security and both persons carrying mobile pho
Injury from site traffic	High	Low	Death, life- changing injury	High-visibility vest worn when surve position close to the property.
Fall from height (climbing to roof level, falling from roof level, slip on wooden stairs or step collapse)	High	Low	Death, life- changing injury	Handrail held and steps appeared Not permitted to roof level due to
Fall into the canal	Medium	Low	Drowning	Assistant advised when approach
Low voltage cables attached to site	High	Medium	Electric shock	Care taken to avoid cables when
Aged, possibly decaying concrete ceilings	High	Low	Death, crush injuries	Building is maintained, occupied o
Injury from tools	Medium	Low	Cuts, eye damage	Care taken with the edge of the s at anyone.
Trip/slip inside building	Medium	Low	Broken bones, bruising, sprains,	Obstacles to free movement were flat, no low doors or trailing cables
Damage to owner's property through surveying	Low	Low	Prosecution, financial recompense	Ladders not used against the prop moved if in the way.

Table 1: Risk Assessment for the Bond's Mill Survey

Mitigation

nd CCTV. Accompanied on site visit, nones.

veying. Car parked in a defensive

ed sound. Appropriate footwear worn. to owners' health and safety policy.

ching canal bank.

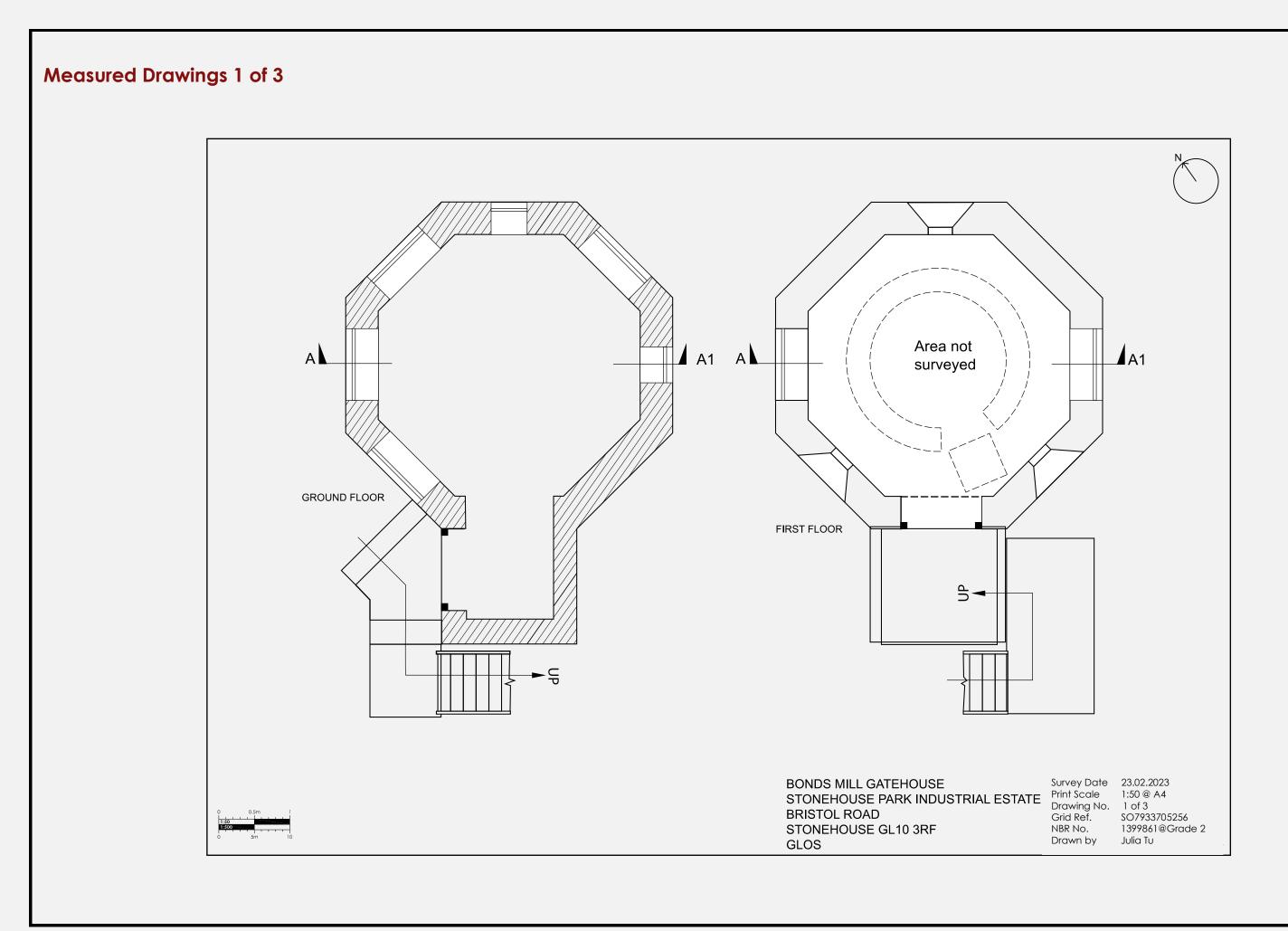
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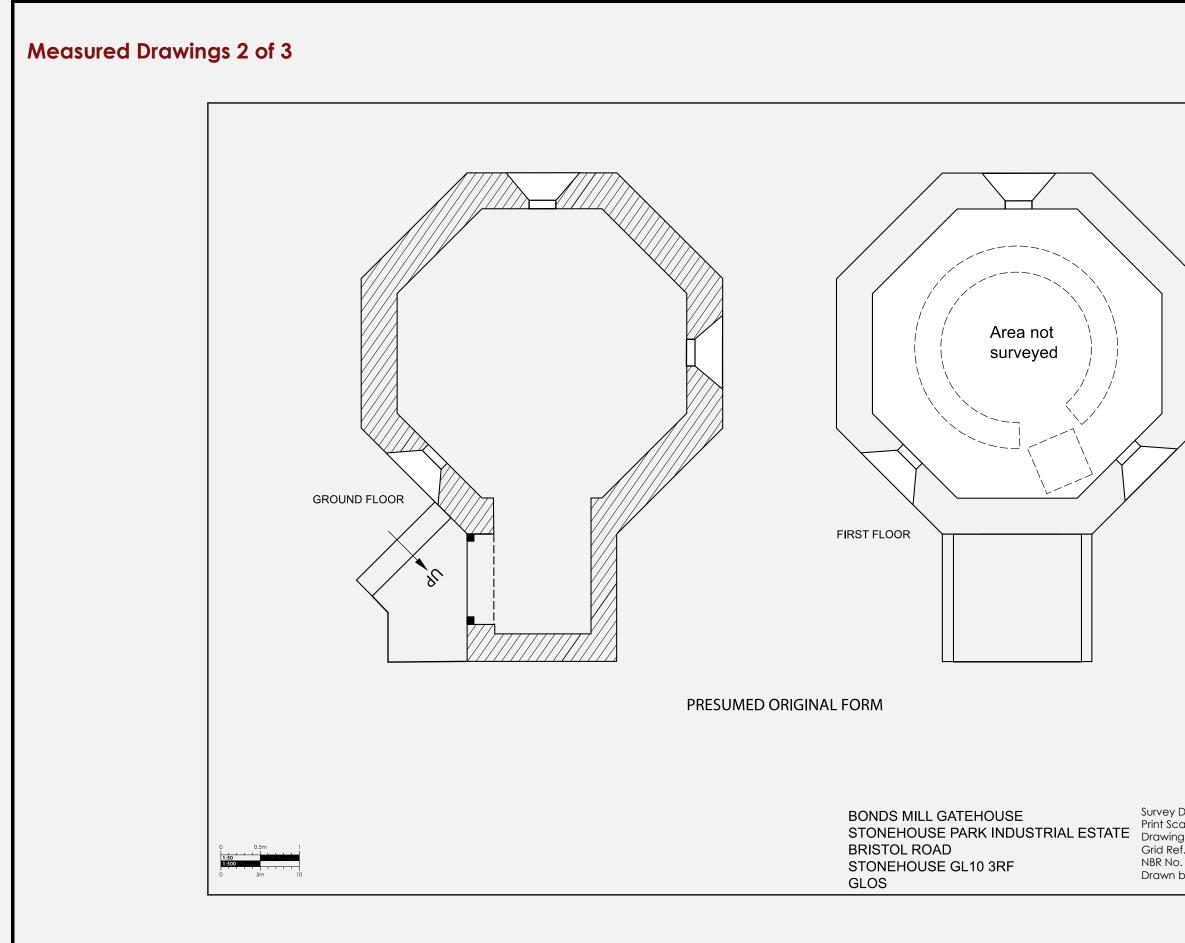
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steel rule and to not point laser device

