

Historic Building Recording at Lower Upnor Depot, Upnor Road, Lower Upnor, Medway, Kent



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Historic Building Recording at Lower Upnor Depot, Upnor Road, Lower Upnor, Medway, Kent

Summary

SWAT Archaeology has been commissioned by Ordnance Yard Developments Ltd to carry out a programme of phased historic building recording at the former R.S.M.E., Lower Upnor Depot, Lower Upnor Road, Lower Upnor, Medway, Kent.

The Site is currently occupied by a number of disused buildings associated with the sites former use as an ordnance depot. The site is of some significance due to its age, interesting features and historic development. It was therefore required that a detailed record be made of some of the buildings on the site, prior to their redevelopment or demolition. This would serve to mitigate the negative effects of the redevelopment/demolition of the buildings by 'preservation by record'.

The following buildings and structures have been identified for recording in the KCC Building Recording Specification issued in 2014:

Empty Case Store

'B' Magazine (Filled Shell Store)

Dry Guncotton Store (Detonator Store)

No. 2 Shell Store (Small Arms Store)

No. 3 Shell Store (Fuse Tube Store)

Wet Guncotton Store & Mine Testing Room

Locomotive Shed (Empty Case Store/Truck Store)

Latrine Block

Guard House

Filled Mine Store

Filled Shell Store (No. 5 Shell Store)

Other Structures

Perimeter Wall & Entrance Gate

Concrete Traverses

River Wall

Brick Traverse to former Shifting House

WW1 Sentry Post

Air-Raid Shelters (x4)

Gates between Upnor Castle and Upnor Depot

Buildings in **bold** are Listed, those underlined are proposed for demolition.

This report is Part 1 of a phased building recording exercise to allow development itself to proceed in phases. Instructions from the client are only to initially proceed with the recording of buildings (below) destined for demolition:

Empty Case Store

No. 2 Shell Store (Small Arms Store)

Locomotive Shed (Empty Case Store/Truck Store)

Latrine Block

Guard House

Entrance Gate

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On site survey and photography was carried out by Peter and Bartek Cichy. Documentary research, building analysis and additional photography was carried out by Paul Wilkinson. The illustrations were produced by B Cichy.

1 INTRODUCTION

1.1 Project background

1.1.1 SWAT Archaeology was commissioned by Ordnance Yard Developments Ltd to carry out a programme of historic building recording at the former Royal School of Military Engineering's (R.S.M.E.) Engineer Park, Lower Upnor Depot, Lower Upnor, Medway, Kent, and centred on National Grid Reference TQ75905 70807 (hereafter 'the Site').

1.1.2 The Site (Fig.53) is currently occupied by a wide range of disused buildings and structures, areas of hard-standing and rough grassland. The buildings on the Site were constructed in various phases and materials in association with a former ordnance depot, and more recently a maintenance, training and support facility for the Royal School of Military Engineering. The Site is situated on the banks of the River Medway and bounded by Upnor Castle to the south and the village of Lower Upnor to the north. The Site boundary to the west is Upnor Road and the main entrance to the Site is also situated on Upnor Road. The development proposals for the Site, for which planning permission has been approved by Medway Council (MC/13/1804) are for:

“Conversion of 5 existing buildings to light industrial use (Class B1) Use of building at site entrance for a restaurant (Class A3). The erection of 20 two and three storey dwellings to the southern portion of the site and the demolition of 3 buildings and replacement by 2 new car parking areas and a new single storey class B1 building together with alterations to the site access and provision of central car park and ancillary works including ramp and stairs to upper ground at rear of site.”

1.1.3 Planning consent for the proposals was granted by Medway Council subject to certain conditions. Condition 23 states that:

23) No development within a specific phase of the development, as agreed pursuant to Condition 03 of this consent, shall take place until the applicant, or their agents or successors in title, has secured the implementation of a

programme of building recording in accordance with a written specification and timetable which has been submitted to and approved by the Local Planning Authority.

Reason: To ensure that historic building features are properly examined and recorded in accordance with the objectives National Planning Policy Framework and in accordance with Policies BNE12, BNE14, BNE17, BNE18, BNE20, and BNE21 of the Medway Local Plan 2003.

1.1.4 The Site is situated within the Upnor Conservation Area, and four buildings are statutorily designated:

1. BUILDING LU001 (FORMER B MAGAZINE), UPNOR DEPOT
Magazine. 1856-7, by Lt Col Savage, the Commanding Royal Engineer at Chatham. Grade II Listed*
2. WWI SENTRY POST AT THE LOWER UPNOR ORDNANCE DEPOT
Sentry post at Lower Upnor Ordnance Depot, of WW1 date. Grade II Listed
3. WALL EXTENDING NE FROM UPNOR CASTLE ALONG THE RIVER MEDWAY
Wall. Early C19. Brick, stone-coped, with four blocked openings along its length
Grade II Listed
4. TRAVERSE TO FORMER SHIFTING HOUSE, LOWER UPNOR ORDNANCE DEPOT
Traverse to former Shifting House, Lower Upnor Ordnance Depot, 1811
Grade II Listed

The Site is entirely within the Upnor Conservation Area. The Site also lies immediately adjacent to Upnor Castle which is a Grade I Listed Building and Scheduled Monument. The northern boundary of the Scheduled Monument corresponds with the southern boundary of the development site.

It was therefore required by KCC that an enhanced Level 3 (analytical) record be made of some of the buildings on the Site, in accordance with the guidelines set out in the document *Understanding Historic Buildings: a guide to good recording practice* (English Heritage 2006).

1.1.5 Specific requirements for the recording works were detailed in the Manual of Specification (Parts A & B) produced by the Heritage Conservation Group of Kent County Council (KCC 2014) following consultation with the Conservation Officer of Medway Council which was submitted to, and approved in writing by Medway Council prior to the commencement of the recording programme.

2 THE SITE

2.1 Site location and description

2.1.1 Part of the Site is currently used by the Chatham Rope Company and was formerly an Ordnance Depot. Many of the buildings of the former Ordnance Depot were demolished in the 1960s but a number (including the 1904 Shell Store, the 1904 Filled Mine Store, the Locomotive Shed for the internal railway system, the 1896 Wet Guncotton Store, the 1883 Shell Store, the 1862 Shell Store, the 1895 Dry (live) Guncotton Store and the 1857 'B' Magazine) have been retained for continued use (Fig.53).

The Site lies on the western shore of the River Medway immediately north of Upnor Castle (SAM 27007 KE171). Immediately to the north of the Site lies an active boatyard and beyond the village of Lower Upnor. The Site is generally level lying between 4.5 m. and 5.5 m. above Ordnance Datum (aOD).

The Geological Survey of Great Britain shows the natural subsoil as Thanet Beds overlying the Upper Chalk (Geological Survey of Great Britain (England and Wales) 1:50,000 scale, sheet 272 - Chatham). There is clear evidence to suggest that substantial portions of the Site were truncated by quarrying before the ordnance depot was established (Fig. 3).

3 METHODS

3.1 Introduction

3.1.1 The aim of the programme of historic building recording was to make a permanent record of the buildings on the Site prior to any redevelopment/demolition works. This would serve to mitigate the negative effects of the redevelopment/demolition of the buildings by 'preservation by record'. This is Phase 1 of the recording programme to enable phased development to proceed.

3.1.2 This recording programme was achieved through a combination of photographic, measured and drawn survey, written record and documentary research. Particular attention was paid to any evidence for functional details or machinery associated with the use of the site as a ordnance depot, although following demolition in the 1960's, much of the former machinery had been removed from the Site. Despite this, the recording works have attempted to detail the processes undertaken at the Site and how the buildings developed and altered over time.

3.1.3 The recording programme included detailed description and analysis, high-quality digital and film photographic record and drawn record taken from the measured survey of the buildings.

3.2 Documentary Research

3.2.1 A search of relevant primary and secondary sources was carried out in the following repositories/locations:

- Kent History and Library Centre, Maidstone
- Kent Historic Environment Record (HER)
- Medway Council (through discussions with the MC Conservation Officer)
- Royal Engineers' Library, Brompton Barracks
- National Archives, Kew

3.2.2 In addition to the above-mentioned repositories, a search for information was also carried out via SWAT Archaeology's own library and via the internet. Two particularly useful sources of information came from the work of Dr David Evans and Ben Found (KCC).

3.3 Site visits

3.3.1 The Site was visited from 4th September to 10th October 2014 by a team of surveyors and buildings archaeologists from SWAT Archaeology and 'Digitise This' during which the buildings were subject to GPS scanning, measured survey, analysis and rectified photography.

3.3.2 The buildings were recorded to enhanced *Level 3*, as described in the document *Understanding Historic Buildings: a guide to good recording practice* (English Heritage 2006). In addition the recording was carried out in accordance with the Manual of Specification for the Site (Parts A & B) issued by Kent County Council (KCC 2014) and guidance given by the Institute for Archaeologists' Standard and Guidance for the archaeological investigation and recording of standing buildings and structures (IfA 1996, revised 2001 and 2008).

3.3.3 During the site visits, some 21 black & white and 148 colour digital photographs were taken using analogue SLR camera equipped with Zeiss optics. In addition 112 high-quality digital images were taken using a Nikon digital SLR camera (with 50 mega-pixel capability) and a further set taken with a high-grade full frame DSLR camera equipped with a 22.3 mega-pixel sensor. The hi-res geo rectified photographs were captured from tripod with a longer exposure time and comprise a digital archive of 232 frames.

3.3.4 Due to varying lighting conditions encountered during the site visits (due to time of day or poorly lit interiors), some of the buildings were digitally photographed a number of times, with varying timed exposure ratings (bracketed shots). A metric photographic scale has been included in all detailed shots and the buildings photographed within their setting to further explain the layout of the site.

3.3.5 All photographic views were recorded on photographic registers which give the direction of the view and a brief description of the subject.

3.3.6 A selection of the digital photographic record has been used to illustrate this report (**Plates 1 - 68**). Plans showing the location of photographic plates used to illustrate the report are included as figures in the report. **Figures 53, 54, 56, 60, 61, 62, 64.**

3.3.7 All GPS survey were conducted using either a Leica 1200 Dual Frequency GPS RTK Rover Kit or NovAtel OEM2 Dual Frequency GPS/single frequency GNSS (GPS + GLONASS) RTK Rover Kit on Site. This survey technique was augmented with traditional hand-measuring techniques using measuring tapes

and a Leica TCR 805 Total Station to produce an accurate survey of the buildings, which were recorded to a level of detail suitable for production of plans and cross-sections at 1:50 - 1:100 scale.

3.3.8 The plans, cross-sections and elevations produced from the metric surveys are presented in the report as **Figures 53-67**.

4 HISTORICAL BACKGROUND

4.1 Site Development: 1779 – 1960

Phase 1 (1779-1856)

A 1779 map copied from a 1724 original (MPH 1/358) is our first indication of military activity in the vicinity of the future Lower Upnor Ordnance Depot. The map shows the approximate position of a ten gun battery and further downriver a 18 gun battery (Fig. 1). Another map shows the site in 1806 as 'Ballast Wharf' with two dwellings and a boathouse (Fig. 2).

A more finished map dating from 1806 shows 'Ballast Wharf' in more detail which includes the wharf for the Ordnance Brickfield and a temporary Magazine located upstream from Upnor Castle (Fig. 3). The building had been offered to the Ordnance Board and bought. It took two months to adapt the building which would take nearly 10,000 barrels of 100lbs gunpowder which in reality each barrel would only hold 90lbs gunpowder (to allow the gunpowder to be shaken to stop it caking). To provide additional capacity an additional temporary Magazine was built to the south of the Castle by 1785.

The arrangement lasted for 50 years until Sir William Congreve the Comptroller of the Royal Laboratory at Woolwich proposed in August 1787 to convert the Purfleet magazines to storehouses and to build eight new magazines above Rochester Bridge. The plans did not come to fruition and in 1806 the temporary magazine shown in the 1789 drawing (Fig. 4) was being used as storage and stabling (WO 55/2350). It was decided to use Ballast Wharf as the site for a new magazine and the adjacent Upnor Castle for a number of Ordnance requirements.

By March 1808 the decision had been taken to build a new magazine to hold 10,000 barrels to a design by Lieut. Colonel D'Arcy, the Commanding Royal Engineer at Chatham who suggested the adoption of a catenary curve as the form of the arches (Fig. 6). D'Arcy pointed out in correspondence that not only would this give greater height, but timber centering was still available from Dover where catenary arches had been built at Dover Castle Keep around 1798, and in 1806 for casements at the Drop Redoubt on the Western Heights. The four cells of the Magazine were grouped together in a single block rather than being spaced out and traversed (Figs. 8 & 9). This was probably because of the restricted nature of the site. The Magazine (A) was completed by 1811 and Lieut. Colonel Charles Pasley writing in 1817 describes in some detail the building:

For example, in Upnor magazine...there are four arches, each 88 feet long, by 19 feet wide, in the clear, with piers 4 feet thick, abutments of 10 feet, and end walls equal to the piers in thickness. The height from the level of the floor to the spring of the arches is 9 feet 6 inches, and the latter, which are of the form called catenarian, have a rise equal to half their span, and are 3 feet thick. The total depth of masonry at the crown of the arch is 7 feet. In every pier there are five interior doors or passages of communication arched at top, each 5 feet wide and about 7 feet high. Every division of the magazine has one door and window at each end, besides which there is one door in the center of each of the abutments or side walls. There are 20 air-holes in the body of the magazine, 8 of which are pierced in the end walls: besides which there are 16 air-holes leading from the outside of the building below the floor.

The roof is formed of paving tiles laid in common mortar upon the masonry of the ridges, the gutters only being leaded. This powder magazine will hold conveniently about 10,000 barrels, piled in tiers of nine barrels high.

Powder magazines are usually divided into certain spaces called bays, by wooden posts or uprights, connected together at top and bottom by open frame-work. A bay, 17 feet 9 inches long by 5 feet 6 inches wide, and 11 feet 2 inches high, will hold 312 common barrels, each containing 90 lbs. Of loose powder, piled nine high, in alternate courses of twelve and eleven barrels each, placed side to side; the pile being three barrels wide, which, in this direction, are laid end to end. A bay of the same length and height, but about 6 inches

wider, will hold 1295 quarter barrels of musquet ball cartridges, containing 500 rounds each, and piled fourteen barrels high, in courses of nineteen and eighteen barrels alternately laid side to side, the pile being five barrels wide. In Upnor magazine there are two bays in the width of every arch, so that passages are left between the parallel bays, as also between each bay and the piers or abutments. Transverse passages are also left, one in the center and one at each end of the magazine, which has 32 bays in all. Some of them are, however, rather larger than the above specified dimensions. Small moveable capstans, placed under the crown of each arch, are used for raising and lowering the barrels. The construction of Upnor powder magazine has, in general, been very highly approved, it being both dry and commodious...

Powder magazines are usually provided with double doors and window shutters, which are made of thick materials, and covered with copper. The winding air-holes, before mentioned, are also covered, both inside and out, with copper plates, having a great number of small holes perforated in them. And as an additional security to powder magazines of any importance, an inclosing brick wall, 10 or 11 feet high, is usually built round them, at a distance of about twelve feet. No iron or steel are ever permitted in the construction of powder magazines, these materials being liable to strike fire. The floors are formed of strong planks, with joists below them, which are supported by low brick walls or piers to keep them dry; and care is always taken to produce a proper ventilation below the flooring.’ (Pasley 1817: 374-8).

The Magazine having been completed by 1811 was also provided with a traversed Shifting House (Fig. 5) and a new covered pier, all of which was completed by the summer of 1812. The location of the Shifting House was roughly equidistant between the castle and the new Magazine and intended solely for the examination of doubtful powder sent from the floating Magazine ships moored nearby. The building, most likely a light timber structure (Fig.10) was surrounded on three sides by protective traverses and blast walls (Fig. 11). Powder from the six magazine ships each holding about 9,400 barrels of powder was landed at the new Powder Pier by the new Magazine.

By 1825 it seems from cartographic sources that the new Shifting House had been rebuilt (Fig. 11). Indeed correspondence in September 1821 says:

'Shifting House is 30' x 18', brick and slate. Temporary Magazine is used as stores' (WO 55/2495).

By 1853 the demands of the Royal Navy had changed. Ships were now steam-assisted sailing ships firing more often than not shell rather than round shot.

The Shifting Room changed function and was converted to an Examining Room where the examination of shells was a procedure which had played no significant part in the operation of an eighteenth century Naval Arsenal, but was now increasing in importance. When vessels returned to refit or pay off they were de-ammunitioned, the shells being taken to such a building as this (preferably made of wood, as had been the case with Shifting Houses where the fuzes and bursting charges were removed). The latter was performed by rolling the shell in a Shell Horse with a barrel underneath, such powder then being considered suitable for instructional purposes only. The shells and fuze holes were then to be carefully cleaned out. The former with copper scrapers and the latter with some oily material. Should there be any suspicion of powder remaining in the fuze hole, the shell was to be referred to the foreman. If only a few grains of powder remained he was to use a heated iron to ignite them, but if a greater quantity were to remain then the shell was to be immersed for some time in boiling water and then carefully dried. After being emptied the shells were to be classed as either serviceable or repairable, and the fuzes similarly differentiated after being cleaned from grease and verdegriis. This was the practice in the early 1850's; it naturally changed as the projectiles and their exploding mechanisms changed over the years (Evans 2000: 5).

Phase 2 (1856-1862)

The Ordnance Depot at Upnor was by now understaffed and cramped, a situation exacerbated by the change from round shot and gunpowder to shells. The space available for more powder was not available. One of the four arches had been emptied in order to renew the flooring and when back in service it was filled with Dell's Metallic Powder Cases which were of pentagonal form. Another arch in 1854 was modified to hold Dell's Cases and John Shepherd, the Assistant Storekeeper in charge at Upnor wrote in January 1855 that further powder and shell 'cannot be accommodated at present' (ADM 160/37). The

situation deteriorated rapidly and on March 17th 1856 Shepherd wrote that: 'The Magazine is full up, ammunition for gunboats is expected, and there is nowhere to stow it' (ADM 160/38).

By 1856 construction of a new Shell Store and new Magazine were underway. Discussion on the design of the Shell store concluded that the building should be fireproof with a slate roof (Fig. 13). The Shell Store was completed by November 18th 1856. A Laboratory building for examining and emptying filled shells was built at the same time, and located to the south of the Shifting House of 1811 which was kept and converted into an Examining Room (Evans 2000: 8).

At this time the construction of a new Magazine designed by Lieut. Colonel Savage was underway (Fig. 15). The building followed the design of the original Magazine (A) and was built adjacent to the earlier Magazine but was half as large again (Fig. 14). The capacity was for 23,000 barrels where as the earlier Magazine only held 10,000 barrels. The new Magazine (B) was handed over by the contractor Joseph Diggle on June 24th 1857. Shepherd wrote to the Director of Stores, War Department that:

June 24 1857. Shepherd to Director of Stores, War Department. I have this day received from the CRE at Chatham, the formal & official delivery into my charge, of the recently erected new Magazine, consisting of 8 arches and calculated to contain Powder equal to between 23 and 24,000 Whole Barrels. 2) Having carefully inspected the same I beg leave to express my entire satisfaction therewith, in every particular so far as the erection and the internal fitments go, which appear well suited to the Service designed. I nevertheless venture to submit...that the following additions appear to be necessary, and would render the Magazine more convenient and efficient.

1) The Platform or wheeling way to be extended between the North door of the Old and South door of the new Magazine, so that the communication may be perfect from the centre as well as the front of the two buildings.

- 2) *That overhead cribs should be formed, same as in the Old Magazine to receive ammunition of natures small in amount, which would otherwise occupy to much disadvantage large Bags, at the ends and over the passages in each Arch making six cribs to each or forty eight in the whole; this measure would give additional strength and support to all the Bay Posts generally which they need, as found by experience with the Old Magazine.*
- 3) *That a covered jetty, crane, and wheeling way appear to be necessary for the embarkation and disembarkation off ammunition from and to the new Magazine...'* (ADM 160/38).

By January 1860 the Shell Store was full and munitions were being stored in the Castle again. Shepherd died in 1860 and his successor Forster undertook the managing of the build of an additional Shell Store (Figs. 17 & 18). In early 1861 a second Laboratory Shed for examining Caps and Fuzes was provided. Plans were drawn up in August 1861 (Figs. 20 & 21) for the second Shell Store which was to be built to the north of the Magazine enclosure.

Phase 3 (1892-1914)

In 1865 a committee was set up to enquire in the viability of Magazines and the committee's first report recommended the abandoning of Upnor and removing the Magazines to a better location further downstream. The reasons given were:

'The Magazines at Upnor were established mainly for the supply of ammunition to the men-of-war in the Medway, Thames, Sheerness, and the anchorage of the Nore. Their capacity is large, being constructed for 40,795 barrels, a quantity which cannot well be reduced. For its actual receipts and issues this establishment is not inconveniently situated, and all its appurtenances are in good order, and generally appropriate to their several objects, but the site, as well as the disposition of the Magazines, involve defects and sources of danger which, in this case, more than in any other which has come under the notice of the Committee, require early remedy.

The Magazines are built in one compact mass close to the bank of the river, in a very narrow reach, on which is a constant, and often crowded navigation. They are situated in the neighbourhood of a large population, and immediately a

new and important extension of Chatham Dockyard, where basins are in course of construction for berthing and fitting out large ships.

For these reasons, the Committee are of opinion that the present site should be abandoned, and the Magazines removed to a suitable and more remote locality further down the Medway (WO 33/15).

For nearly 20 years there were no major changes to Upnor but major storage of explosives was moved elsewhere to more isolated locations. A third Shell Store (Figs. 23, 24 & 25) was added in 1882-3 located adjacent to the 2nd Shell Store (Fig. 52). In November 1890 the second report of the committee recommended the division of the Ordnance Depots between the Army and the Navy, The Royal Navy getting all of Upnor with the Navy taking over on April 19th 1894.

By now a fourth Shell Store had been built south of the Examining Room, and being converted to a second Examination Room in 1892-3. The railway system was expanded and a Truck Shed built by 1893-4 (Figs. 28, 29, & 30). In addition storage facilities were needed for wet and dry guncotton and these were provided in 1895-6 (Fig. 37 & 38) with a workshop for cleaning cartridges. A Detonator Store was built into the traverse by the 2nd Shell Store.

Dr David Evans identified that by 1890 the principal buildings at Upnor were:

Expense Magazine with earthen traverse

Shell Filling room with earthen traverse 2 unheading sheds

Block of buildings containing cartridge filling room, packing room

Cartridge drying room

Examining room for fuzes

2 examining rooms

Store for empties

Block containing guard room, office and shifting room

Store for painting, finishing and packing shells

Fuze proving house

Elevated tramway for powder

2 ft 6 inch gauge railway (Evans 2000: 7)

All these building can be identified on the map of 1901 (updated 1920). Figures 37, 38 & 39. The final expansion at Upnor was the proposed purchase of waterside land to the NNE adjoining the Upnor Depot (Fig. 22). The Committee reported that:

‘The Committee recommend the purchase of this property by the Admiralty for two reasons: firstly, because the space and locality are well adapted and required for the storage of filled mines and shell; and secondly, because an element of danger to the Upnor magazines as a whole, will be eliminated if these private premises are secured as the property of the Crown.

At present there exist two filled shell storehouses, containing areas of 3,050 and 2,800 square feet respectively. The latter it is proposed to appropriate as a wet guncotton store, and the former it is proposed to utilize as a lay-out store, to supply a much needed want at Upnor. The total accommodation required for filled shell is 24,000 square feet. As in the case of mines, it is desirable to store filled shell at Upnor, and if the premises...are secured, the...accommodation required can be erected thereon...’ (ADM 116/655).

On April 26th 1900 the additional land had been purchased (Fig. 22), and two large buildings, the Filled Shell Store and Mine Store were constructed being ready for occupation by 1904 (Fig. 32).

Other buildings identifiable at this time are clustered around the entrance yard and included- Offices, Fire Engine House, Tinsmiths’ Shop, Carpenters’ Shop etc., all of which can be identified on the 1901, updated 1920 map (Fig. 38).

The functions of the buildings at Upnor changed over time as ordnance changed and specialist functions moved to other sites. By 1904 A and B Magazines which had been linked earlier by an Empty Case Store of post-1893 date were now filled with cartridges for small arms, six and three pounder QF

guns plus by 1913 one arch of A Magazine held cartridges, the other three arches held small arms ammunition while arches 1 to 7 of B Magazine held filled shell, the 8th being used as a Shell Painting Room (COL 18/1 April 1904).

With the completion of the new Filled Shell Store in 1904 on recently acquired land the original Shell Store became an Empty Case Store, the 2nd Shell Store became a Small Arms Store, and the third a Fuze and Tube Store (Figs. 37, 40). Shell Filling Rooms protected by concrete traverses and an Unheading Shed and an Expense Magazine were built by 1906-7 and supplemented by Shell Painting and Shell Scraping Rooms.

The last phase of development as an ordnance depot was the provision of Trotyl and Amatol stores around 1914. These six buildings were located in front of the six shell filling rooms constructed in 1906-7 (Fig. 39) and below.



Plate 71. Looking towards Upnor Castle across the Trotyl and Amatol Stores. Note the flat roof of the Empty Case Store

5. BUILDING DESCRIPTIONS

5.1 Guardhouse, Boundary Wall and Gate

5.1.1 The Guardhouse at the site comprises a small, rectangular-shaped structure which measures 7.40m in length and 2.87m in width and is orientated NE-SW along its long axis (Figure 54, Plates 9, 10, 14, & 15).

5.1.2 The building comprises an office which provided shelter for the security staff which controlled access to the Site from the adjacent main gate. The building butts up to the Boundary Wall and is constructed of 28 courses of Yellow Stock bricks with a number of soft red bricks added to the mix (Plate 17). The solid external walls of the Gatehouse are about 0.32m thick and set on a concrete plinth of which 60mm is exposed above ground. One course of stretcher bond bricks had been laid then a bitumen damp course laid before the rest of the structure was built with stretcher courses to a height of 2.20m. The courses are laid in yellow brown cement mortar with tiny crushed flint inclusions finished with a flush joint about 18mm thick.

5.1.3 The windows and doors are Upvc replacements with a half-glazed door to the front elevation with two sidelights 5.20m wide and a casement window 2.24m wide. Both doors and windows have cast concrete lintels. The sides of the building have a casement window each, both Upvc replacements.

5.1.4 The roof is flat and constructed with regular machine-sawn softwood joists of 200mm x 50mm diameter. They are capped with machine-sawn softwood furring pieces overlaid with plywood and finished with a waterproof layer of green bitumen felt topped with granite granules.

5.1.5 A single cast iron gutter is fixed to the front white-painted soffit board and connected by a swan-neck pipe to a single 400mm cast iron downpipe. The front facade of the building has three signs attached, one to the left of the front door says 'GATEHOUSE' painted white on a board painted black whilst to the right says '114' again white painted on a black background painted black on to the bricks (Plate 14). An outside light above the door is controlled by a

waterproof gunmetal switch located to the right of the door. Another, larger gunmetal switch is located on the right-hand corner of the building.

5.1.6 The interior of the building comprises a single large volume which is open to the plastered ceiling. The floor is concrete, the walls plastered and painted white. There are no other internal fittings or furnishings.

5.1.7 The building is of typical late 20th – early 21st century construction and of little architectural merit. The building is not shown on the OS map of 1962 but shown on the 1969 OS map.

5.1.8 The Boundary Wall in the vicinity of the existing Gateway has been recorded in advance of the proposed widening of the entrance.

The OS map of 1933 (Fig. 42) show in some detail the configuration of the Boundary Wall and Gateway with its two capped piers marked by numbers 26, 29. By 1952 the OS map (Fig. 45) show a much narrower Gateway entrance than there is today.

Detailed investigation of the two piers show that the pier to the north is of a later build with concrete blocks rather than the sandstone blocks of its earlier built neighbour (Plates 1, 2, 3, 4). In addition the 1952 OS shows the location of the boundary markers of which a number survive (Plates 5, 6). The construction of the entrance can be seen in Figures 54, 55, and Plates 3, 4, show in some detail the three phases of build of the Boundary Wall whilst rectified photography (Fig. 72) carry much more detail than can the plans. The south pier is constructed of yellow/brown bricks about 700mm wide set on a mortar bed 9mm thick. The lime mortar is off-white with very small flint inclusions and with a stepped vertical recess on the internal edge of 115mm cut to receive the closed timber gates of the entrance. The gate was hung on three wrought iron pintles- the lower one below the level of the modern tarmac road – set into three stone blocks with an ogee chamfer cut into the brickwork to facilitate the hanging of the gates on its pintles (Plate 7).

The Boundary Wall to the south is built in three phases.

1. Phase One, the original wall built in English bond with dark cherry red bricks set in a off-white lime mortar

2. Phase Two, the original wall heightened by 1.10m with a mix of dark cherry red bricks and a lighter dark straw brick set in a English bond set in a dark yellow lime mortar
3. Phase Three, the Gate Pier built in English bond with the adjacent wall of a mix of dark cherry red and a lighter off yellow brick set in a grey lime mortar capped by a stone cap. This phase was joined to the brickwork of both Phase One and Phase Two brickwork by block bonding (Fig. 72).

The Gate Pier to the north is a later build with concrete blocks and no inset wrought iron pintles. The adjacent wall is off the same phase of build as Phase Three of the south Gate Pier with some later repair work in yellow stock bricks. Of interest is that the internal face of this stretch of Boundary Wall has brick buttresses every 2m and the footing of which five courses are showing are of a harder cherry red brick fabric (Plate 12).

6. Latrine Block

The Latrine Block is located to the SW of the Guardhouse and is a small rectangular building that measures 4.81m in length and 3.40m in width and is orientated NE-SW along its long axis (Figure 42, Plates 18, 19, 20).

6.1.1 The building comprises part of an earlier building which can be seen on the 1897 OS map as part of a much longer building (Fig. 35) but by 1933 (Fig. 42) was a separate building which has been extended or rebuilt to the NE and in its rebuild contained three toilets, urinal and washing facilities. The building butts up to the Boundary Wall and is constructed of 31 courses of wire cut red/brown/orange bricks and where extended, yellow stock bricks (Plate 19). The solid external walls are about 0.32m thick and set on a soft red brick plinth of which three courses exposed above a foundation of rendered concrete brickwork. The rest of the structure was built with English Bond courses to a height of 2.25m. The courses are laid in yellow brown cement mortar with tiny crushed flint inclusions finished with a flush joint about 18mm thick.

6.1.2 The three windows to the SE are timber framed casement windows set one brick thickness into the wall and provided with a cast concrete sill with its upper surface rebated and sloped and the underside provided with a groove to prevent rain penetration. The lintel is of concrete, and the window openings are 0.70m high and 0.46m wide. These three windows are replacements and

smaller in height than the original windows which extended down for another seven courses of brick (Plate 18). Below the later infill brickwork is located three white plastic pipes which are the overflow from three toilets. Below this are three additional openings with rubbed brick segmental gauged brick arches some 0.79m wide and infilled with later brickwork.

6.1.3 The front of the building indicates that the building has been either extended or rebuilt with yellow stock bricks on the NE end and to the right and above the door (Plate 18). The brick doorway 0.90m wide is framed with a white painted timber frame rebated to enable the blue painted framed and braced door to open inwards. The door consists of two stiles and a top rail, bottom and middle or lock rail and braces less than the full thickness of the stiles with tongued and beaded boards tongued to the stiles and top rail and the rails tenoned into the stiles. The lintel to the doorway is cast concrete. The wall to the NNE is built of yellow stock bricks laid in a English Bond and pierced by one window opening capped by a cast concrete lintel. The window 1.25m wide is a timber casement window (Plate 19). The roof is flat and constructed with regular machine-sawn softwood joists of 200mm x 50mm diameter. They are capped with machine-sawn softwood furring pieces overlaid with plywood and finished with a waterproof layer of green bitumen felt topped with granite granules. Piercing the roof is a modern clear plastic lantern light. The guttering is 100mm black plastic running to an ad hoc arrangement of re-used cast iron piping attached to the Boundary Wall. Outside electrics include a switched wall mounted light on the front facade. The building is likely to be the SW end of a range of buildings shown on the OS map of 1897 (Fig. 35). The map of 1901 (Fig. 37) shows this range of buildings to include the Carpenter's Shop (III 7), the Tinsmith's Shop and Electrical Store (III 8). By 1933 the OS map shows the building as it is today.

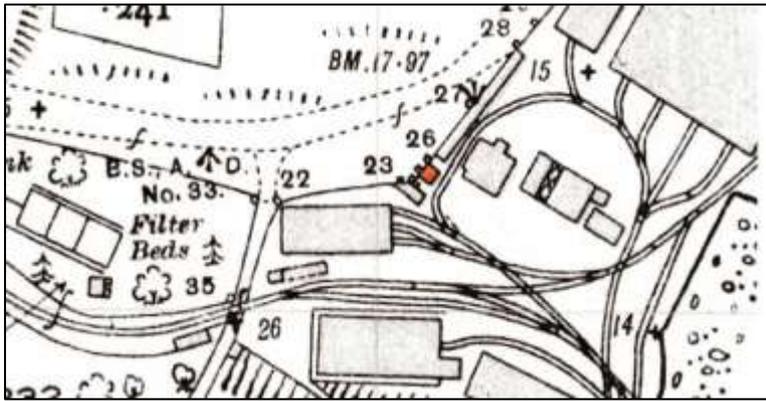


Figure 42. The location of the Toilet Block in 1933 (OS 1933 1:2,500)

7. Pol Store (No.67)

This building is situated on the corner boundary of the earlier Ordnance Depot and the newly acquired land, and is called a 'shed' on a map of c.1900. The contemporary annotation reads: 'This shed apparently be included' (Figure 31). The building is 3.14m wide and 4.23m deep and does not butt up to the Boundary Wall- there is a gap of 150mm. The building has a chimney stack situated in the SW corner and a door and window facing NE. The building is built of red/yellow/orange bricks laid in English Bond with a sloping roof of corrugated asbestos cement sheets.

7.1.1 The brick doorway on the NE side is 0.90m wide is framed with a white painted timber frame rebated to enable the blue painted framed and braced door to open inwards. The door consists of two stiles and a top rail, bottom and middle or lock rail and braces less than the full thickness of the stiles with tongued and beaded boards tongued to the stiles and top rail and the rails tenoned into the stiles. The door has a series of circular ventilation holes cut into the top. There are two signs on the door- 'POL STORE' and 'NO SMOKING'. (Plate 22).

7.1.2 The door is stepped down, presumably because the ground has been raised. To the right of the door is a truncated brick built buttress some 0.23m wide (Plate 22). The lintel to the doorway is cast concrete. The wall to the NE is built of red/yellow/orange bricks bricks laid in an English Bond and pierced by

one window opening capped by a cast concrete lintel. The window 1.43m wide is a timber casement window painted blue.

7.1.3 The cill of the window is constructed with half round (bullnose) bricks laid on edge. The roof is sloped and constructed with regular machine-sawn softwood joists of 200mm x 50mm diameter overlaid with modern cement corrugated sheeting. The guttering is 100mm black plastic running to an ad hoc arrangement of re-used cast iron piping attached to the Boundary Wall. Outside electrics include a switched wall mounted light on the NE facade.

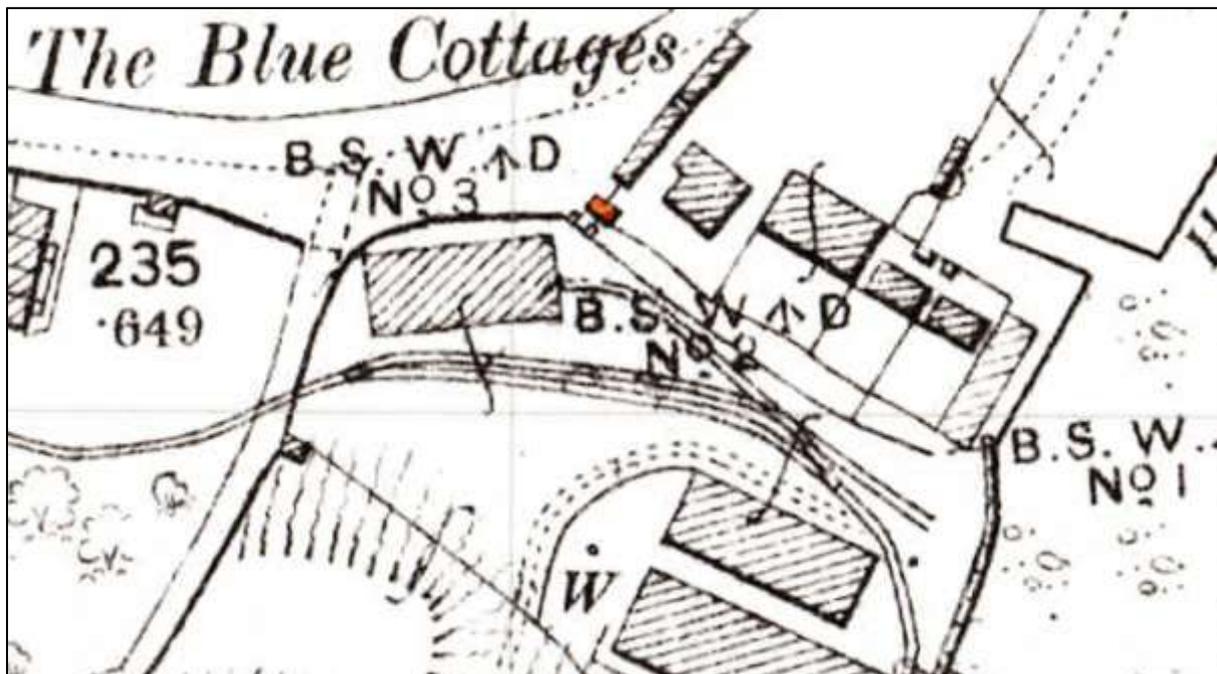


Figure 35. The location of the Shed 'Pol Store' in 1897 (OS 1933 1:2,500)

8. The Locomotive Shed (later Empty Case Store then Truck Shed)

The Locomotive Shed at the Site comprises a rectangular-shaped structure which measures 25.90m in length and 9.50m in width and is orientated almost West-East along its long axis (Figures 03-06, 56-59. Plates 24-30).

