PN1648

birmingham archaeology

Chance Brothers Glassworks, Smethwick, West Midlands
Historic Building Record
Building C and Associated Features

2007

UNIVERSITY OF BIRMINGHAM

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Former Chance Brothers Glassworks,

Spon Lane, Smethwick, West Midlands

Historic Building Recording

BUILDING C AND ASSOCIATED FEATURES

by

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FORMER CHANCE BROTHERS GLASSWORKS, SPON LANE, SMETHWICK, WESTMIDLANDS

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SUMMARY

Birmingham Archaeology undertook a programme of historic building recording in July – September 2007 at the former Chance Brothers Glassworks, Spon Lane, Smethwick West Midlands, in advance of limited demolition and refurbishment works associated with the redevelopment of the site.

Recording work extended to seven listed structures on the site, all of which relate to the expansion of the glassworks in the 1830-50s when Chances attained a position of prominence in the glass manufacturing industry. Additional recording work was commissioned to cover a series of tunnels located beneath the present access road and a series of features to the north of Building C, beneath the current hard-standing of the site and accessed from the lower level of the building. The current report the results of the initial study of Building C and the associated features to the north.

Building C is a two-storey warehouse dating to the period c.1840-52, a phase of rapid expansion of the Chances glassworks. The remains to the north of Building C have been provisionally interpreted as the basal remains of a regenerative furnace, dating most probably to the 1870s or 80s.

It is recommended that the basal remains north of Building C be subject to a further phase of investigation once access is enhanced by the removal of accumulated debris.

FORMER CHANCE BROTHERS GLASSWORKS, SPON LANE, SMETHWICK, WESTMIDLANDS

Historic Building Recording

Building C and associated features, September 2007

1 INTRODUCTION

1.1 Birmingham Archaeology was commissioned by Templegate Land and Commercial Property Consultants of Edgbaston, Birmingham to undertake a programme of historic building recording at the former Chance Brothers Glassworks, Spon Lane, Smethwick, West Midlands. The recording was undertaken in advance of limited demolition and refurbishment works associated with the redevelopment of the site.

1.2 A total of seven buildings and associated features have been recorded as part of the project. This report presents the results of the study of Building C and a series of associated features to the north, accessed from the lower level of the building and located below the current hard-standing of the site.

1.3 Building L and a series of tunnels below the present access road off Spon Lane have been previously reported (Tyler, 2007a and b respectively).

2 SITE LOCATION

2.1 The site of the former Chance Brothers North Glassworks is located approximately 2 km north-west of Smethwick town centre and 7 km north-west of the city-centre of Birmingham (centred on NGR: SP 0040 8975; Figure 1).

2.2 The site is bounded to the west and north by the Brindley's Old Main Line (OML) canal (Wolverhampton Level) of 1768-69 and to the south by Thomas Telford's New Main Line (NML) canal (Birmingham Level) of 1829-30. To the south, the canal frontage of the site extends eastwards as far as Spon Lane (A4031) while north of Palace Drive, the site is bounded by a series of modern light industrial buildings and car parking fronting onto Spon Lane. These latter structures encroach onto the eastern side of the Chance Brothers site, which formerly extended as far as Spon Lane. The site is entered off Spon Lane to the east via Palace Drive and an access road which descends parallel to the NML canal.

2.3 The site includes seven Grade II Listed Buildings (Buildings A - E, K and L: Figure 2) all of which are also included on the Black Country Sites and Monuments Record (SMR). In addition, they lie within the Smethwick Summit / Galton Valley Conservation Area (DSD184) and form a part of a Scheduled Ancient Monument (DSD195, MBL3153). A large proportion of the 19th-century industrial buildings were removed in the 1940's, and, since closure of the site in 1981, the majority of the above ground structures on the site have been cleared, the remainder comprising concrete slab and areas of hard standing.

2.4 Building C is located to the centre of the southern site boundary, terraced into the northern embankment of the NML canal and is centred on NGR SP 0048 8974 (Figure 2, Plate 1). The series of associated features, are located immediately north of, and are accessed from, the lower level of Building C, and extend beneath the hard-standing of the current site.

3 AIMS AND OBJECTIVES

3.1 The principal objective of the project, as stated in the Written Scheme of Investigation (Birmingham Archaeology, 2007), was to make 'a detailed record of the structures in accordance with best practice' taking into consideration 'it's historical development, typology, spatial layout technology and function'.

3.2 The Historic Building Record has been made in accordance with by English Heritage's '*Understanding Historic Buildings; A Guide to Good Recording Practice*' (EH, 2006) and with guidelines laid out in the Institute of Field Archaeologists '*Standards and Procedures for Historic Building Recording*' (IFA, 2004).

4 METHODOLOGY

4.1 The Written Record

4.1.1 A written record of the Building C and associated features was made using *pro-forma* building and room recording sheets.

4.2 The Drawn Record

4.2.1 The drawn survey comprised the verification and annotation of pre-existing measured elevation drawings in addition to the generation of plan and sectional drawings at an appropriate scale (1:100 for plans, 1:50/1:20 for sections) to illustrate the horizontal and vertical relationships within/between the buildings.

4.3 The Photographic Record

4.3.1 The photographic survey comprised monochrome print accompanied by high-resolution digital photography. Where possible, photographs included a graduated photographic scale. Details of photographs were recorded on *pro forma* index sheets, and included location, subject and orientation.

4.4 Documentary Research

4.4.1 No programme of documentary research was commissioned as part of the current study, however a rapid regression analysis of readily available historic Ordnance Survey 1:2500 maps has served to put the tunnels within the general context of the development of the glassworks as a whole (see §.5.6 below). It is understood that the Chance Brothers archive, now amalgamated into the Pilkingtons archive, may contain a considerable amount of significant information relating to the history and development of the Spon Lane site (Upson, 2004, §.2.1.8-2.1.10).

5 HISTORICAL BACKGROUND

5.1 The Spon Lane glassworks traces its origins to the formation of the British Crown Glass Company by Thomas Shutt and the works he established on the site on the south side of the OML canal in 1814. This works was sold in 1822 by Joseph Stock and Thomas and Philip Palmer, two of the original partners, to Robert Lucas Chance. Chance ran the company under its original name with his brother William and with John Hartley. On the death of

Hartley and following the departure from the firm of his two sons, the works began trading as Chance Brothers and Company in 1836.

5.3 Immediately upon acquiring the company, Chance began to expand the operation, specialising in fields such as coloured glass, and developed alternative techniques, including the innovative cylinder methods of sheet glass production, imported from the continent. From around 1850, Chances began to develop lighthouse glass and a subsidiary company, Chance's Lighthouse Works was established in the south works (south of the NML canal) producing not only lenses but also related lighthouse apparatus including lanterns and revolving carriages.

5.4 The company went on to attain a position of prominence within the British glass manufacturing industry, becoming the largest crown and sheet glass manufactory in England by 1851 when it famously supplied the glass for Paxton's Crystal Palace at the Great Exhibition.

5.5 Pilkingtons Brothers of St. Helen's acquired a sizeable interest in Chance's in 1936, eventually taking over control of the company in 1955. Glass production at the Spon Lane works ceased in 1976 and the remainder of the site was closed in 1981.

5.6 As stated above (§.4.4.1), it is beyond the scope of the current project to undertake research into the origins and development of the Chance Brothers company and their activities at the Spon Lane site. A brief overview of the company's development is given in Upson (2004), while a number of unpublished articles and theses (eg. Chance 1979) have described the firm of Chance Brothers and their operations at Spon Lane in some detail. However, no detailed study has yet been undertaken of the development of the Spon Lane site and its operations and it is understood that the Chance Brothers archive, now amalgamated with the Pilkington archive, may contain a considerable amount of significant information in this respect (Upson, 2004, §.2.1.8-2.1.10).

5.7 A review of readily available historical maps indicates that Building C, along with Buildings D and E to the west, was constructed between the time of the 1841 Tithe Map (Figure 3) and the Board of Health Plan of 1858 (Figure 4), a period of rapid expansion of the Chance's site. Reference to the 1841 map indicates that Building C was built up against a pre-existing structure to the north. The range is clearly illustrated on the view of 1857 (Figure 5), which also shows a series of hip-roofed buildings to the north, the western of which includes a large chimney, presumably a glass house. The structure north of Building C is truncated to the east at some point between the Ordnance Survey editions of 1938 (Figure 7) and 1958 (Figure 8), alterations probably related to the insertion of a brick built structure at the lower level of the range and the insertion of a substantial steel girder within the northern elevation supporting a renewed roof structure (see §.6.2.7).

6 DESCRIPTION

6.1 Building C

6.1 Building C is a two-storey, rectangular structure aligned approximately east-west along the northern embankment of the NML canal, extending between the Hartley and canal bridges (see Figure 2; Plate 1), centred on NGR SP 0048 8974. It has maximum exterior dimensions of 56.7m long (E/W) x 9.85m wide (N/S). The range is terraced into the canal

embankment such that the southern (canal) elevation is of two storeys above a battered clinker plinth, while the northern elevation, facing the main site, is of single storey height. It is brick built of purple-red brick laid in English bond to the cill level of the lower storey windows, in English garden wall above this level, with three courses of stretchers between header courses (Plate 1).