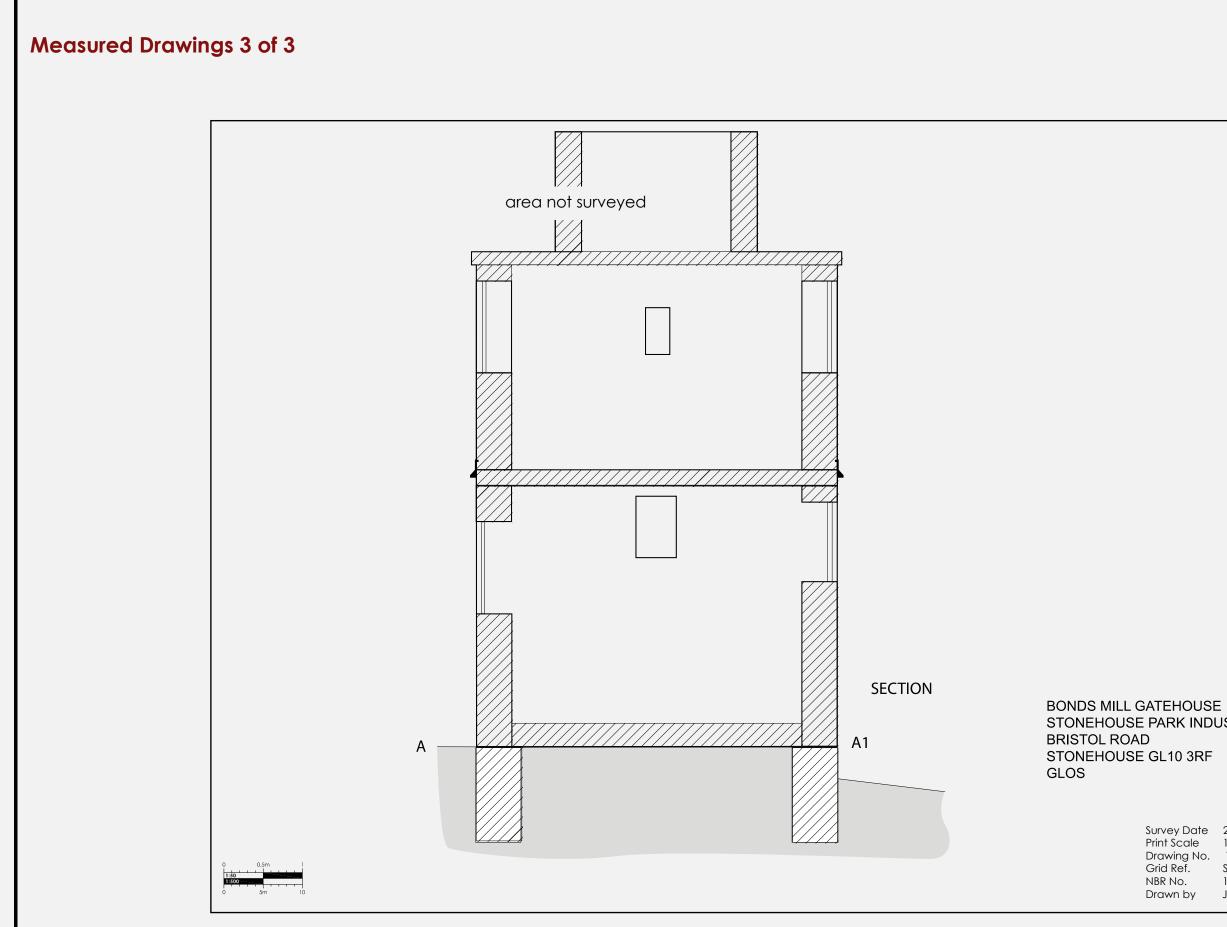
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operty, internal fixtures and fittings were