8.1.1 The building is located in the north area of the site just behind the curve of the original boundary wall of the Ordnance Depot. The 1891 map shows a 'Sidings Yard' in this location (Fig. 27), and the 1895 map shows a building of the present dimensions in this location but annotated 'Store' (Figs 28, 29).

8.1.2 On Drawing No. AD 278 (Fig. 30) the plan shows the 'Conversion of Empty Case Store into Shelter for Loaded Wagons'. The building shown is of seven bays with corrugated iron walls on a dwarf bunk wall with a rounded corrugated iron roof trussed with a Queen Post (Fan). The OS map of 1897 (Fig. 35) shows a single line only entering this building but the later map of 1901 shows three lines which exist to today. A photograph of the original building with its rounded corrugated roof can be seen in a photograph taken in the early 20th century (Fig. 48). Aerial photographs of January 1960 still show the rounded roof but by 1990 this had been rebuilt (Plate 72).

8.1.3 The present building (Figs 03, 04) is of a single-storey steel framed structure comprising seven bays with steel vertical stanchions sitting on –for the most part- a modern concrete dwarf bunk wall with the load of the stanchions and roof sitting on a base plate or bloom rather than steel grillages (Figs. 56-58).

In some areas the dwarf wall is of brick of up to seven courses of pale brown to red/yellow bricks laid in English Bond and 1.01m high (Fig. 03). The trussed welded steel roof is of a Double Fan design built with welded standard steel angle sections (Fig. 04) and connected to the stanchions by means of angles secured by a system of bolting as shown in Figure 04. The exterior vertical facings are of overlapping galvanised steel sheeting painted light blue and secured by steel clips to horizontal internal steel angle sections. The pitched roof is covered with overlapping corrugated concrete sheeting secured by steel clips to steel purlins.

8.1.4 Set into the vertical and horizontal steel wall framework are six timber-framed tripartite casement windows (Plate 30) measuring 1.51m high and 2.07m wide, and one timber-frames double casement window set into the north wall (Fig. 03 & Plate 26). On the east elevation two late 20th century timber windows have been inserted (Plate 28). The building is accessed by two doorways. The main double doorway is located on the east elevation (Plate 28) and consists of two doors 2.80m wide with a smaller access door cut into one of the doors. The other door in the building is a modern fire door 0.90m wide and situated on the north wall (Plate 29). The doors are painted blue and

consist of two stiles and a top rail, bottom and middle or lock rail and braces less than the full thickness of the stiles with tongued and beaded boards tongued to the stiles and top rail and the rails tenoned into the stiles. The floor of the building is of poured concrete and set into the floor are three sets of rail tracks 2' 6" (762mm) wide (Plate 27). Inside electrics consist of strip fluorescent lighting.

8.1.5 From the analysis of the building it is likely that the only parts of the 1895 building to survive are the three sets of rail track, parts of the dwarf bunk wall and possibly the vertical steel stanchions. In addition the six timber-framed tripartite casement windows may be original or 20th century copies.

9. No. 2 Shell Store (Small Arms Store)

The Small Arms Store (No. 2 Shell Store) at the Site comprises a rectangular shaped structure which measures 34.37m in length and 10.90m in width and is orientated WNW- ESE along its long axis (Figures 07-10, 60-63. Plates 31-42).

9.1.1 The building is located in the north area of the site adjacent to the River Medway (Fig. 53) and like the Locomotive Shed has been considerably altered since its build in 1862. One of the surviving plans (Fig.21) although drawn to show the additional lightening conductors to be added shows a building similar to the construction of No. 1 and No. 3 Shell Stores of which detailed plans and sections have survived (Figs. 17, 18, 24). The two buildings are of similar design with substantial timber Queen Post Truss roofs shown for No. 1 and No.3 Shell Stores, the angle of which is the same as in the plan of the No. 2 Shell Store, and can be seen in Figure 24 which shows not only the 1882 No. 3 Shell Store but a part section of No. 2 Shell Store. No. 2 Shell Store is shown in detail on Figure 42 (Evans 2000: 11). Of particular interest are the lengths the Ordnance Board went to ensure the buildings were damp-proof, the gully shown in Figures 24 and 42 for both No.2 and No.3 Shell Stores is deep and below the level of the under floor void shown in No.3 Shell Store. In addition No.2 Shell Store has evidence of an asphalt damp course above the level of the under floor air vents shown with some clarity in the section drawing of No.3 Shell Store (See right on Fig.24). This damp course has survived and been noted in

the site archive (Plates 37, 38). In addition steel slots have been added to the exterior wall of the main entrance on the east side to enable a timber barrier to be slotted in to help prevent the ingress of floodwater (Plate 35).

9.1.2 The building comprises a large open space sub-divided with a partition built of single brick in English bond courses with two brick buttresses to strengthen the doorway situated mid centre of the partition. Inside the main east entrance and on the north side of the building has been built a small office area using the same method of construction as the partition. The building itself is constructed of 35 courses of grey/brown bricks laid in an English Bond (Plate 38). The solid external walls are about 0.42m thick and set on a brick plinth of seven courses set also in English Bond. Set between the brick plinth and the rest of the wall is an asphalt damp course. It is unusual to have an asphalt damp course as early as 1862. Up to about 1930 damp courses are usually of slate or lead. All courses are laid in yellow brown cement mortar with tiny crushed flint inclusions finished with a flush joint about 18mm thick. The wall is embellished on the north/south elevations with a stringer course of brick just under the original build eaves (Plate 32).

9.1.3 Piercing the walls are 12 casement windows. The windows openings on the side elevations have cambered arches of brick with concrete sills, some of which are missing (Plates 36, 37). The window apertures have been rebuilt/repared on all 12 windows with a mix of soft red and grey/yellow mottled bricks (Plate 36). The windows are of mixed designs, all of them replacements and in a poor state of repair. It is unusual to have such extensive repairs to window openings especially seeing that the aperture size has not enlarged or decreased. The reason has become clear during the demolition phase of the building where Window No. 9 was revealed once the dense undergrowth had been cut down. The casement window is recessed unlike the replacement windows and has a strong timber framework to accommodate a pair of substantial wooden shutters which could be opened and hooked back flush to the exterior wall. A historic section of the window design can be seen in Fig. 17, a drawing dated to 1856-57. All of the windows have now been photographically recorded and which show the 20th century brickwork alterations to accommodate the replacement modern flush windows. A photo

example is shown in Figs 74, 75. The remainder of the photographs will form part of the site archive.

9.1.4 The building is accessed via four entrances with principal access via the eastern entrance on the front elevation (Plates 31, 35). This comprises a double doorway set back into the building which has been rebuilt with Common Fletton frogged bricks dating from the mid-20th century. The lintel is a steel beam painted green. The rear entrance is a double door braced and ledged wooden door set into the original opening with a cambered arch of brick (Plate 34). Two additional side double doors are located on the south elevation and are of the same design and construction (Plate 33).

9.1.5 The roof has been rebuilt either just before or during the early years of the Second World War and is a flat reinforced concrete roof constructed of poured concrete on to a horizontal wooden boarded shuttering placed on top of 11 reinforced concrete girders. The area of the roof was enclosed by a bolted concrete beam parapet then covered with a layer of green bitumen felt, and the parapet pierced at intervals for drainage. In its initial build there were up to eight rectangular ventilation towers. It is understood the purpose of the concrete roof was to protect the contents of the building from incendiary devices dropped from German aircraft (Found 2006: 5.13).

9.1.6 Four cast iron downpipes are fixed to the front brick facade of the building and connected by a hopper pipe to a single 600mm cast iron downpipe (Plate 33). The front facade of the building has one painted sign, just to the right of the front door on the north elevation and says '60' painted white on painted black bricks (Plate 31).

9.1.7 The interior of the building comprises a single large sub-divided volume which is open to the poured concrete ceiling which sits on reinforced concrete beams (Plates 39, 42). The floor is poured concrete, and divided on its surface by painted squares with chalk writing 'rope', 'pegs' etc. The walls are brick and painted green, there is a brick skirting and architrave. There are no other internal fittings or furnishings apart from a number of vertical wooden battens secured to the internal walls with Frearson screws produced from 1930 to

1970 (Figs. 63. Plate 39). The lights are modern florescent strips.

10. Empty Case Store

The Empty Case Store at the Site comprises a rectangular shaped structure which measures 29.41m in length and 13.20m in width and is orientated WNW- ESE along its long axis (Figures 011, 012, 013 & 64-71, Plates 43-67).

10.1.1 The building is located in the central area of the site adjacent to the River Medway (Figures 5, 40, 41, 53) and built originally between 'A' and 'B' Magazines (Plates 69, 70).

The former Empty Case Store is joined to the southern exterior end wall of 'B' Magazine and the northern exterior end wall of 'A' Magazine and built around 1893. The internal southern wall of this building preserves the northern external wall of the original 'A' Magazine built 1808-10 whilst the internal north wall preserves the external south wall of 'B' Magazine built by 1857. The eastern façade of the building has been substantially modified by the insertion of a large roller door (Plates 58, 62) and the original roof has been replaced by a flat one built of poured reinforced concrete on reinforced concrete beams just prior or during the Second World War.

10.1.2 The building comprises a large open space with a single track railway line 2' 6" wide served from a turntable located outside the main entrance to the building on the east side (Fig. 39). The remains of the exterior west wall of 'A' Magazine are constructed of 86 courses of dark red/brown bricks laid in a Flemish Bond (Plates 46, 47) and can be seen on the exterior corners of the current building. This solid wall is about 3.08m thick.

All courses are laid in course gritty off-white cement mortar with tiny crushed flint inclusions finished with a flush joint about 18mm thick.

10.1.3 The interior north wall of 'A' Magazine which is exposed on the exterior south wall of the Empty Case Store is dark red/brown bricks laid in a English Bond and are pierced by ten vertical ventilation slots, four set in pairs and arranged each side of the blocked central doorway, and measure 10 x 87cm. All the slots have been bricked up with Common Flettons and also used for

repairs to the original structure (Plate 52). The central doorway with access to the inside of 'A' Magazine can be seen in plans of the original build dated 1808?, 1812 (Figs. 8, 9) and is 1.51m wide with a double header brick arch built in a brick and bat pattern and blocked up with yellow stock bricks. In addition hardwood 'bricks' are set into the build of this interior wall to facilitate the fixing of internal furniture and fittings as seen in the 'B' Magazine plans (Fig. 15). The hardwood 'bricks' are laid in the header courses approximately every 6th brick. This interior wall of 'A' Magazine (now exterior of Empty Case Store) has been coated with white distemper usually made from powdered chalk and lime mixed with white lead (Plate 50).

10.1.4 Above the surviving internal wall of 'A' Magazine are about 24 courses of pale and mid orange bricks laid in a stretcher bond with the occasional header course (Plate 55). This build which can be seen on both exterior corners of the building (Plates 43, 44, 46, 47, 53, 56) and are repair works done when 'A' Magazine was demolished after 1960 as can be seen on aerial photographs of 1960 and later (Plates 72, 73 & Figs 69, 70).

10.1.5 This post-1960 rebuild did not include the internal walls on the south and north sides of the building which incorporated 11 corbelled brick brackets which would have cantilevered out to collect the load of a timber or steel framed roof. For each bracket there are eight courses of brick set on a flush stone pad and each brick projects out about one third of its bed length. It is standard practise that the maximum distance corbelled out should not exceed one third of the walls thickness (Plates 59, 60, 64). These walls are part of the original build of both 'A' and 'B' Magazines dating from 1811 and 1857.

10. 1.6 The central internal doorway on the south wall which gave access to 'A' Magazine has the addition of a brick relieving arch comprising two courses of bricks laid in a stretcher bond (Plate 67). A photograph of the Empty Case Store (next page and Plates 69, 70) show the building filling the space between the two Magazines and this has been confirmed in the demolition cycle of work. However, the plans of 1901 and 1903 (Figs. 39, 40) show a gap between 'A' Magazine and the Empty Case Store which may suggest there was an earlier building on this site before the present build.



10.1.7 The original build can be more clearly seen in the rear facade of the building (Plates 45, 48, 57, 69, 70 and Fig. 012 West Elevation). The brick courses of the rear facade are of mid yellow/brown brick laid in a Flemish Bond. All courses are laid in course gritty off-white cement mortar with tiny crushed flint inclusions finished with a flush joint about 18mm thick. The building was accessed via three entrances with principal access via the eastern entrance on the front elevation (Plates 43, 45). This now comprises a large roller doorway which has been rebuilt with Common Fletton frogged bricks dating from the mid-20th century. The lintel is a steel beam painted green and the roller apparatus is built into an internal steel framework (Plate 62). The rear entrance is a single wide (1.83m) braced and ledged wooden door set into the original opening but with a later sliding door apparatus within an original cambered arch of brick (Plates 48, 63). One additional blocked side door is located on the south elevation.

10.1.8 Above the rear door is set a circular vented opening with a rectangular vented opening immediately below (Plate 48). The roof has been rebuilt either just before or during the early years of the Second World War and is a flat reinforced concrete roof constructed of poured concrete on to a horizontal wooden boarded shuttering placed on top of 11 reinforced concrete girders. The roof was enclosed by a bolted concrete beam parapet to the south the west and east but flush to the north and then covered with a layer of green bitumen felt (Plates 64, 65).

10.1.9 Below the flat roof line on the east and west elevations is a pitched decorative brick eaves cornice of ten courses with spandrel infill courses to the concrete parapet (Plates 56, 57). The sloping roof to the south is constructed of overlapping corrugated concrete sheeting enclosed within a decorative stepped brick parapet embellished with a vertical slot recess and capped by concrete coping. To the north the sloping roof joins the roof line of 'B' Magazine.

10.1.10 The interior of the building comprises a single large volume which is open to the poured concrete ceiling which sits on reinforced concrete beams (Plates 60, 65). The floor is poured concrete. The walls are brick and painted white. There are no other internal fittings or furnishings. The lights are modern florescent strips.

10.1.11 The Empty Case Store is a complex building incorporating important changes to facilities which can lead to an understanding of the chronology of the structure. On present information the chronology is:

1. The building of 'A' Magazine in 1811
2. The building of 'B' Magazine in 1857
3. The building of the Empty Case Store between in about 1893
4. The roof replacement with reinforced concrete in about 1940
5. The demolition of most of 'A' Magazine in about 1960
6. The rebuilding of the south exterior wall ('A' Magazine) following demolition in about 1960
7. The rebuilding of the east main frontage with a roller door and the blocking of the ventilation slots and doorway on the south side post 1960.

10.1.12 In addition the historic photographs (Plates 53, 70) seems to show a truncated pitched roof with additional later brickwork to enable a flat roof to be built whilst the plans of 1901 and 1903 (Figs. 39, 40) show a clear passageway between the Empty Case Store and 'A' Magazine.

11. DISCUSSION

11.1.1 The Site is made up of a mixture of buildings which largely date to three main phases:

Phase 1 1779-1856

Phase 2 1856-1862

Phase 3 1892-1914

It is unfortunate that so much unrecorded demolition took place in the 1960's of the major buildings. The buildings that are planned for demolition have now been recorded and found for the main part to have suffered from 20th century rebuilds that have left little of the original fabric. However it is recommended that a Watching Brief be maintained on the demolition so that hidden details of construction can be recorded. In particular:

1. Guard House- no additional work required
2. Latrine Block- no additional work required
3. The 'Shed'- no additional work required
4. The Locomotive Shed- Watching Brief maintained during demolition to record any earlier structures under the existing building
5. No. 2 Shell Store- Watching Brief maintained during demolition to record the original build underfloor ventilation system
6. Empty Case Store- A programme of building recording during demolition of some parts of the original building were not available for access during this phase of recording
7. Boundary Wall and gate- no additional work required

11.1.2 The remaining ordnance buildings generally survive well and are in good condition serving as a reminder of the origins of the Site and their adaptation to serve the later ordnance requirements. The buildings also provide a

reminder of an age when even buildings of an industrial nature were routinely well constructed by the military to a high level of detail and to classically inspired architectural parameters. Such is the visual merit of these buildings. The recording of Phase 1 of the proposed development is the first stage of recording this site and no doubt in the fullness of time all surviving structures will also be recorded. It would be a worthwhile venture to enhance the recording of these building with an oral history programme from surviving members of the Ordnance Establishment at Lower Upnor.

12. ARCHIVE

12.1 Preparation and Deposition

12.1.1 The Site archive, to include all project records, will be prepared in accordance with Guidelines for the preparation of excavation archives for long-term storage (UKIC 1990).

On completion of the project SWAT Archaeology will arrange for the archive to be deposited with the appropriate repository (to be advised). Any alternative arrangements will be agreed with the Medway Council Conservation Officer, the County Archaeologist and the Local Planning Authority.

12.1.2 The historic building record archive will include:

- hard copy of the report
- pdf copy of the report on CD
- full photographic record with photographic registers
- hard copies of the floor plans at 1:100 (or other appropriate scale)
- hard copies of any sections and any elevations at 1:100
- field notes and sketches

12.1.3 Following approval of the report, SWAT Archaeology will provide the Kent Historic Environment Record (HER) with copies of all reports in both hard copy and digital format.

12.1.4 Upon completion of the on-site programme of historic building recording SWAT Archaeology will supply the Kent HER with a completed HER form.

13. Copyright

13.1.1 The full copyright of the written/illustrative archive relating to the Site will be retained by SWAT Archaeology under the Copyright, Designs and Patents Act 1988 with all rights reserved. The designated repository, however, will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use shall be non-profit making, and conforms to the Copyright and Related Rights regulations 2003.

14. REFERENCES

14.1 Primary sources

The bulk of the Board of Ordnance records are held at the Public Record Office located at Kew and can be found in the classes WO44, WO47, WO54, and WO55. WO44 and WO55 contain original plans and drawings. However, drawings have been removed from these classes and are now part of MPH, MPH, MR and MFQ. Most plans can be found in the classes WO78 and WORK 43. Other records can be found in classes SUPP5 and SUPP 6. In addition the Royal Engineers' Library at Brompton hold a useful collection of plans and drawings of Upnor prefixed AD with a reference number of 420/SE/2 and Letter Books prefixed CHA.

14.2 Secondary sources

English Heritage, 2006: *Understanding Historic Buildings, A guide to good recording practice*, English Heritage

Evans, D. 2000: *A historical account and Gazetteer of the Medway magazine systems*. Unpublished English Heritage Report.

Evans, D. 2000b: Lower Upnor Batteries, Topography, Buildings and Structures. PowerPoint presentation.

Evans, D. 2006: *Upnor Ordnance Depot - an outline history*. Unpublished Desk Based Assessment.

Found, B. 2006: *An Archaeological Evaluation on the RSME Engineers Park, Lower Upnor, Medway, Kent*. CAT Project Code LUD EV 06

Kendall, P. 2006: *Preliminary thoughts on appropriate re-use of Lower Upnor Ordnance Depot- Medway, Kent*. Unpublished English Heritage Document.

Kent County Council, 2014, *Mitigation - Historic Building Recording Requirements*, Manual of Specifications Part B

Kent County Council, 2014, *Specification for a Programme of Historic Building Recording at Lower Upnor Depot, Upnor Road, Lower Upnor, Medway, Kent ME2 4UP*, Manual of Specifications Part A

Pasley, C. 1817, *Course of Military Instruction originally composed for the use of the Royal Engineer Department*. Volume 3 London

Saunders, A. D. 1993 (reprint): *Upnor Castle, Kent - An English Heritage Handbook*. London: English Heritage.

Searly, P. 2006: *The Air Raid Shelters, Lower Upnor - A Historic Building Survey*. Unpublished Canterbury Archaeological Trust Ltd Client Report.

Wessex Archaeology 2003: *RSME land disposal, Rochester, Kent - Proposed developments at Lodge Hill Training Area, Chattenden Depot, Chattenden Barracks, Upper and Lower Upnor Depots, Kitchener Barracks, Amherst Hill, Maxwell Road, Wood Street, Collingwood Barracks, and the Lower Lines, Chatham, Kent*.

14.3 Cartographic Sources consulted

1867 Ordnance Survey, 1:2,500

1897 Ordnance Survey, 1:2,500

1909 Ordnance Survey, 1:2,500

1933 Ordnance Survey, 1:2,500

1952 Ordnance Survey, 1:2,500

1962 Ordnance Survey, 1:2,500

1969 Ordnance Survey, 1:1,500

1970 Ordnance Survey, 1:2,500

1993 Ordnance Survey, 1:1,500



Figure 1. 1779 plan copied from 1724 original (Evans 2000b: 4)

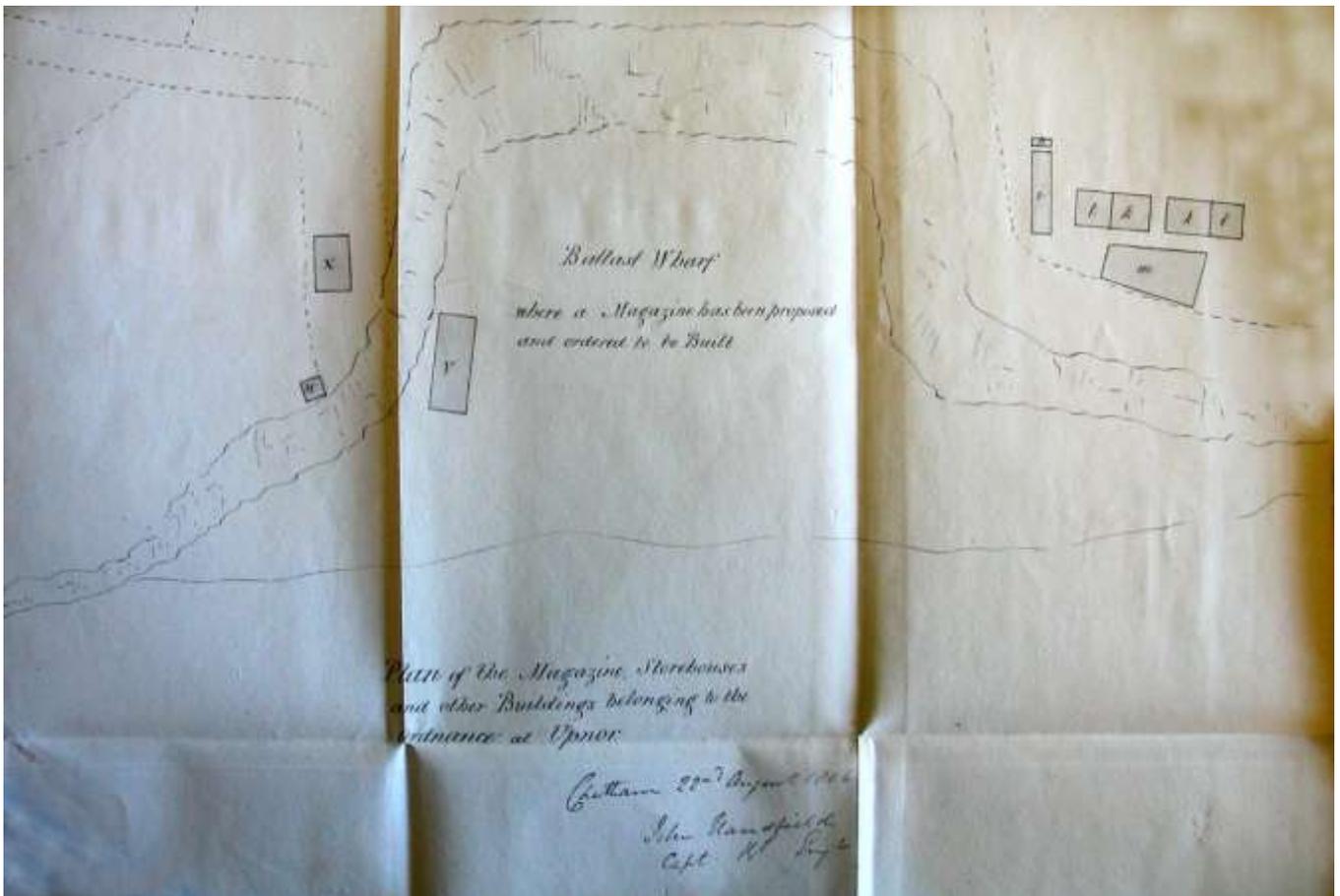


Figure 2. The site in 1806 showing how quarrying had created a level area for the proposed Magazine (Evans 2000b: 10)



Figure 3. A map of 1806 showing the temporary Magazine, the Ordnance Brick wharf and the site then called Ballast Wharf (Evans 2000b: 11)



Figure 4. The plan of 1789 showing the Temporary Magazine to the west of Upnor Castle (Evans 2000b: 12)

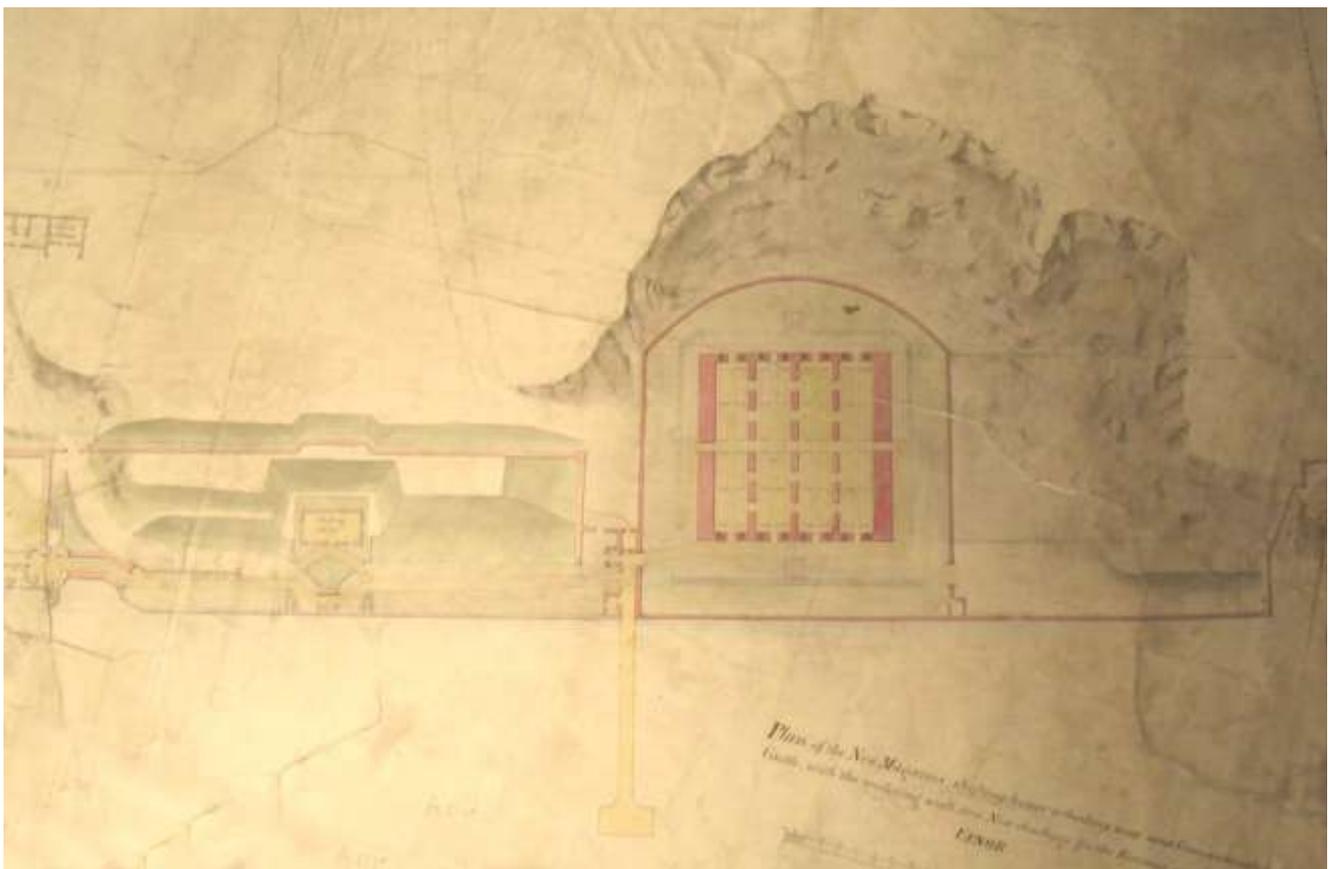


Figure 5. The new 'A' Magazine shown on this map of 1812 with the Shifting House (left) and pier (WO 44/140)

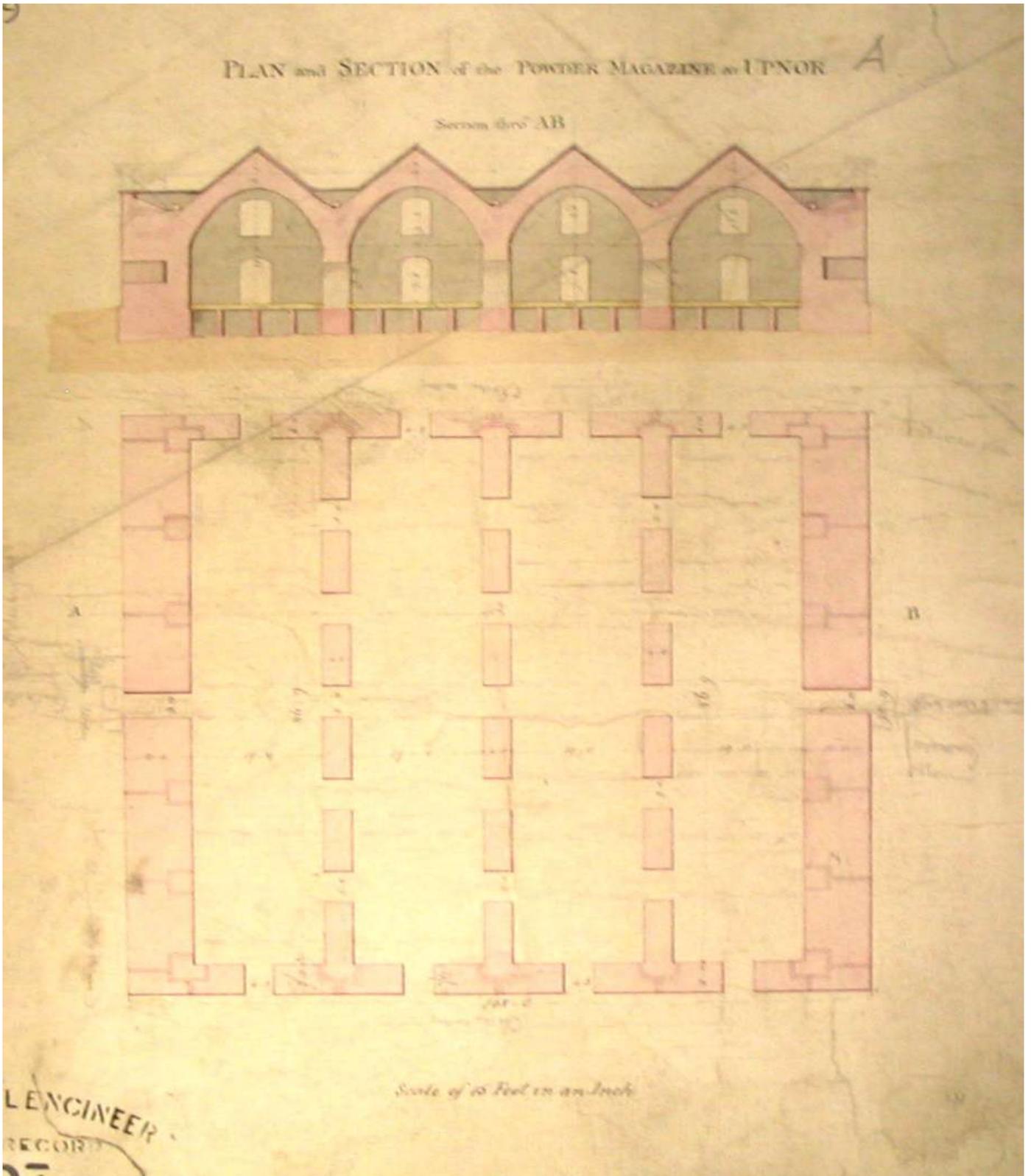


Figure 8. The REM Museum archive has two designs for the new Magazine (WO RK 41/89) dated 1808?

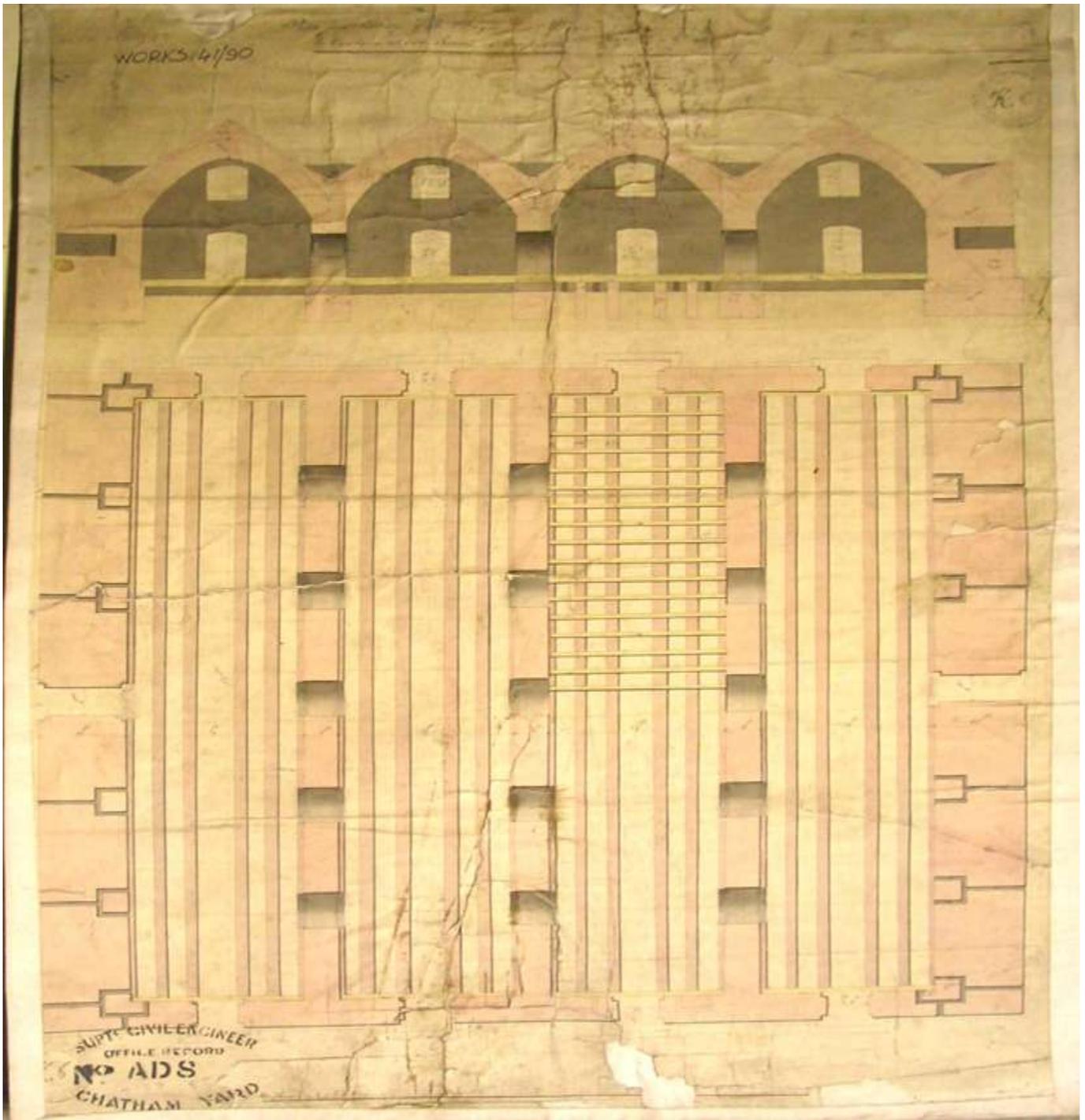


Figure 9. Plan for the 1812 'A' Magazine (WORK 41/90) dated July 8th 1812

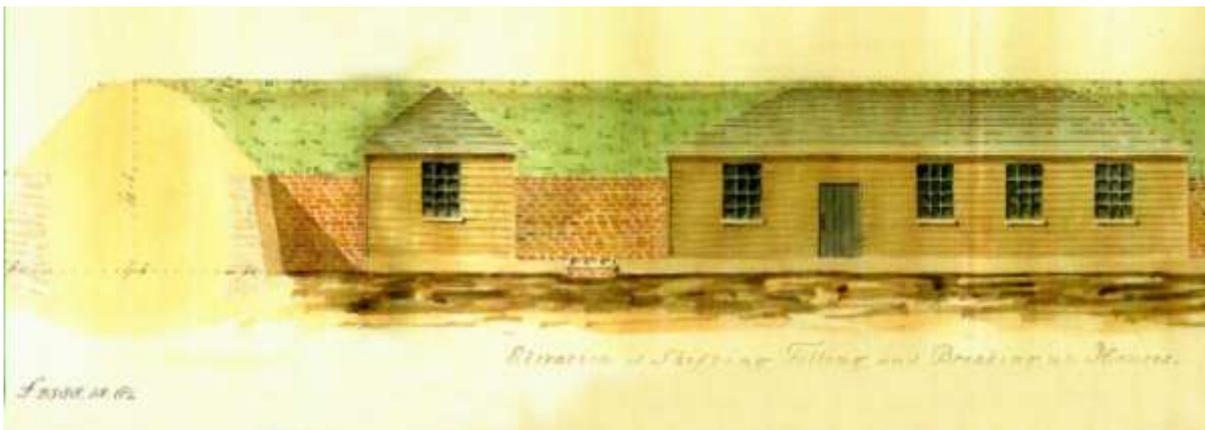


Figure 10. The adjacent Shifting Room seems to have been originally a flimsy structure (Evans 2000b: 30)