6.2 The Upper Storey (Level 2)

6.2.1 The building is of 16 bays (here numbered 1-16 from east to west) originally demarcated by 15 trusses (T1 to T15 from east to west), which sit upon rounded, bull nose brick piers, projecting slightly from the internal wall face (Figure 10a). The southern wall overlooking the canal survives intact to the full length of the building (Plates 1/2); the northern wall however, survives only within bays 1-10, beyond which only the brick pier truss supports survive. The roof over bays 9-16 has collapsed.

6.2.2 Fenestration of the south wall can be divided into two sections. To the east, Bays 1-5 each display rectangular openings housing timber casements of four vertical lights with two double-width, bottom hinged panels over (Plate 9). The window within Bay 1 is somewhat narrower than those within Bays 2-5. Bay 6 displays a large window opening with segmental-head (double-header arch) with perpendicular reveals housing a three-light, transomed timber casement (Plate 10). Beyond Bay 6, alternate bays (8, 10, 12, 14) are lit by similar, segmental headed windows, Bays 7, 9, 11 and 13 being unlit. Reference to the view of 1857 (Figure 5) indicates that all fenestration at this level is secondary, an observation that is verified by evidence of insertion within exterior brickwork of the elevation.

6.2.3 Bays 3-6 of the north elevation are open at floor level, the upper section of wall being supported by a substantial, inserted webbed steel girder supported to east and west by inserted piers of brickwork (Plate 4). This girder supports the northern end of trusses T3-T7.

6.2.4 The floor structure is carried by substantial (18in. x 9 in.) principal beams aligned north-south on the line of the bay divisions. These beams carry east-west aligned joists (11 in. x 3 in. @ 18 in. centres). Where exposed, the original floor appears to have been of 11 in. softwood boards, though this has been extensively overlaid by a level of 5½ in. boards, aligned east-west. Within the northern part of Bays 3 to 6, the floor comprises the concrete capping of an angled, brick-built structure at Level 1 (Plate 8), the insertion of which most probably entailed the introduction of the large steel girder within the north elevation (§.6.2.3, Plate 4) and the partial renewal of the roof structure (§.6.2.6).

6.2.5 To the far east end of the range, the building is subdivided to form a series of offices by studwork partition walls with glazed upper panels (Plates 5/6). The partition walls retain, in part, vertical tongue and groove cladding also recorded at the upper, attic level (Plate 5).

6.2.6 As a part of remedial works to stabilise the building, the unstable eastern section of the roof and the studwork office partition walls were removed in September 2007 (Plate 11). Removal of the partition walls exposed the remains of a former ramp, aligned longitudinally on the axis of the range, sloping down towards the eastern elevation (Plate 12). This ramp had been converted to a shallow pitched stair before being boarded over in north-south aligned softwood boards.

6.2.7 The roof of Building C can be split into two distinct sections. To the east and west, trusses T1/2 and T8 represent primary work and are of timber construction of standard queen-post form with angled struts and gibbed-and-cottered iron strirrups strengthening the junction of queen-post and tie (Figure 12). T2 has collapsed to the north. Trusses T3 to T7 inclusive are secondary insertions in steel, of fink form with cranked ties and angled struts (Figure 12 inset). Westwards of T8, the roof has collapsed, though the timber members of the former structure survive and are laid out upon the floor joists within the western part of the building. Original parts of the roof are supported on two tiers of trenched purlins; the replaced section of Bays 3-7 is supported on two purlins to the northern slope and a single member to the south, all supported on iron cleats. The renewal of the roof, and the insertion of the girder within the north elevation, most probably relate to the construction of the angled, brick-built structure at Level 1, which arguably dates to the period 1938-58 when significant changes to the structure north of Building C are evident from historical Ordnance Survey mapping (see Figures 7 and 8).

6.3 The Lower Storey (Level 1)

6.3.1 The lower level of Building C (Figure 10b; Plate 13) is again of 16 bays. It is divided into two sections by a transverse, brick-built barrel-vaulted tunnel occupying Bay 9 (Plate 14) which opens to the south and leads to the furnace base (§.6.4) to the north. Fenestration to the south elevation comprises plain rectangular openings with straight jambs and perpendicular reveals, housing twin-light timber casement windows beneath segmental brick arches.

6.3.2 The ceiling of Level 2 is formed of substantial, north-south aligned timber beams supporting east-west aligned joists, which retain lath and plaster render in places. The principal beams are supported on two alignments of circular section, cast-iron posts on the axis of the building and to the northern side of the range (Figure 12; Plate 13).

6.3.3 Bays 1 and 2, to the east, are separated off from the body of the range by a brick wall which includes a segmental headed doorway towards its northern end (blocked).

6.3.4 Within the northern part of Bays 3 to 7, an angled brick built structure has been inserted, the function of which remains unclear. Its insertion can reasonably be associated with the introduction of the heavy steel girder to the north wall at Level 2 and the renewal of the roof structure to Bays 3 – 5. To the east of this structure a passageway (blocked) leads north and rises to exterior ground level via a straight stair.

6.3.5 A wooden, quarter-turn stair rises against the north wall of Bay 7 (Plate 16); this stair does not emerge into the upper level of the range, being floored over with two layers of floor boards suggesting a considerable time has elapsed since it was in use. A segmental-headed doorway with bull nose brick jambs in the north wall of Bay 7 (inserted), is partially blocked by the stair (Plate 17).

6.3.6 The central transverse passage occupying Bay 9 is brick built with a semi-circular vault (Plate 14). Through access is provided by simple rectangular doorways in the northern end of the eastern and western walls. The tunnel opens out to the south above the battered plinth overlooking the NML canal, and to the north provides access to the furnace base (see §.6.4).

6.3.7 At the time of survey, access to the western section of Level 1 was restricted due to accumulated debris and undergrowth. It mirrors the details of the eastern half, with paired alignments of cast-iron columns supporting the Level 2 floor. A brick built store has been inserted within the southern part of Bays 10-12 (Figure 10a; Plate 15). A further door in the north wall of Bay 10, again inserted, gives access to the western passage of the furnace base.

6.4 The Furnace Base

6.4.1 A series of three tunnels leading off the north side of Level 1 (Bays 7, 9 and 10) give access to the well preserved structural remains, here provisionally interpreted as the base of a regenerative furnace. Both the eastern and western entrance passage doors display clear evidence of having been inserted into the pre-existing brickwork of the north wall (Plate 17).

6.4.2 The structure comprises a total of seven parallel tunnels (A-G from south to north, Figures 11/13), aligned approximately east-west, the southern six of which are constructed entirely in refractory brick. To the west of the tunnels, accessed via the door in Bay 10 of Building C, is a longitudinal passage running approximately north-south giving access to each of the tunnels (Plates 18/19). The ceiling of the western passage is formed of a series of shallow jack-arches supported on transverse RSJs. Beyond Tunnel G at the northern end of the passage, the western passage continues as a red-brick barrel-vaulted passage for a further *c*.7 m before turning westwards; access to the westward extension was not possible because of accumulated spoil, though it was noted to extend for at least 10m before veering gradually to the north. Upson (2004; Fig. 14), based upon a combination of previous studies and historical maps, indicates that this tunnel extends further to the west and serves a second furnace base.[1]

6.4.3 The southern two tunnels (A and B) are narrow (1.15m and 1.20m respectively), Tunnel A standing slightly taller than tunnel B.[2] Both are constructed of refractory brick and have semi-circular barrel vaults terminating in an arch of stretchers. Tunnel A retains a packing of checkerwork refractory brick, laid to a 'pigeon-hole' setting with horizontally disposed passages (Plate 20). At 7.5m long, Tunnel A is somewhat shorter than the remaining tunnels; the north flanking wall of the tunnel extending beyond the body of the tunnel to both east and west to form the southern wall of Tunnel B (Figure 11). Tunnel A is blocked off to the east (Plate 29).

6.4.4 Tunnel B slightly wider and shorter than Tunnel A, and longer at 10m in length. The tunnel is blocked off 2.75m from its western end. From the east, it is seen to retain checkerwork brick packing (Plate 30) of a similar nature to that recorded within Tunnel A.

6.4.5 The central tunnels (C and D) are significantly wider (2.53m) and taller than the flanking tunnels (A, B. E and F) and vary structurally in that, rather than tunnels *per se*, they comprise a series of arched brick ribs (Plate 22), separated by *c.*0.4m wide voids which extend to the underside of a perforated iron plate (Plate 23), and are interconnected at high level.

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[1] It is understood that Upson's Fig.14 was based, at least in part, upon survey of the sub-terrainian structures undertaken in the 1980s (Anne Upson, *pers. comm*.).

[2] It was not possible to define full original heights for the tunnels due to accumulated spoil and debris obscuring the original floor level.

6.4.6 Tunnels E and F to the north mirror Tunnels A and B to the south, being narrow (1.18m wide) and Tunnel E being slightly lower than Tunnel F. The end of tunnel F is set back from Tunnel E, and the former tunnel is thus shorter, again reflecting the arrangement to the south. Both tunnels are blocked off close to their western ends (Plate 25), and are not accessible from the east, so it is not known whether they retain checkerboard packing as is the case with the southern flanking tunnels (A and B).