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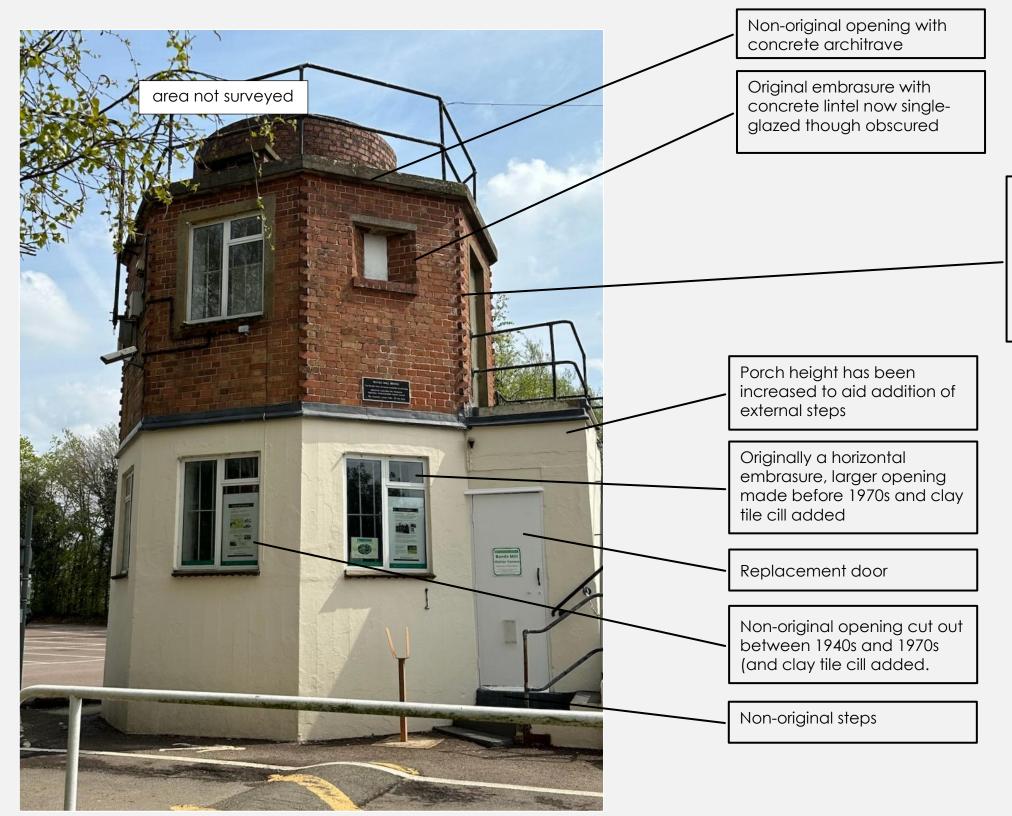
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Photographic Survey