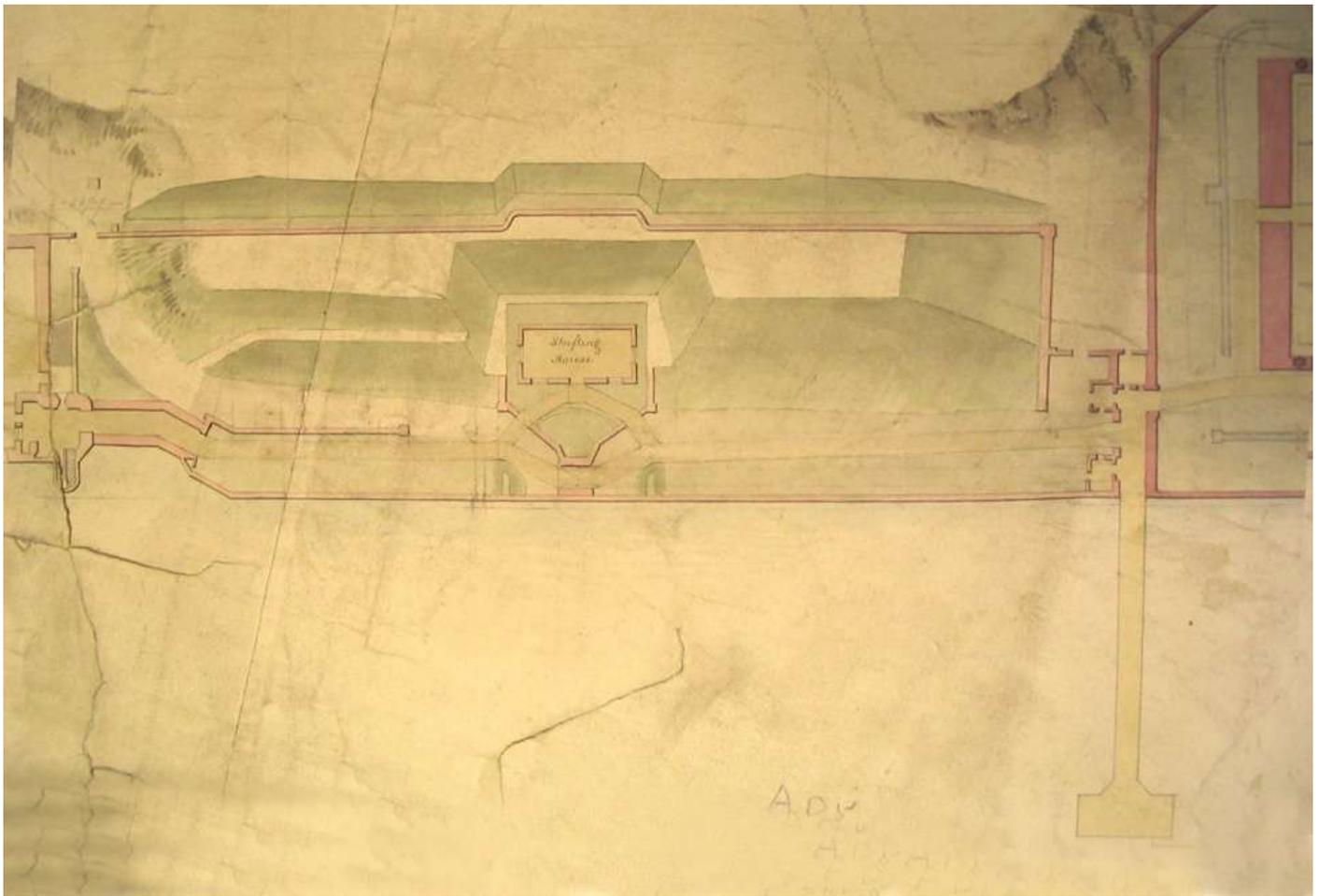


Figure 11. The Shifting Room was a brick building (Evans 2000b: 30)

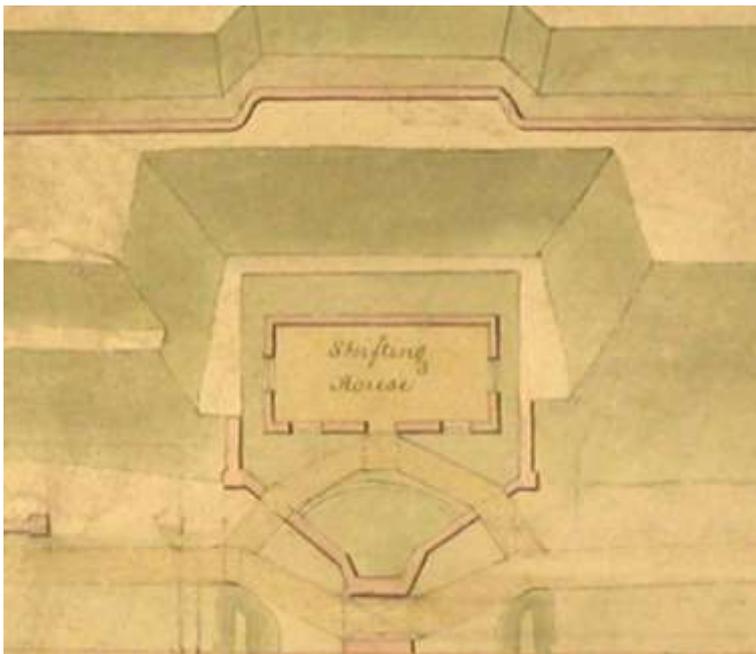


Figure 12. The Shifting House appears to have been rebuilt to slightly smaller dimensions after 1825 (Evans 2000b: 32)



Figure 13. The map of 1821 shows the development of the Upnor Depot with the Magazine completed in 1811 and the adjacent traversed Shifting House between the new Magazine and Upnor Castle. Inland and to the north can be seen the trenches and earthworks of Colonel Pasley's School of Fieldworks (Evans 2000b: 15)

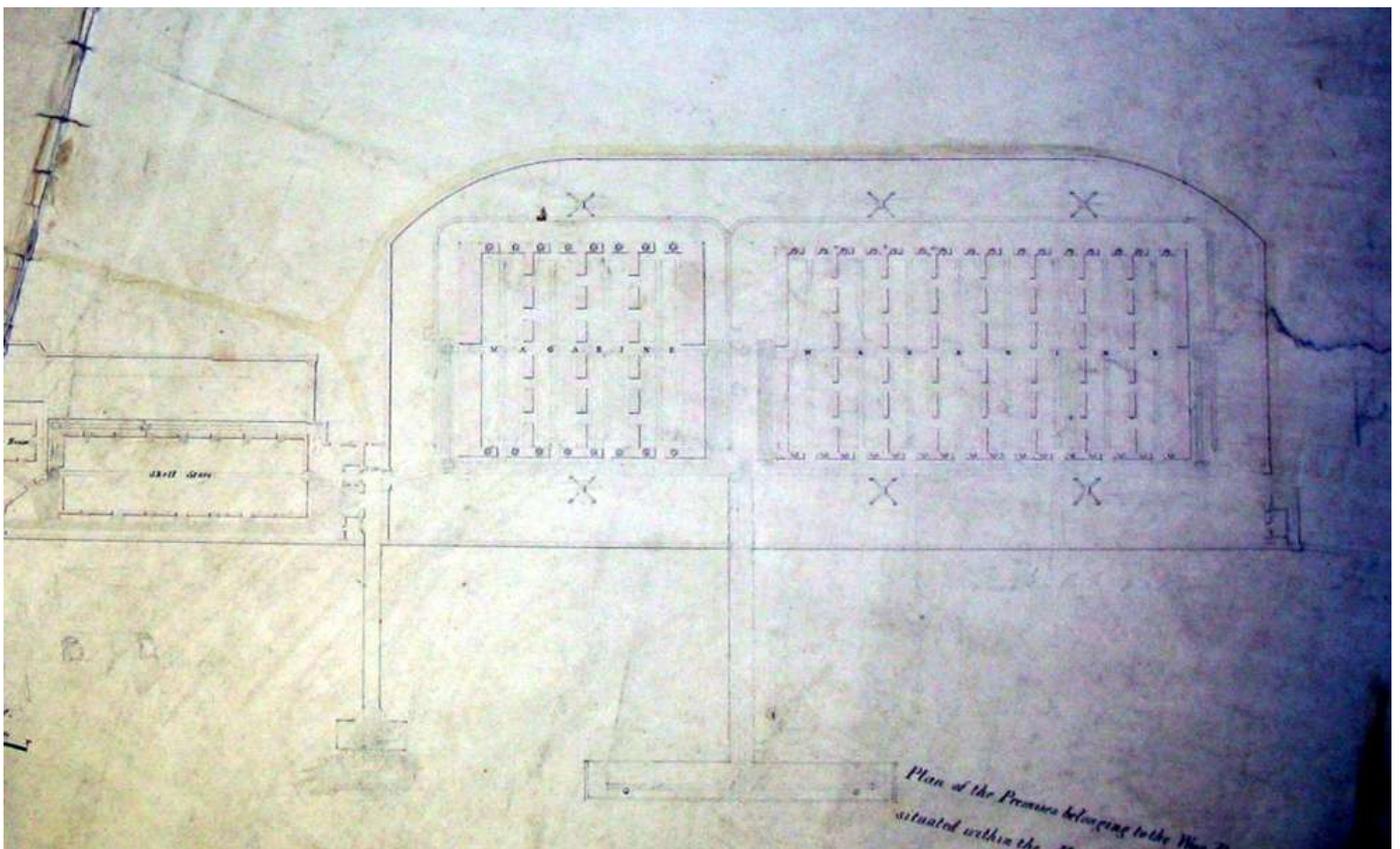


Figure 14. A new Magazine 'B' was built adjacent and to the right (east) of the first Magazine 'A' (Evans 2000b: 18)

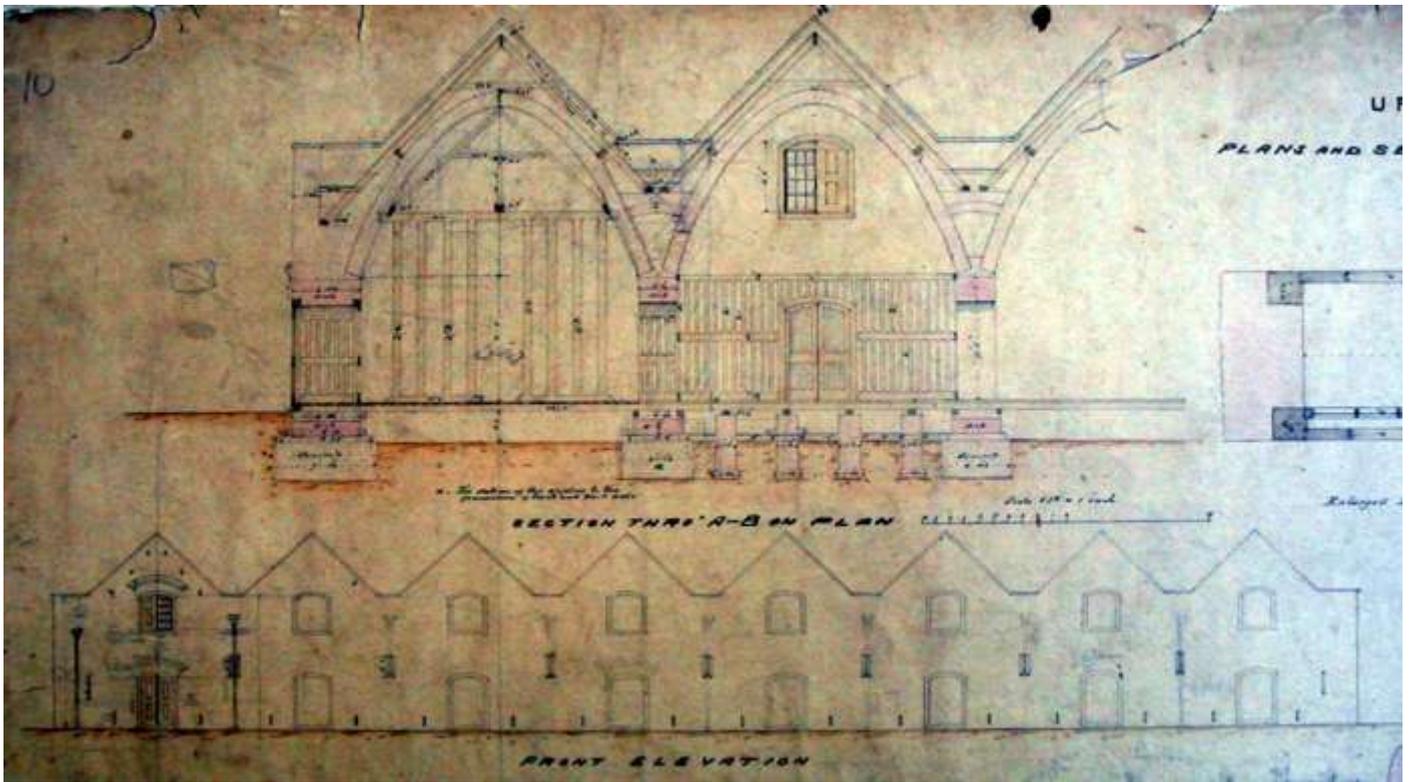


Figure 15. Section of 'B' Magazine (AD 10/420/SE/2/0558)

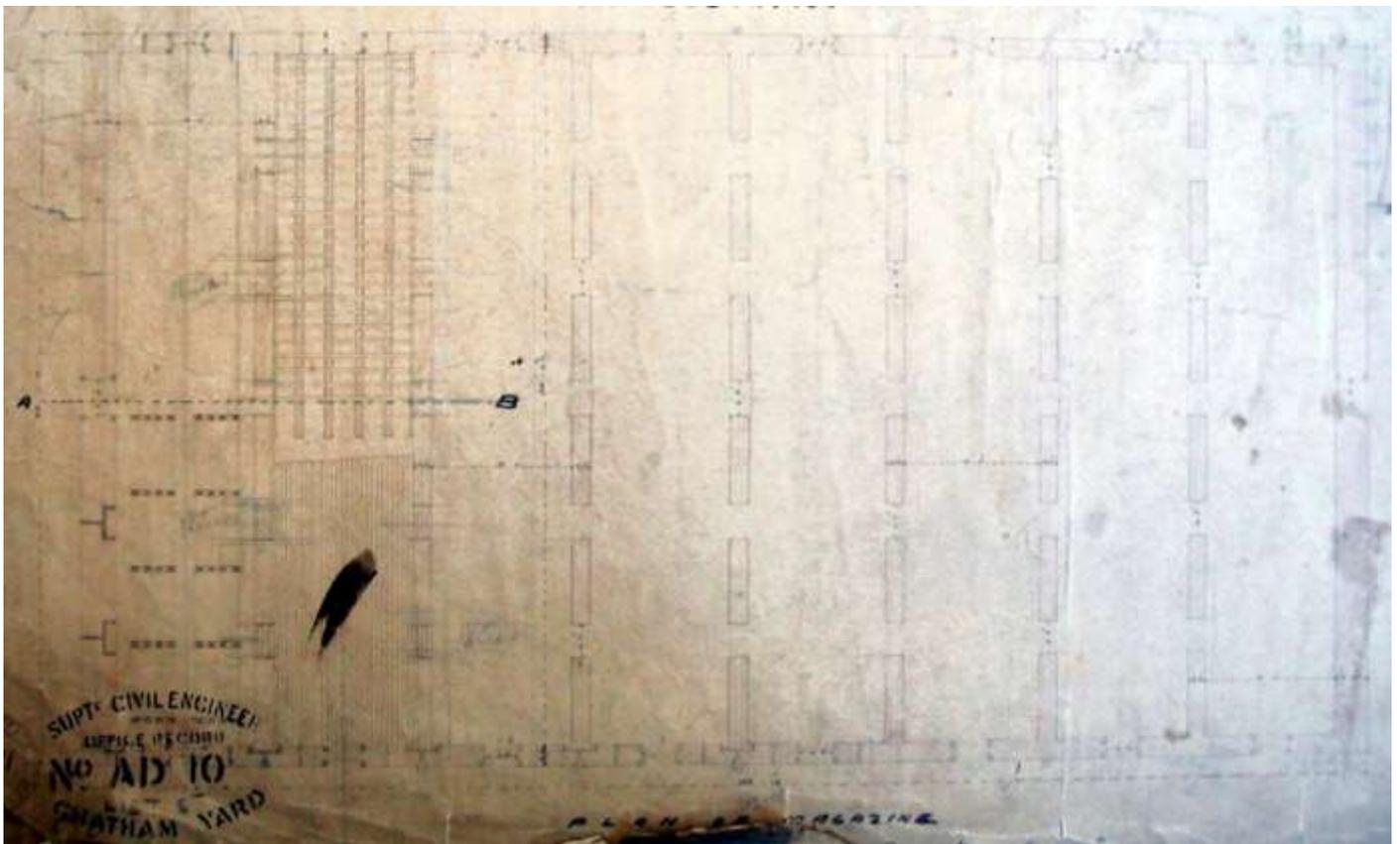
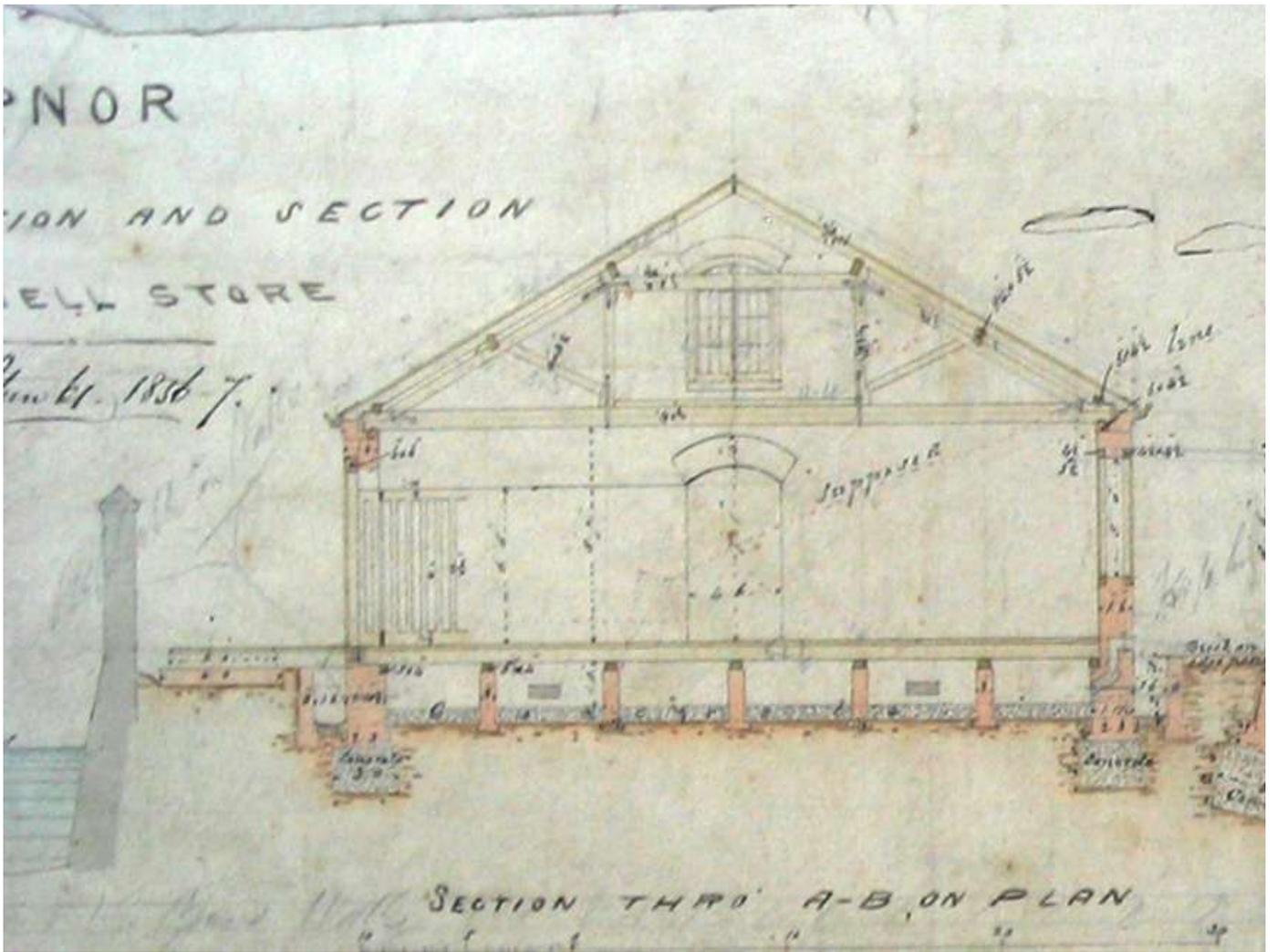
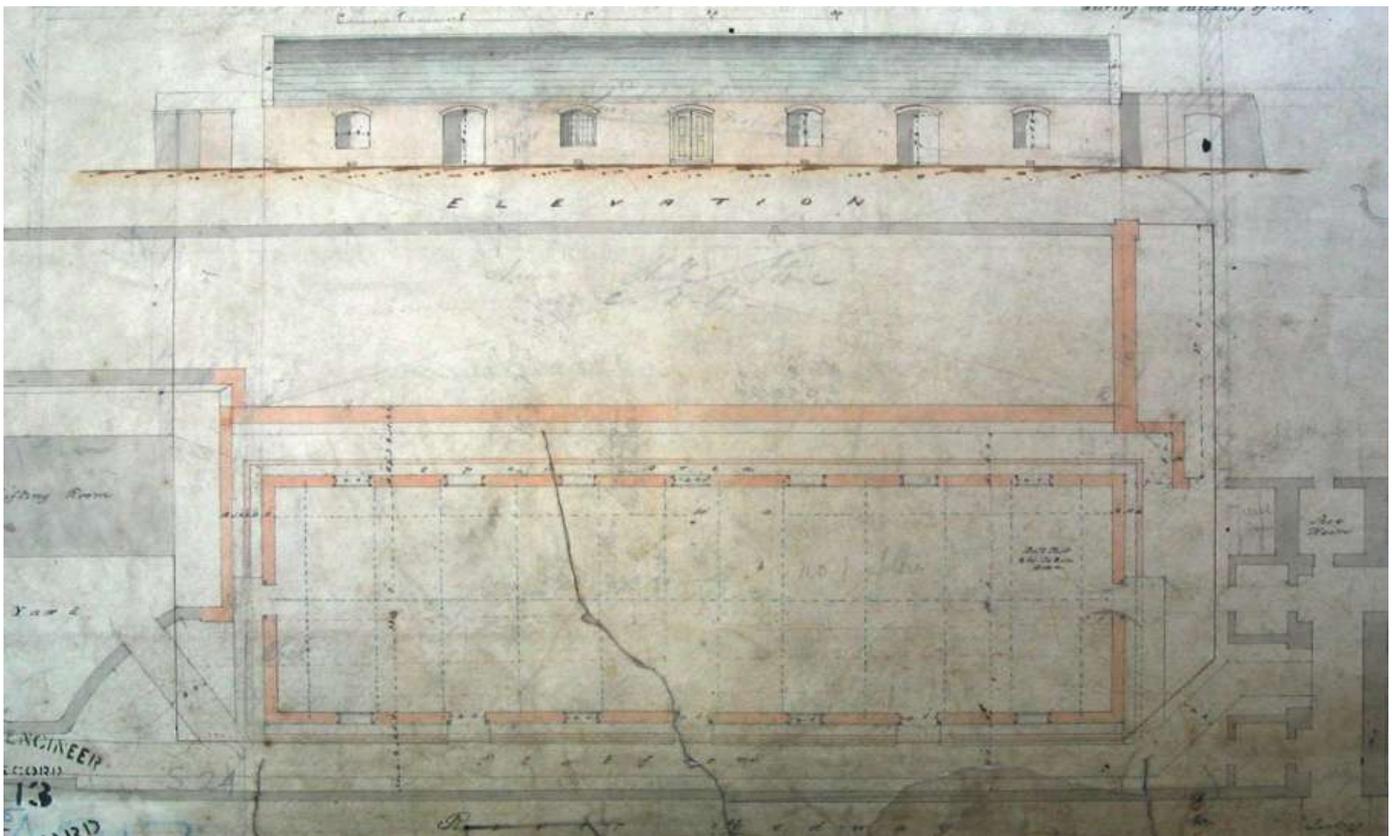


Figure 16. Plan of 'B' Magazine (AD 10/420/SE/2/0558)



Figures 17, 18. The new Shell Store built in 1856-7 (AD 13/429/SE/2/0544)



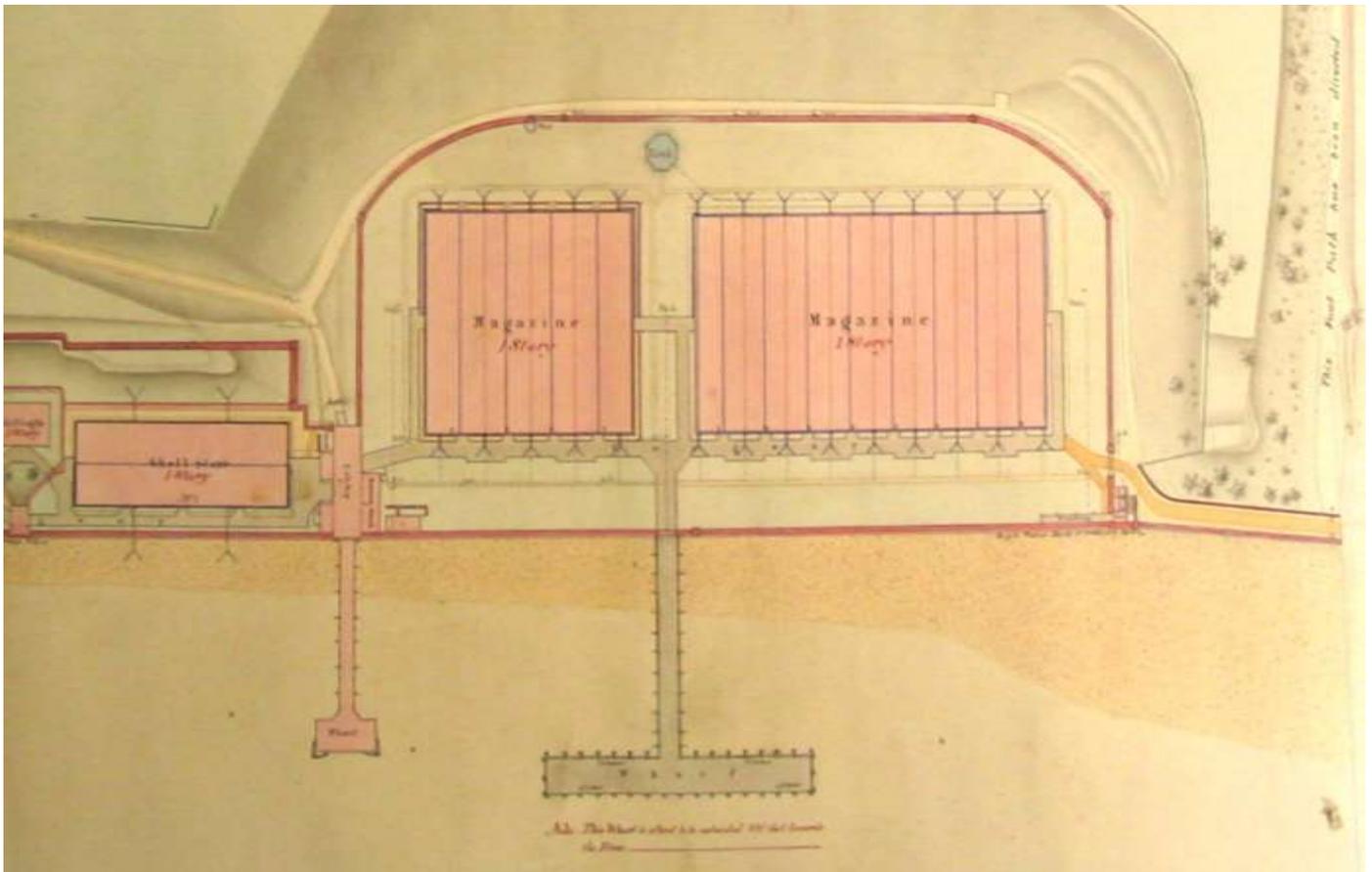
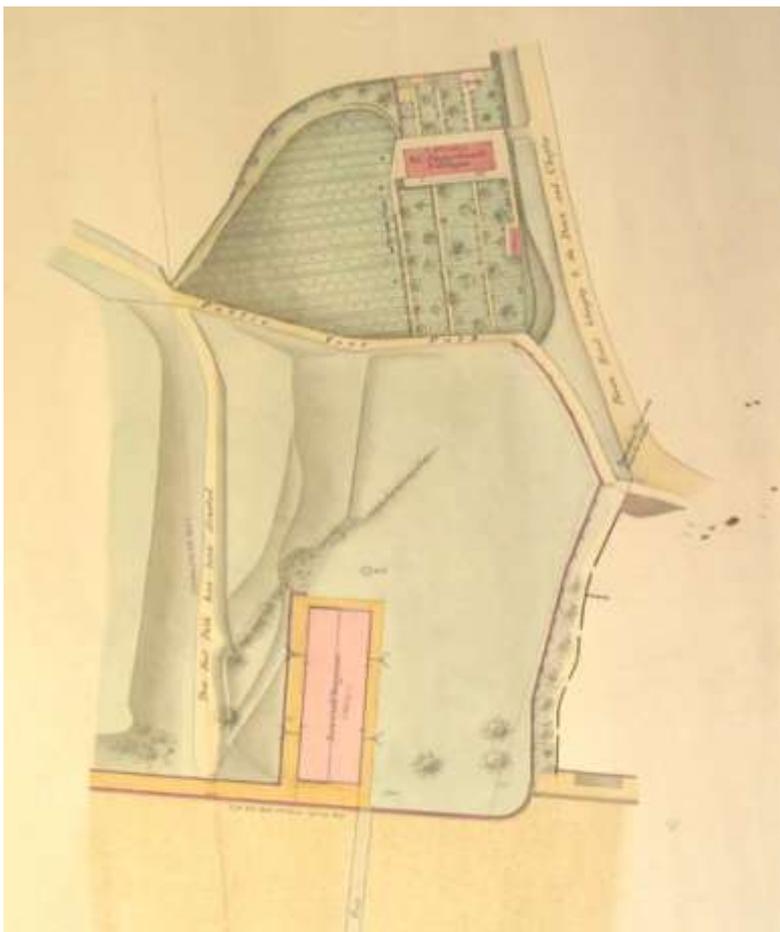


Figure 19. Location of the new Shell Store (No 1) of 1856 (left), and the second Magazine (right). AD/420/SE/2/0532

Figure 20. Another shell store (No 2) added in 1862 (Evans 2000b: 38)



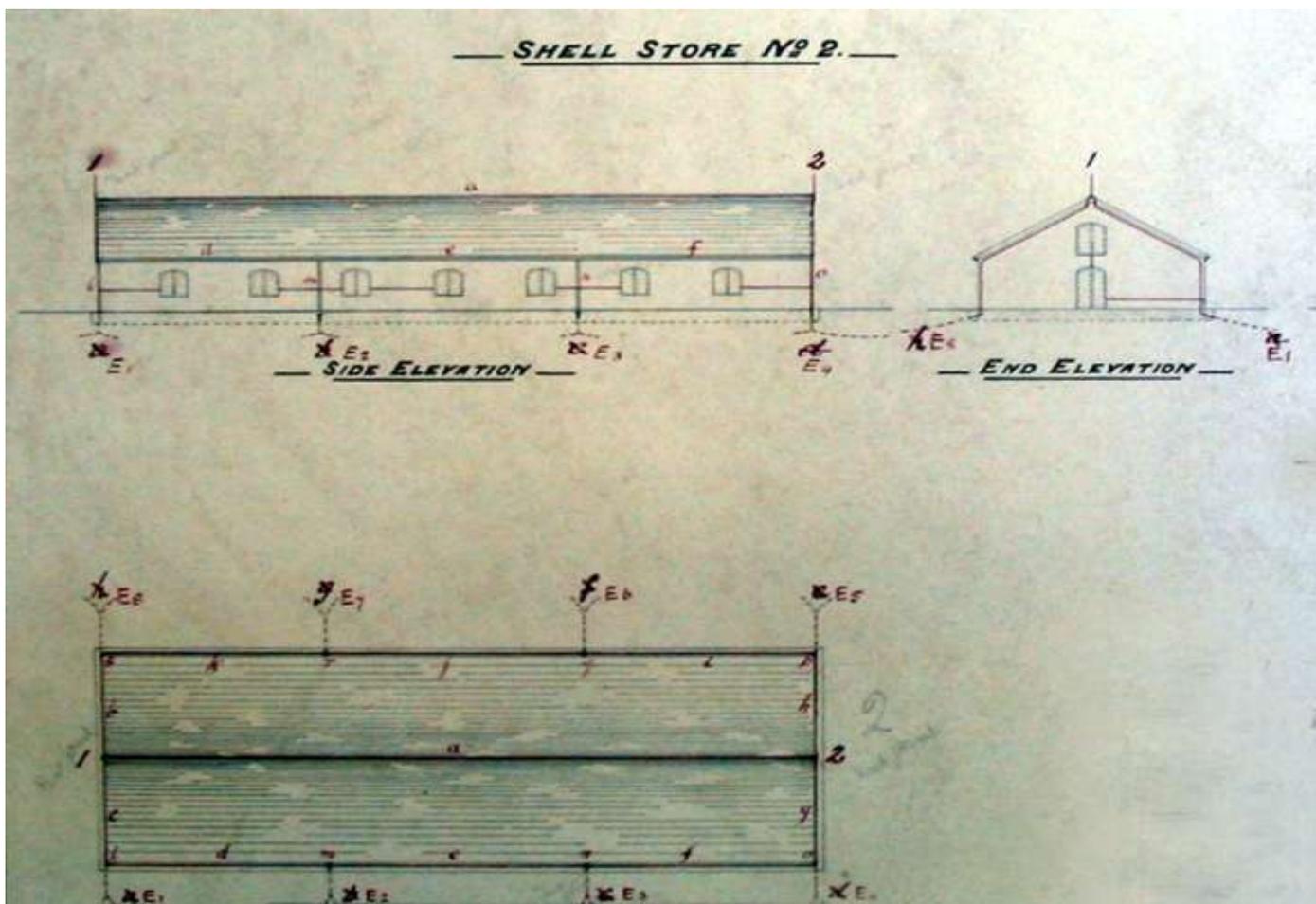


Figure 21. Shell Store No 2 (AD 21/420/SE2/0553)

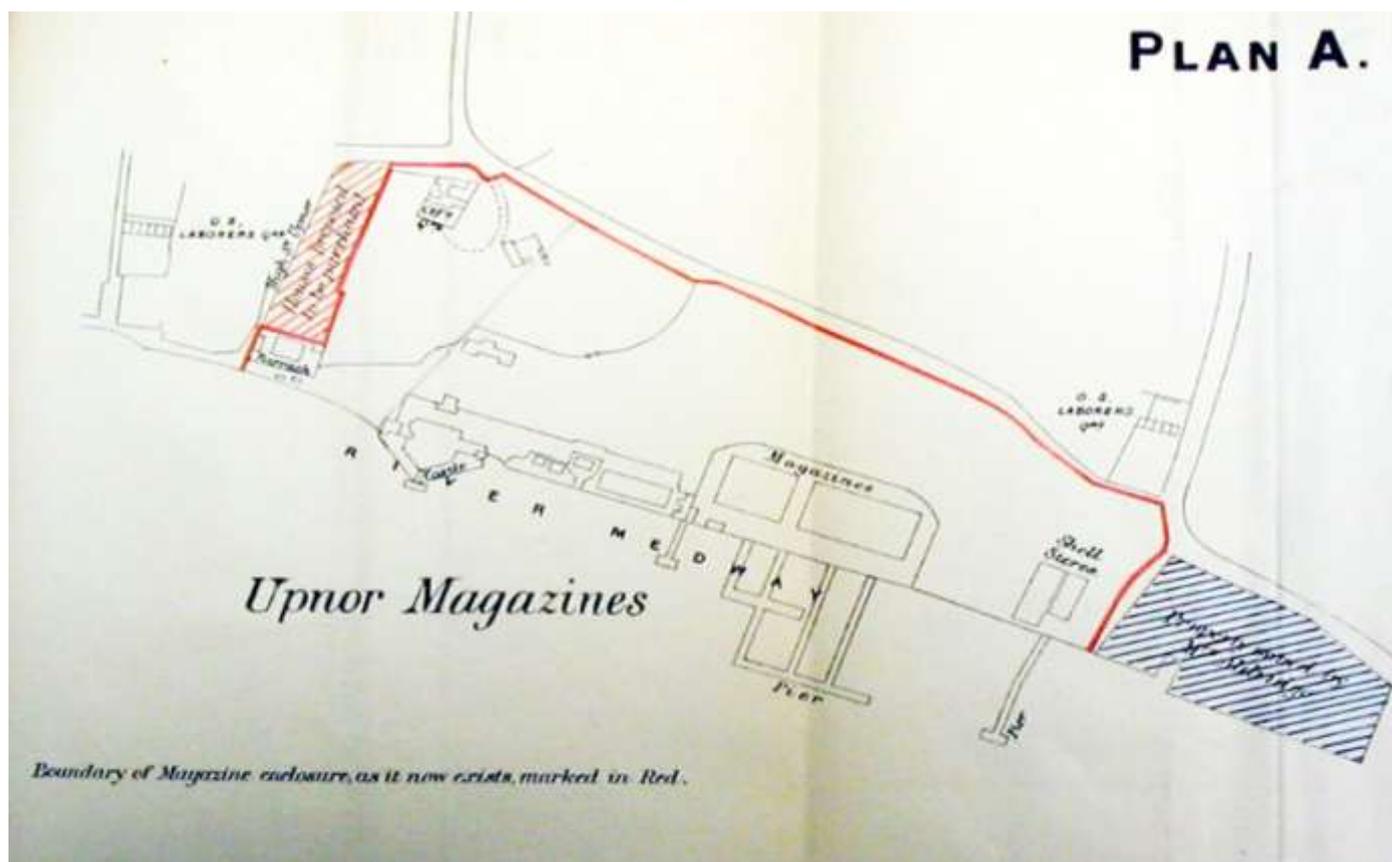


Figure 22. In 1894 it was proposed to expand the works by acquiring more land (Evans 2000b: 22)