6.4.7 At the far north end, Tunnel G probably forms some form of access tunnel. Only the southern wall is in refractory brick (being the north wall of Tunnel F; Plate 26), the remainder of the structure is in red-brick with rounded, bull-nose arch and two alignments of grey engineering brick which run the length of the barrel vault (Plate 27).

6.4.8 The brickwork of all the tunnels is of high quality, with rounded and stopped jambs (Plate 31).

6.4.9 At the eastern end of the tunnels, accessed via a passageway from Bay 7 of Building C, is a rectangular area, 3.5m wide and ceiled by three low brick jack-arches, allowing access to the eastern end of the tunnels (Plate 28). To the north, an inserted redbrick structure obscures the eastern end of tunnels E- G. Two voids in the floor provide access to sub-surface, brick-built flues, one of which extends below Tunnel A returning to the east to run approximately north-south, parallel to the eastern wall. The second flue, accessed immediately east of Tunnel C seems to run on a north-south alignment (?possibly returning westwards to run beneath Tunnel B?), though it has been blocked internally.

6.4.10 The exterior walls of the 'east end' space are in red brick and include a pair of superimposed openings in the eastern wall (Plate 32); reference to Upson (2004, Fig.14) indicates that these tunnels may serve a further furnace base to the north. The doorway in the south wall of the east end is clearly inserted (Plate 33).

7 INTERPRETATION AND SIGNIFICANCE

7.1 Building C represents a two storey structure dating to the rapid expansion of the Chances Manufactory between 1841 and 1858. It bears similarities with Buildings D and E to the west, though certain variations of construction (fenestration details, clinker as opposed to brick for the battered base) may represent either a chronological or a functional distinction.

7.2 The structure to the north of Level 1 of Building C has been provisionally interpreted as the basal remains of a regenerative furnace, dating most probably to the 1870s or 80s. The scale of the remains suggests that it may be the base of a tank furnace, though it is probable that it represents a large pot furnace (D. Martlew, *pers.comm*.). It bears a striking resemblance to the remains of a regenerative furnace exposed during investigations at the Pilkington's St Helens Sheet Glass Works site (Krupa and Heawood, 2002), and the similarity to original Siemens Brothers design drawings of a '20 pot plate glass furnace' for Chances dated 1873-4, reproduced in the 'Hotties' publication (*ibid*., Pl. 7), is of particular interest in this respect.

7.3 The introduction of regenerative furnace technology from Germany in the later part of the 19th century, and in particular the continuous tank furnace, played a crucial role in increasing both the efficiency and fuel economy of sheet glass production, Friedrich

Siemens claiming that in one experiment, fuel savings reached as high as 79% (Barker 1960, 139 quoted in Krupa and Heawood 2002, 12). Chances were one of the first to experiment with the new technology, though in the longer term they resorted to more traditional methods of production, a decision that eventually led to the company losing its predominance in the industry in favour of Pilkington's of St Helens (Upson 2004, §2.2.19).

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 The buildings of the Chance Brothers factory are all Grade II Listed and are accepted to be of national importance and significance. Further, the structure lies within the Smethwick Summit /Galton Valley Conservation Area and has recently been designated as part of a Scheduled Ancient Monument. These designations highlight the importance of the surviving glassworks structures to the industrial heritage of the local area and wider region and to the heritage of the industrial revolution on a national scale.

8.2 The current project has allowed for as full a record as possible to be made of the buildings and features in their present state. It is recommended that a further stage of photographic recording be undertaken at Level 1 of Building C once the undergrowth and accumulated debris has been cleared from this level; it is however unlikely, from an archaeological perspective, that further detailed measured survey will be necessary for this structure. In the case of the furnace base structure north of Building C, it is recommended that a further phase of detailed recording (both measured and photographic) of these remains be made, again once accumulated debris has been cleared from within the tunnels, and in advance of / during any proposed reinforcement works. In particular, the extent and nature of the east-west aligned tunnel continuation at the north end of the recorded remains, together with any possible further related structures, will need to be investigated once safe access is established.

9 ACKNOWLEDGEMENTS

9.1 The fieldwork was undertaken by Ric Tyler of Birmingham Archaeology and was managed by Dr. Malcolm Hislop. The current report was written and illustrated by Ric Tyler and edited by Malcolm Hislop.

9.2 Thanks are extended to the staff of the Broadfield House Glass Museum and Redhouse Glass Cone, both in Stourbridge, to Anne Upson for information regarding previous work at the Chance's site and also to Dr David Martlew for informal discussions on the nature and significance of the basal furnace remains.

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Tyler R, 2007b. 'Chance Brothers Glassworks, Smethwick, West Midlands: Historic Building Recording: Tunnels between Buildings A and B, Interim Report.' Unpublished client report, Birmingham Archaeology report number 1648b.

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APPENDIX A : List Entry for Building C

SP 08 NW SANDWELL MB SPON LANE SOUTH
Smethwick

9/134

Warehouse between Hartley Bridge and Canal Bridge, Chance's Glassworks

21.7.78

GV

II.

Warehouse. Circa 1840-52. Brick with hipped slate roof. South wall, facing Birmingham Level of Birmingham Canal, of two storeys above a battered clinker base. There are 15 windows to the lower storey, with segmental heads. To the right of the seventh one is a wide doorway with round arch. The upper storey has ten wider windows, the five left hand ones with segmental heads, the five right hand ones with flat heads under the eaves. Interior: bolted queen-post trusses.

Figure 1: Site location plan

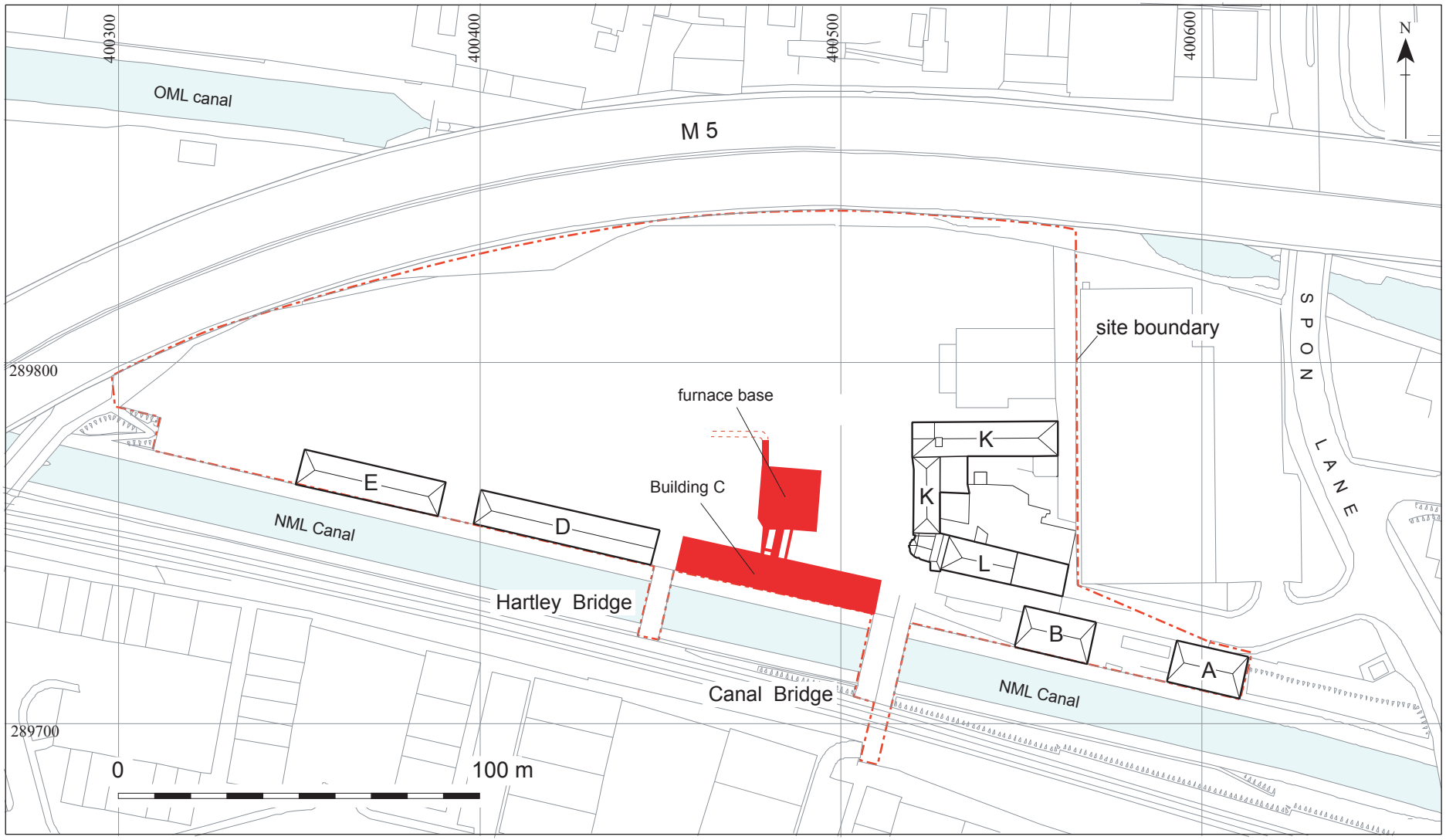


Figure 2: Site layout

Figure 3: 1841 Harborne Parish Tithe map.