12

Northern Elevations





Southern Elevations



Prefabricated concrete roof/ceiling to upper floor

Non-original opening cut out between 1940s and 1970s with concrete architrave

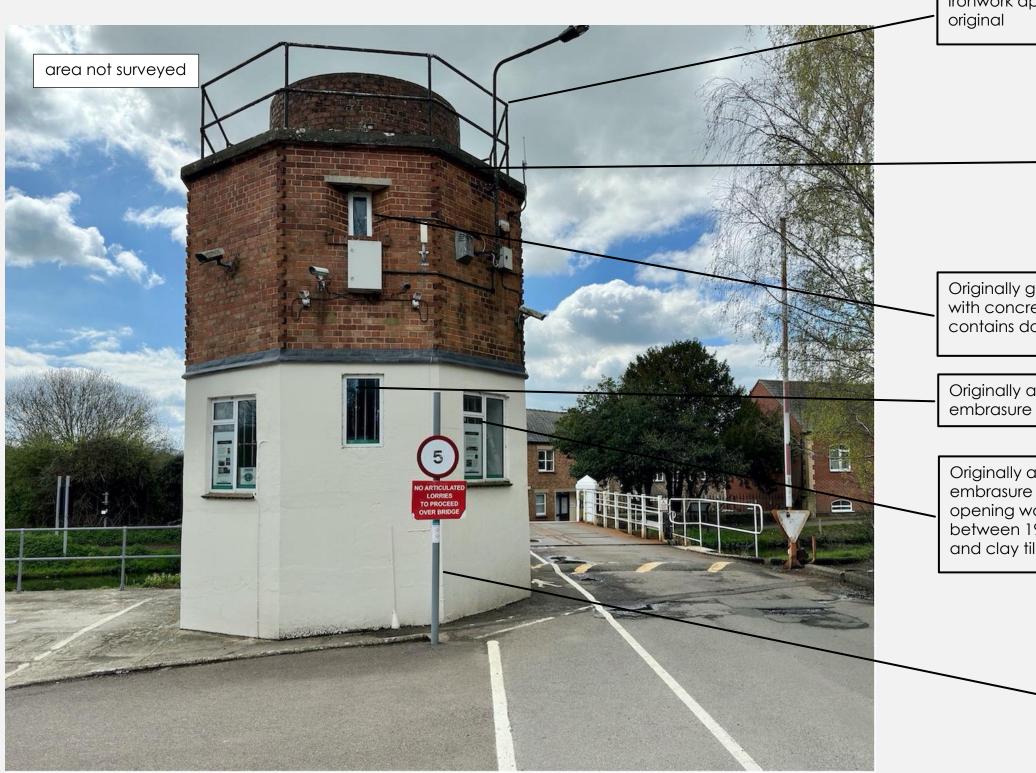


Non-original opening cut out between 1940s and 1970s with clay tile cill added

Original embrasure, probably not glazed originally

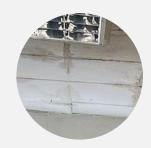
Evidence of construction method (prefabricated shuttered concrete panels)

Eastern Elevations



Ironwork appears to be original

Internal ceiling is clad with tiles (showing signs of damp)



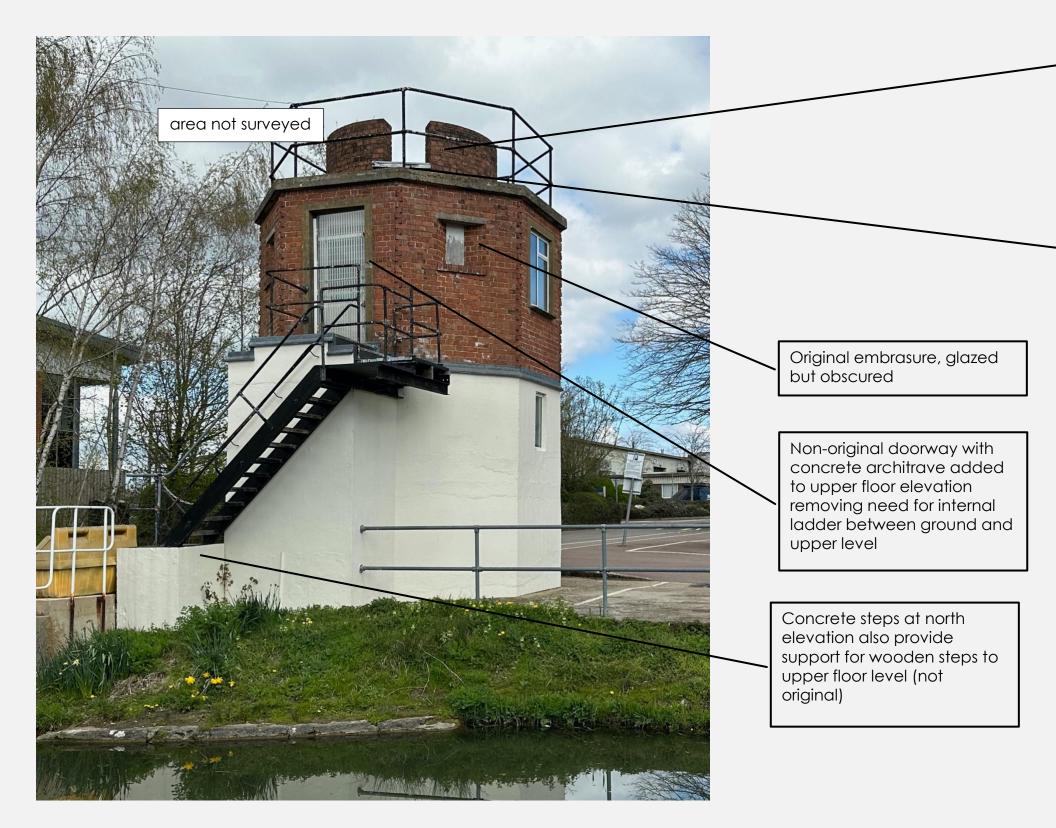
Originally glazed embrasure with concrete lintel now contains double-glazed unit

Originally an unglazed embrasure

Originally a horizontal embrasure (see Fig. x), opening was made larger between 1940s and 1970s and clay tile cill added