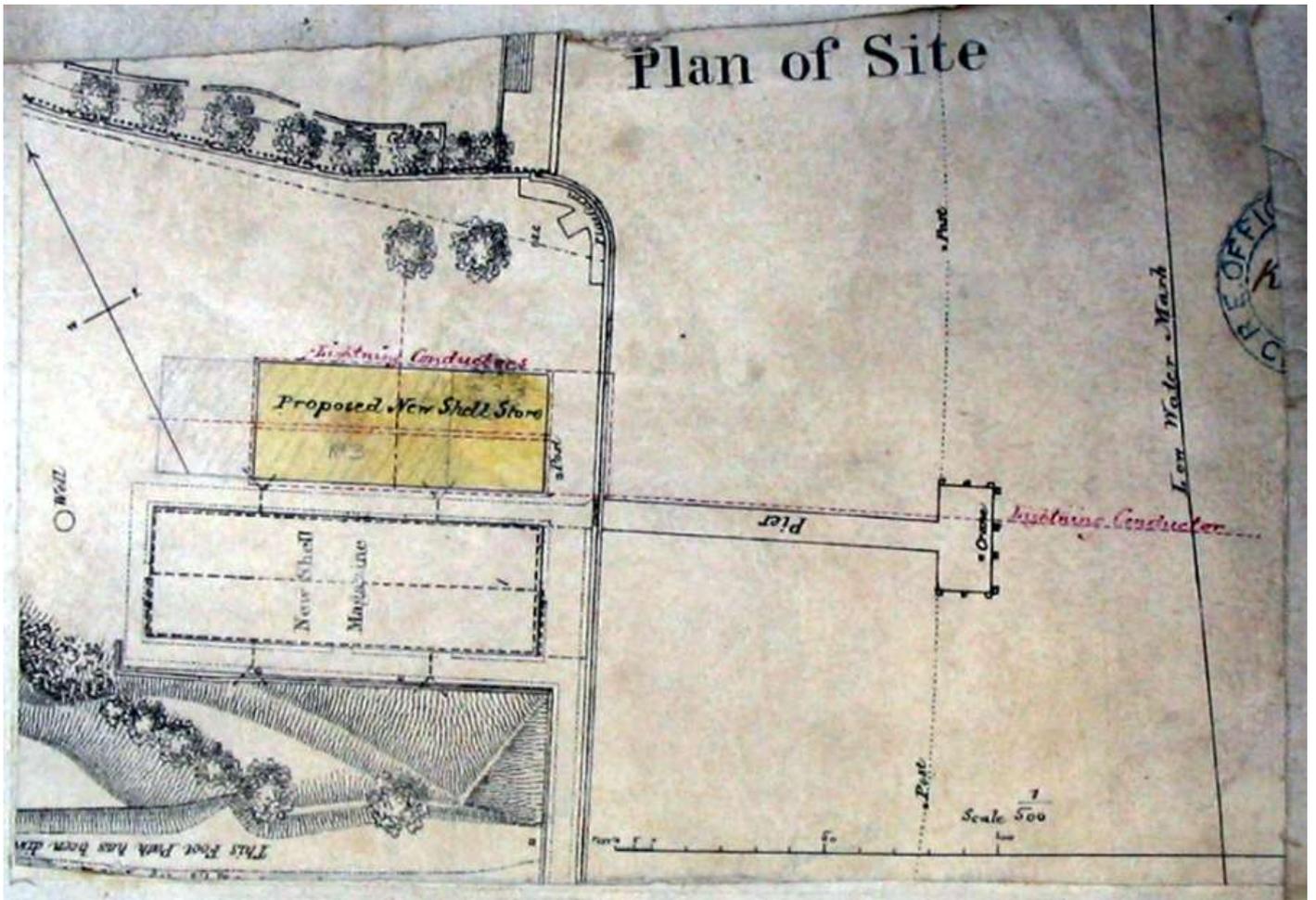


Figure 23. A further Shell Store (No 3) was added in 1882 (AD/28/420/SE/2/0543)

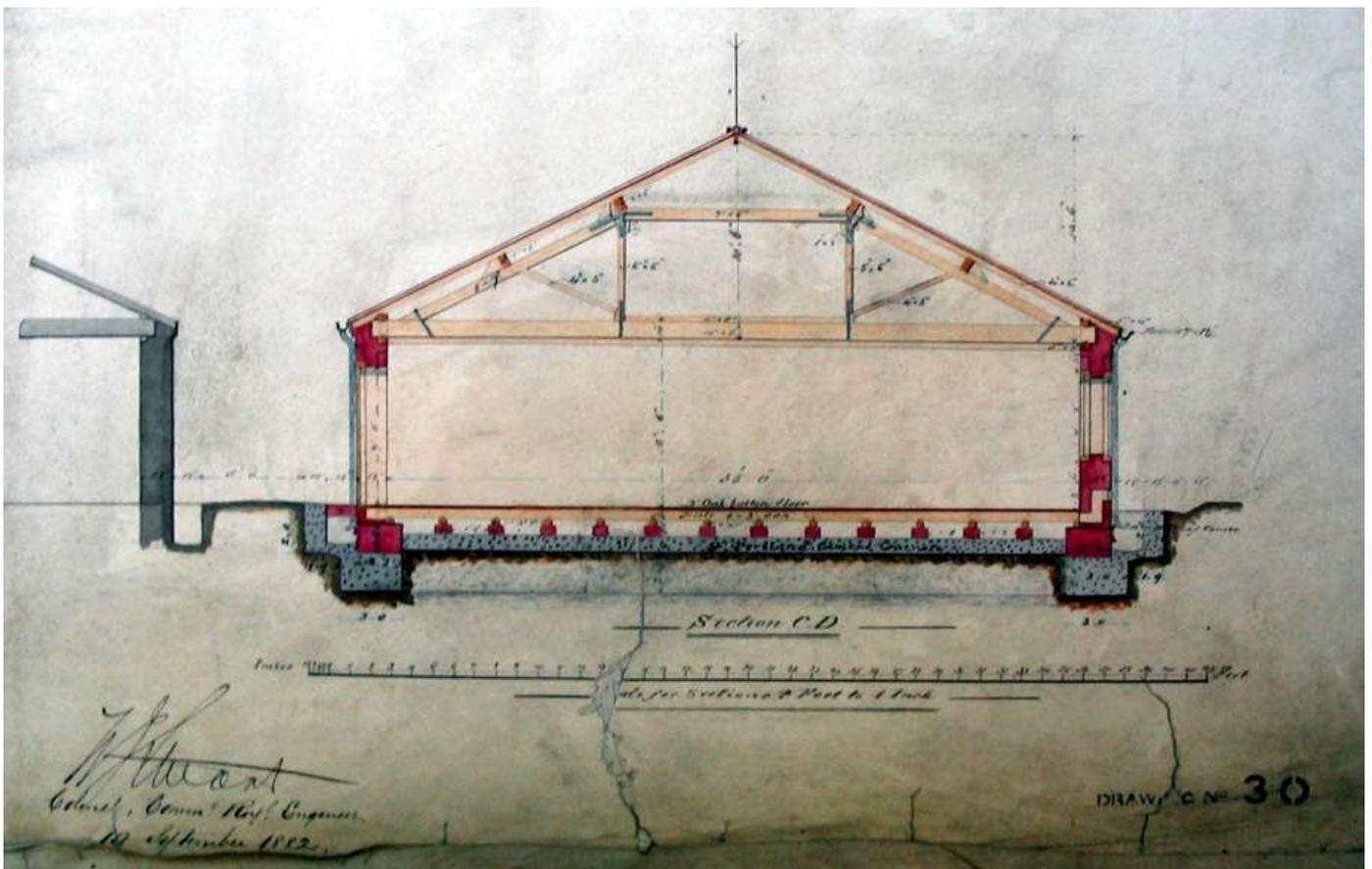


Figure 24. Section drawing of the 1882 No 3 Shell Store (AD/28/420/SE/2/0543)

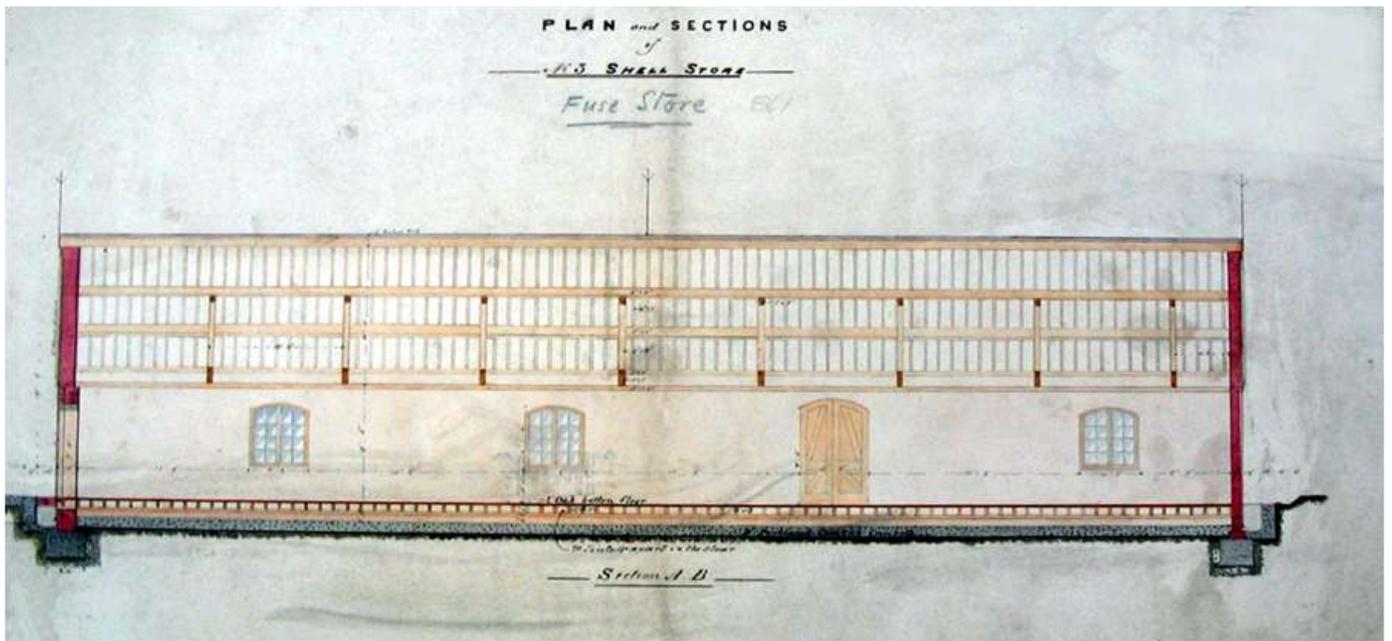


Figure 25. Section through Shell Store No 3 (AD/28/420/SE/2/0543)

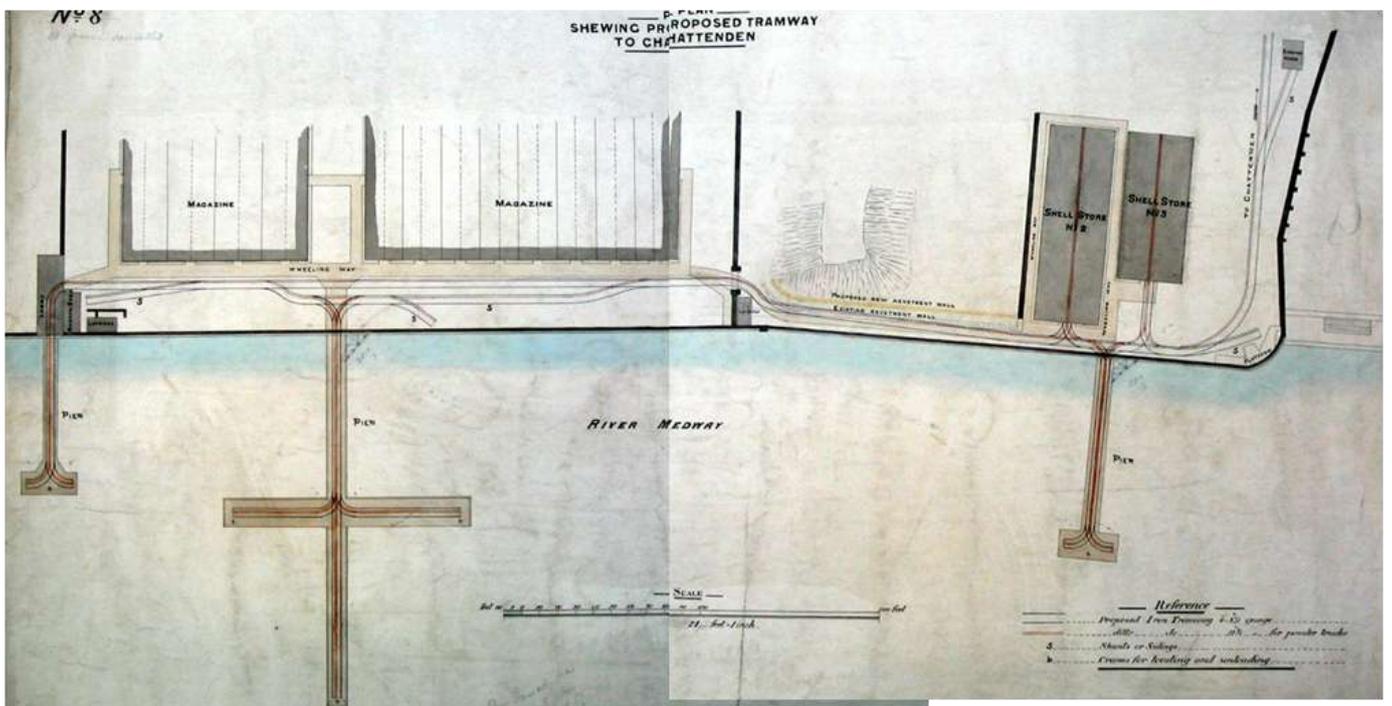
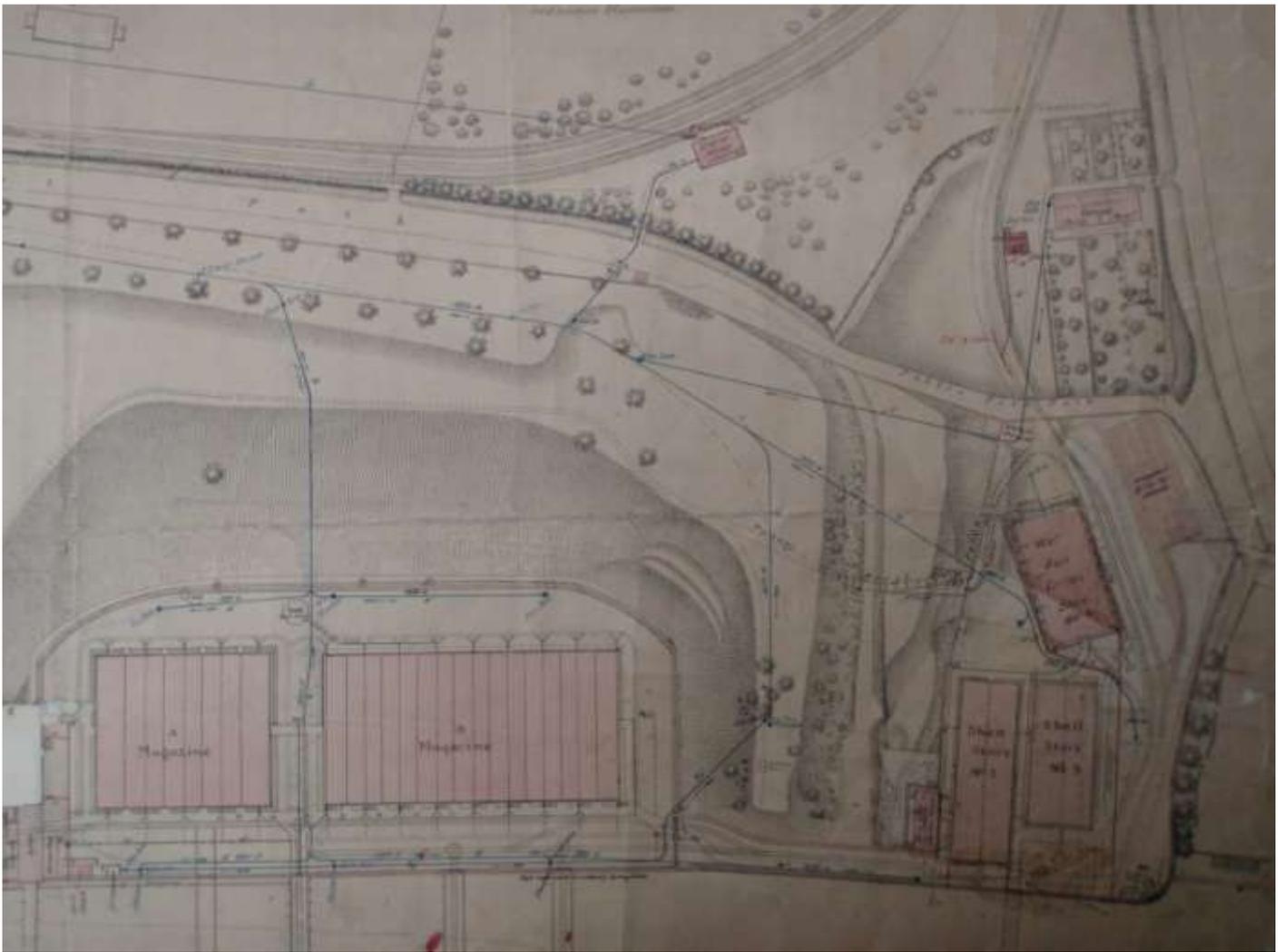
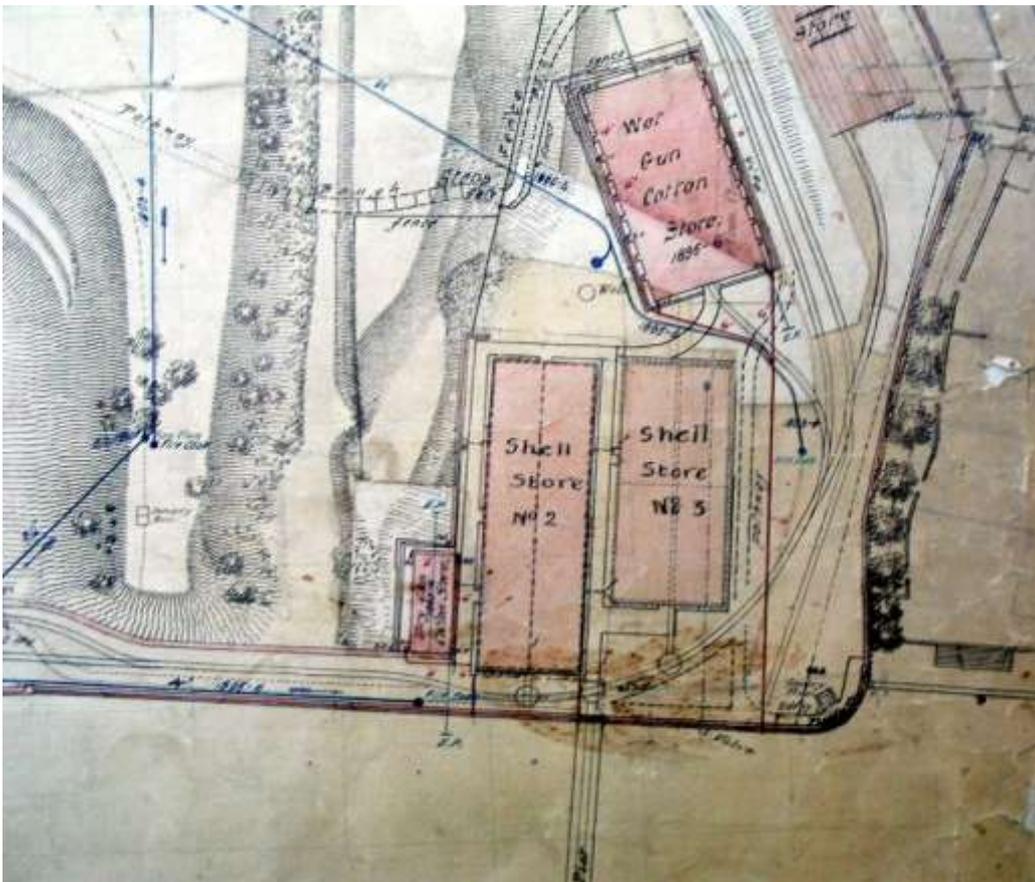


Figure 26. Map of 1884 showing the two Magazines, the two Shell Stores and the proposed tramway system (Evans 2000b: 44)



Figures 28, 29. By 1895 Dry and Wet Guncotton Stores had been added (420/SE/2/0542)

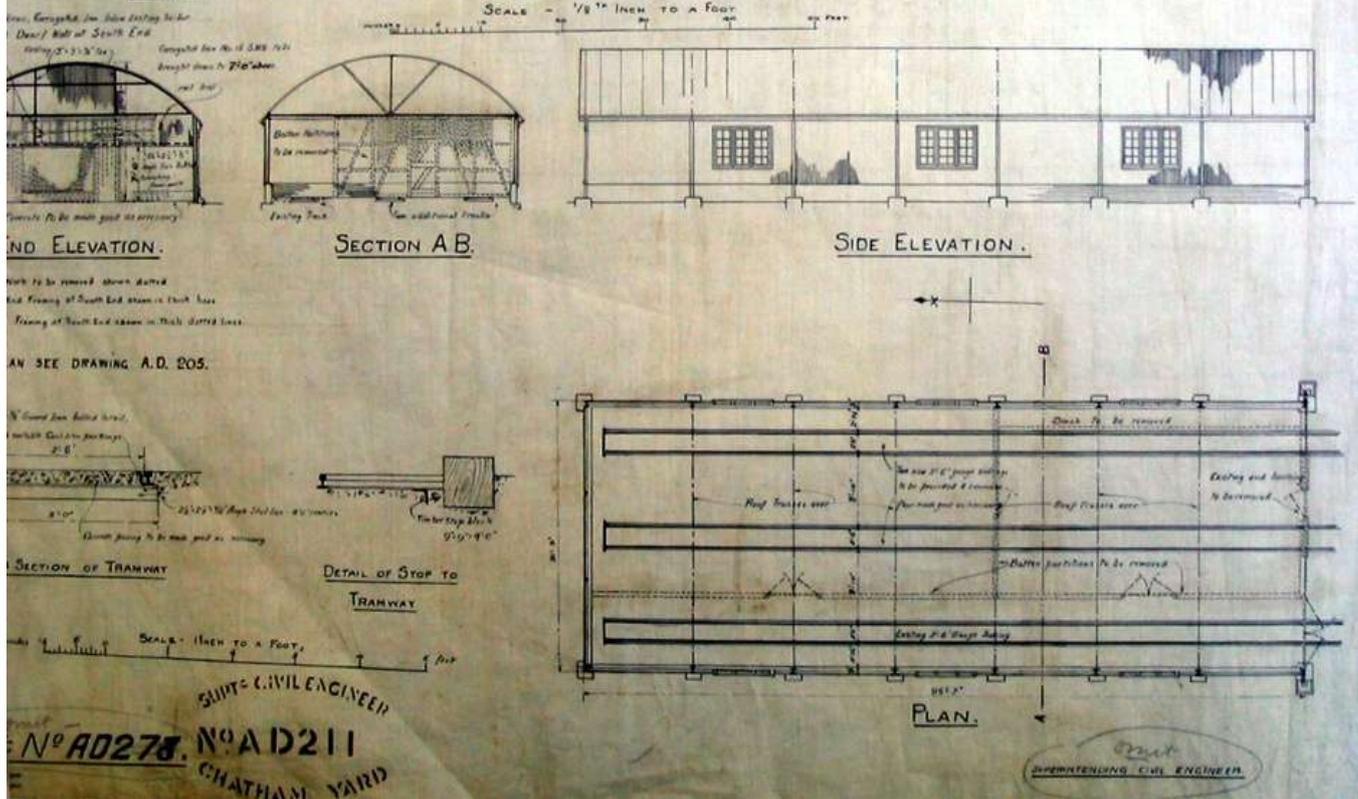


CHATHAM DISTRICT.—ARRANGEMENTS FOR STORAGE, TRANSPORT, &^{SE} OF AMMUNITION.

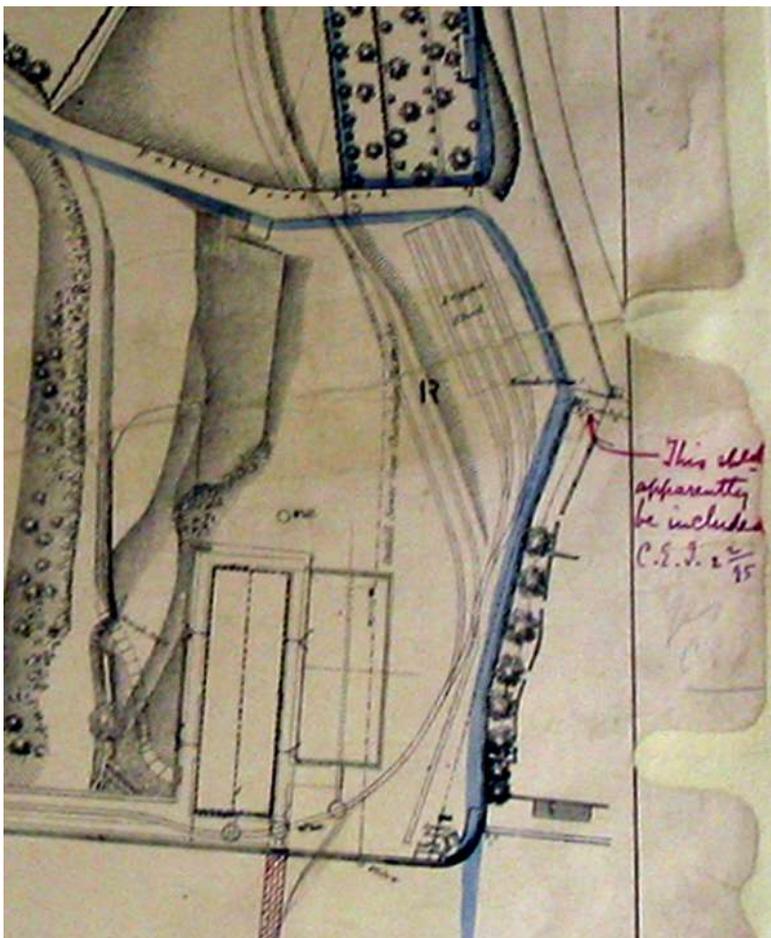
DRAWING N^o AD278.

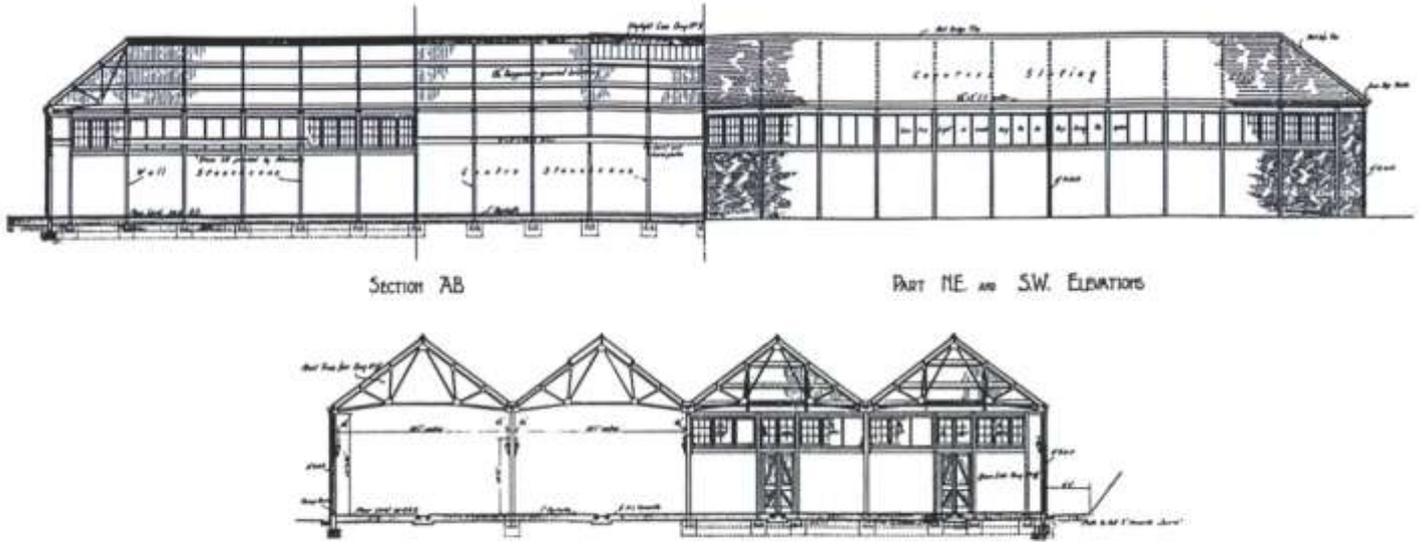
ARRANGEMENTS AT UPNOR.

CONVERSION OF EMPTY CASE STORE INTO SHELTER FOR LOADED WAGONS.



Figures 30, 31. By 1896 the Engine Shed had been converted to an empty case store. In 1905 it reverted to a shelter for loaded wagons of 2 ft 6 inches gauge (AD 211/420/SE/2/0567), and (WO 78/2269) below





Figures 32, 33. By 1904 a Filled Shell Store had been built on the recently acquired land with a large Shifting Room (Evans 2000b: 55)