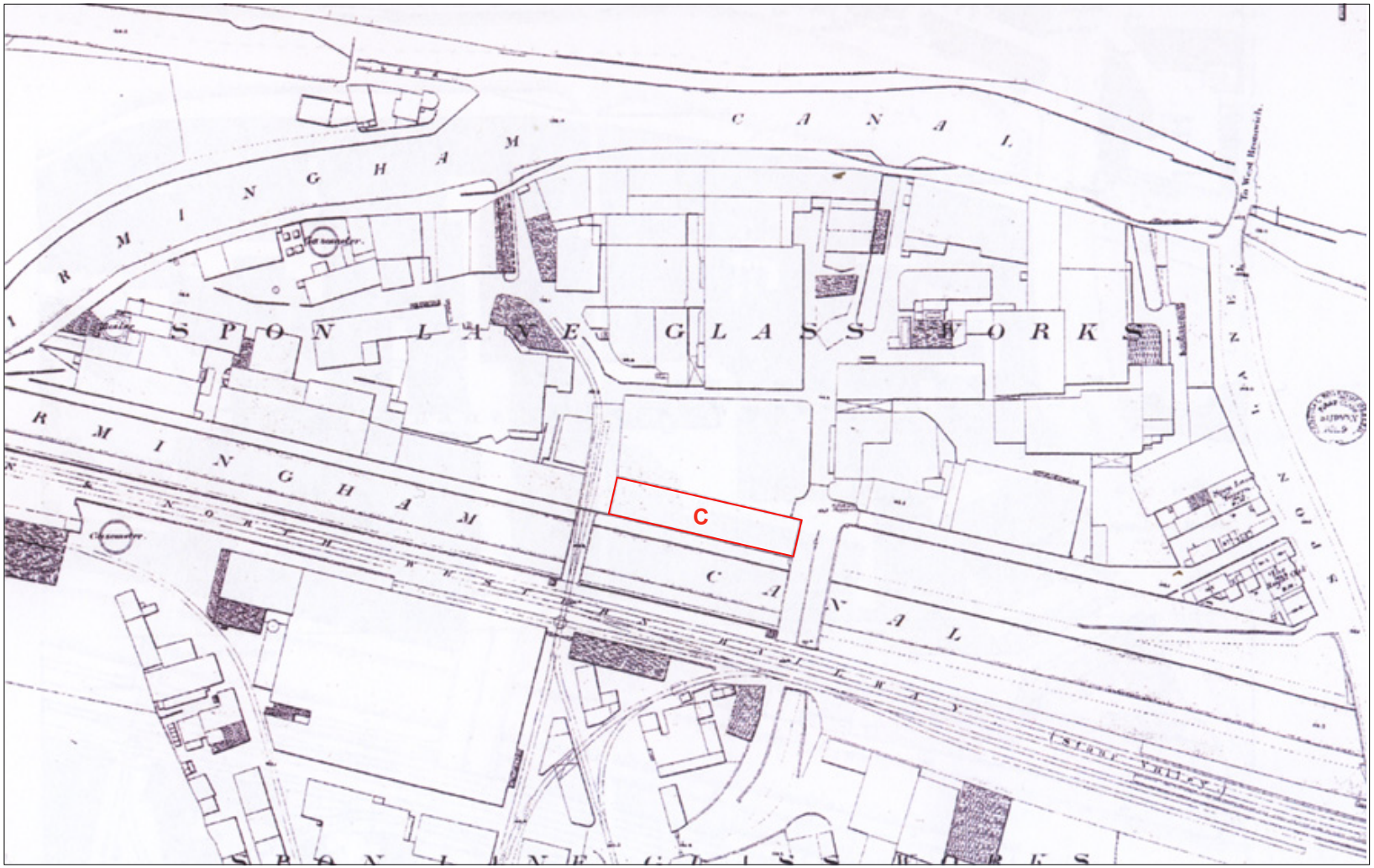


Figure 4: Board of Health map of 1858.

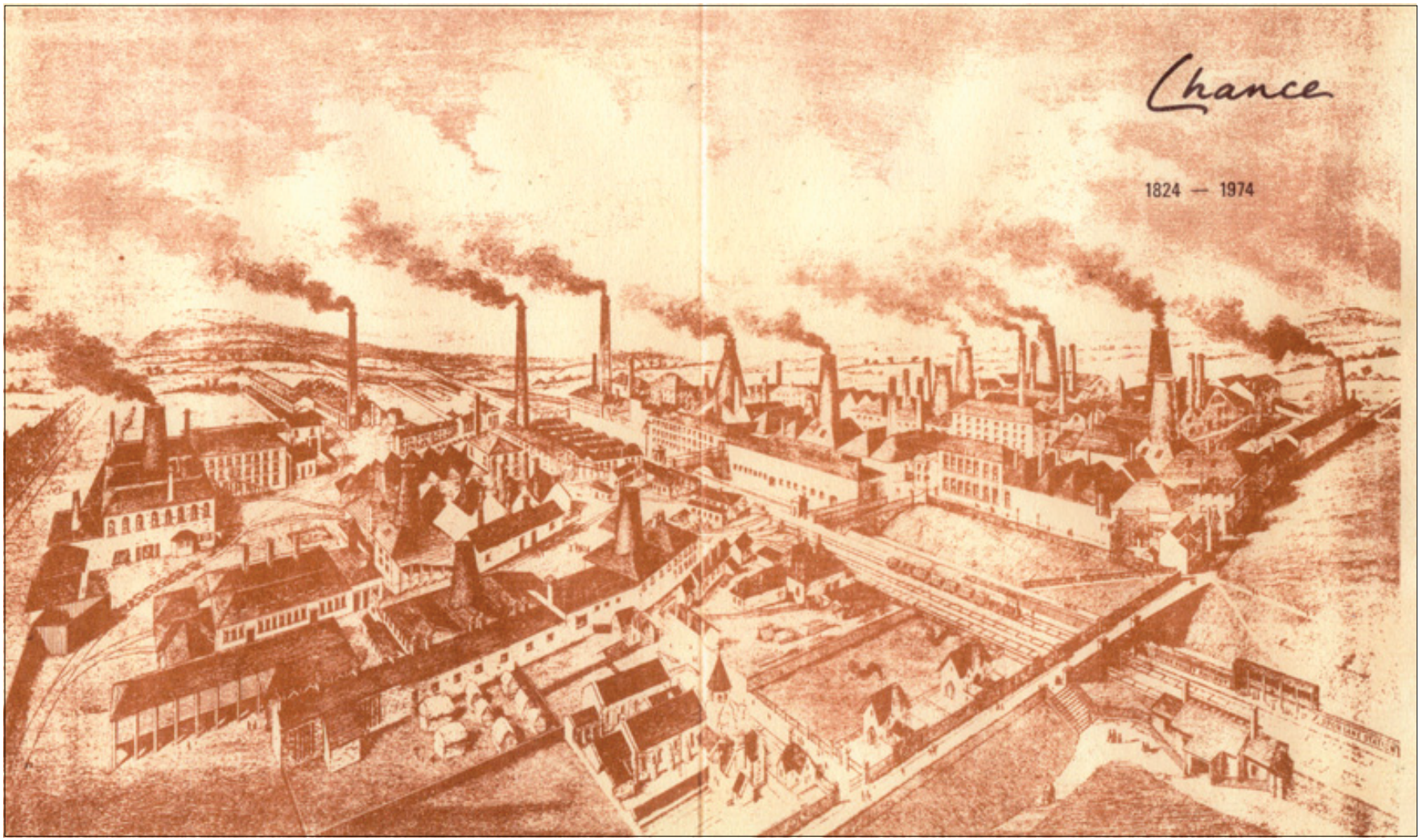


Figure 5: Chances Manufactory c.1857, Building C to centre of view.