Internal joints are roughly bonded together

Western Elevations



Machine gun emplacement on turret





Building Phasing

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1940

Both figures show a portion of Queen Mary's visit to Bond's Mill pillbox in 1941 (see Figure 13) but Figure 9 does not contain the door area and makes some features clearer

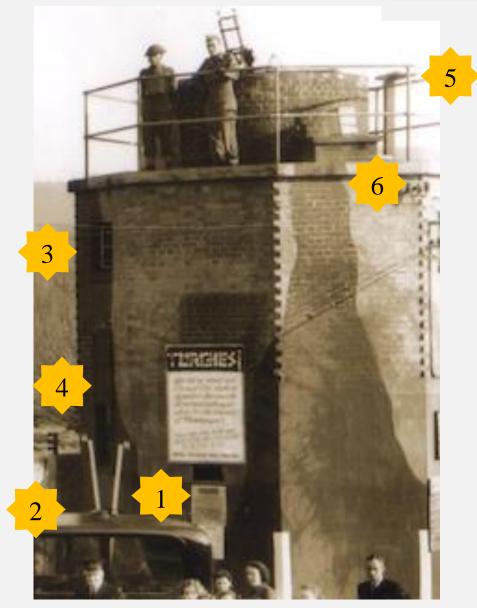
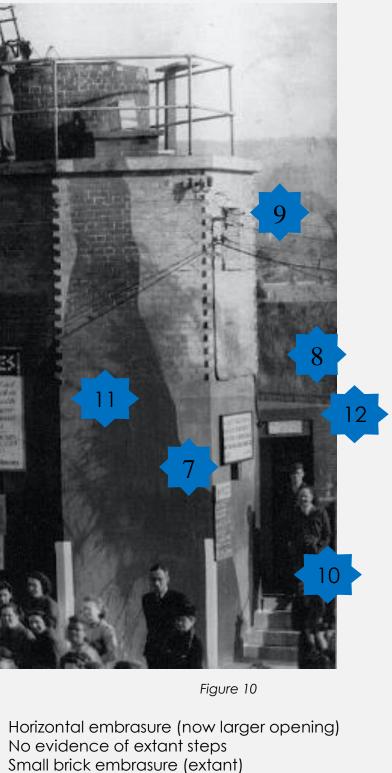


Figure 9

Keys to starred features and status

- Horizontal embrasure (now larger opening) 1
- 2 Brick wall (removed)
- 3 Narrow vertical embrasure (extant)
- Narrow vertical embrasure (extant) 4
- 5 Support for machine gun (removed)
- 6 Brick built container purpose unknown (extant but area not surveyed)



- Camouflaging? (no evidence remains)
- Lower height of porch
- 7 8 9 10 more steps than present day 11

12

Lower road level meaning greater height to entrance and

Explanatory Notes:

Features 1 and 7: Prefabricated embrasures are likely to resemble of the unaltered pillbox to the south of Bond's Mill (see Figures 11 and 12 below):



Figure 11 and Figure 12: External and internal views of an embrasure

Feature 2: Pillboxes in this area were protected with a brick-built protective porch (see Figure 27) with a reinforced roof. This is a local variation not found along other defence lines.⁴ Embrasures afforded limited visibility and an observer was generally placed outside the building to obtain a better view.⁵

Figure 9 above identifies a brick wall around the southern elevation of the pillbox and evidence of repairs to the entrance porch, southern and eastern elevations was identified during the photographic survey. The Historic England listing and Defence of Britain⁶ archive document possible indications of a blast wall to the door however none is visible in the 1940 photograph (see Figure 10 above).

Feature 8: There is no evidence of any external steps. It was felt that the upper floor would have been reached internally via a ladder and hatch in the ceiling (much like that between upper floor and roof level) shown on page 16. This has recently been verbally confirmed by a member of the Cotswold Canal Trust advised that a hatch had been seen in situ at ground level (evidence now under ceiling tiles).

Feature 12: The height of the entrance porch today is greater than shown in Figure 9. It is believed it was raised when adding the external steps to reach floor level of the upper floor.



Figure 13: Visit of Queen Mary's Visit in spring 1941 © The Peckham Collection, c/o Stonehouse History Group

⁴ Strickland, 'Stroudwater Pillboxes', p. 19.

⁵ Strickland, 'Stroudwater Pillboxes', p. 19.

⁶ 'Pillbox', Defence of Britain Archive: Council for British Archaeology (2002), <u>https://archaeologydataservice.ac.uk/archives/view/dob/ai_full_r.cfm?refno=7755</u>

Post-War to 1970s



Figure 14: 1970s photo showing the swing bridge and pillbox © M. Handford

This picture identifies that, between the end of the war and the 1970s, the following had already taken place:

- at upper floor level, the larger window openings seen today had already been made either in elevations that previously had no embrasure (those with a concrete architrave)
- the height of the entrance porch has been raised and concrete block inserted at ground level to support the new steps
- the steel stairway with timber steps had been added, thereby removing the need for the internal ladder between floors
- also at upper floor level, a doorway had been inserted, also with a concrete architrave
- at ground floor level, the horizonal embrasures had been enlarged and new large openings created.
- Crittal-style window frames had been installed

- the ground floor of the building (constructed of concrete) had been painted white.
- any blast protection to the south of the building had been removed
- any camouflaging has been removed
- it's probable that the clay tiled cills at ground level were added to larger openings in this period

These changes are believed to have been made to facilitate reuse as commercial space.