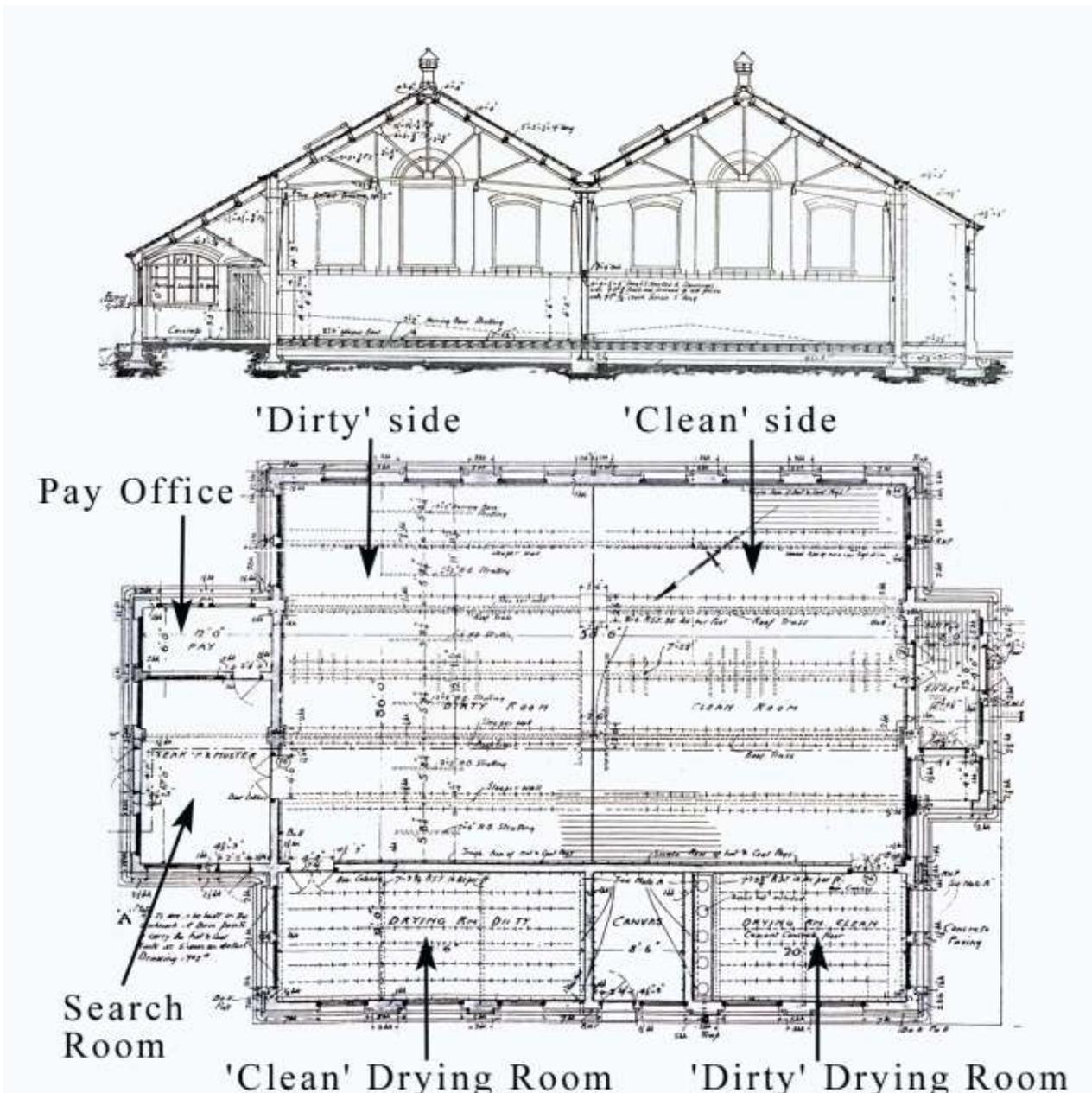




Figure 34. OS map of 1897

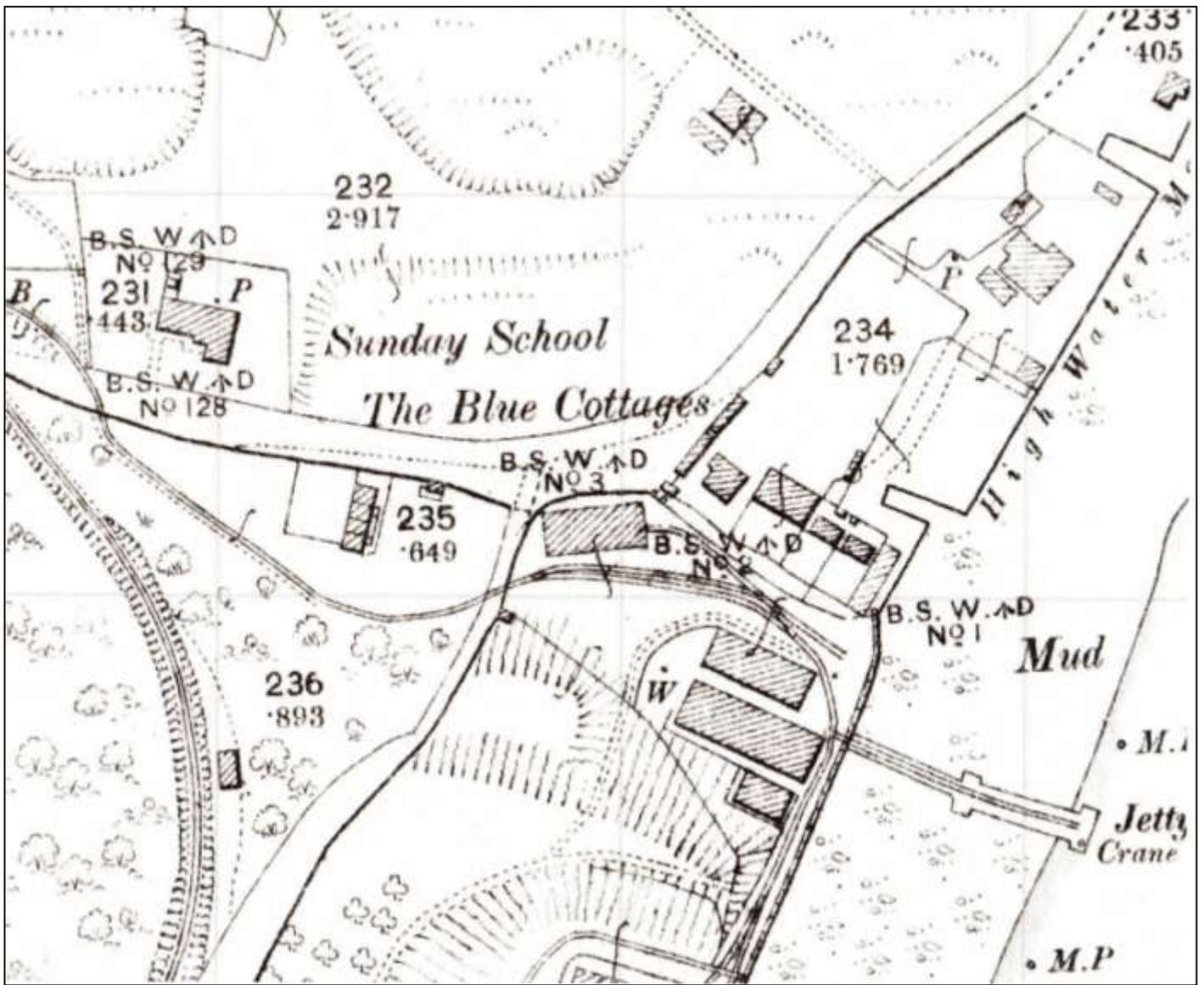


Figure 35. Detail of the 1897 OS map

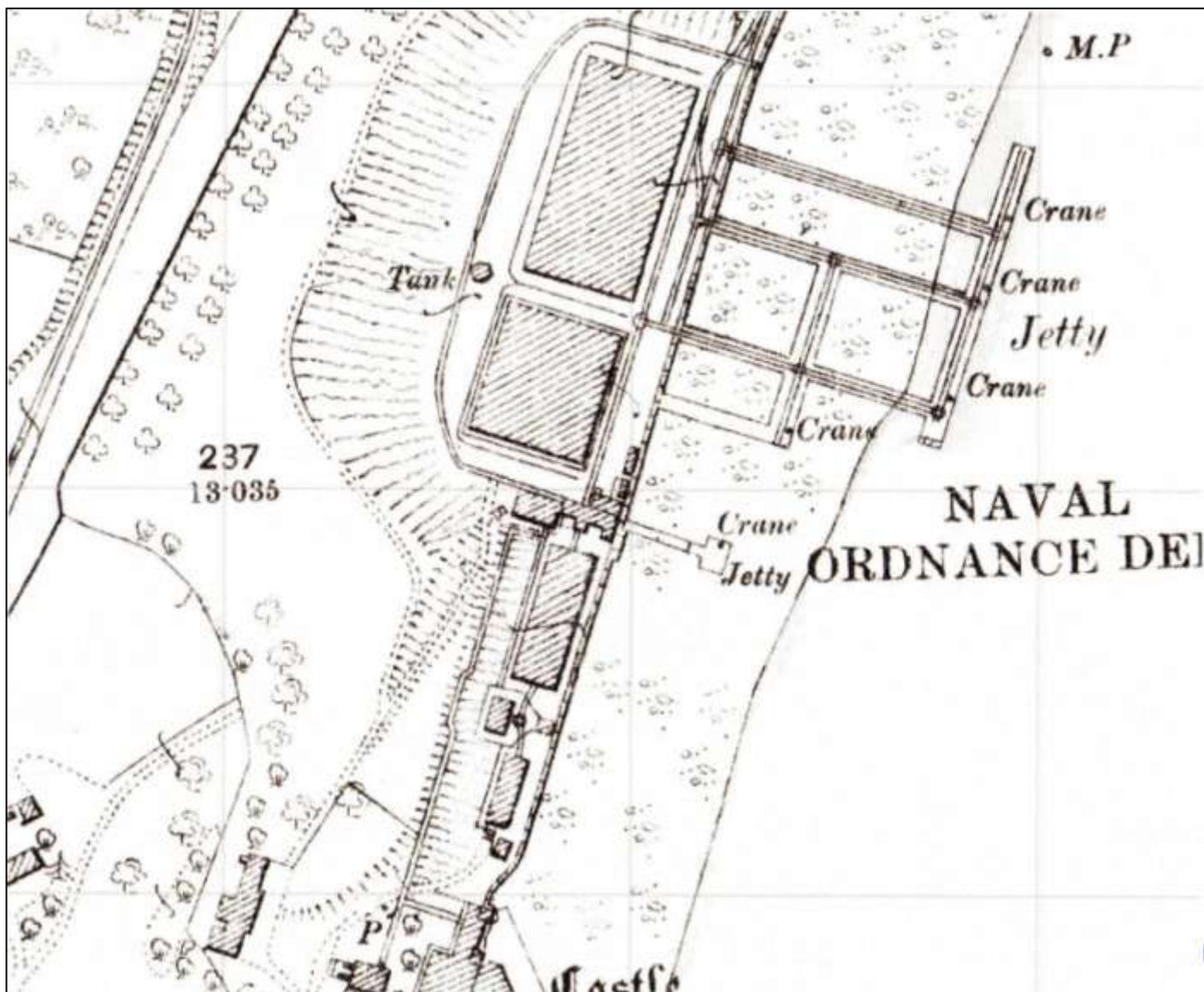


Figure 36. Detail of the 1897 OS map

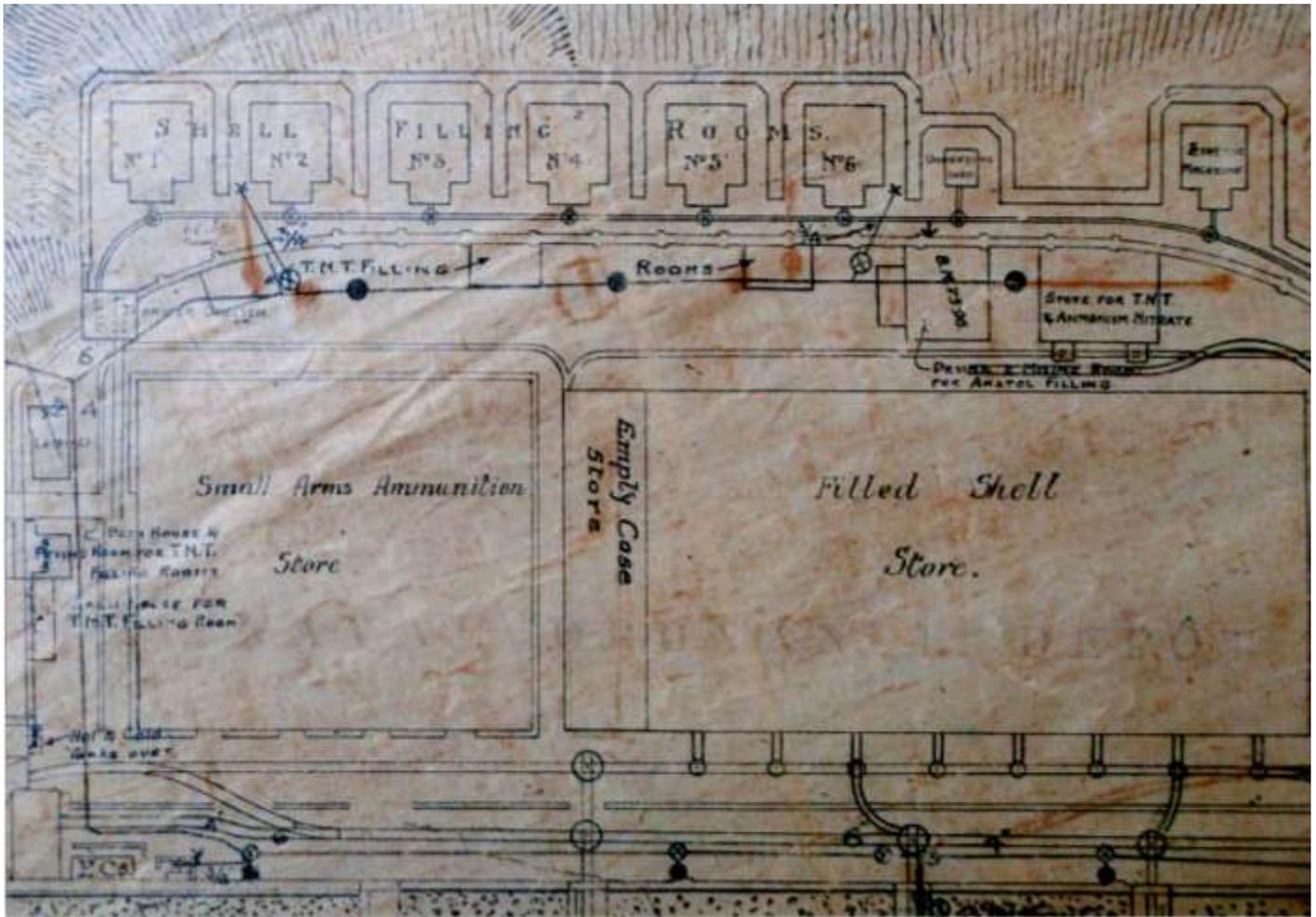


Figure 40. The plan of 1903 shows the Empty Case Store, the Small Arms Ammunition Store (Magazine A) and the Filled Shell Store (Magazine B) No. AD 195/420/SE/2/0554



Figure 41. The OS map of 1933 shows the Ordnance Depot in detail

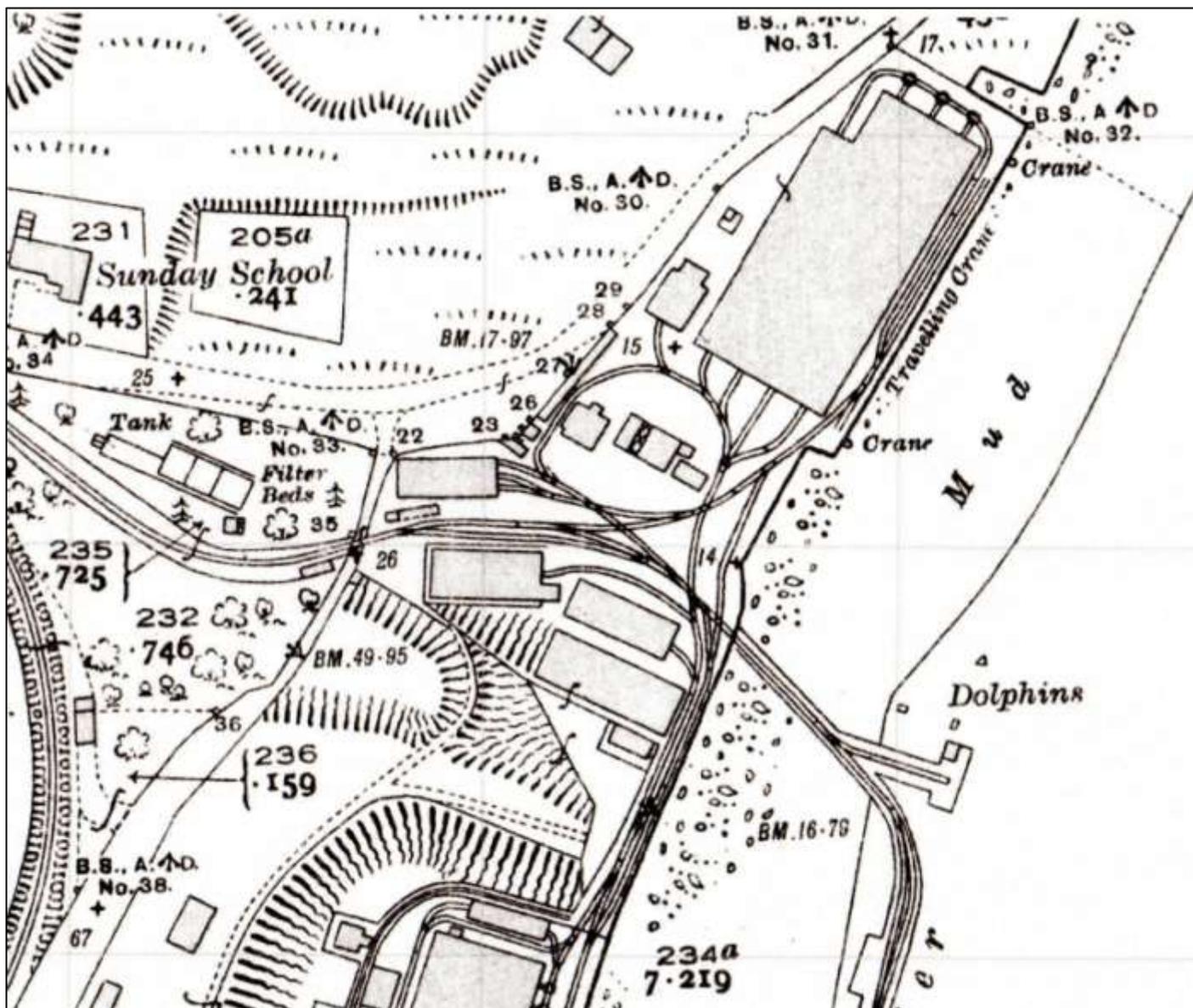


Figure 42. The OS map of 1933 shows the Truck Shed, the 'Shed' and the Latrine Block

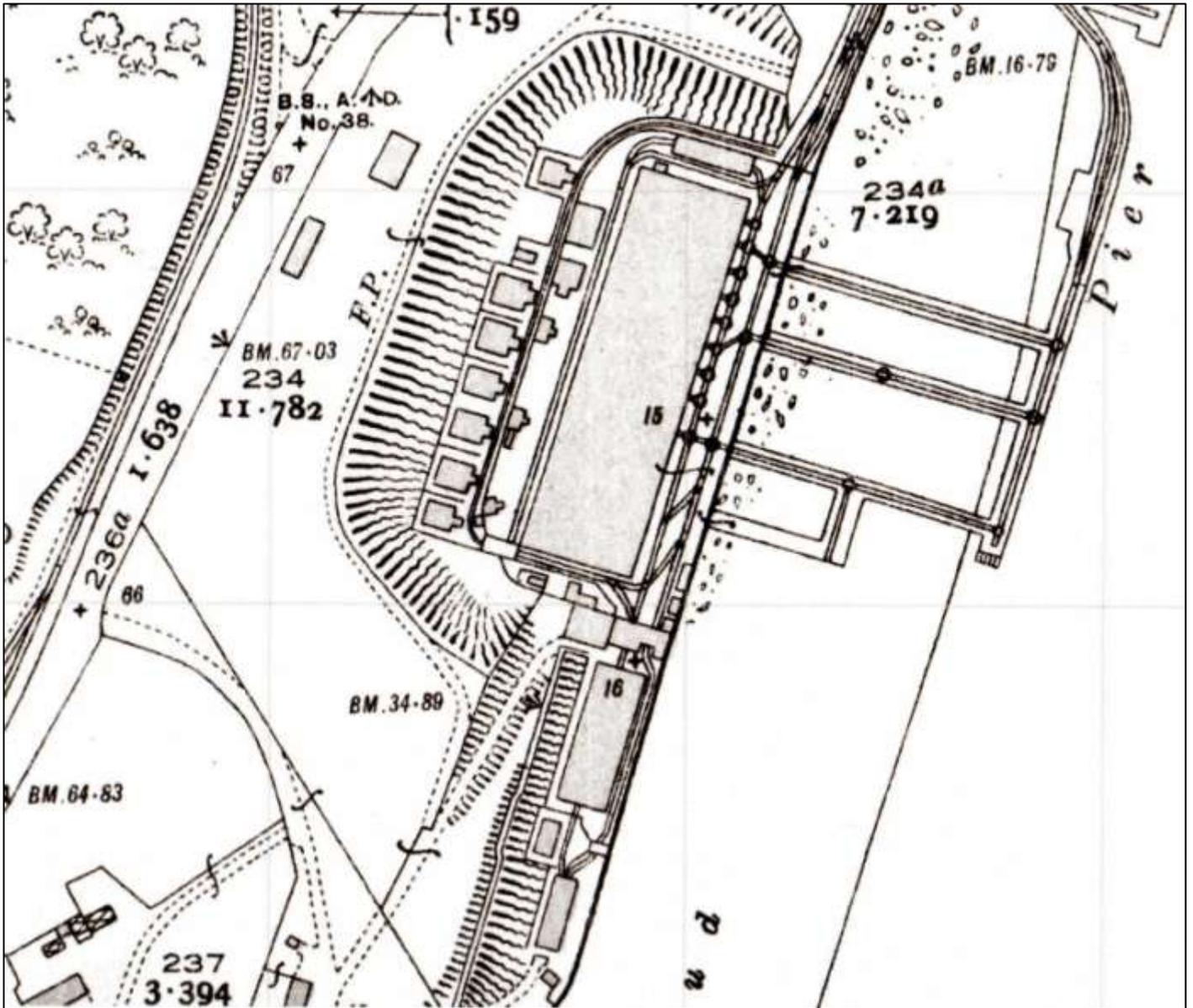


Figure 43. The OS map of 1933 shows the 'A' and 'B' Magazines



Figure 44. The OS map of 1952 shows the Site

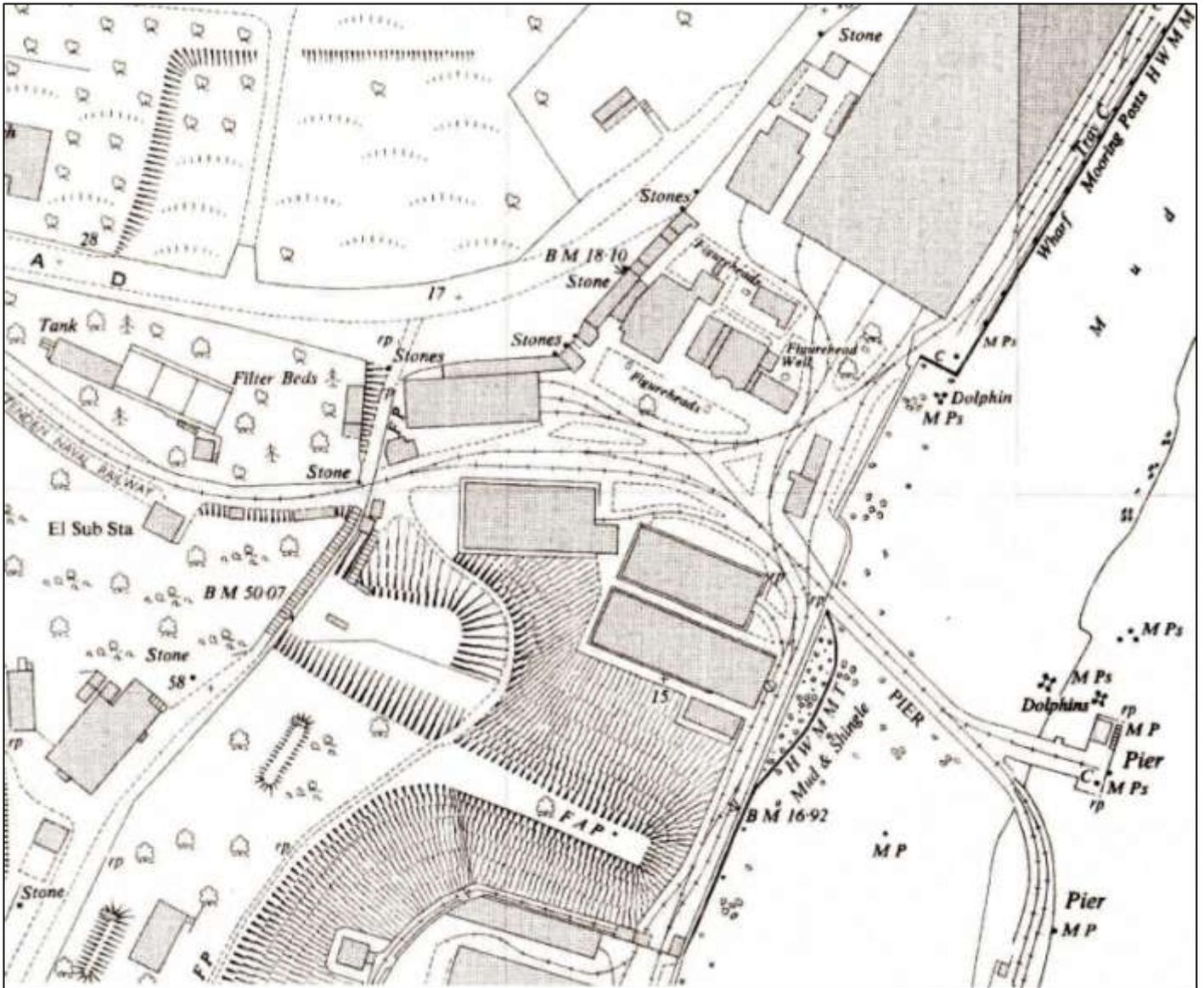


Figure 45. The OS map of 1952 shows the Truck Shed, the 'Shed' and the Main Gate

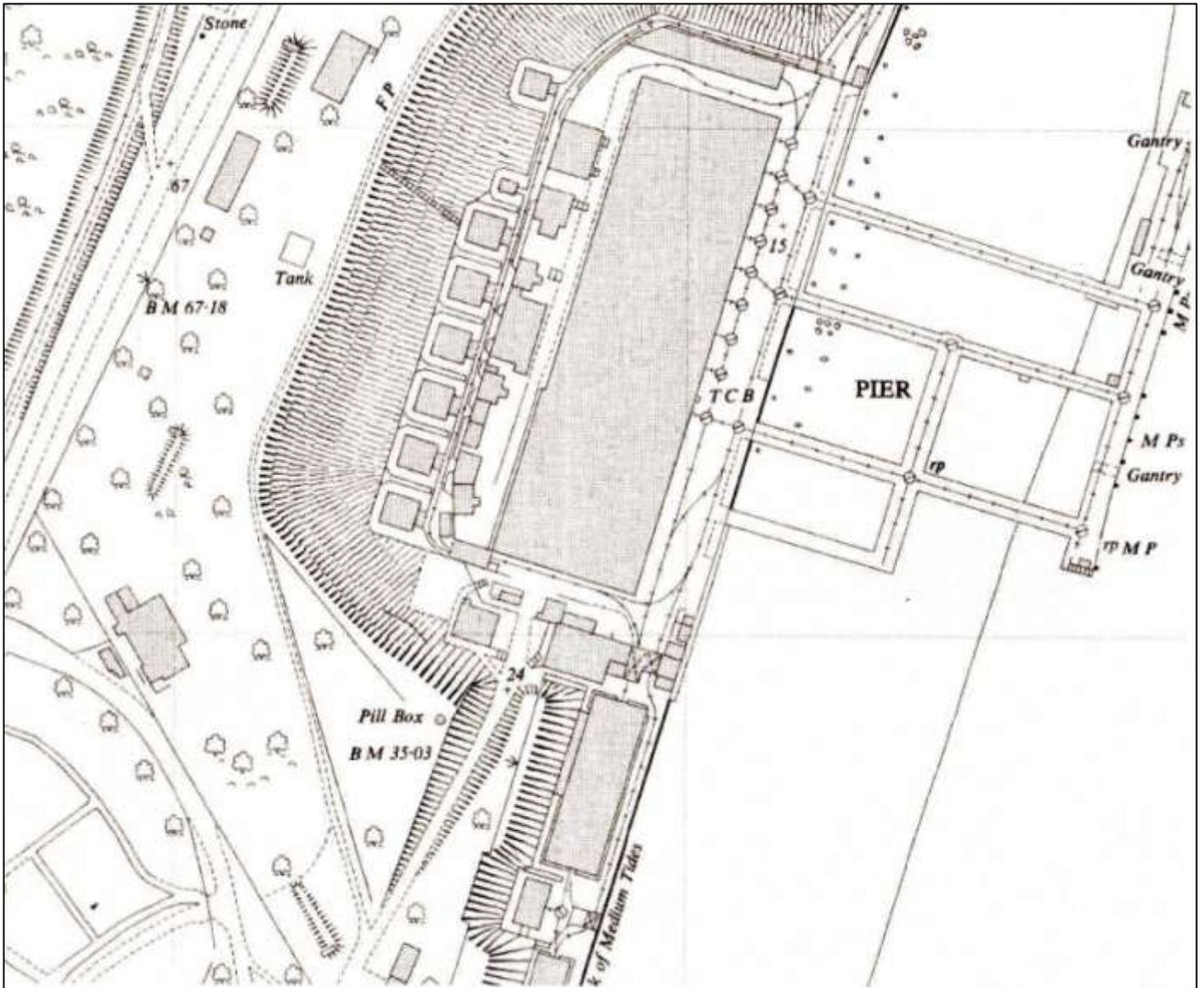


Figure 46. The OS map of 1952 shows the 'A' and 'B' Magazines

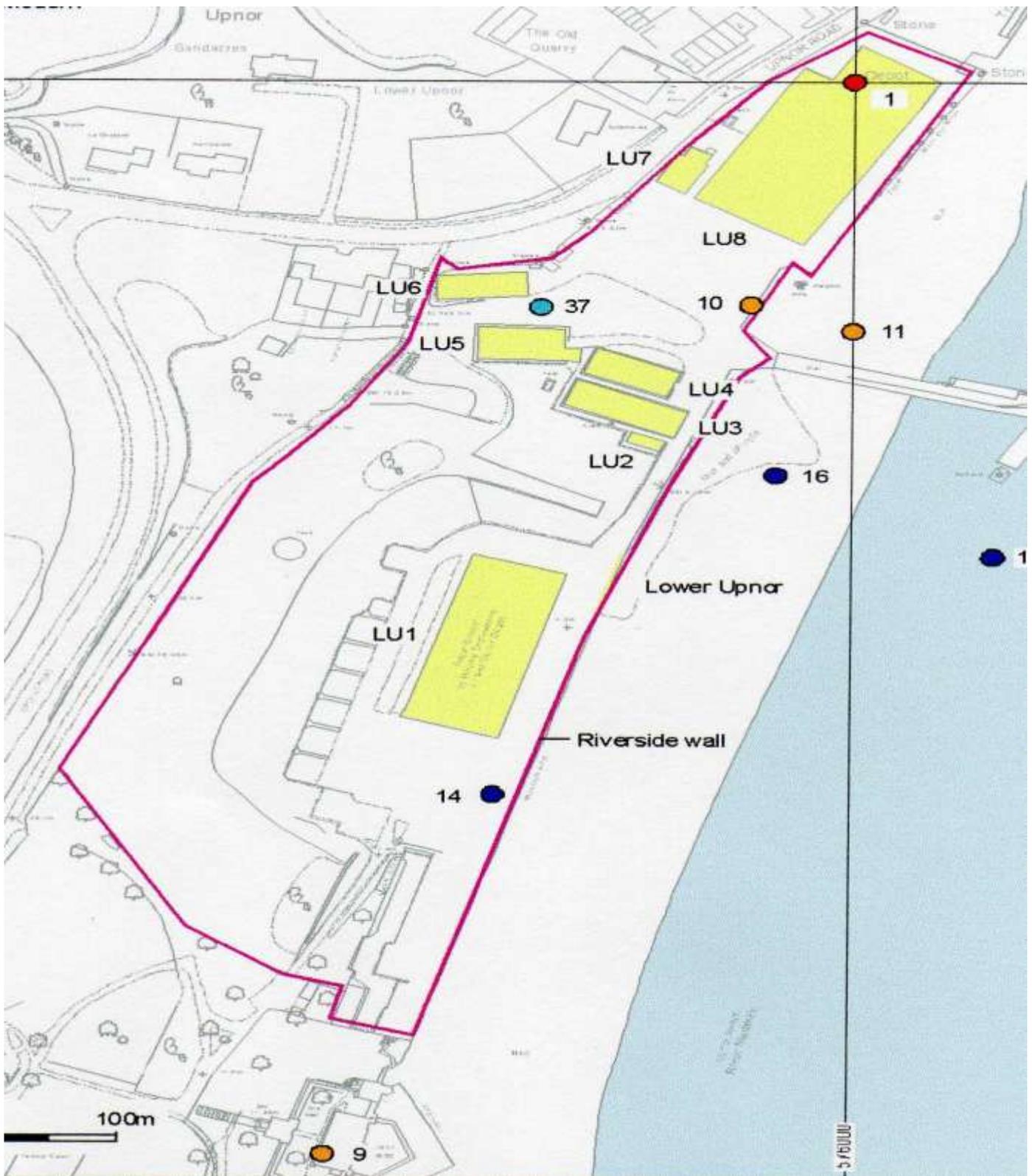


Figure 47. The map of shows the clearance of the site after 1960 (Evans 2000b: 69)



Figure 48. This photograph shows the former civilian houses (right), the Truck Shed (centre), and to the right the Latrine Block. To the left of the Truck Shed across the railway tracks can be seen the Wet Guncotton Store and Mine Testing Room (Evans 2000b: 67)



Figure 49. Looking downriver and to the north and probably photographed from an upper window of Upnor Castle. The view shows in the immediate foreground the Laboratory Sheds (with concrete flat roofs added in WW2), to the left the Shifting House with its 19th century curved walls, and adjacent alongside the wharf the No. 1 Shell Store. Beyond you can see 'A' Magazine, 'and B' Magazine (Evans 2000b: 63)



Figure 40. A view to the North over the roofs of the No. 3 Shell Store and the Wet Guncotton Store to the civilian houses turned after purchase into Offices. Beyond can be seen the roof and entrance of the Filled Shell Store

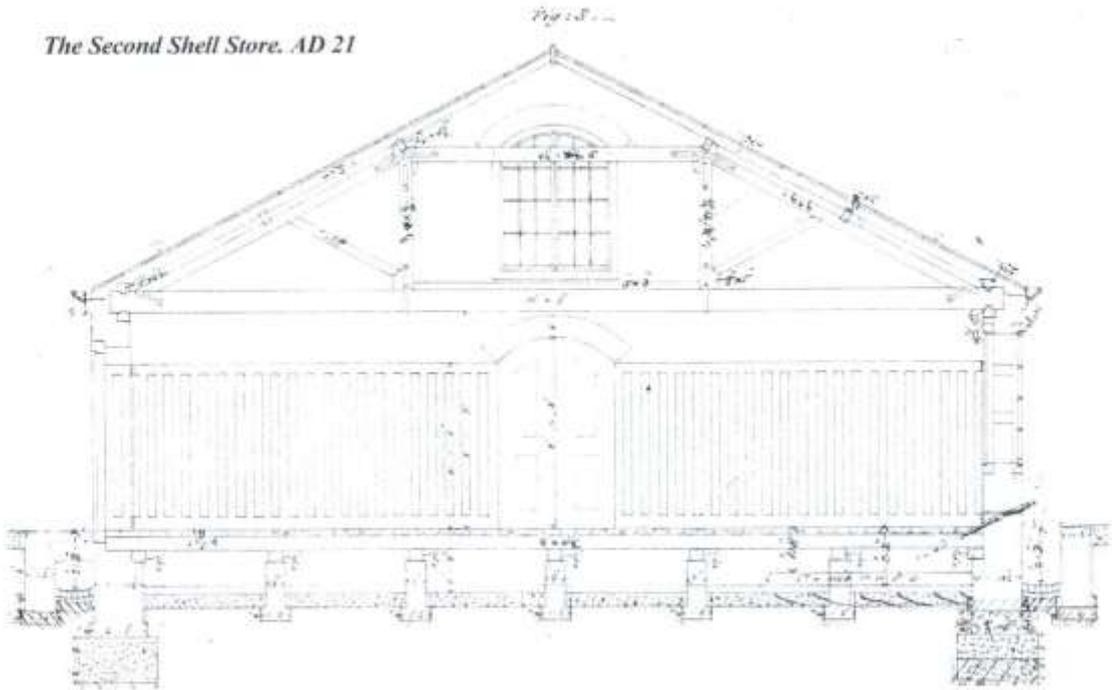


Figure 50. A view inside the Shell Scraping Room (Evans 2000b: 60)



Figure 51. A view across the Medway at the Ordnance Depot (Evans 2000b: 68)

The Second Shell Store. AD 21



The Second Shell Store. AD 21

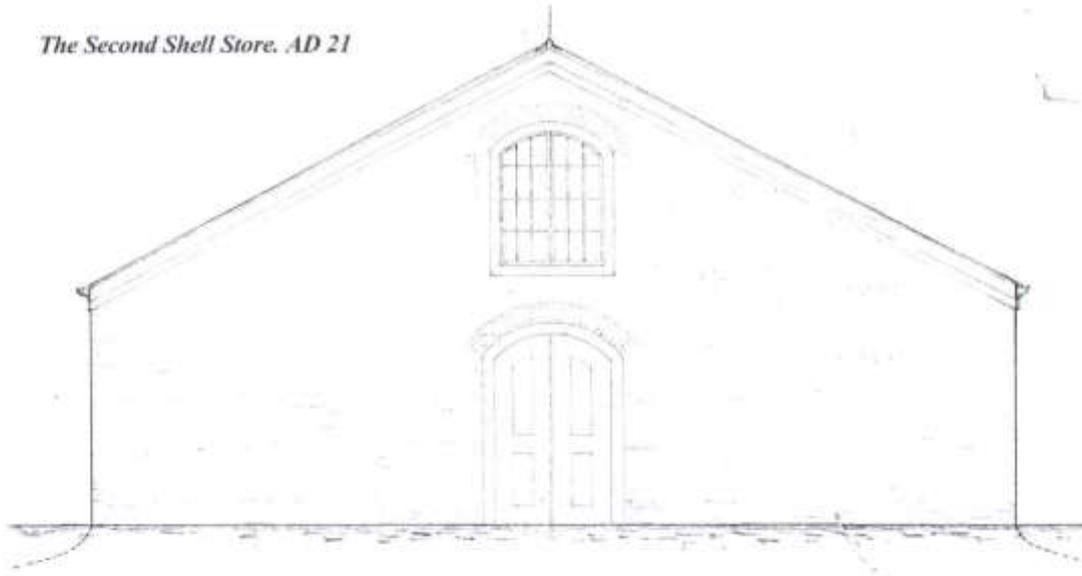


Figure 52. Plans of the 1862 No. 2 Shell Store (Evans 2000: 11)

PLATES (2m scale in 25cm segments and 1m scale in 10cm segments)



Plates 1,2. Main Gate (looking ENE and below South) 2m scale





Plates 3,4. Main Gate (looking ESE). Note three phases of build





Plates 5,6. Boundary markers. No. 28 on Main Gate pillar and (below) on outside wall to the north- cm scale





Plate 7. Detail of 'sandstone' pillar. Note pintles for the original gate



Plate 8. Later phase gate pillar in yellow stock brick keyed into earlier build wall -2m scale



Plates 9,10. Main Gate looking out. Note concrete render to internal face of south wall





Plates 11,12. Inside face of boundary wall north of Main Gate. Note foundation courses-2m scale





Plates 13, 14. Main Gate north pillar and (below) Gate House- 2m scale





Plates 15, 16 View of Gate House looking WNW and (below) SW- 2m scale





Plates 17, 18. Gate House looking North and (below) NNW- 2m scale





Plates 19, 20. Latrine Block looking West and (below) NNW-2m scale





Plates 21, 22. Long view of 'Shed' and closer view (below) looking west- 2m scale





Plates 23, 24. Side view of 'Shed' and long view of Truck Shed looking WNW- 2m scale





Plates 25,26. Truck Shed looking WSW and (below) ENE





Plates 27, 28. Internal view of Truck Shed looking WSW and (below) ENE





Plates 29,30. Internal views of Truck Shed





Plates 31,32. View of Small Arms Store looking WSW and (below) north- 2m scale





Plates 33,34. Small Arms Store showing rebuilt window opening and modern concrete flat roof-1m scale





Plates 35, 36. Small Arms Store showing rebuilt main entrance and (below) window- 1m scale





Plate 37. Small Arms Store showing drainage gully, foundation bricks and damp course- 1m scale



Plates 38, 39. Small Arms Store showing damp course and (below) internal view of concrete roof-1m scale





Plates 40, 41. Small Arms Store showing concrete floor and (below) internal brick partition





Plates 42,43. Small Arms Store internal view and (below) Empty Case Store looking NW





Plates 44, 45. Exterior view of Empty Case Store looking NE and (below) rear view of Empty Case Store





Plate 46. Detail of the rear of the Empty Case Store (left) showing butting on to remains of north end wall of Magazine 'A' (centre) and post-1960 repair to exposed wall following demolition of Magazine 'A' (right)



Plate 47. Detail of the front of the Empty Case Store (right) showing butting on to remains of north end wall of Magazine 'A' (centre) and post-1960 repair to exposed wall following demolition of Magazine 'A' (left)



Plate 48. Rear wall of the 1893 Empty Case Store showing the original build



Plate 49. Showing the internal face of the north wall of Magazine 'A' with the entrance blocked with yellow stock bricks. Following demolition in post-1960 the wall has been rebuilt with fletton bricks-1m scale



Plate 50. Detail of the internal wall of Magazine 'A' showing hardwood blocks in the brickwork to facilitate fixing internal panelling- 1m scale (10cm segments)



Plates 51, 52, Detail of arch and (below) blocked ventilation slots in the wall of Magazine 'A' -1m scale





Plates 53, 54, Original brickwork of Magazine 'A' and (below) detail of brickwork on internal north wall





Plate 55. Detail of hardwood blocks, ventilation slots, and repaired wall- 1m scale



Plates 56. 57. View of front of the Empty Case Store showing four phases of build, and (below) rear view





Plates 58, 59. View of modern main door of the 1893 Empty Case Store and (below) internal view



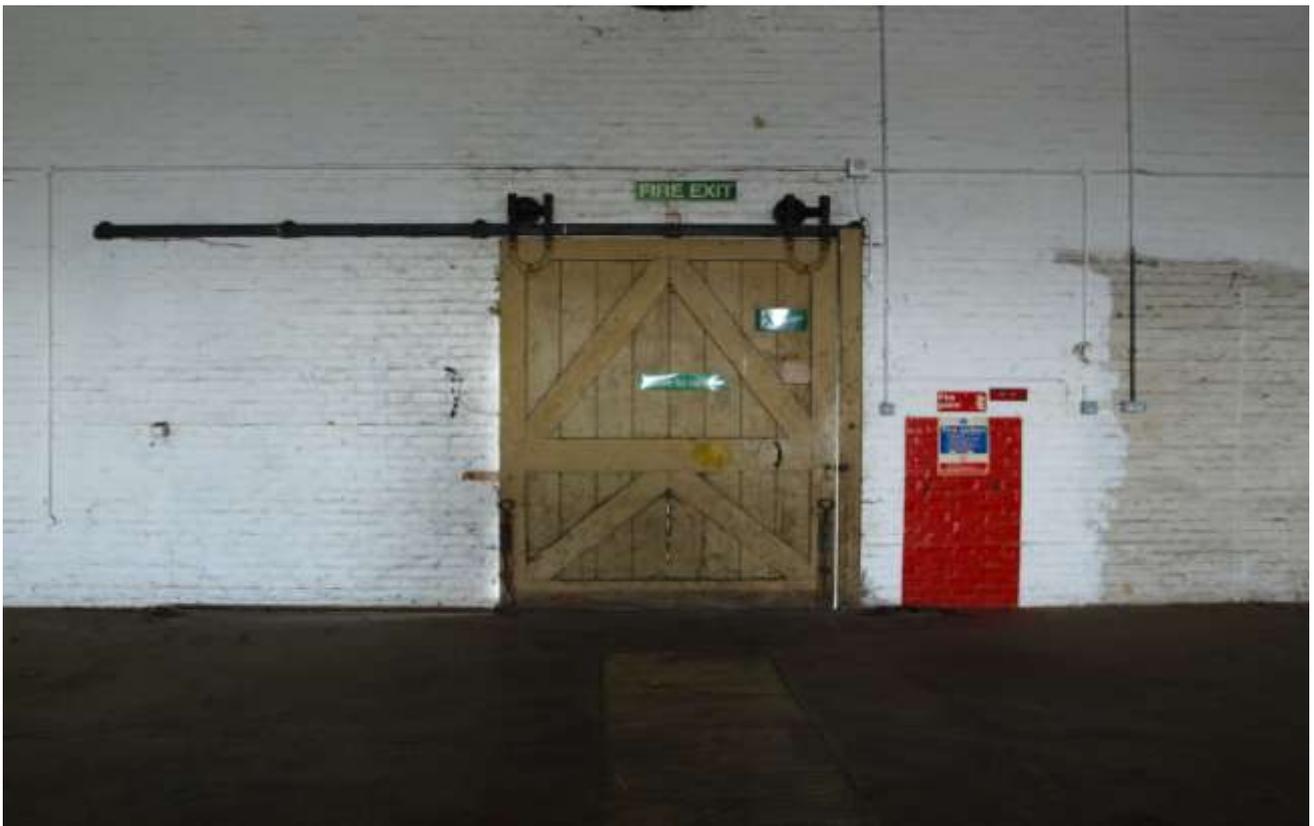


Plates 60, 61. Internal view of Empty Case Store showing 1893 rear entrance-closed and open