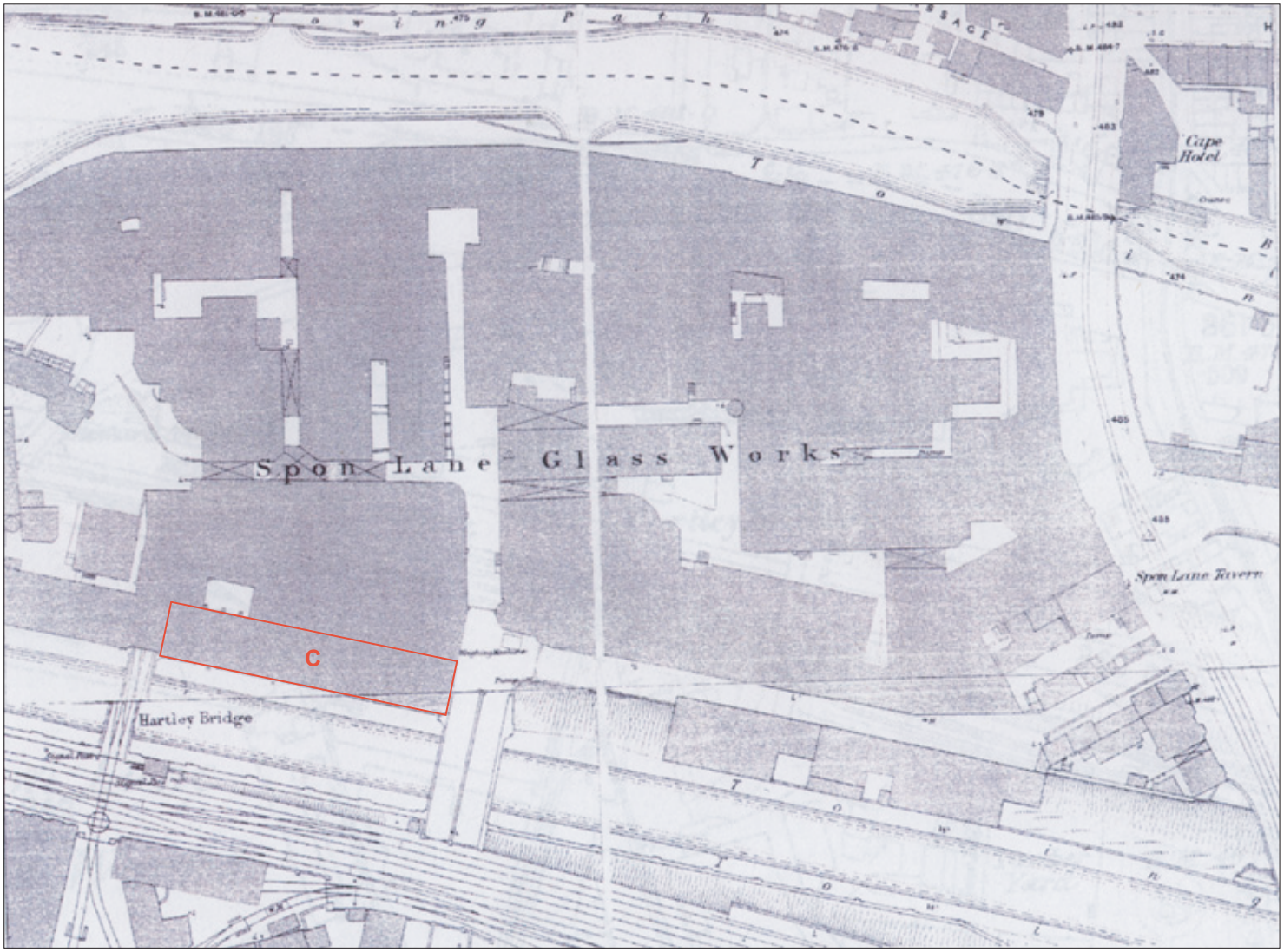


Figure 6: Ordnance Survey 1st edition 1:500 map of 1890.

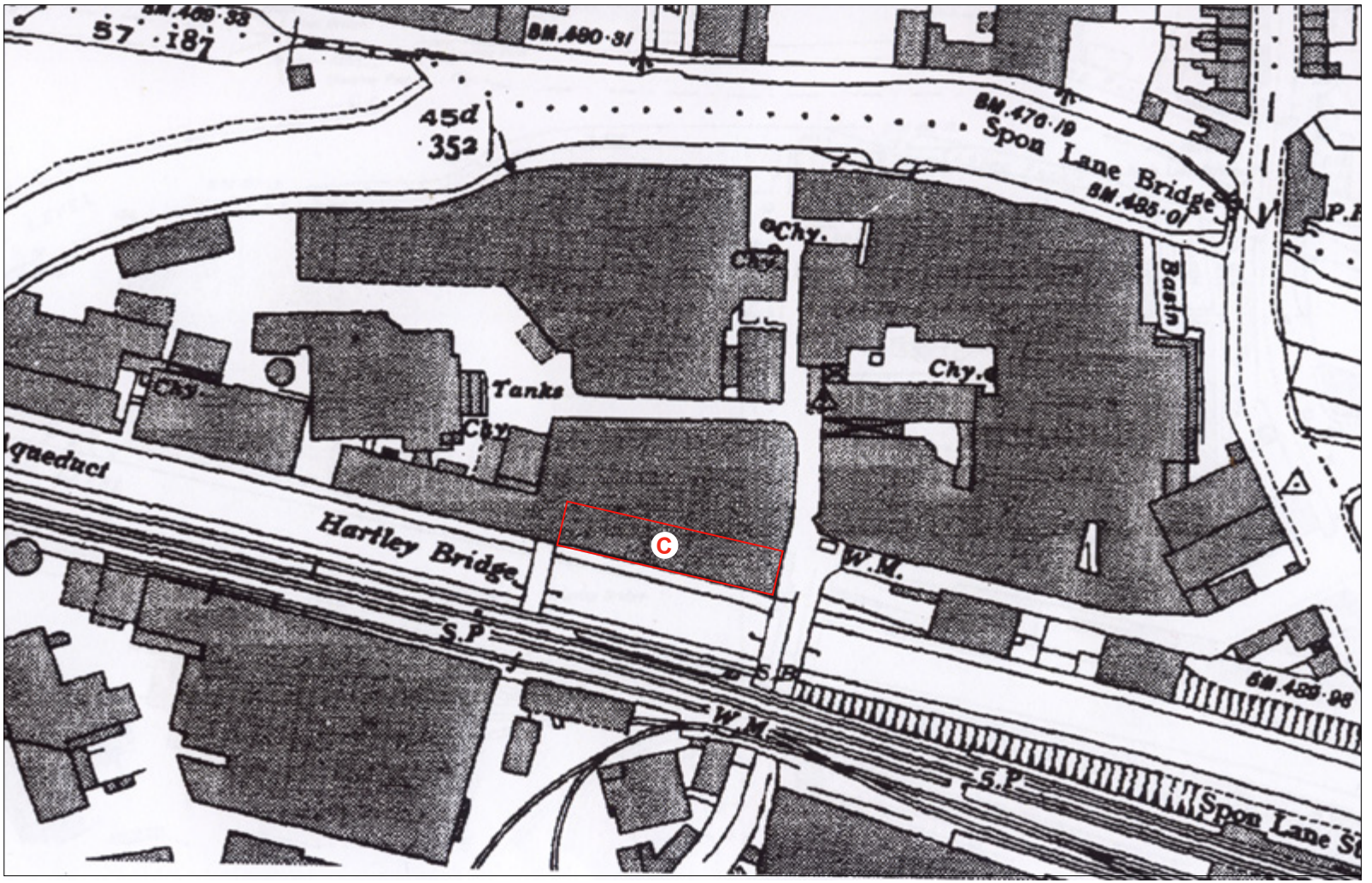


Figure 7: Ordnance Survey 1:2500 3rd Revision map of 1938.