1970s to Present Day

Minor changes have taken place since the photo taken in the 1970s, identified through the listing and the present day, as follows:

- uPVC double-glazed units have been installed to most openings (except the upper floor original embrasures)
- the apron flashing between ground and upper floor has been inserted post-May 1994 (see Figure 15 below taken on the day a new bridge was installed), perhaps to stop rust staining from concrete reinforcement.
- Extensive tarmac has been laid around the pillbox area as part of car park creation which has raised the level of the road.





Figure 16: 2015 South-western perspective site changes © Stonehouse History Group

Figure 15: Photo known to be from May 1994 with no lead flashing and evidence of rust staining circled © Stonehouse History Group **Brief History of the Site**

22

Rivers, Canals, and Mills

Rivers, canals, and mills are all integral to this story; without these elements, the Gatehouse would not have been built it its current location.

The numerous mills located along the river Frome date from C14. The fast-flowing current of the river was created by its steep descent from the Cotswold hills to the river Severn to the west⁷ which the mills utilised to drive their wheels. The area's mills were famous for their fine quality wool (the scarlets of the Stroudwater area being regarded as the 'finest anywhere in England; perhaps in any part of the world'⁸). The textile industry was instrumental in the creation of wealth in the Cotswolds and was a major employer.

Mill owners had to send their goods via expensive overland routes to London, Bristol, and Southampton due to the distance from the mills to the waterway routes of the rivers Thames and Severn. Petitions to the State to make the river navigable to ease transport costs were made as early as 1610 which were not universally popular for fear of a reduction in water power.



Figure 18: C17 Packhorse Transport © Stroudwater Navigation Archive Charity



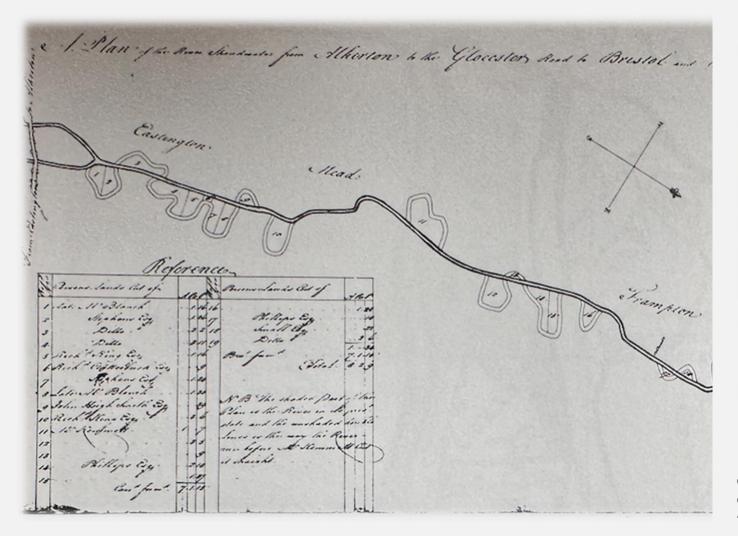
Figure 17: Bond's Mill in early-C20 (exact date unknown) © Stonehouse History Group

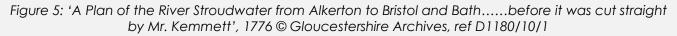
Records indicate New Mill being built on the river Frome at the edge of the lands of the lords of Stonehouse Manor in 1496. The Fowler family owned the mill for about 150 years to around 1700 after which the mill was leased to various tenants. In 1714, the tenant was called John Bond and the mill became known as 'Bond's Mill'.⁹

⁸ J. De L. Mann, The Cloth Industry in the West of England from 1640 to 1880 (Gloucester, 1987), p. 9.

⁹ 'Bond's Mill Timeline', <u>https://stonehousehistorygroup.org.uk/wp-content/uploads/2019/12/Bonds-Mill-timeline.pdf (</u>consulted March 2023)

⁷ M. Palmer & P. Neaverson, The Textile Industry of South-West England: A Social Archaeology (Stroud, 2005), pp. 39-43.





A canal was finally built between 1775 and 1779 by the Stroudwater Navigation Company as a cut of the river between Framilode on the Severn to the basin at Wallbridge in Stroud (see Figure 19 above) passing Bond's Mill by a hundred yards to the north. The mills were slowly transitioning away from water power¹⁰ so the canal's primary purpose was to bring coal to the woollen trade¹¹ from the Forest of Dean and Staffordshire.

By 1789, the Thames & Severn canal was realised which gave Britain her first east-west navigable link, shown in Figure 16 below.¹²

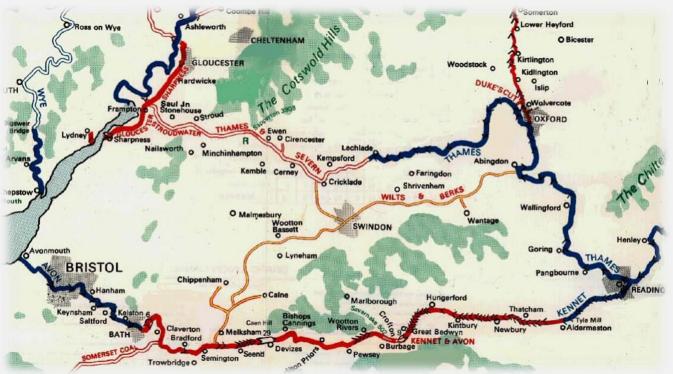


Figure 20: Inter-connected nature of the region's canals © Stroudwater History Archive

Competition from the Kennet and Avon canal and then the Great Western railway in C19 led to the Stroudwater canal becoming redundant by the 1930s¹³ with parts being filled during the construction of the M5 motorway during 1960s and 1970s.