Plates 62, 63. Showing modern front entrance to the 1893 Empty Case Store and detail of rear entrance





Plates 64, 65. Showing brick corbelling for original 1893 roof and (below) replacement concrete roof





Plates 66. 67. Internal view looking south to blocked up entrance to Magazine 'A' and (below) detail





Plate 68. Front view of Magazine 'B' built by 1857 (looking SW)

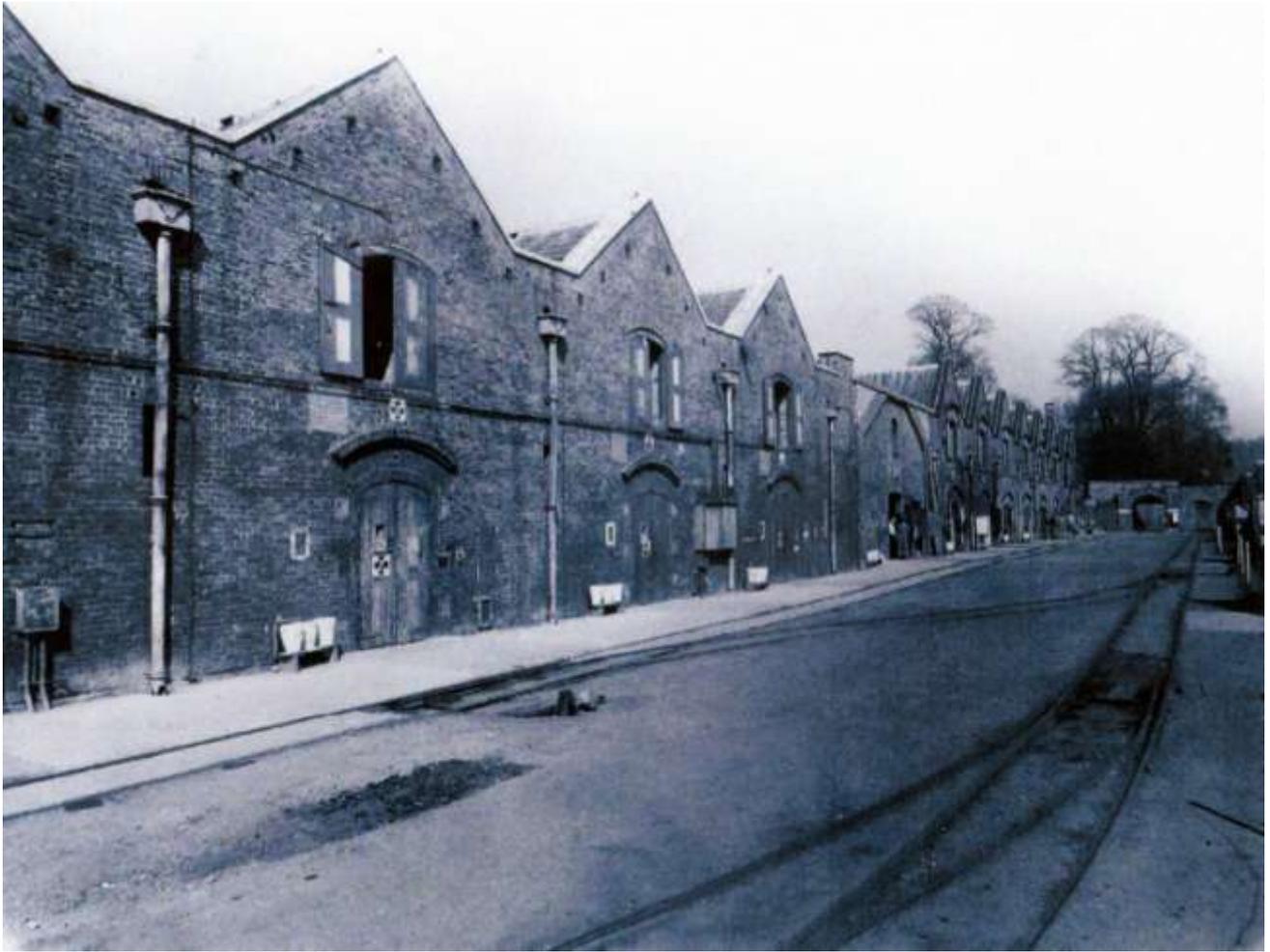


Plate 69. Historic front view of 'A' and 'B' Magazines (Found 2006: Plate 57)



Plate 70. Historic close-up front view of 'A' and 'B' Magazines (Found 2006: Plate 57)

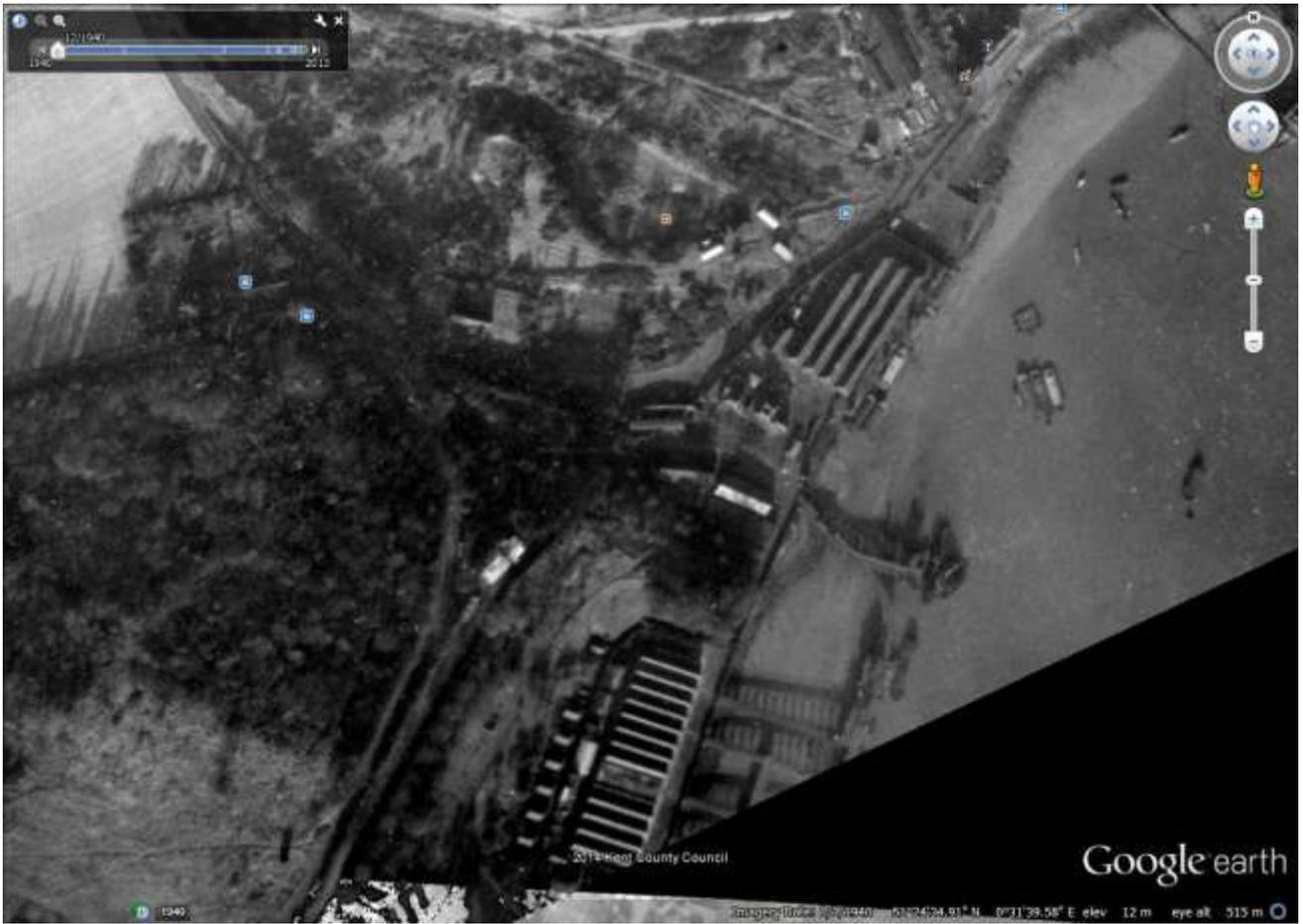


Plate 71 Google Earth 1st January 1940



Plate 72. Google Earth 1st January 1960



Plate 73. Google Earth 1st Jan 2003



Plate 74. Google Earth 11th March 2006



Plate 75. Google Earth 7th September 2013

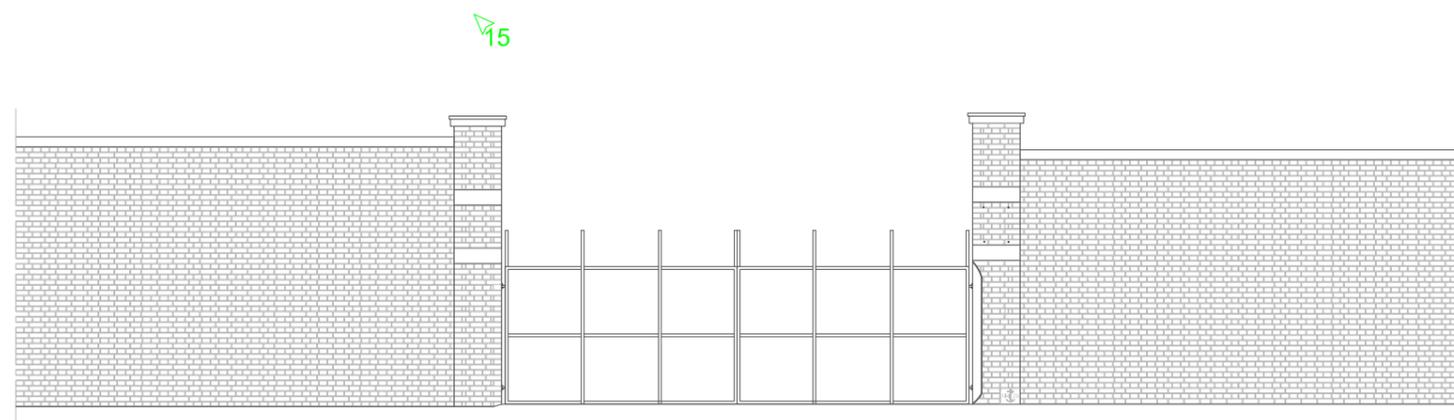
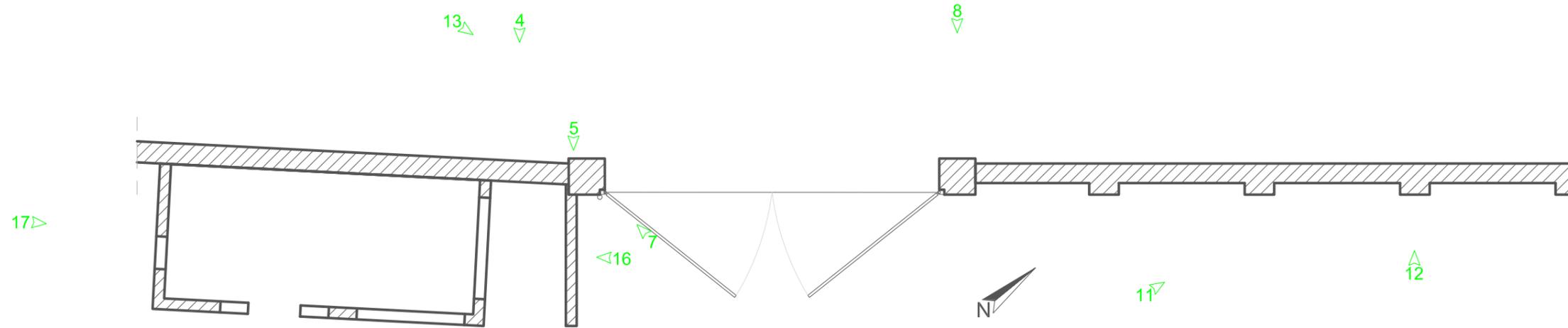


KEY:

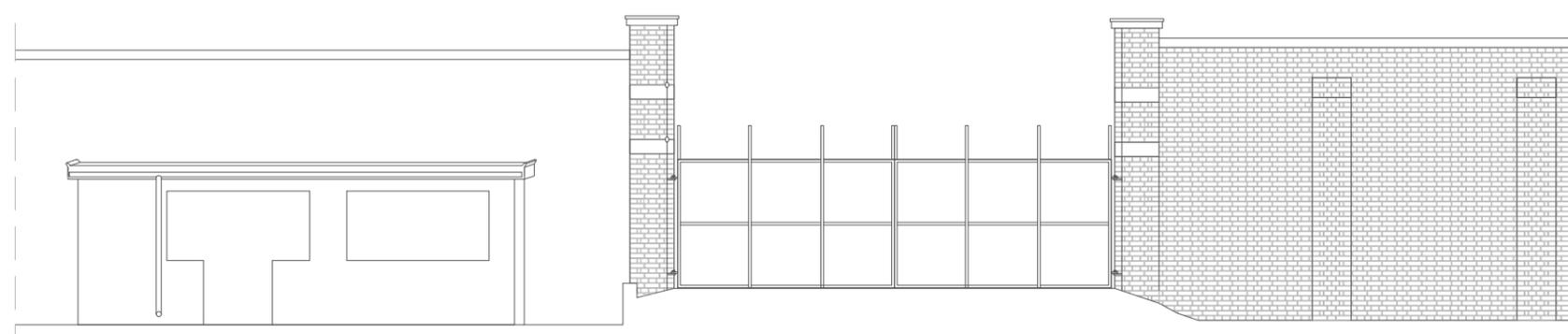
- 1. Main Gate
- 2. Guard House
- 3. Latrine Block
- 4. Latrine Block
- 5. Locomotive Shed, building number 66 (later Empty Case Store than Truck Shed)
- 6. No. 2 Shell Store (small arms store), building number 60
- 7. Empty Case Store, building number 49

 Plate number and looking direction

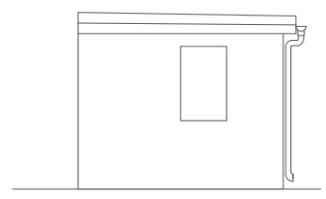
Figure 53: Site location plan, scale 1:1250.



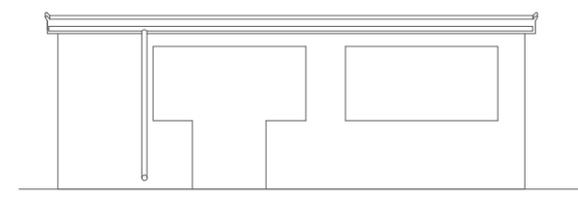
MAIN GATEWAY - NORTH WEST ELEVATION - OUTSIDE



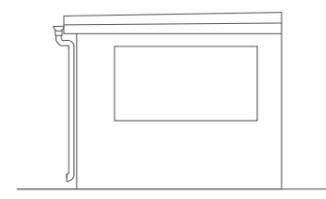
MAIN GATEWAY - SOUTH EAST ELEVATION - INSIDE



GUARD HOUSE - SOUTH WEST ELEVATION - LEFTSIDE



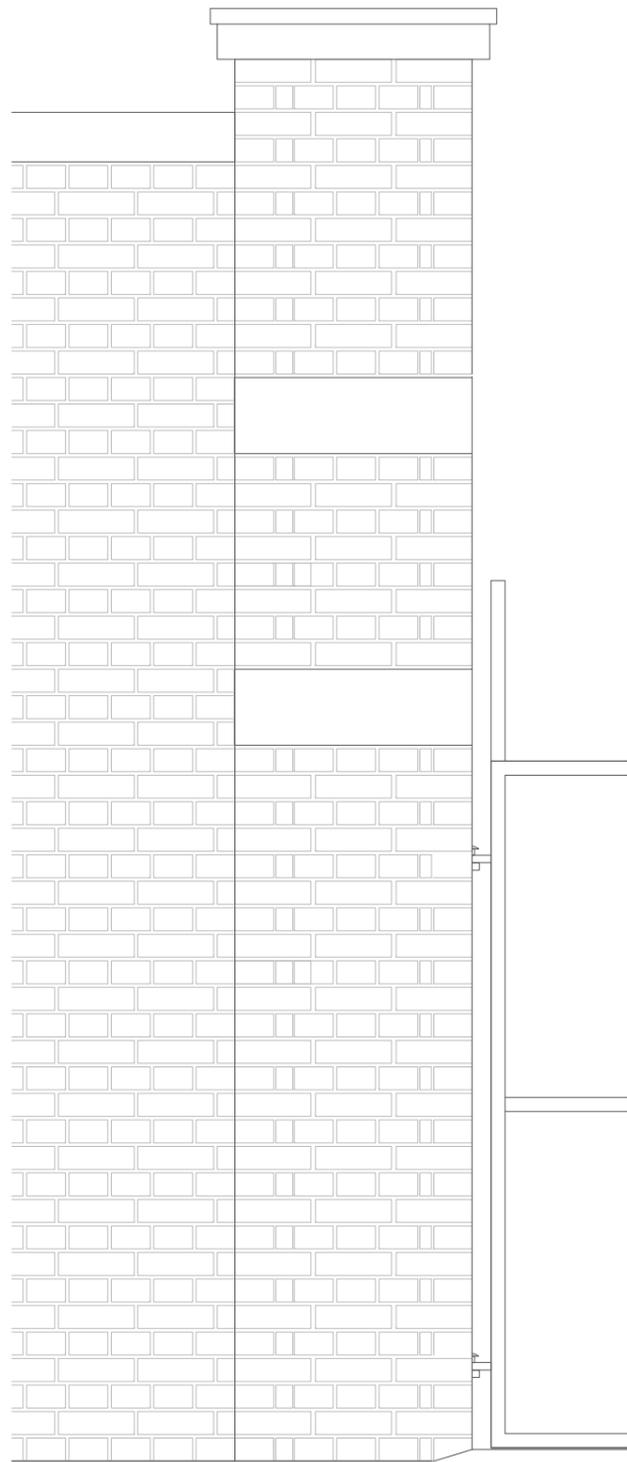
GUARD HOUSE - SOUTH EAST ELEVATION - FRONT



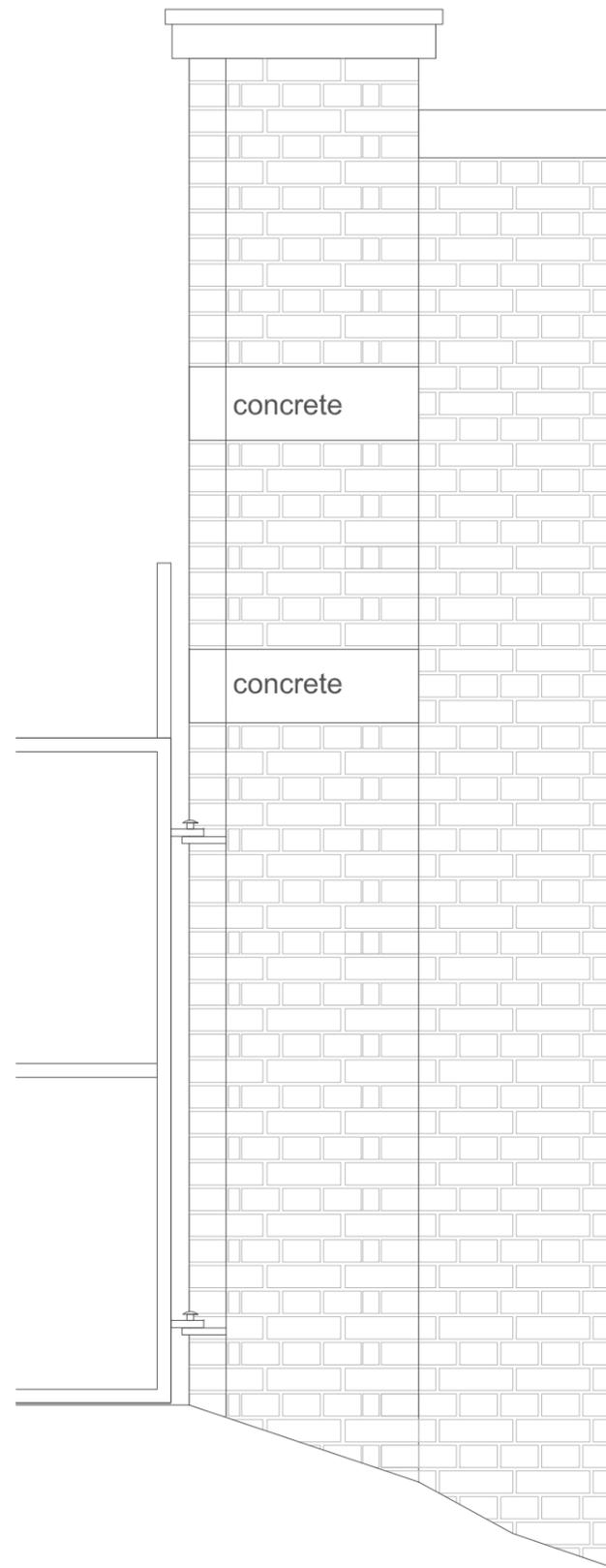
GUARD HOUSE - NORTH EAST ELEVATION - RIGHT SIDE



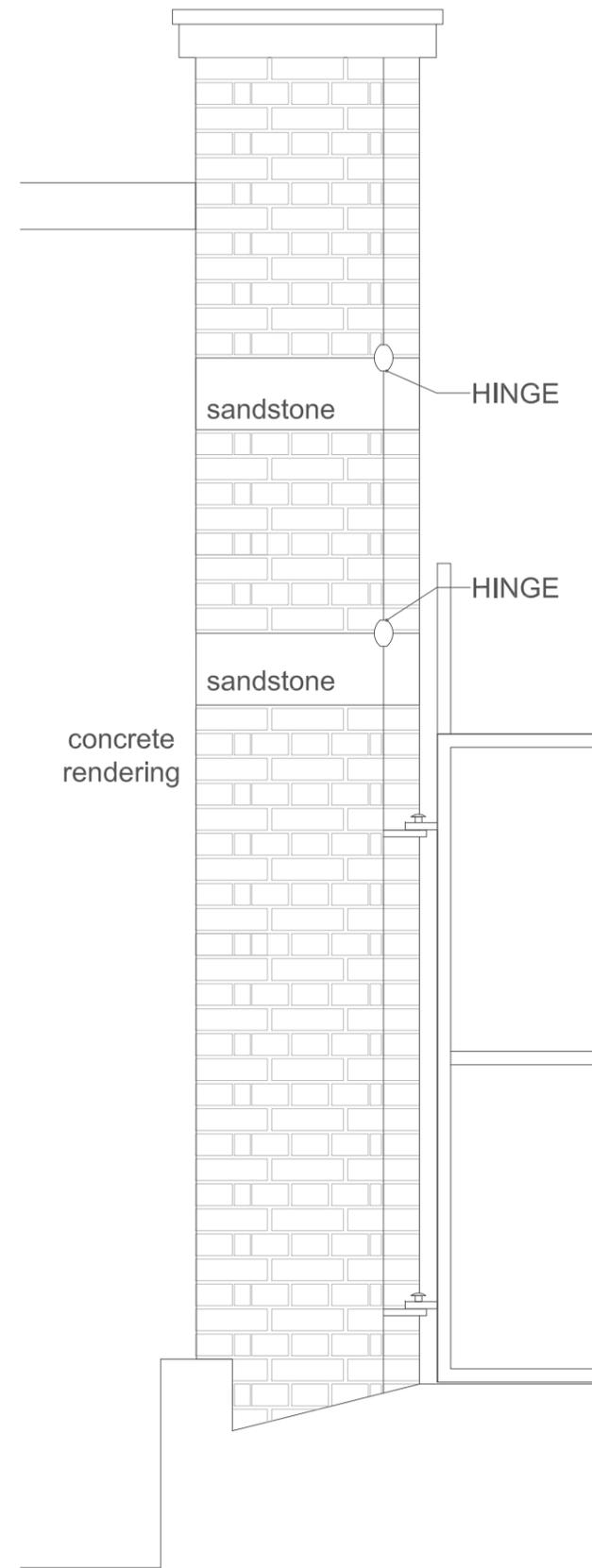
Figure 54: Plan and elevations of the main gateway and Guard House.



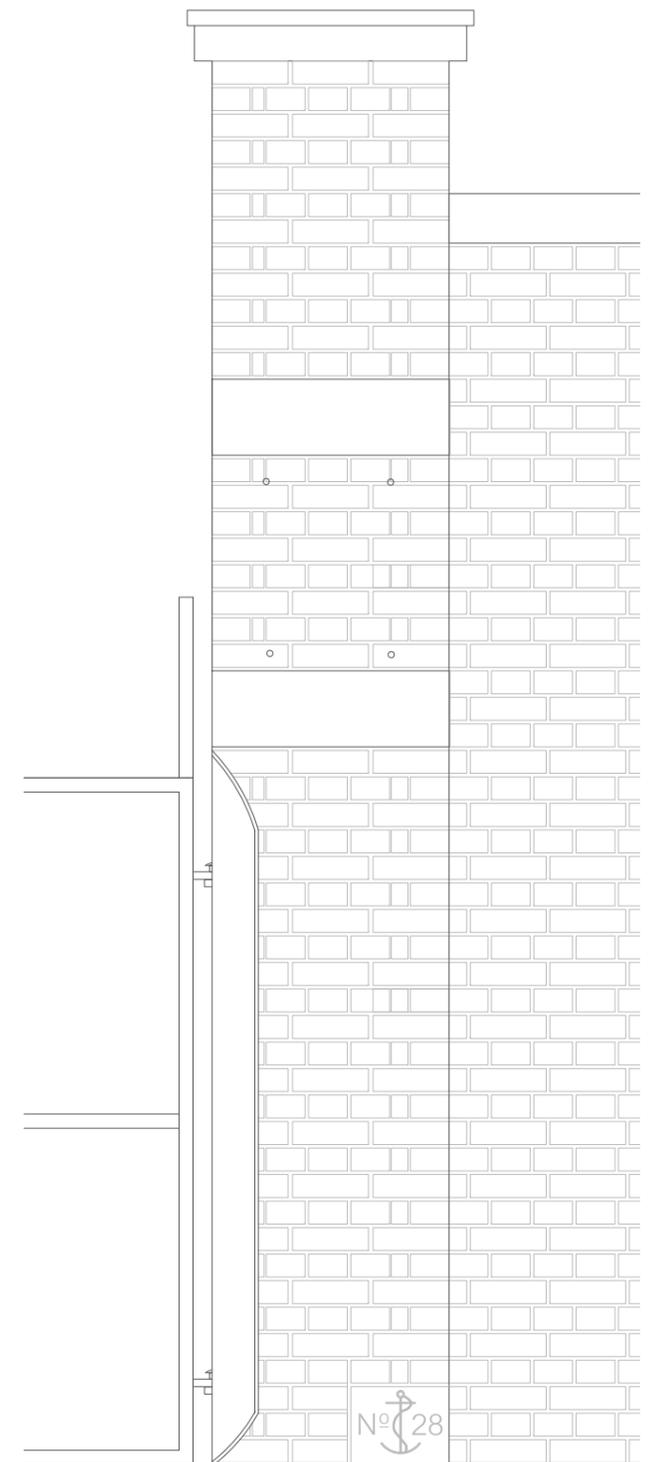
North elevation of eastern gate pier



South elevation of eastern gate pier



South elevation of western gate pier



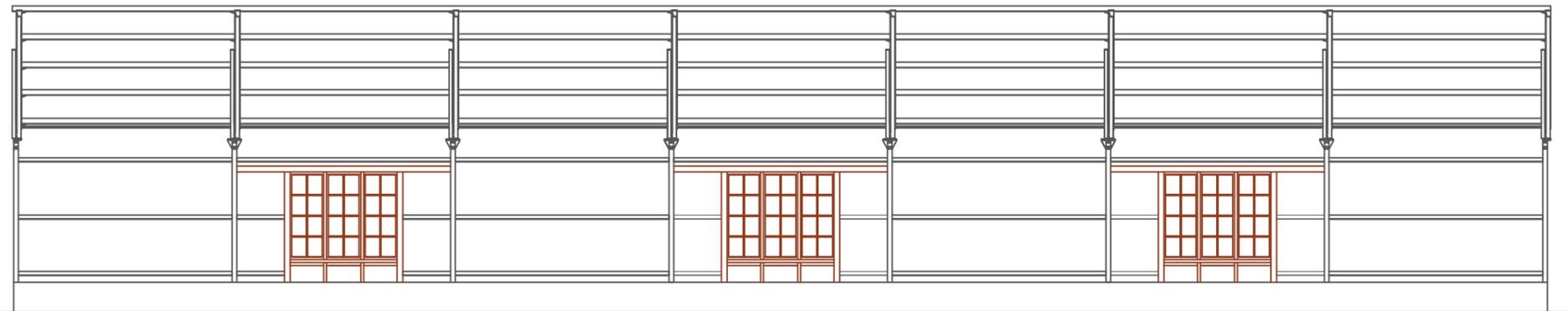
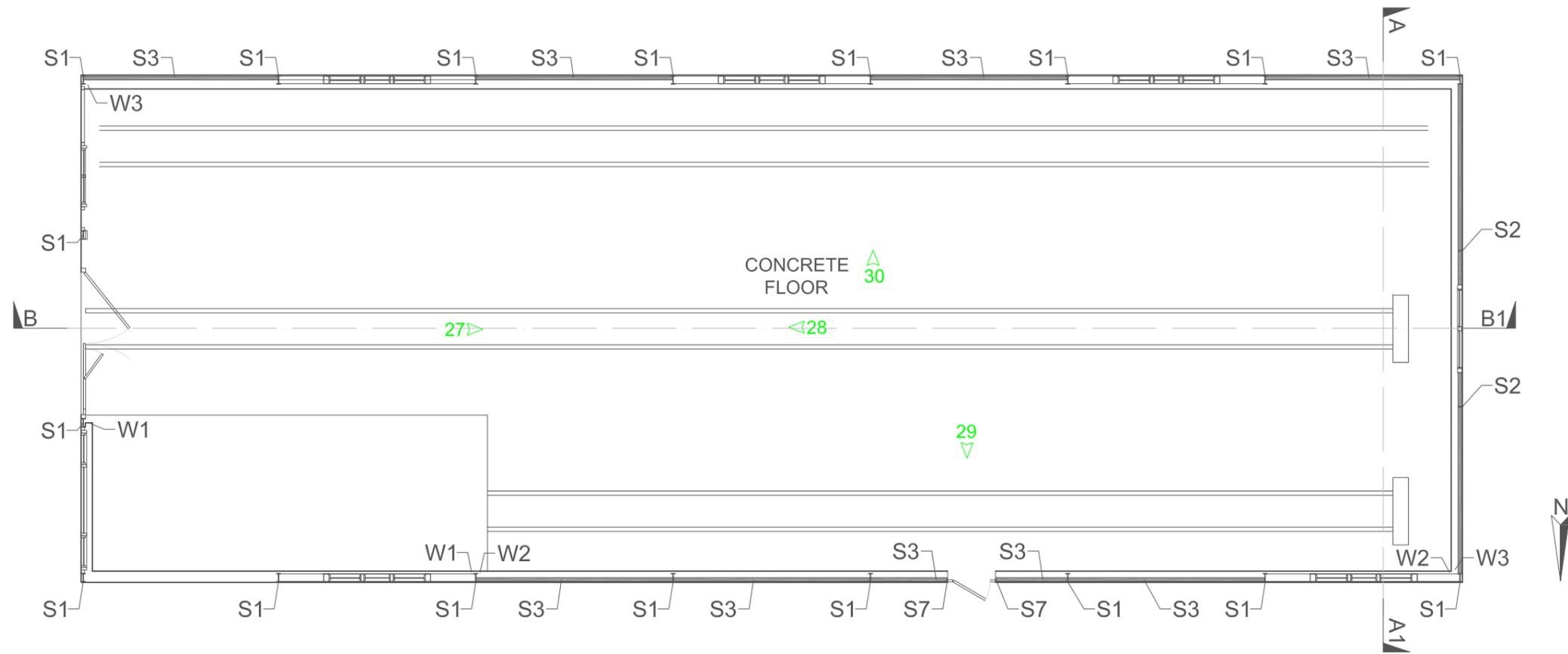
North elevation of western gate pier



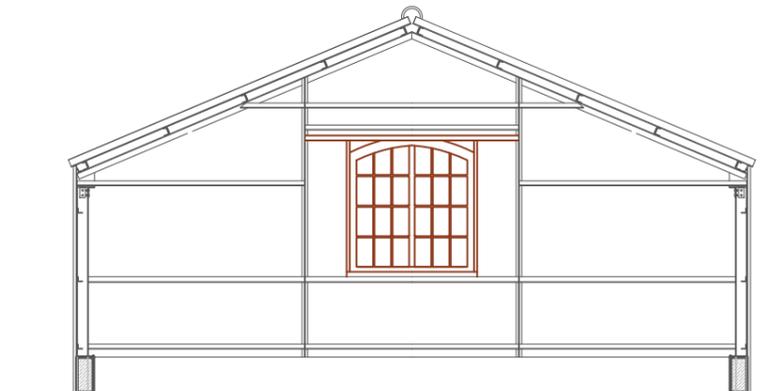
Figure 55: Elevations of the main gateway piers.

25

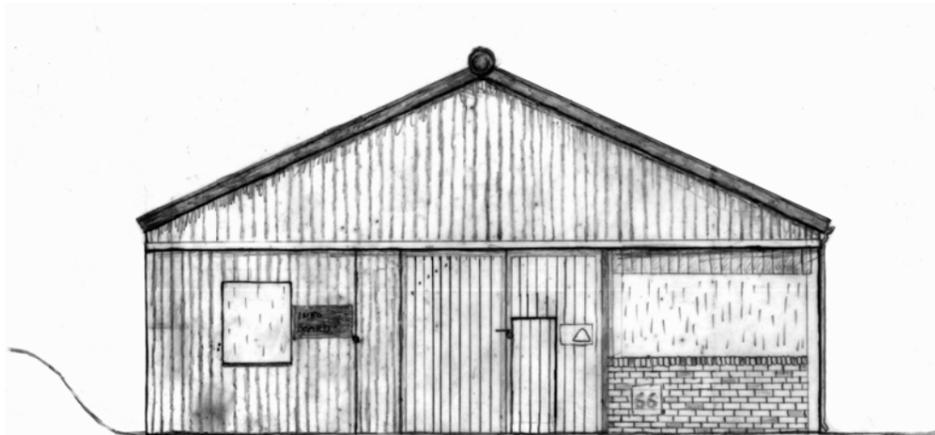
W1 - PALE BROWN BRICK WALL, STRETCHER BOND, 1.01M. HIGH
 W2 - PALE BROWN BRICK WALL, STRETCHER BOND, 0.5M. HIGH
 W3 - CAST CONCRETE WALL, 0.5M. HIGH



SECTION B-B1



SECTION A-A1



EAST ELEVATION - FRONT



WEST ELEVATION - REAR



Figure 56: Plan, sections and elevations of locomotive shed, building number 66.

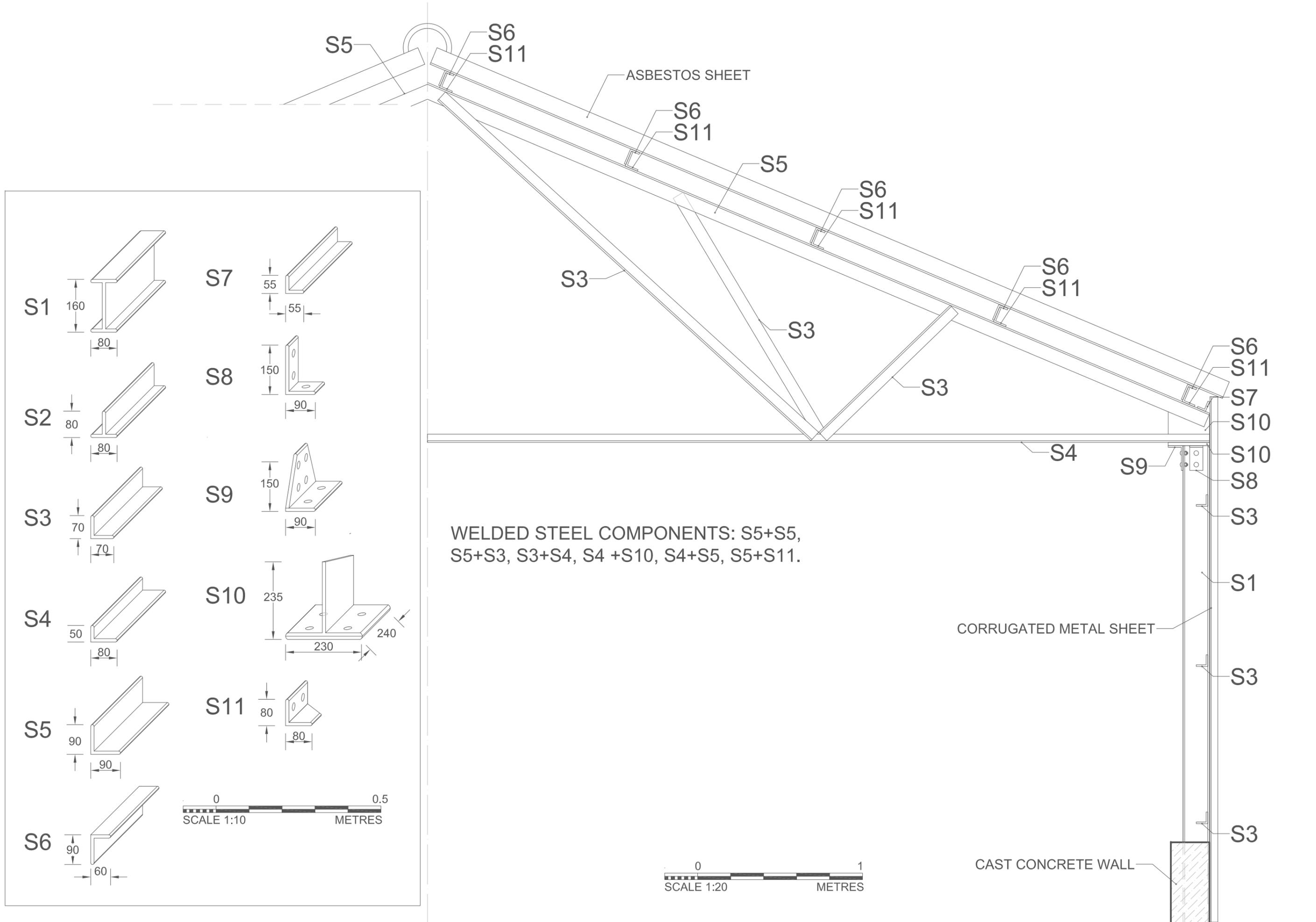


Figure 57: Section through steel frame and profiles of steel components of Locomotive Shed, building number 66.