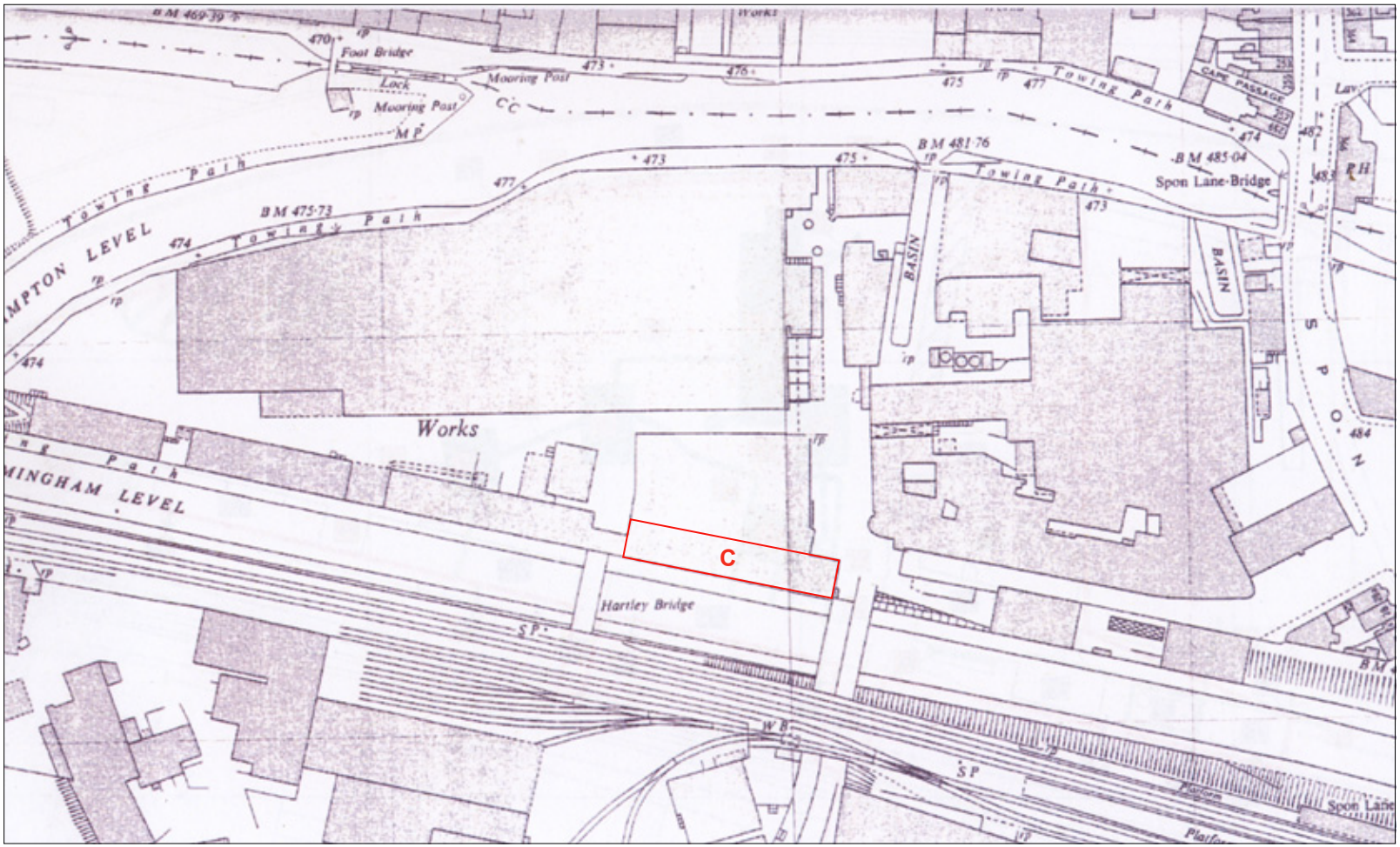
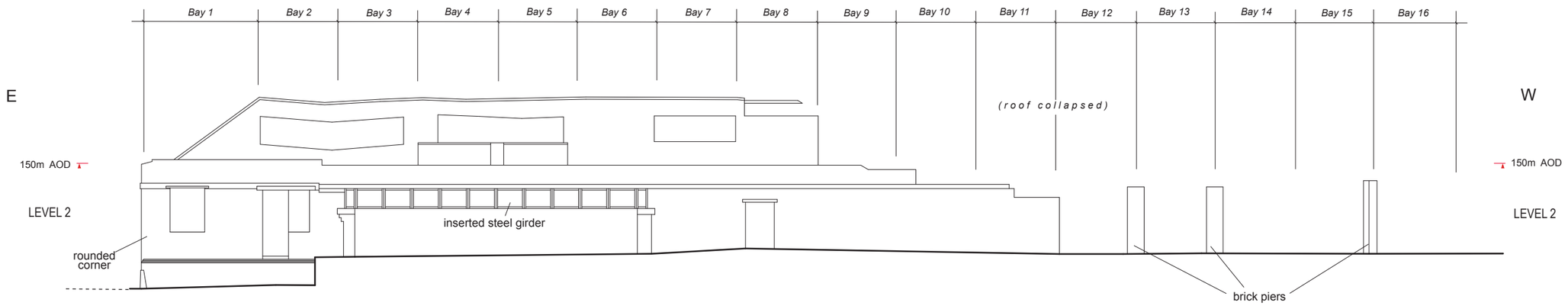
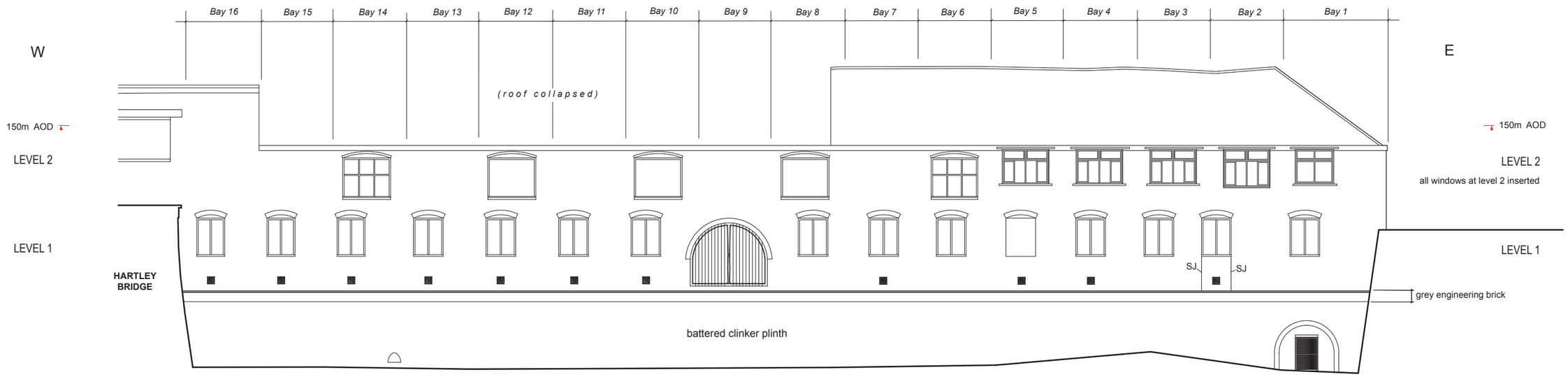


Figure 8: Ordnance Survey National Grid Series 1:2500 map of 1958.



(a) South elevation



(b) North elevation

0 10 20 m

Scale 1:200 @ A3

Building Location

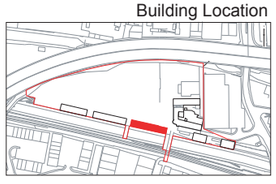
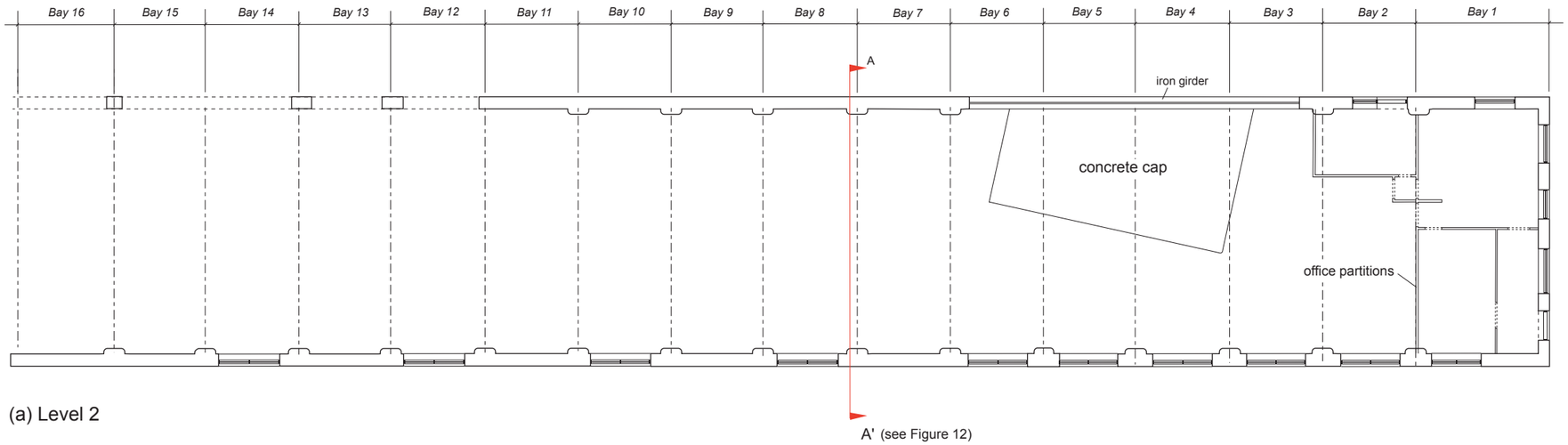
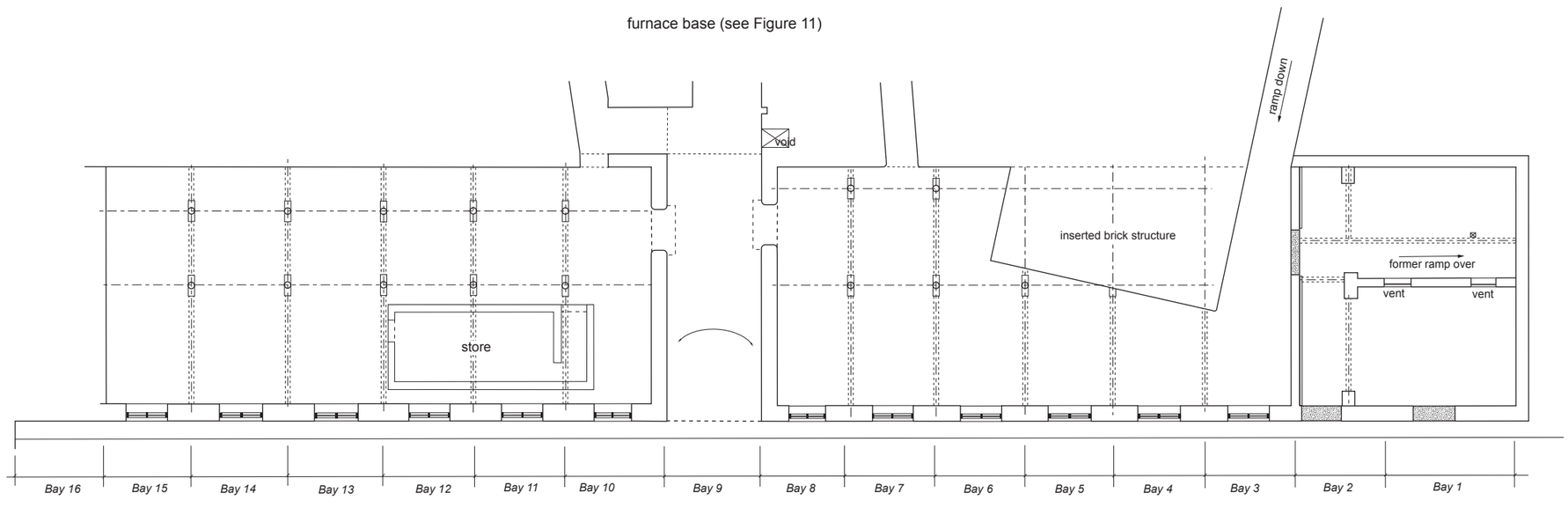