Various owners and tenants continued to operate Bond's Mill as a fulling mill until 1934 when it closed.14

¹³ J. Cumberlidge, Inland Waterways (Huntingdon, 2009), pp.283-284. ¹⁴ 'Bond's Mill Timeline', <u>https://stonehousehistorygroup.org.uk/wp-content/uploads/2019/12/Bonds-Mill-</u> timeline.pdf (consulted March 2023)

¹⁰ Palmer & Neaverson, 'SW Textile Industry', pp. 77-79.

¹¹ M. Handford, The Stroudwater Canal: A History (Stroud 2013), p. 11.

¹² Palmer & Neaverson, 'SW Textile Industry', p. 79.

The Anticipation of War

In1938 the Sperry Gyroscope Company took over the empty Bond's Mill in order to create a 'shadow' factory for the parent factory in Brentford in west London. These factories were set up to provide back-up for established factories making military aircraft and their components, activities which made them vulnerable to attack by enemy bombers. Sperry Gyroscope principally made gyrocompasses, altimeters, and other instruments for aircraft.

In1939, the Hoffmann Manufacturing Company constructed a building north of the mill as a shadow factory for their main factory in Chelmsford, Essex. Hoffman's primary industry was ball and roller bearings for cars and aircraft, each Lancaster bomber containing 950 bearings.¹⁵



Figure 24: Sperry Gyroscope Home Guard who helped man the pillbox © Stonehouse History Group





Figure 22: Visit of Queen Mary to the completed Hoffmann's shadow factory June 1941 © Stroud News and Journal

¹⁵ 'The History of Hoffmann's Bearings', <u>https://www.hoffmann</u>bearings.co.uk/history-of-hoffmannbearings.html (consulted April 2023)

Figure 23: Hoffmann factory workers © Hoffmann Bearings

The Threat of Invasion

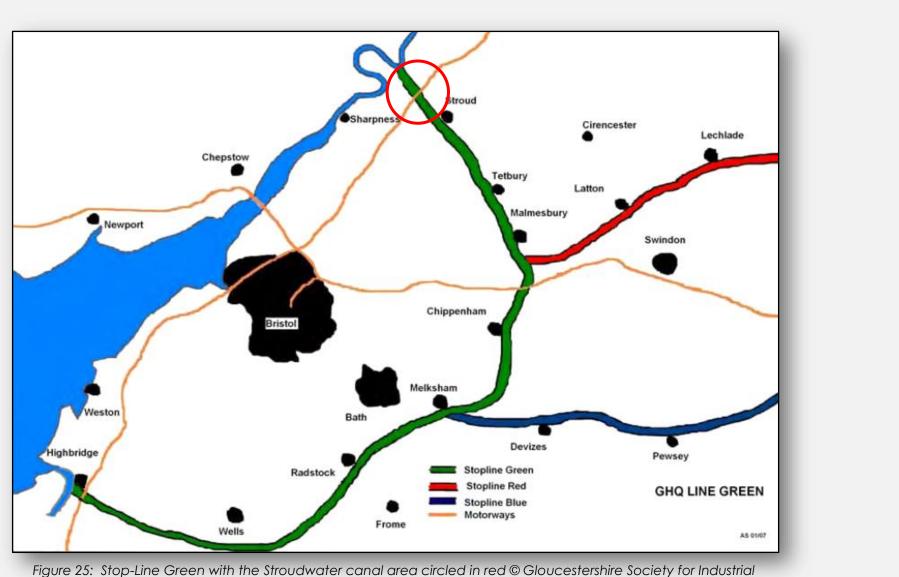
The Germans had been preparing to invade Great Britain since 1939 (under Operation Sealion) and effective counter measures were considered crucial.¹⁶ By June 1940, the France, Belgium, the Netherlands, and the Channel Islands had been occupied, and it appeared that an invasion was inevitable.

Newly appointed Commander-in-Chief of the Home Forces, Edmund 'Tiny' Ironside' was tasked with quickly creating a plan for the defence of Britain¹⁷ with over 400 miles of its coastland deemed as a potential invasion site by German forces.¹⁸ His plan included a large scheme of coastal and inland defences that would be utilised in the event of an invasion along Britain's less-defended coastline.

'Stop-lines' were created inland to halt any German advance long enough for centralised mobile troops to arrive. These stop-lines utilised natural topological features such as rivers, canals, and hills along with man-made obstacles/features such as bridges, concrete anti-tank blocks, ditches, minefields etc. between pillboxes.¹⁹ Used since WWI, these brick or concrete structures protected a small number of men behind bullet-proof walls and doors where they could fire at the enemy through narrow openings known as embrasures.