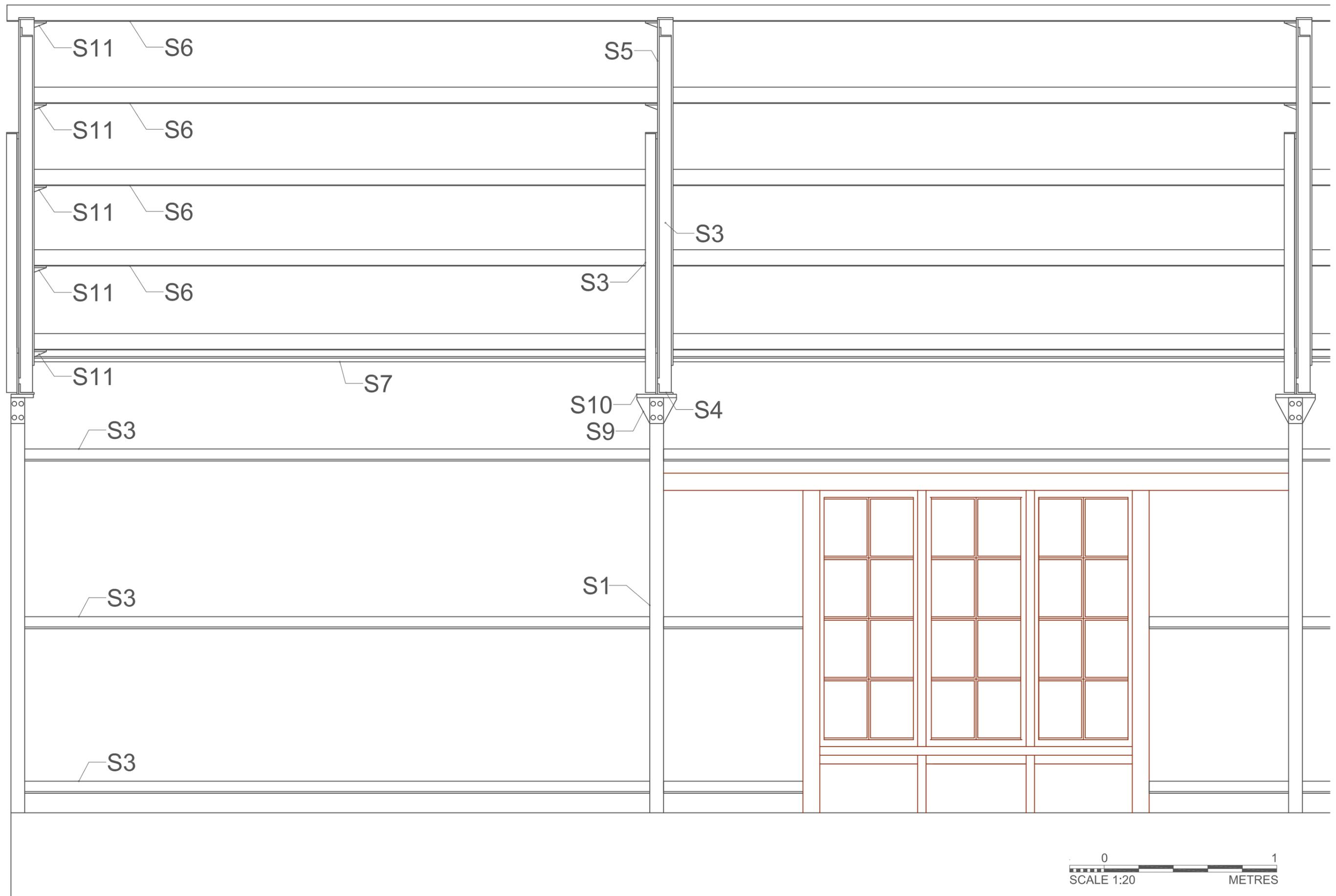


Figure 58: Section of steel frame of Locomotive Shed, building number 66.

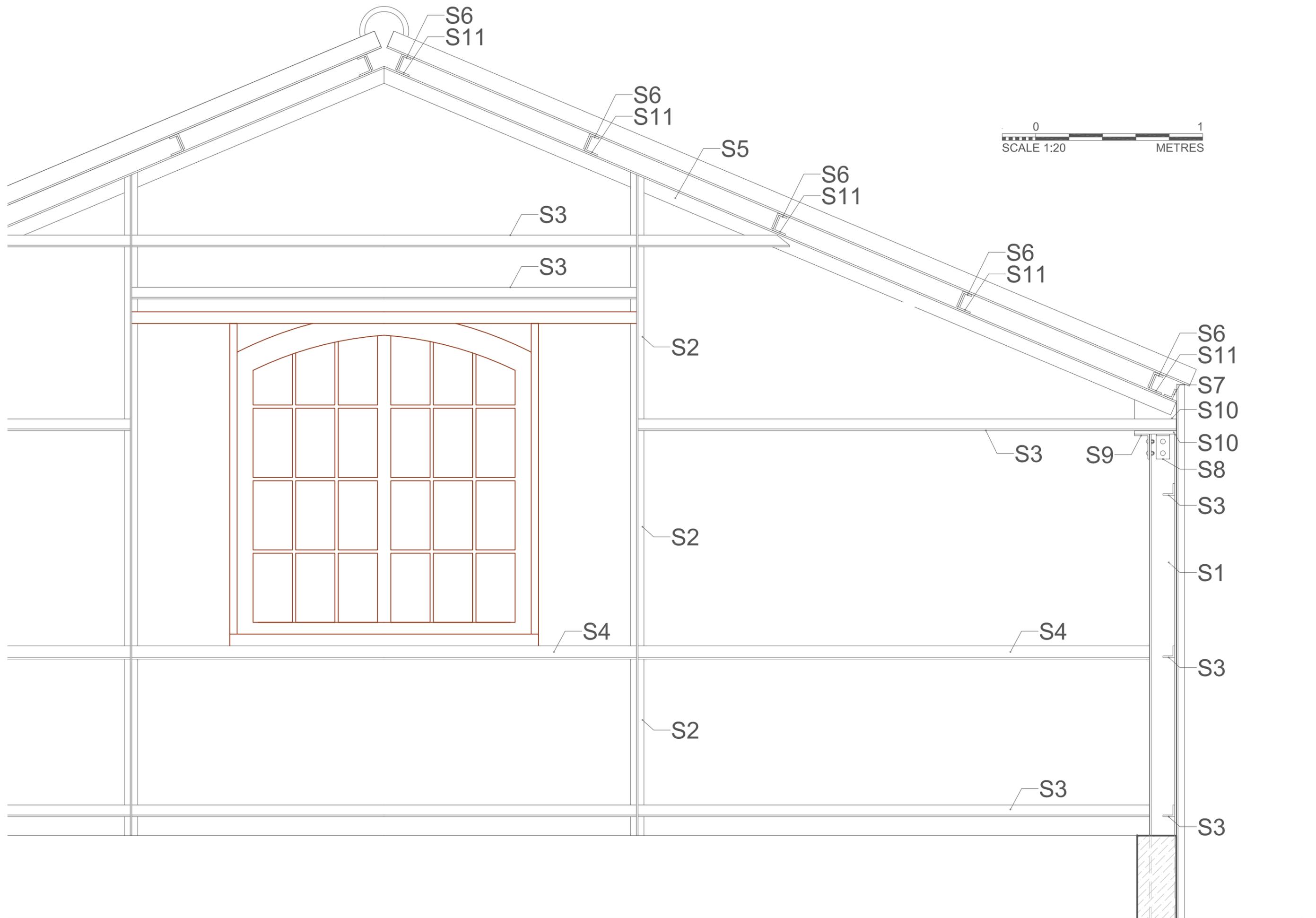
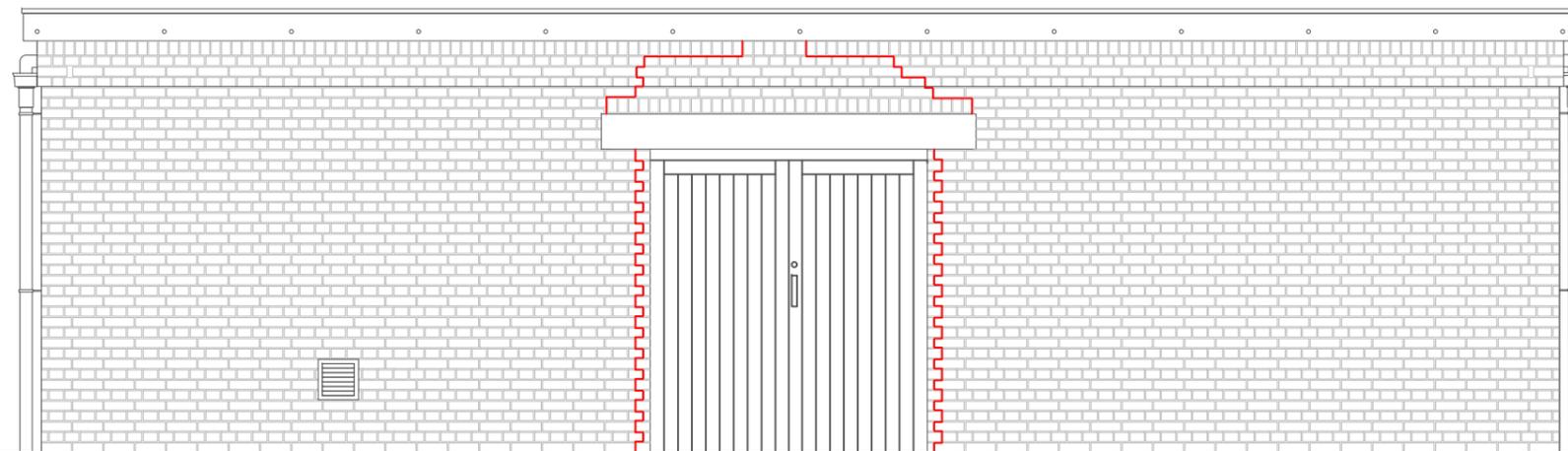


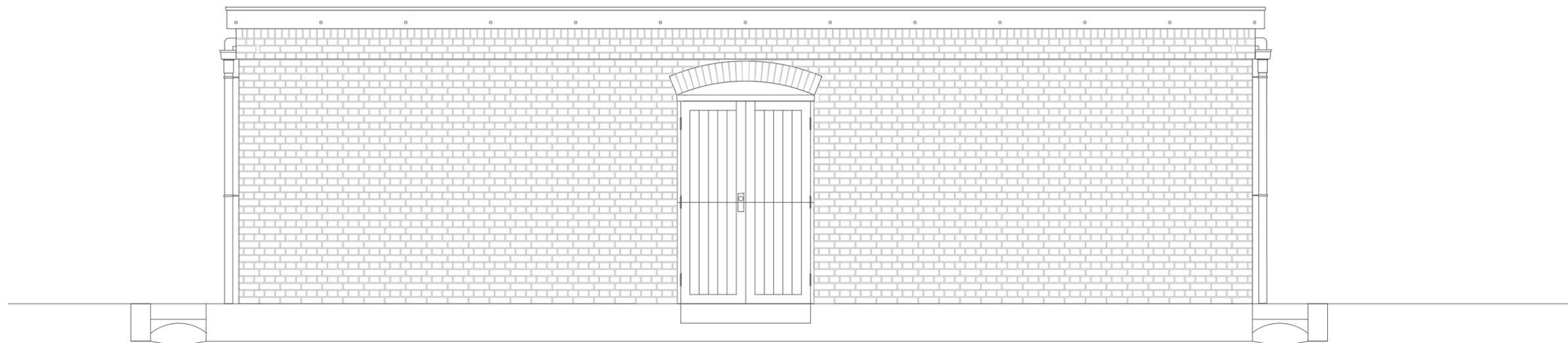
Figure 59: Section of steel frame of Locomotive Shed, building number 66.



Figure 60: Floor plan with roof beam axes and elevations of No. 2 Shell Store, building number 60.



EAST ELEVATION - FRONT



WEST ELEVATION - REAR

KEY:
— Phased division line



Figure 61: Elevations of No. 2 Shell Store, building number 60.

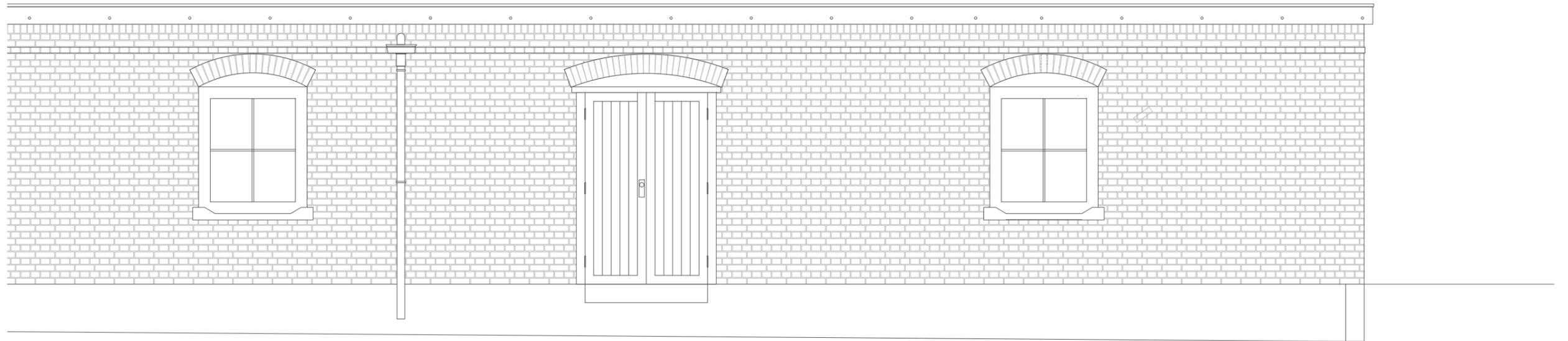
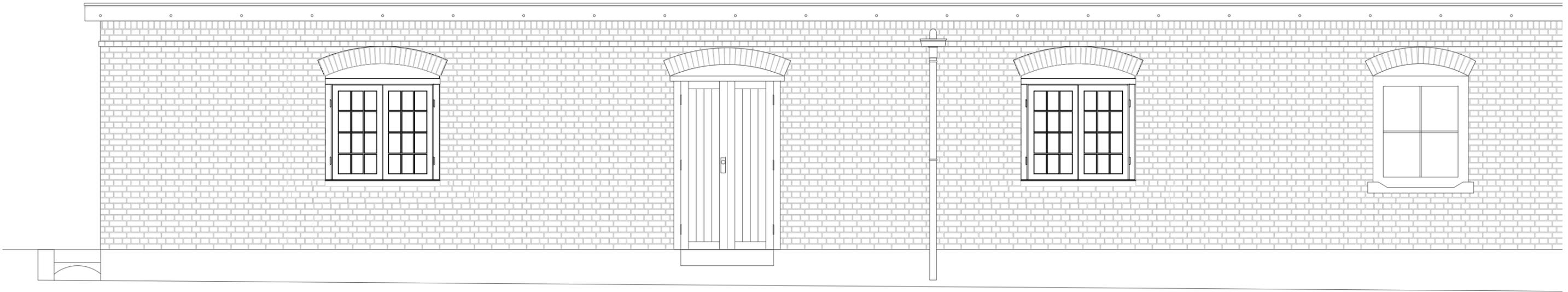
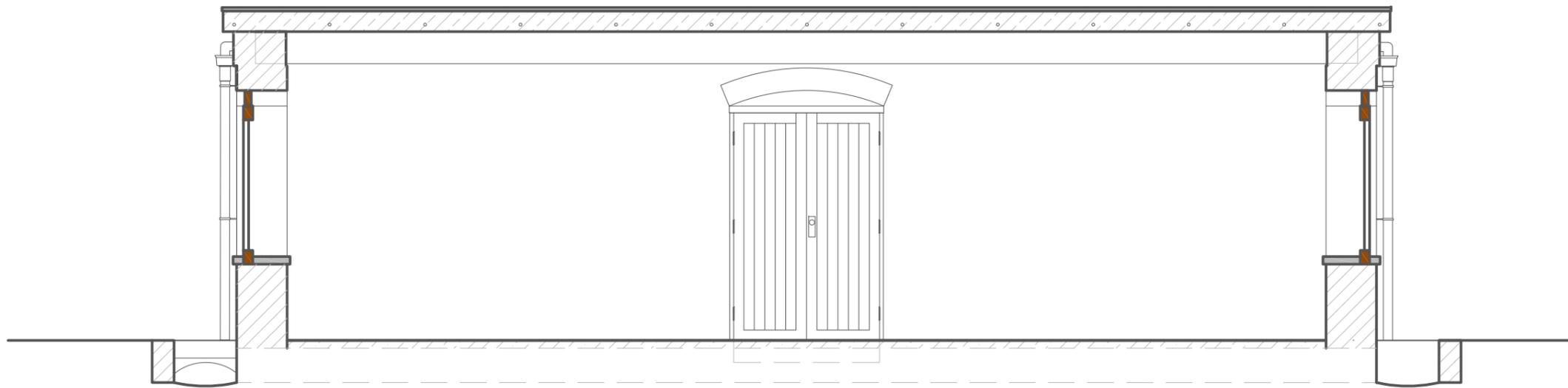
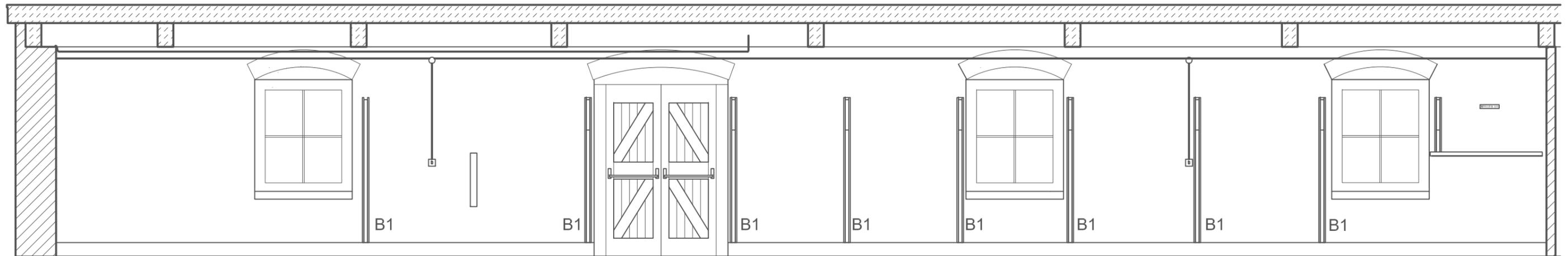
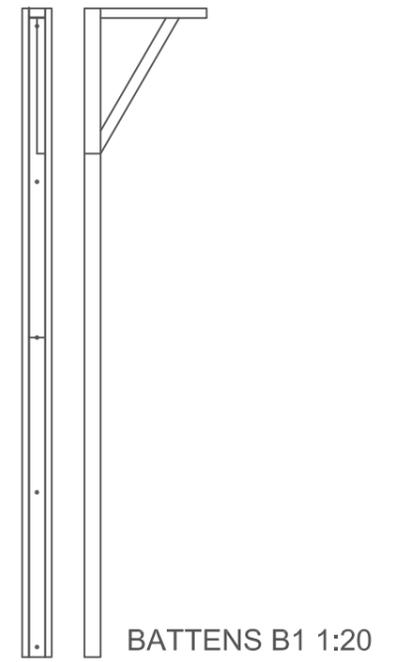


Figure 62: South elevation of No. 2 Shell Store, building number 60.



SECTION A-A1



SECTION B-B1

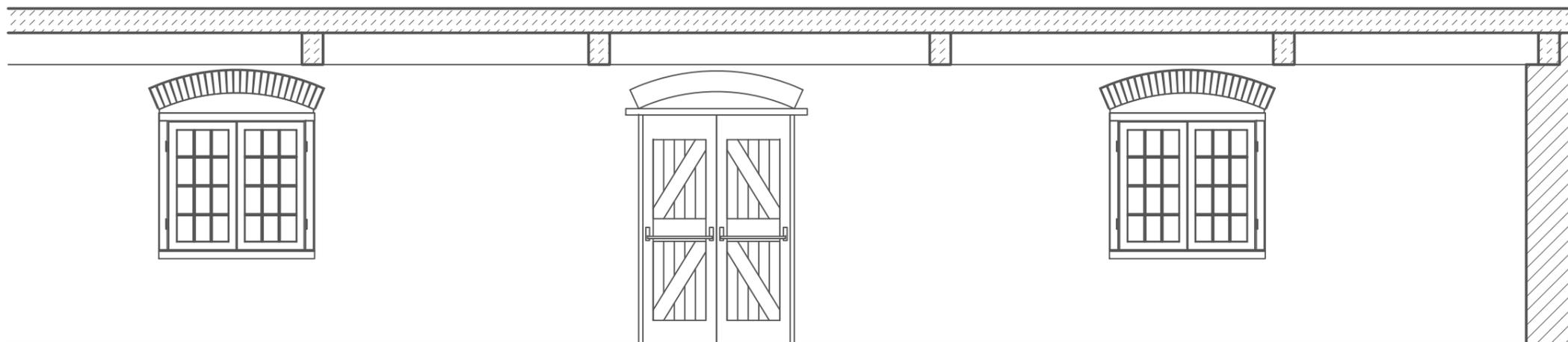


Figure 63: Cross - section A-A1 and B-B1 of No. 2 Shell Store, building number 60.

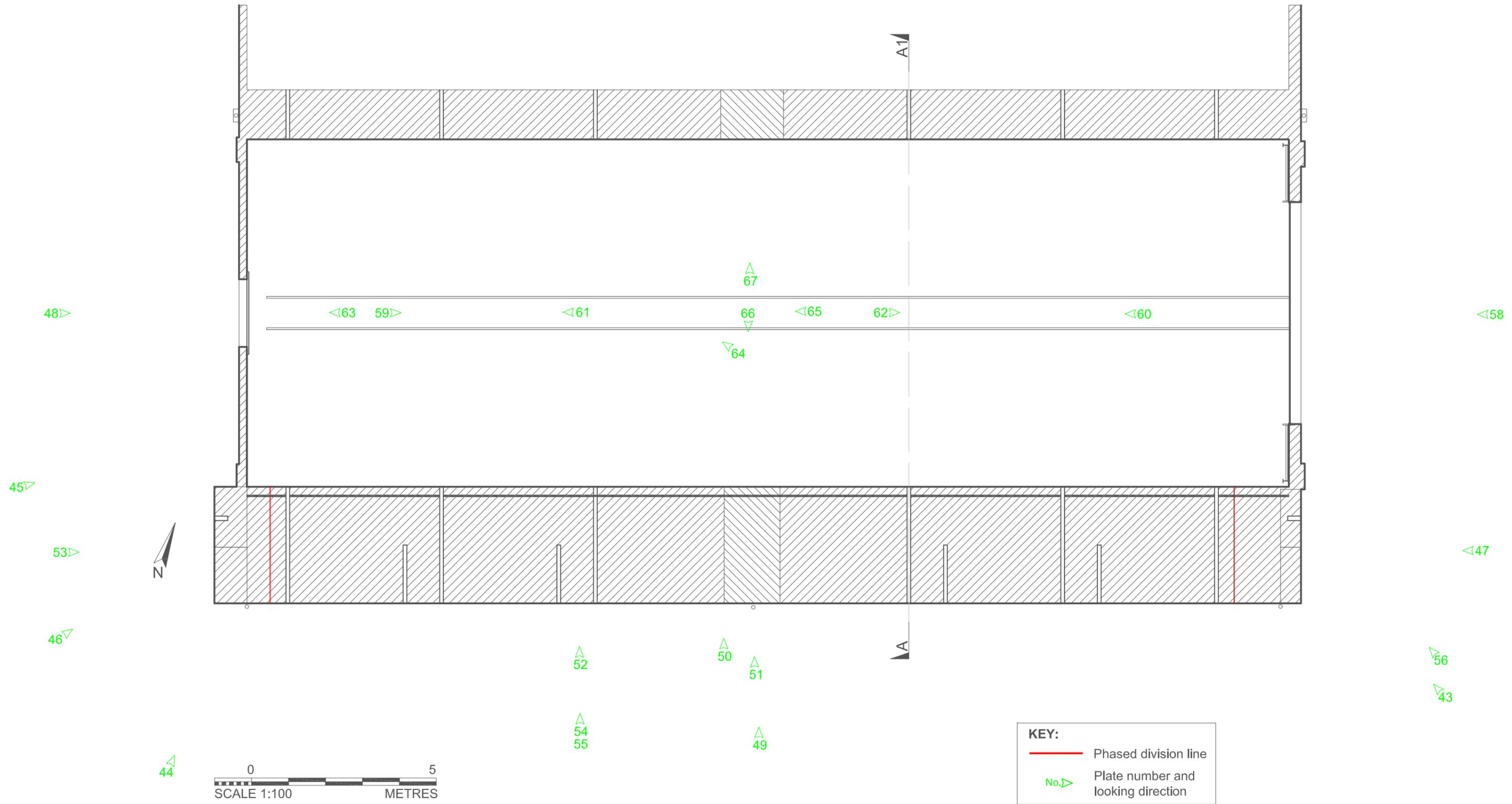
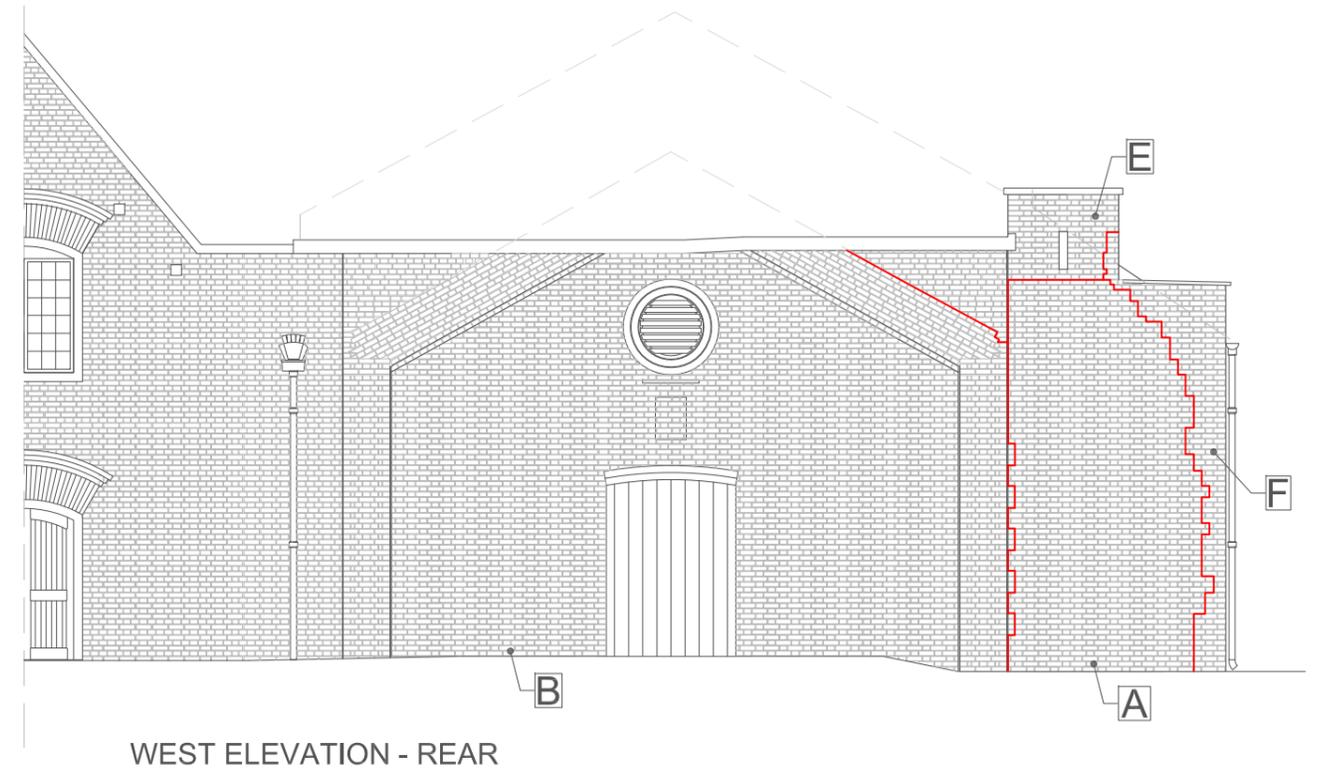
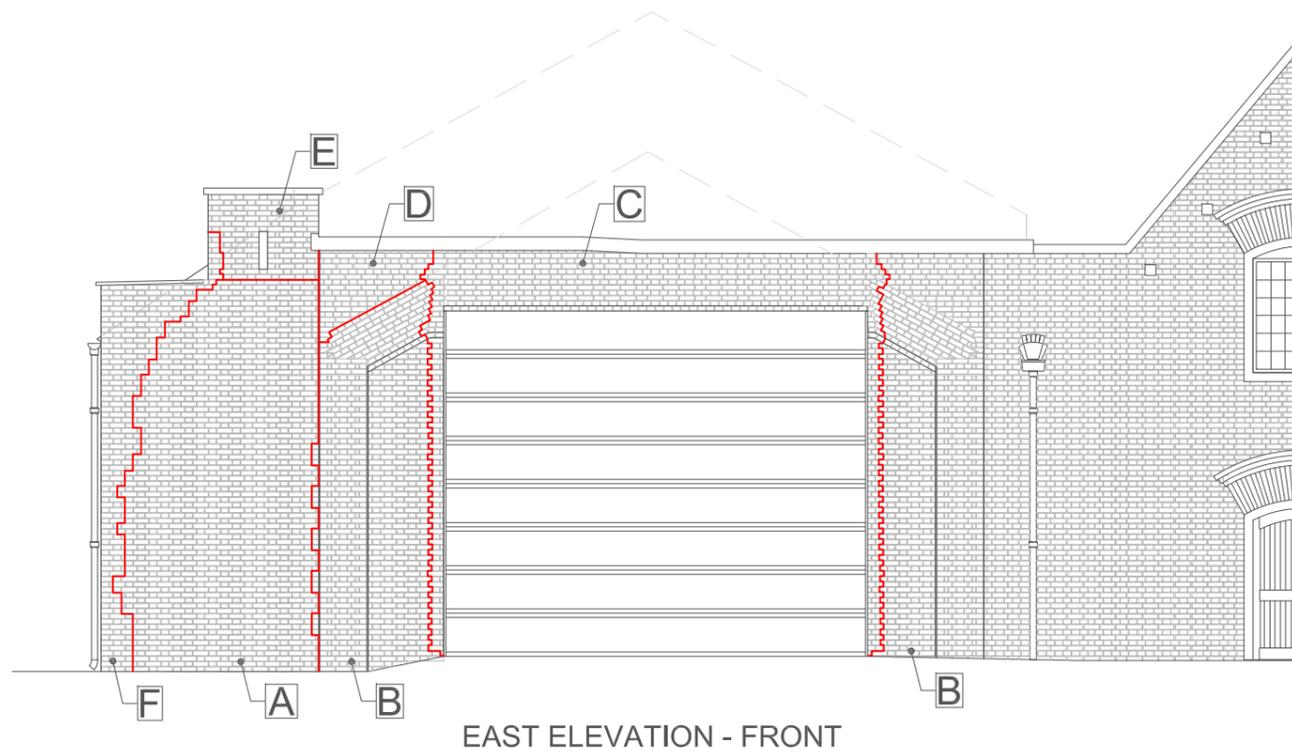
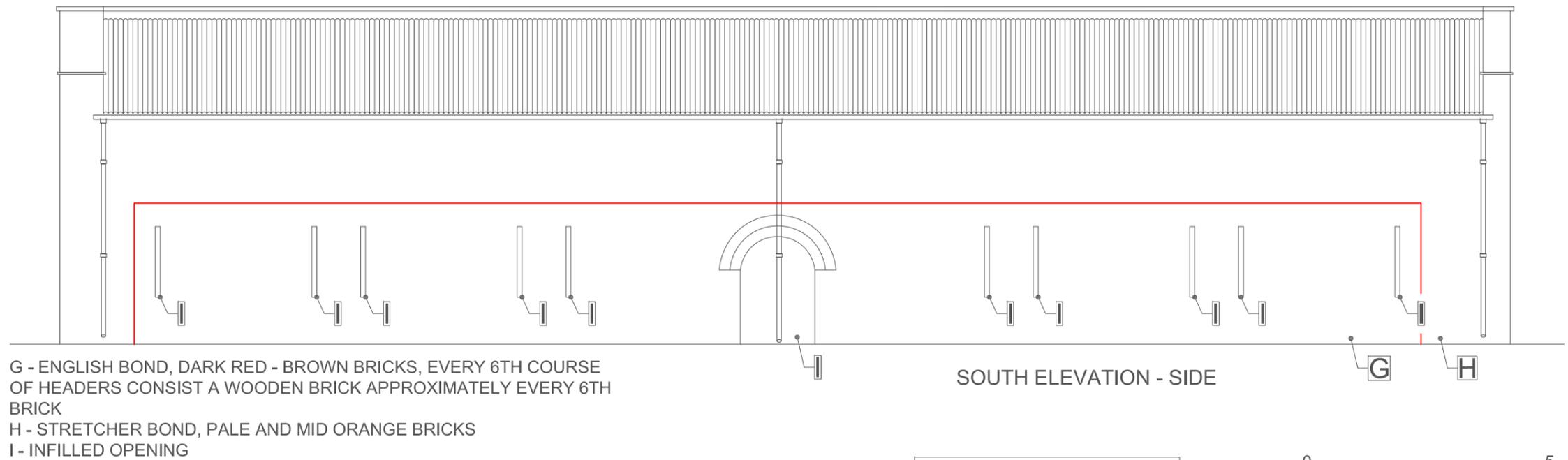


Figure 64: Plan of Empty Case Store, building number 49.



- A - FLEMISH BOND, DARK RED - BROWN BRICKS
- B - FLEMISH BOND, MID YELLOW - BROWN BRICKS
- C - ENGLISH BOND, PALE ORANGE - BROWN BRICK
- D - ENGLISH BOND, MID RED - BROWN BRICKS
- E - FLEMISH BOND, MID BROWN BRICKS
- F - STRETCHER BOND, PALE AND MID - ORANGE BRICKS

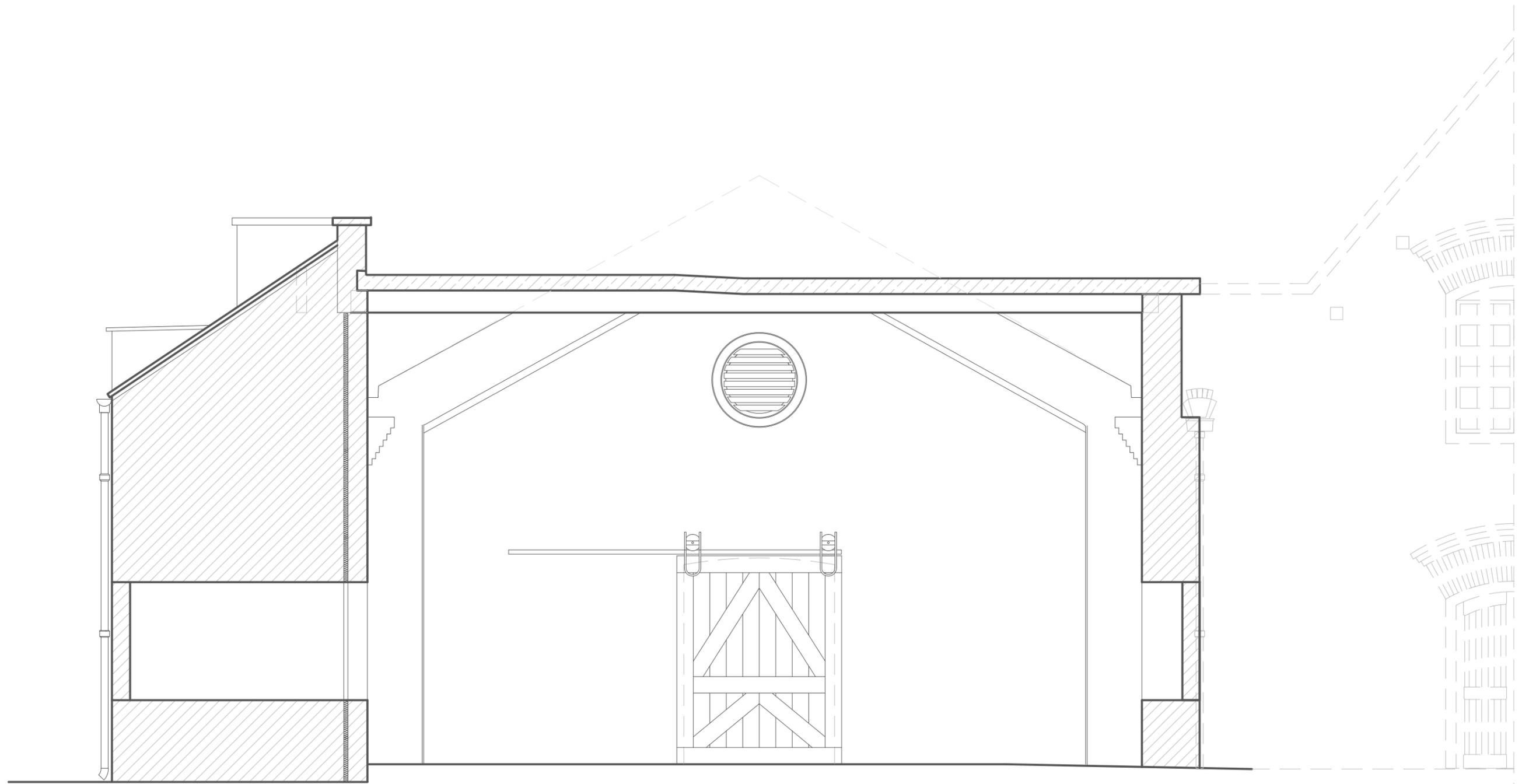


- G - ENGLISH BOND, DARK RED - BROWN BRICKS, EVERY 6TH COURSE OF HEADERS CONSIST A WOODEN BRICK APPROXIMATELY EVERY 6TH BRICK
- H - STRETCHER BOND, PALE AND MID ORANGE BRICKS
- I - INFILLED OPENING

KEY:
— Phased division line

0 5
 SCALE 1:100 METRES

Figure 65: Elevations of Empty Case Store, building number 49.