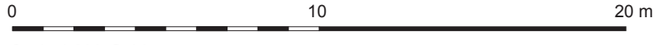
Figure 9: Building C, elevations



(a) Level 2



(b) Level 1



Scale 1:200 @ A3

Building Location

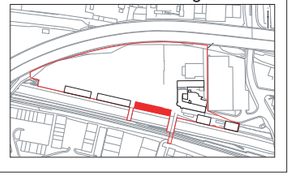


Figure 10: Building C Floor Plans

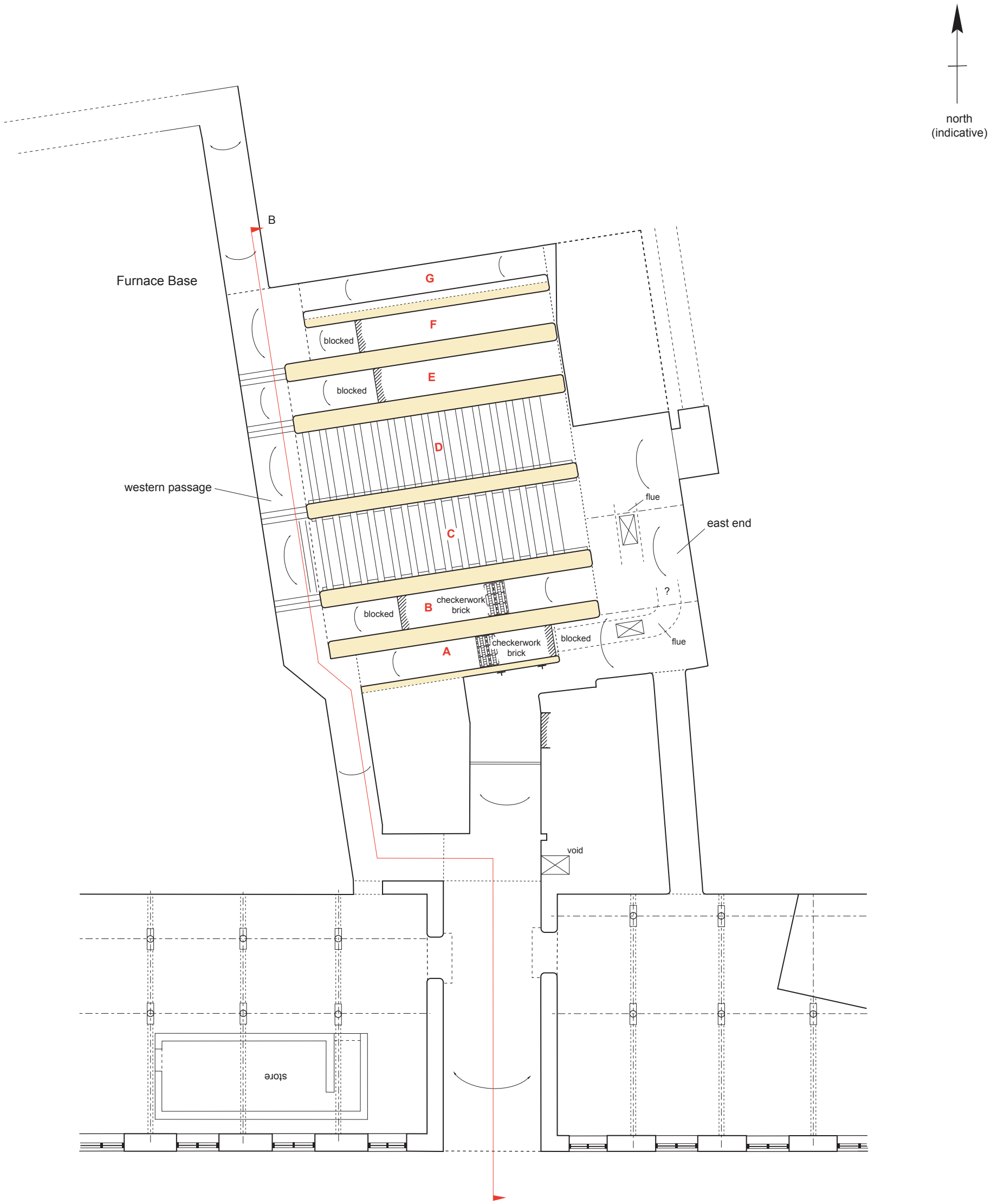
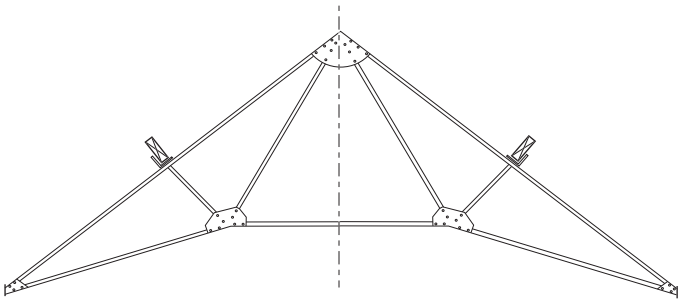
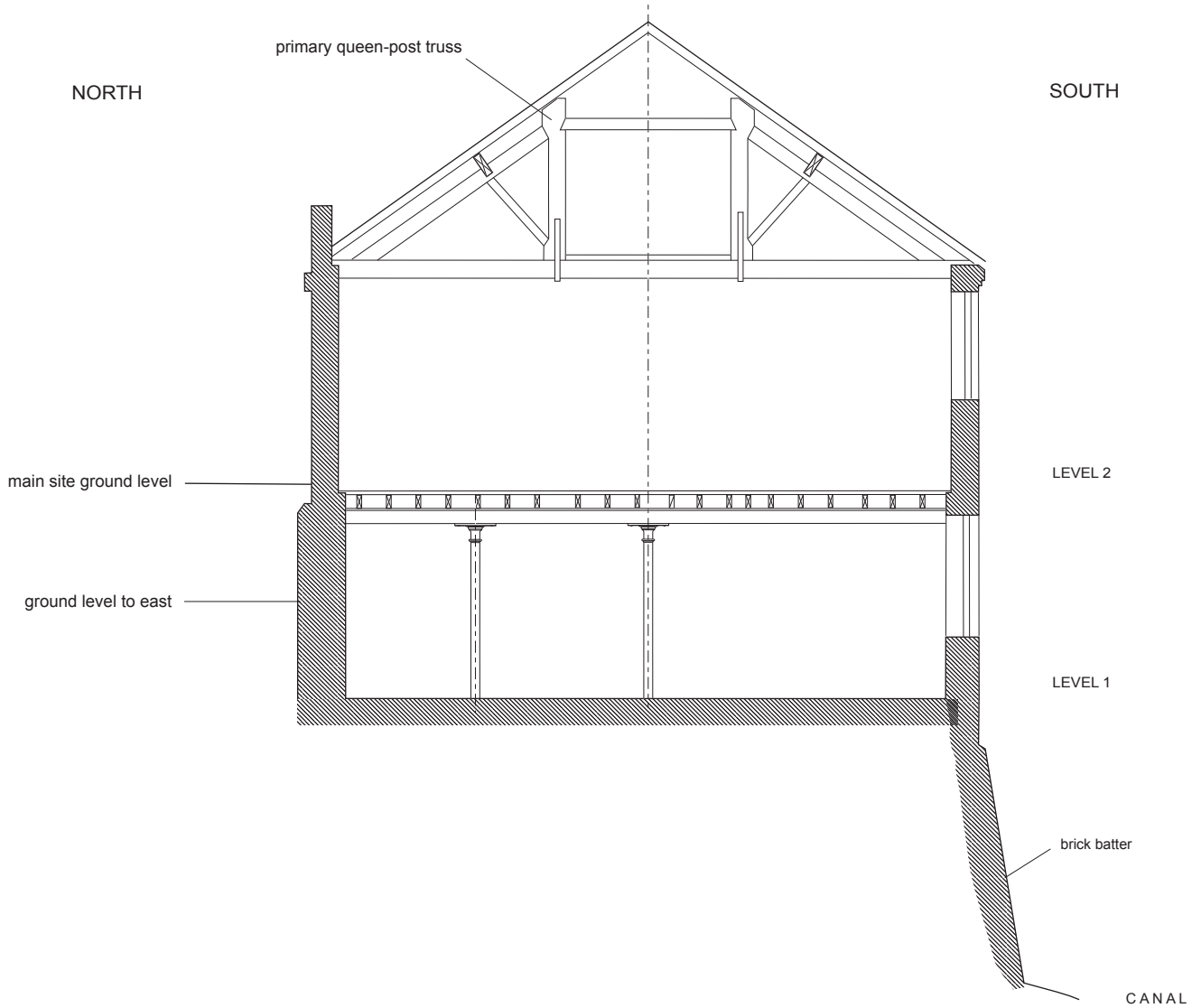