GHQ Stop-Line Green, or 'Bristol Outer Defences', ran for approximately 90 miles in a semi-circle around Bristol from Upper Framilode on the river Severn to Highbridge on the Bristol Channel.²⁰ Its purpose was to protect the industry of Bristol (well-known as an area of aircraft engine manufacture) and the port of Avonmouth.²¹

The Stroudwater canal and river Frome made up the final section of the stop-line. Defences along its route (see Figure 25, right), built during 1940/41, included 18 miles of dug anti-tank ditch, approximately 370 pillboxes, including Bond's Mill with its surrounding supporting pillboxes (Figure 26 below), and over 250 road blocks.²²



Archaeology

Strategically placed on the canal, the pillbox at Bond's Mill would be able to guard the bridge over the canal and to have an all-round visibility of the shadow factories. The surrounding pillboxes support this: they appear more reinforced and robust than Bond's Mill being constructed more strongly to withstand attack and keep the enemy at bay

¹⁶ A. Strickland, 'The Stroudwater Pillboxes: A Review of the WWII Pillboxes Along the Stroudwater Canal' (Gloucestershire Society for Industrial Archaeology, 2007),

https://asia.org.uk/sites/canals/projects/s04 ars pillboxes.pdf, p. 9.

¹⁷ 'Tiny Ironside', https://historylearning.com/world-war-two/world-war-two-western-

europe/homefront/tiny-ironside/ accessed April 2023)

¹⁸ 'Anti-Invasion Defences', <u>https://forestryandland.gov.scot/learn/heritage/world-war-two/anti-</u> invasion-defences, (consulted March 2023)

¹⁹ Strickland, 'Stroudwater Pillboxes', pp. 8-9.

²⁰ Maj. M. Green, 'War Walks: Stop Line Green' (Reardon, 1999), p. 3.

²¹ Strickland, 'Stroudwater Pillboxes', p. 11.

²² Strickland, 'Stroudwater Pillboxes', p. 12.



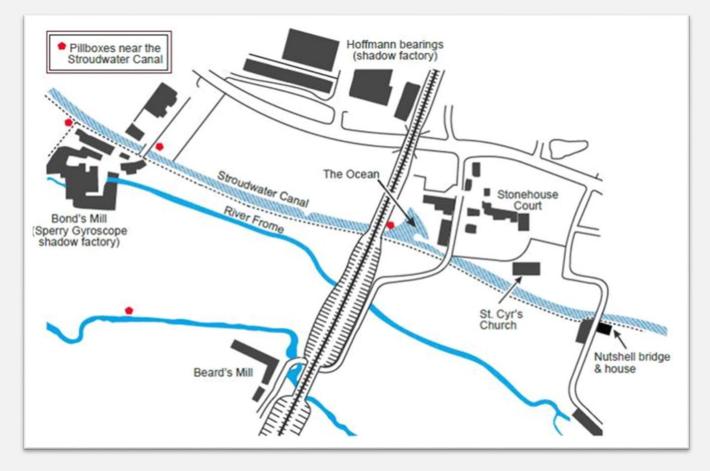


Figure 26: Location of pillboxes strategically placed to defend them (Bond's Mill Gatehouse circled) © Stonehouse History Group



Figure 27: The reinforcements seen at the pillbox south of Bond's Mill which include reinforced entrance porch, iron bolt reinforcement to thicker walls along with a ricochet wall

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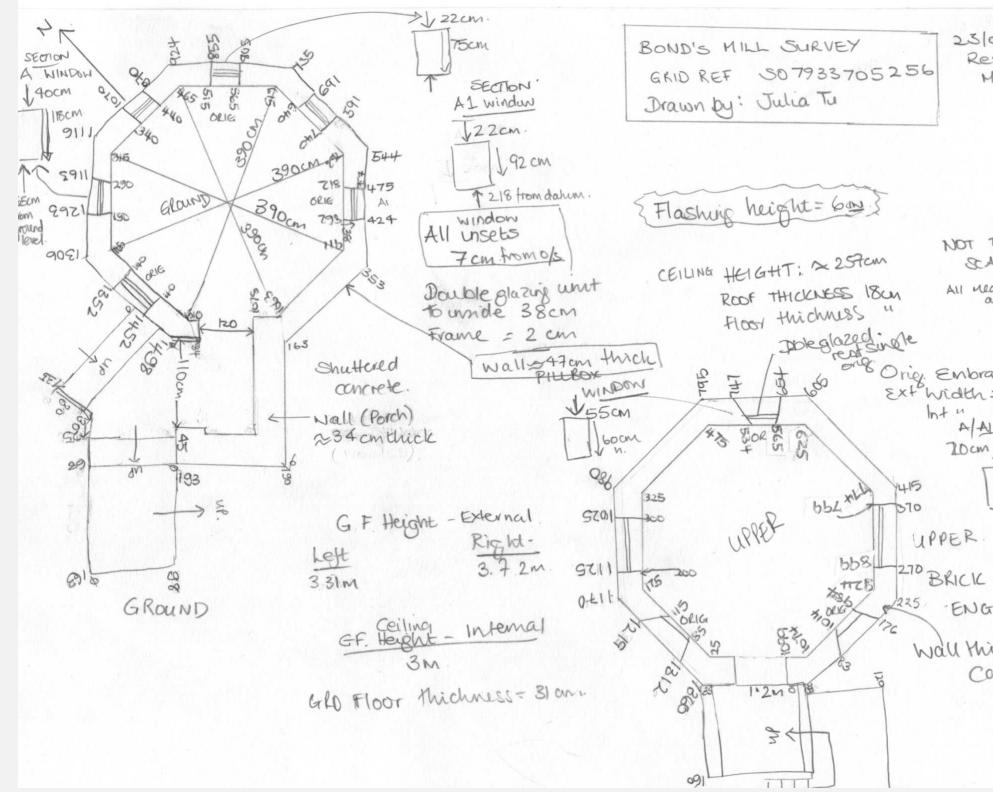
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APPENDIX A - Bond's Mill Gatehouse Survey: Field Notes 1