SECTION A-A1



Figure 66: Section A-A1 of Empty Case Store, building number 49.

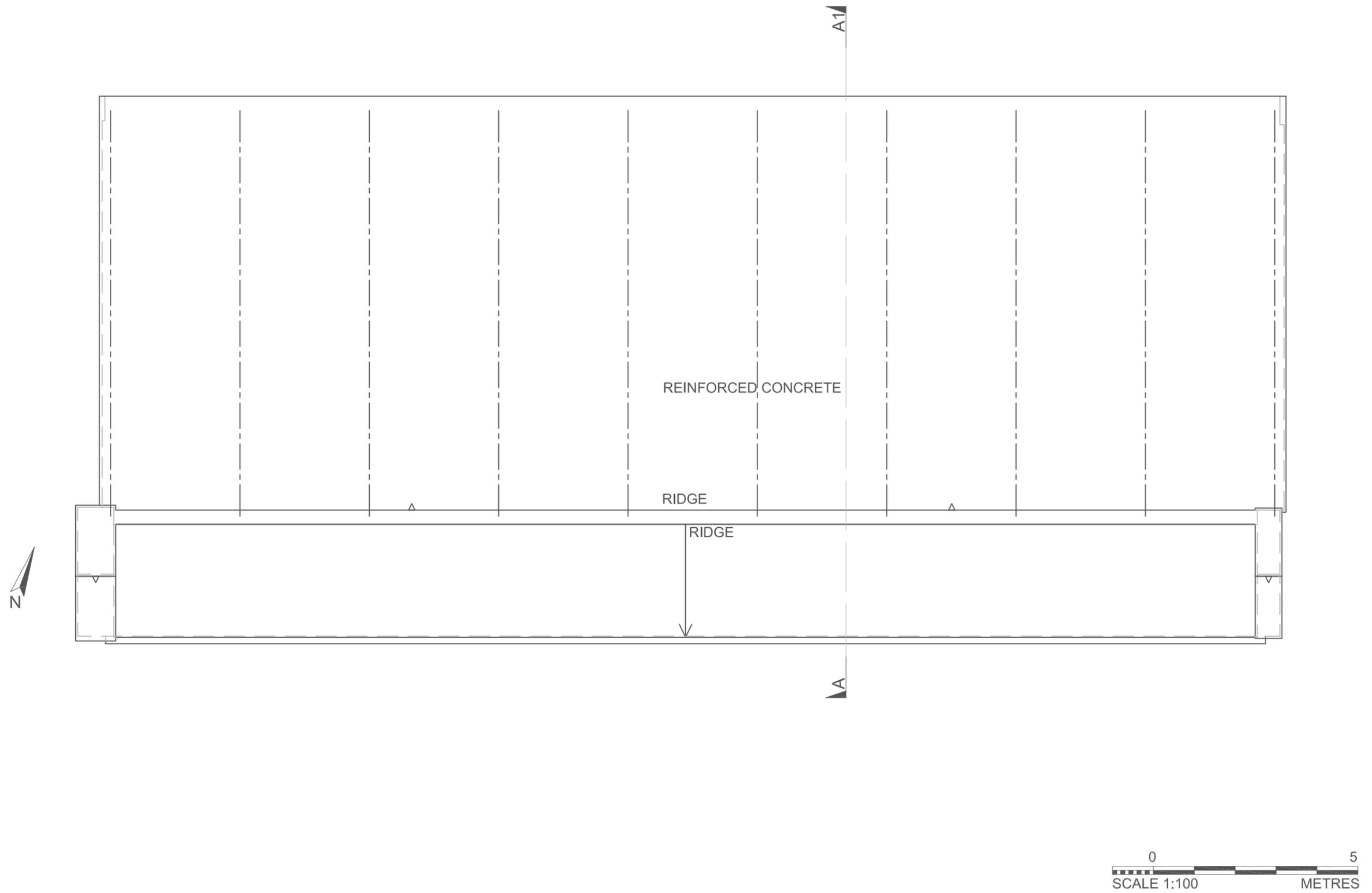


Figure 67: Plan of the roof of Empty Case Store, building number 49.

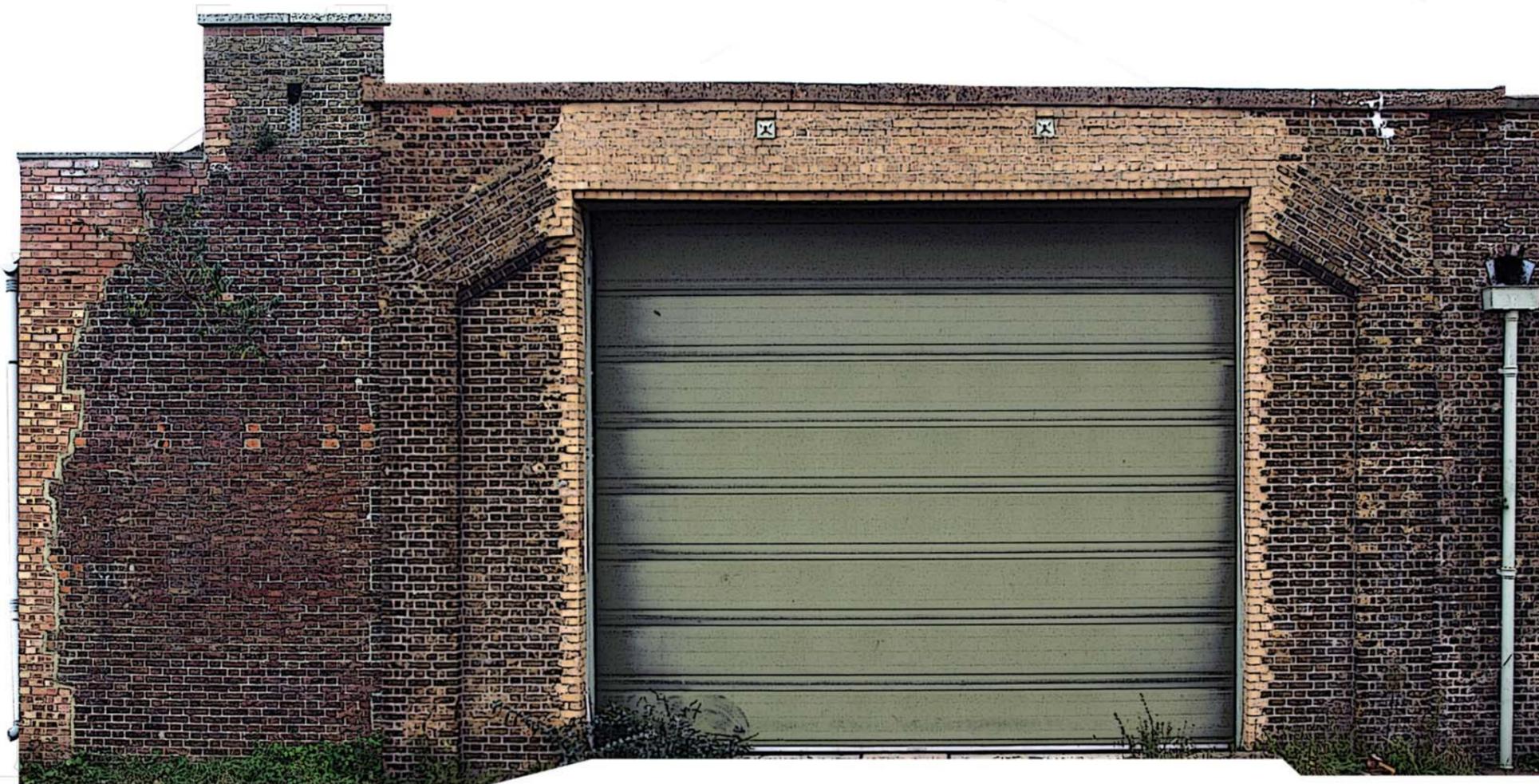
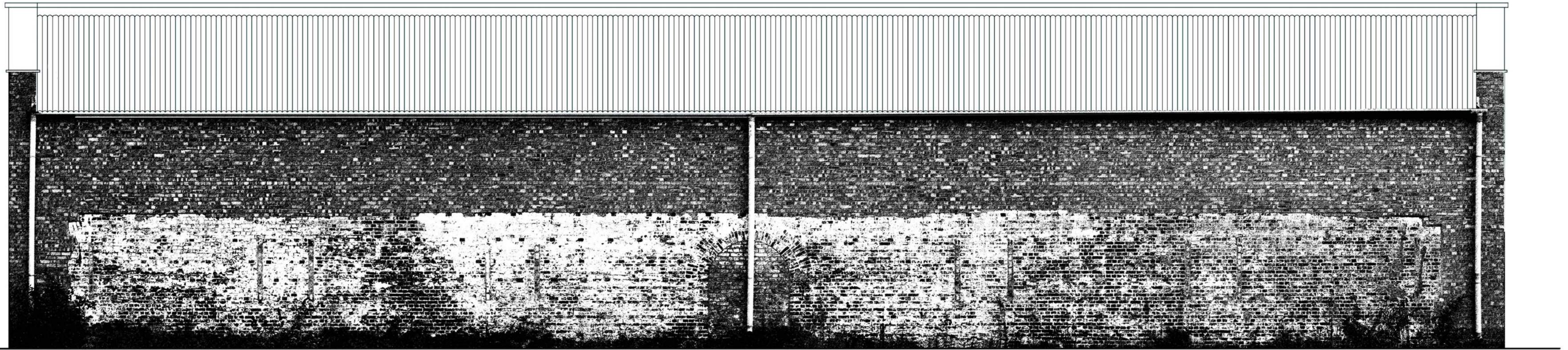


Figure 68: Front of the Empty Case Store, scale 1:50.



Figure 69: South wall of the Empty Case Store, scale 1:50.



SOUTH ELEVATION



Figure 70: South wall of the Empty Case Store, scale 1:50.

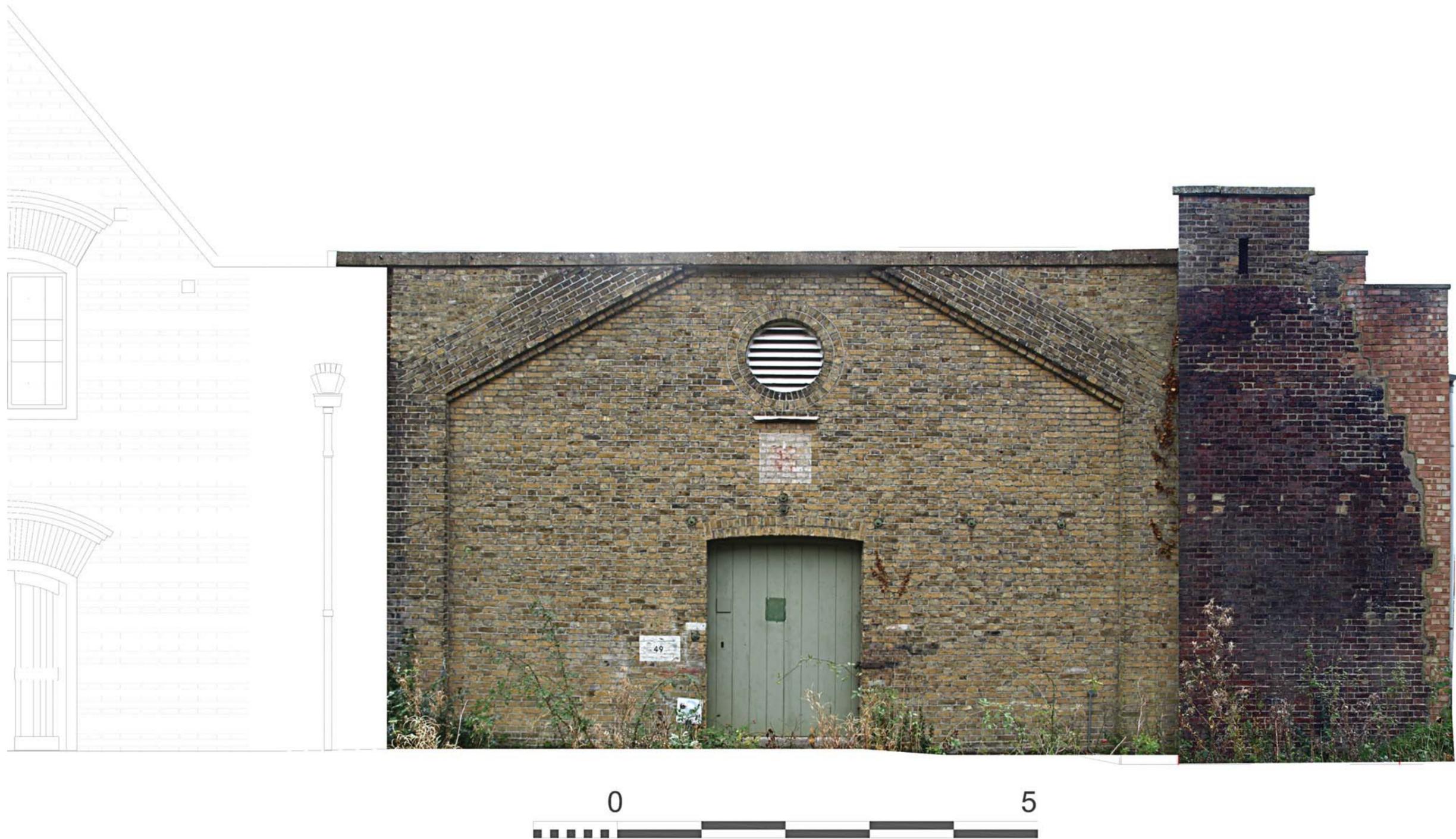


Figure 71: Rectified west exterior wall of the Empty Case Store, scale 1:50.



GATE - NORTH WEST ELEVATION - OUTSIDE

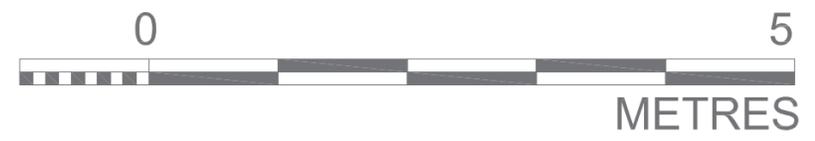


Figure 72: Main Gateway and boundary wall, scale 1:50.



Figure 74: Window 9 in No. 2 Shell Store, scale 1:10

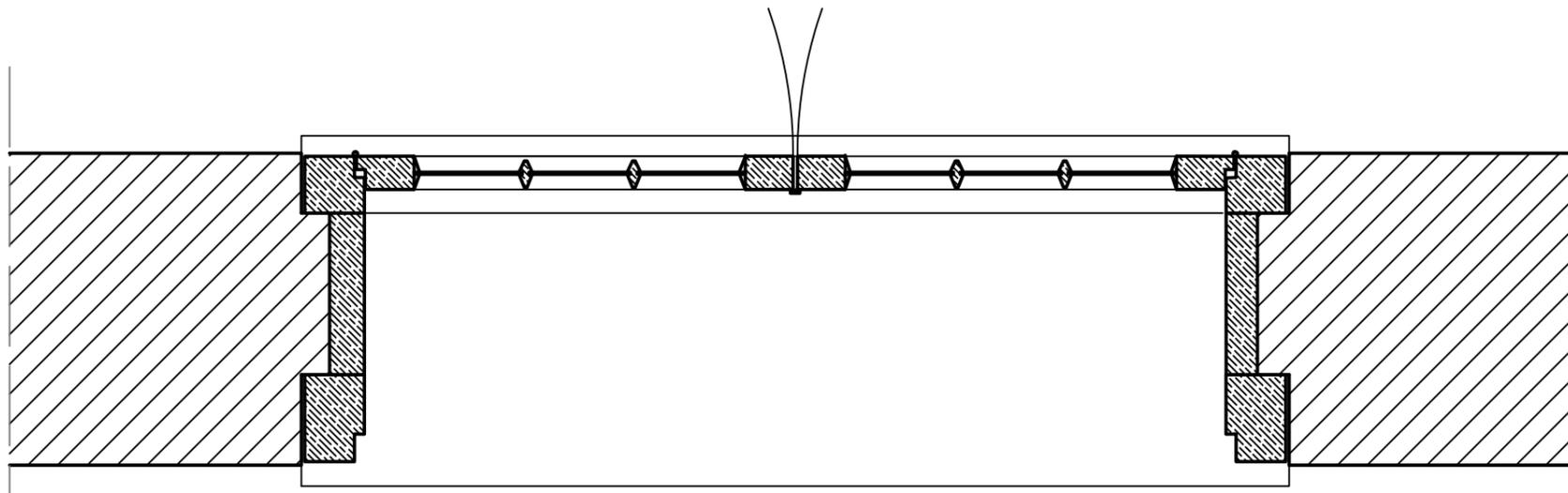
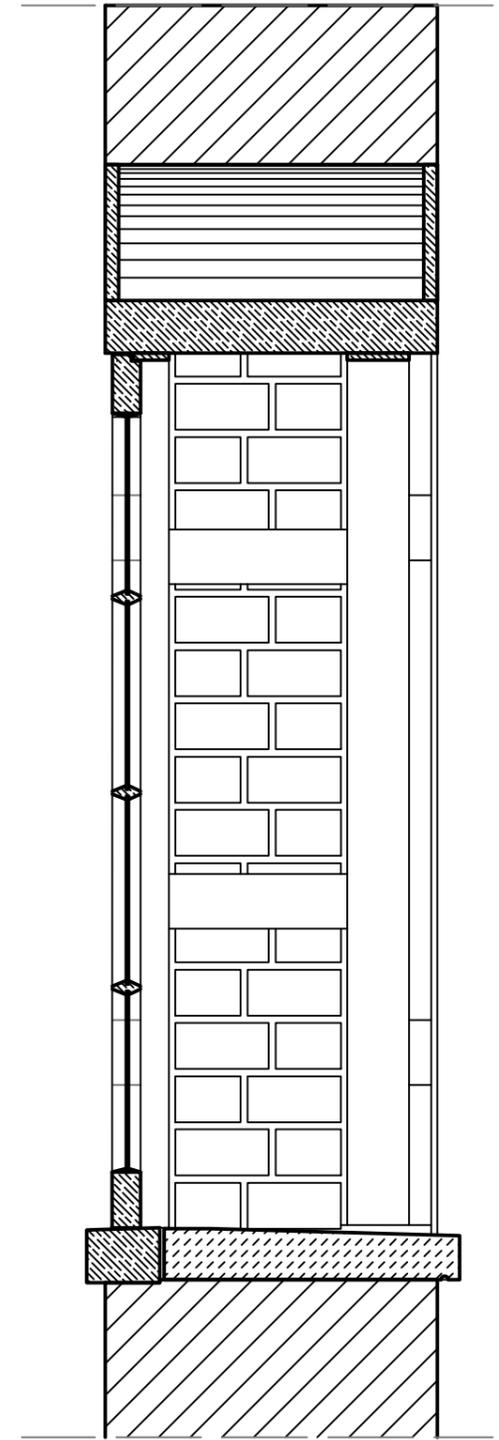
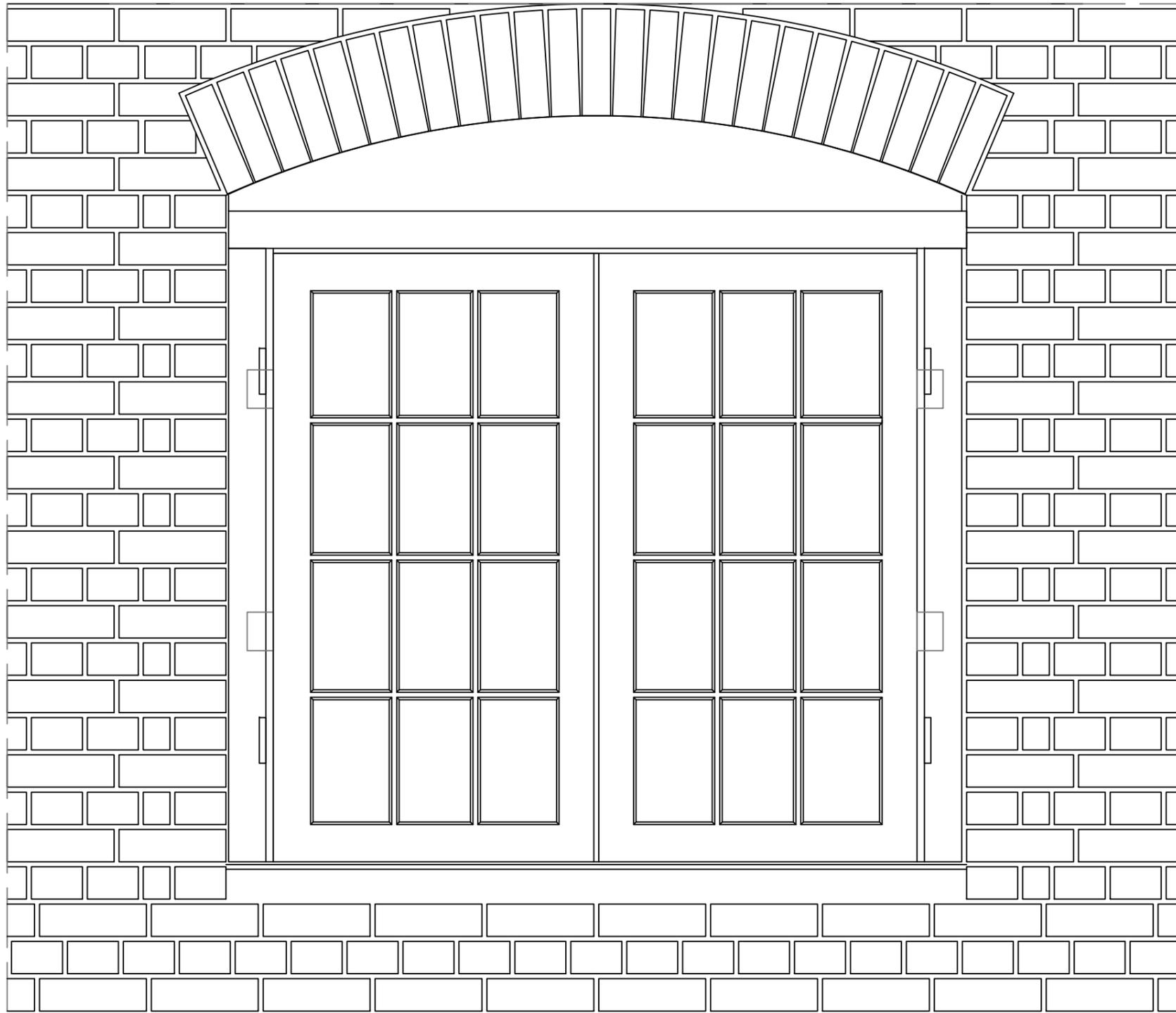


Figure 75: Window 8 and 9 details in No.2 Empty Case Store, scale 1:10



Figure 76: Window 1 in No. 2 Shell Store, scale 1:10

Appendix 4- Description of Magazine 'A' north wall following part-demolition

From 18th to 23rd March 2015 part of the north wall of Magazine 'A' was demolished as part of an agreed programme of works.

The initial demolition work was to remove the 20th century flat reinforced concrete roof, rolling shutter doors and modern brickwork from the adjoining Empty Case Store (Plate 77).

Plate 79 shows with some clarity the four phases of brickwork visible in the structure of Magazine 'A'.

Phase 1. The original fabric of the 1811 Magazine 'A' as seen in Plates 56, 57

Phase 2. The square tower/parapet with a vertical slotted opening built in c.1893 on top of the existing north wall of Magazine 'A' as part of the construction of the Empty Case Store in c.1893. In addition the corbelled brick brackets on the external walls of Magazine 'A' and 'B' were inserted at this time, no doubt to facilitate the construction of a timber or steel framed roof (Plates 46, 47, 56).

Phase 3. Magazine 'A' was demolished c.1960 and the internal face of the north wall of Magazine 'A' (and now the exterior of the Empty Case Store) faced with modern fletton bricks in a stretcher pattern.

Phase 4. 20th century modern brickwork to facilitate the installation of steel roller shutter doors (Plate 58).

The second phase of demolition was to remove the corrugated asbestos cement roof and the sawn timber joists (Plate 80) exposing a solid brick structure but sloped on its upper surface. The core of the wall was built from plain half and whole bricks laid bed down in a stack pattern at right angles to the external wall which was constructed of two rows of bricks laid in a Flemish Bond on the east and west faces of the wall and English Bond on the north and south walls. These external walls used a soft plain red/brown brick with courses laid in a course gritty off-white lime mortar cement with tiny crushed flint inclusions finished with a flush joint about 18mm thick. The bricks both

internally and externally were of the same quality and where circumstances allowed bricks were examined for stamps but none were found.

The slope of the wall has been the subject of discussion and I am indebted to Ben Found (KCC Heritage) for his useful suggestions on the function of the slope and his reference to plans of Magazine 'A' (work 41/89 and work 41/90). The drawing of the arch shown in Plate 85 shows that the slope was most likely constructed for the spring of the arch and this detail can be seen on both the plans of Magazine 'A' referred to (Plates 86, 87).

The chronology of build can now be considered as:

1. The building of Magazine 'A' in 1811
2. The building of Magazine 'B' in 1857
3. The building of the Empty Case Store and insertion of the brick corbels for the roof in about 1893 between the two magazines
4. The roof replacement of the Empty Case Store with reinforced concrete in about 1940
5. The demolition of Magazine 'A' in about 1960 but retaining the north wall which was now part of the c.1893 Empty Case Store and blocking of the ventilation slots and doorway on the south with modern yellow stock bricks
6. Repairing the damage done through demolition to the north wall with modern fletton bricks
7. The rebuilding of part of the east main frontage with the insertion of a roller door



Plate 77. Demolition of the Empty Case Store



Plate 78. Demolition of the reinforced roof of the Empty Case Store



Plate 79 Phases of brickwork



Plate 80. Removal of the corrugated roof exposed the 1811 brickwork



Plate 81. The sloped brickwork upper surface of Magazine 'A'



Plate 82. Showing the inserted corbelled brick brackets



Plate 83. Demolition complete



Plate 84. The view today

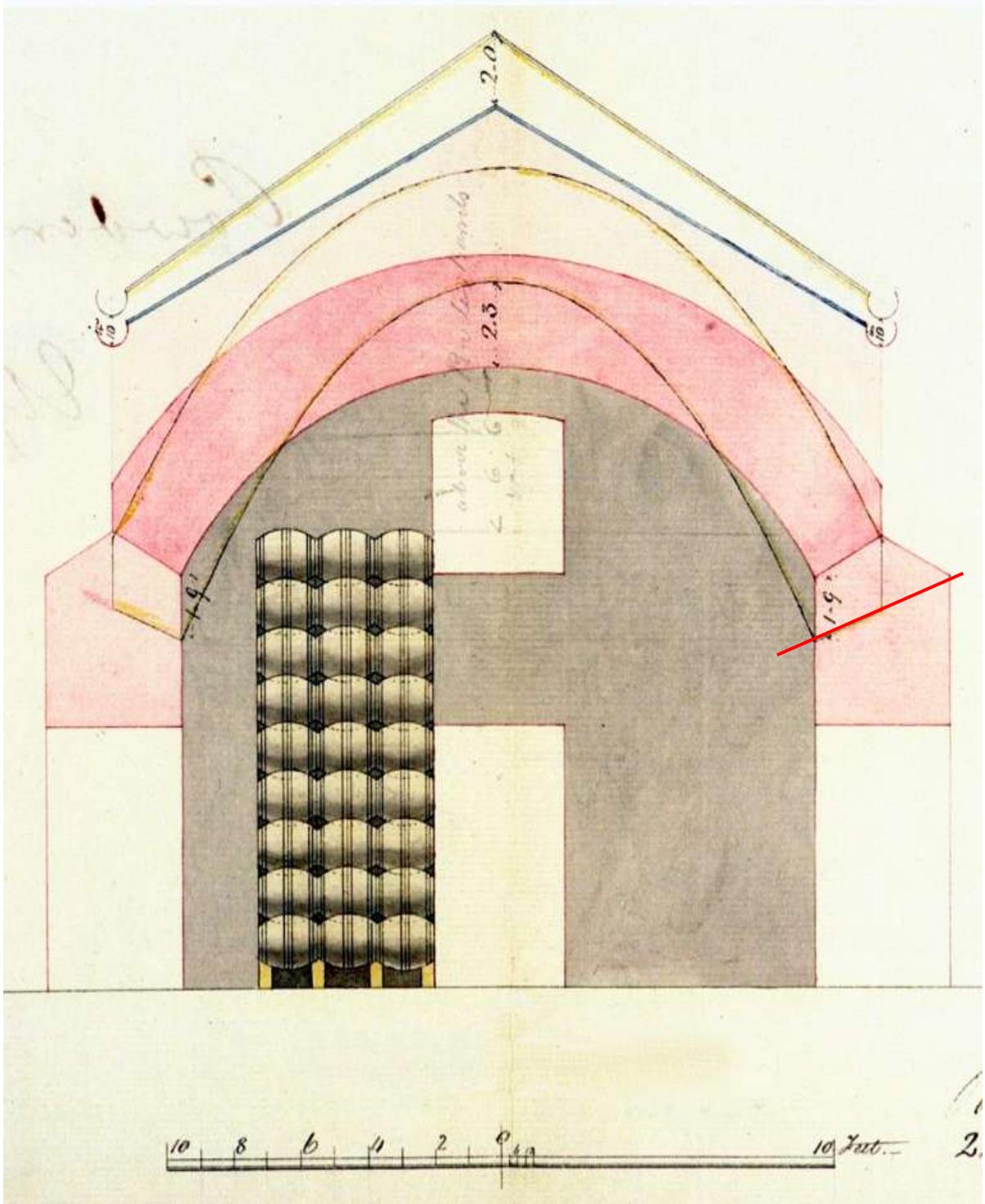


Plate 85. The catenary vault experiment (MFQ 1215). Note the angle of spring for the arch

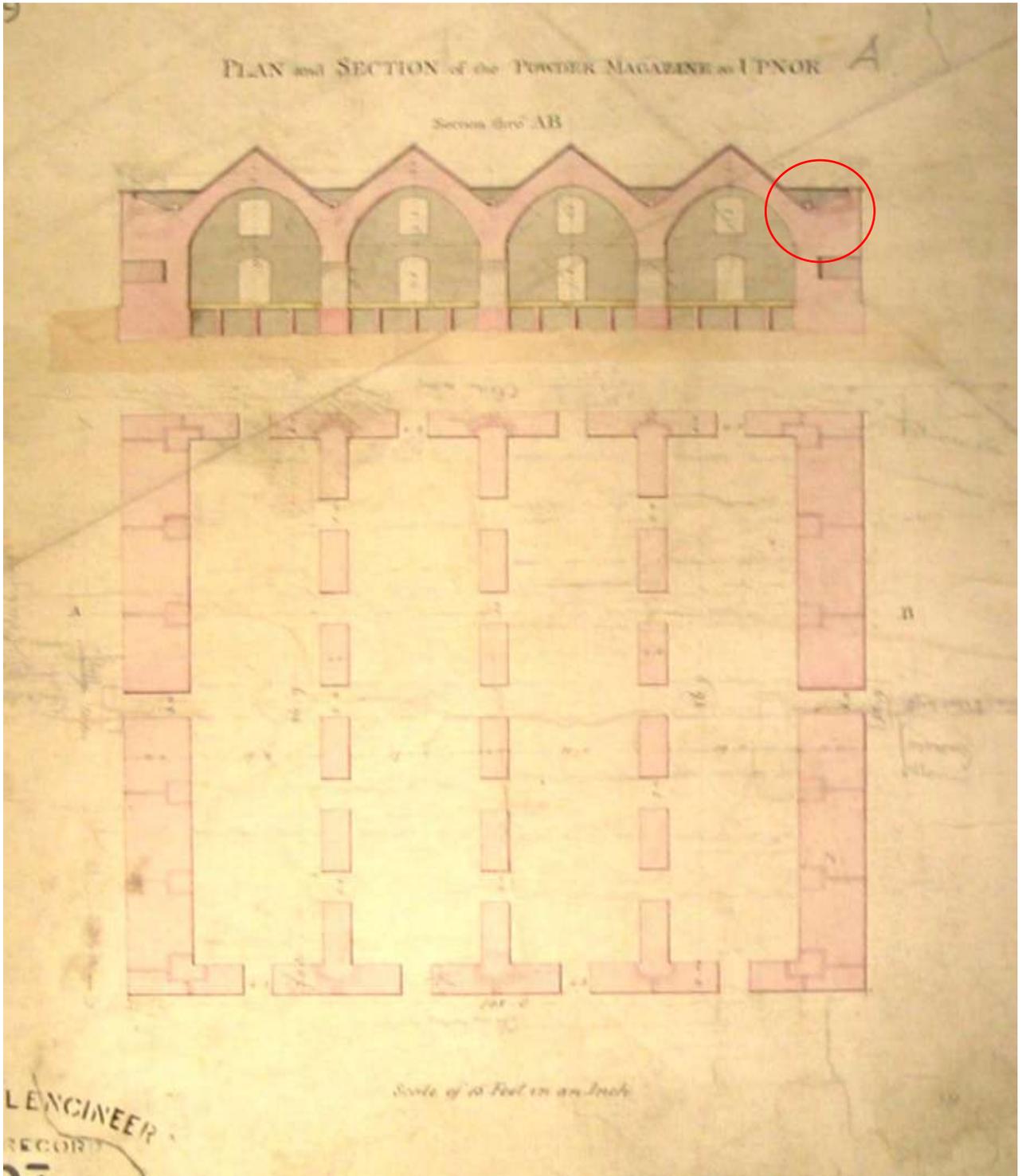


Plate 86. The REM Museum archive has two designs for the new Magazine (WO RK 41/89) dated 1808? Note the angle of spring for the arch

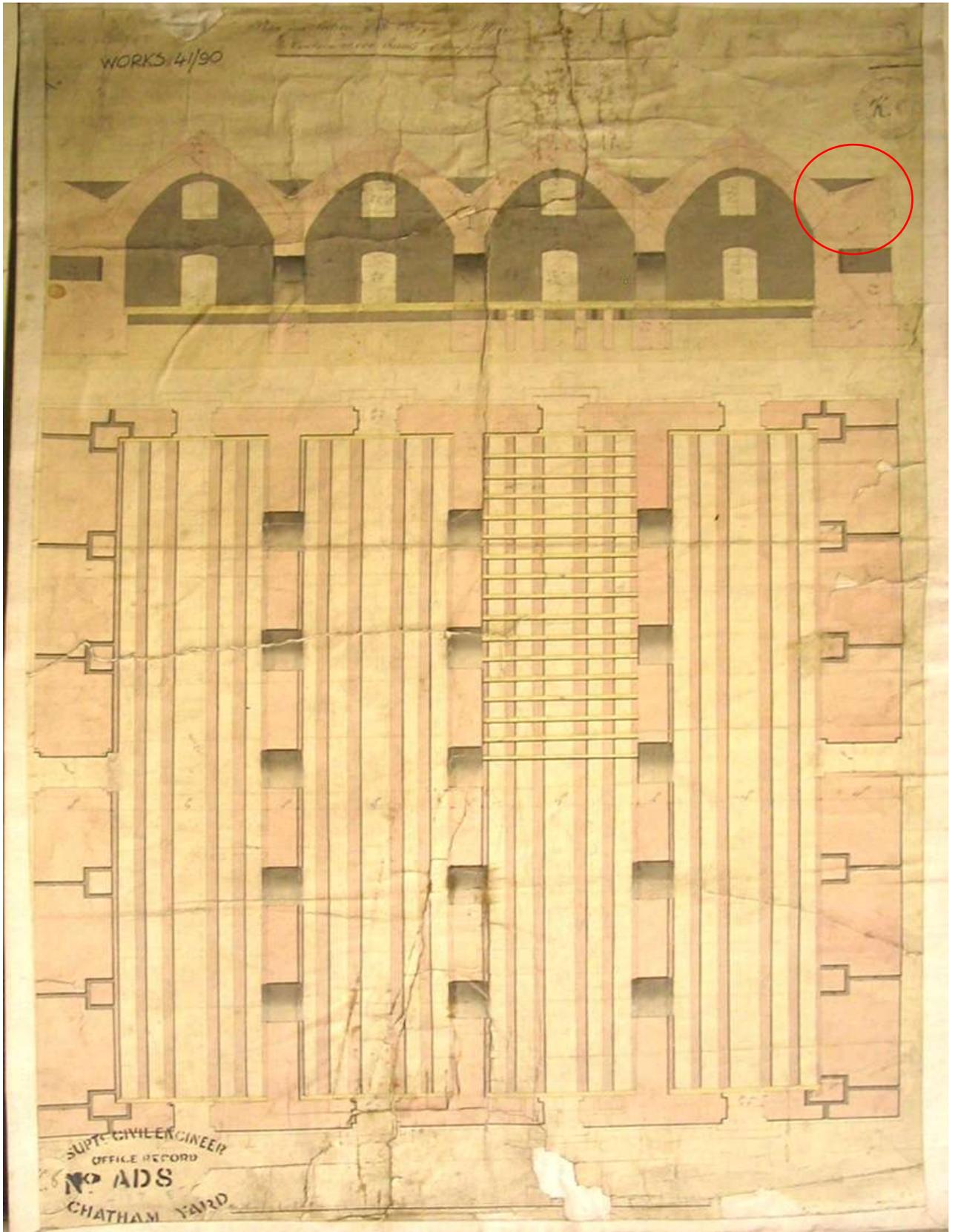


Plate 87. Plan for the 1812 'A' Magazine (WORK 41/90) dated July 8th 1812. Note the angle of spring for the arch