Figure 11: Furnace base north of Building C



replacement steel truss Bays 3 - 6



Scale 1:100

Building Location

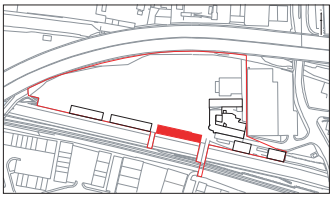
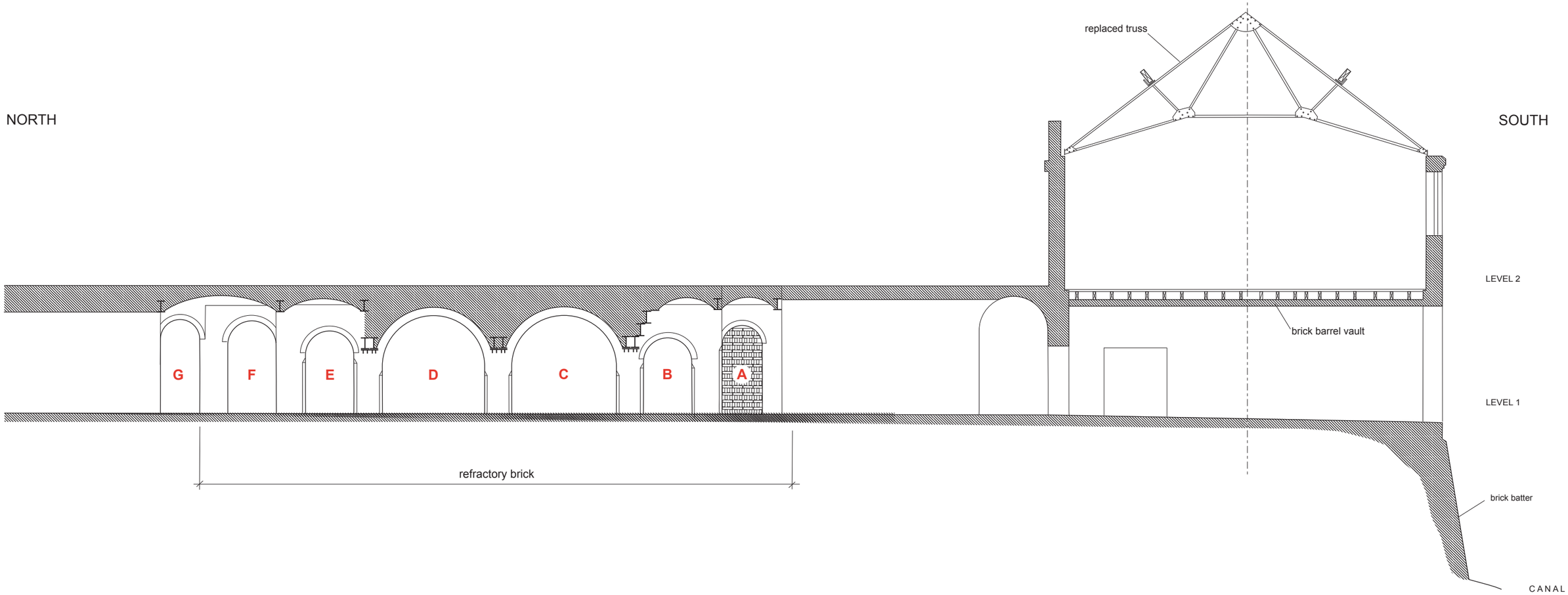


Figure 12: Building C, cross-section at A-A'

NORTH

SOUTH



0 5 10 m

Scale 1:100

Building Location

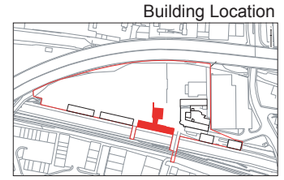


Figure 13: Cross section through furnace base at B-B'

Plate 1: Building C, oblique view looking west from Canal Bridge.

Plate 2: Building C, south elevation, east end from south side of NML canal.

Plate 3: Building C, east elevation.

Plate 4: Building C, north elevation, inserted iron girder over wide opening.

Plate 5: Building C, Level 2 interior looking east; office sub-divisions, note collapsed roof.

Plate 6: Building C, Level 2, east end; detail of office partitions.

Plate 7: Building C, Level 2 looking west.

Plate 8: Building C, Level 2; concrete top of inserted Level 1 structure.

Plate 9: Building C, Level 2; fenestration of south elevation (E).

Plate 10: Building C, Level 2; fenestration of south elevation (W).

Plate 11: Building C, Level 2 looking east after removal of office partitions and unsafe roof structure.

Plate 12: Building C, Level 2; evidence of former ramp (centre) exposed beneath office partitions.

Plate 13: Building C, Level 1 (E) looking west.

Plate 14: Building C, Level 1; central entrance tunnel looking south.

Plate 15: Building C, Level 1 (W); inserted store.

Plate 16: Stair against north wall.

Plate 17: Entrance to furnace base (inserted).

Plate 18: Western passage looking north.

Plate 19: Western passage looking south.

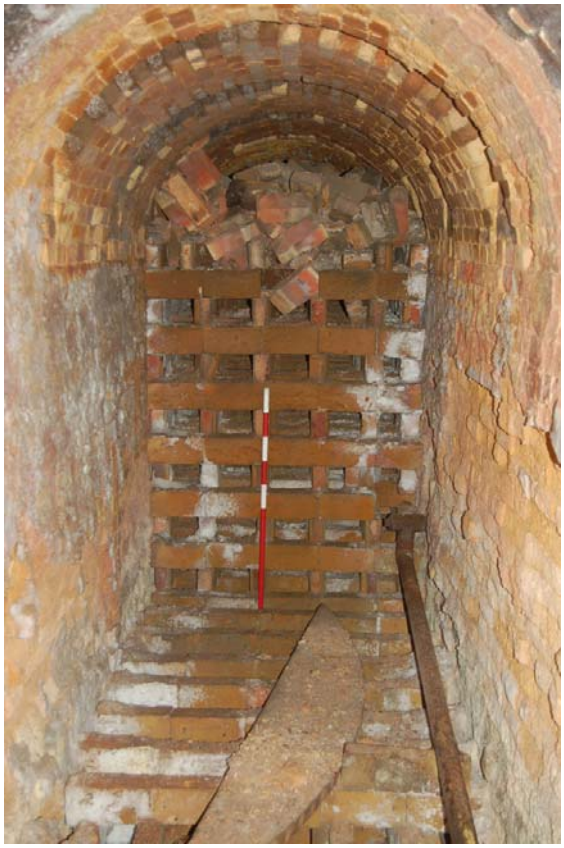


Plate 20: Tunnel A looking east, note packing.

Plate 21: Tunnel C, looking east.

Plate 22: Tunnel C, detail of brick ribs.

Plate 23: Tunnel C, detail of voids extending upwards to soffit of perforated iron plate. Note iron tie rod.

Plate 24: Tunnel D looking east.

Plate 25: Tunnel E looking east.

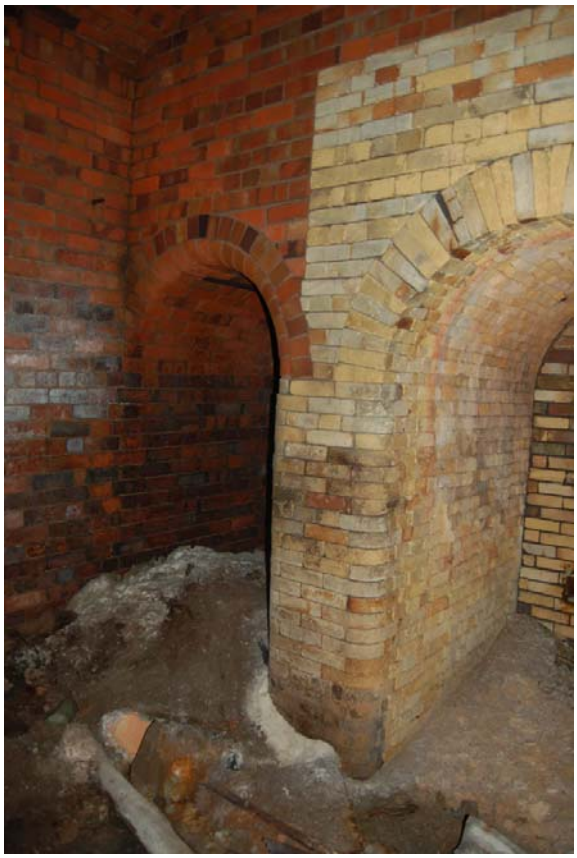


Plate 26: Tunnels F (right) and G (left).

Plate 27: Tunnel G looking east.

Plate 28: Furnace base, east end; tunnels A (left; blocked), B and C (middle), and D (far right).

Plate 29: Tunnel A, east end; blocked.

Plate 30: Tunnel B looking west, note packing.

Plate 31: Brick detailing to east end arches.

Plate 32: East end, openings in east wall.

Plate 33: East end, south wall, (eastern passageway leading to Building C, Level 1; inserted).