

# WALTHAM ABBEY SOUTH SITE ROYAL GUNPOWDER FACTORY

# **BUILDING No. G403**

REPORT No. ESG 2367/97



#### ENVIRONMENTAL SERVICES GROUP REPORT NO. 2367/97

# WALTHAM ABBEY SOUTH SITE ROYAL GUNPOWDER FACTORY

HISTORICAL SURVEY OF BUILDING NO. G403

This document is of UK origin and is © Royal Ordnance plc. It contains proprietary information which is disclosed for the purposes of assessment and evaluation only. The contents of this document shall not in whole nor in part: (i) be used for any other purpose, (ii) be disclosed to any member of the recipient's organisation not having a need to know such information nor to any third party individual, organisation or government, (iii) be stored in any retrieval system nor be reproduced or transmitted in any form by photocopying or any optical, electronic, mechanical or other means, without the prior written permission of the Director, P & E S Business Unit, Royal Ordnance plc, Westcott, Aylesbury, United Kingdom.

Environmental Services Group Royal Ordnance Division British Aerospace Defence Limited Westcott Venture Park Westcott Aylesbury Bucks HP18 ONP

Tel: 01296 652123 Fax: 01296 652121 Date: September 1997 Ref: Int 3-97/2367 Issue 2

### REPORT NO. ESG 2367/97

## Subject: Historical Survey of Building G403 Waltham Abbey South Site

Client:

Royal Ordnance Property Services Department

Hladded

6.10.97

ORIGINATOR: ..... S CHADDOCK

.....DATE

G G VINCENT CHECKED BY: AUTHORISED

8.10.97 DATE 10/12/97

DR G BULLOCH

# Power House G403, South Site, Waltham Abbey Royal Gunpowder Factory, Essex

# **Table of Contents**

LIST OF PLATES	2
LIST OF FIGURES	.2
INTRODUCTION	.3
	2
SURVEY METHOD	3
HISTORY OF THE SITE	4
HISTORY OF G403	4
DECEMPTION OF DOMES HOUSE CAR	
DESCRIPTION OF POWER HOUSE G403	4
ACKNOWLEDGMENTS	9
	-
BIBLIOGRAPHY	9
UNPUBLISHED SOURCES	9
PUBLISHED SOURCES10	0

# List of Plates

Plate 1	Showing women workers outside G403, beside the coal heap.
Plate 2	Copy of design drawing G403.B04 showing the Guncotton Factory Power Station.
Plate 3	Copy of a photograph of the interior of G403 showing the arrangement of boilers and screw feed for coal.
Plate 4	Power house from south
Plate 5	West elevation, from south
Plate 6	Steel framing and catwalk, south-east corner of power house
Plate 7	Detail: window in south wall of power house
Plate 8	Detail: access door and building number, south elevation
Plate 9	Power house and east annexe, from south-east
Plate 10	Narrow standard-height window, south end of east elevation
Plate 11	North annexe, from north-east
Plate 12	North wall (steelwork, blocked window, traces of ?mezzanine floor)
Plate 13	Steel stairway to north annexe, north-east corner
Plate 14	Power house and east annexe, from north-east
Plate 15	Detail: window in west wall of power house (central opening section replaced by louvres)
Plate 16	Detail: main electricity supply box, south elevation
Plate 17	Gantry crane, from north
Plate 18	Interior of unaltered 'standard' window in east wall
Plate 19	East wall: clock, warning notice, electrical conduits
Plate 20	Detail of roof structure
Plate 21	East side of travelling beam and supports
Plate 22	Detail of interior face of east wall
Plate 23	Detail of north end of east travelling beam for gantry crane (rail, buffer, power cables, warning lights, notice)
Plate 24	Gantry crane: hook and control box
Plate 25	Detail: steel framing at south-west corner, south elevation

# List of Figures

Fig 1	Location Map showing South East England, Waltham Abbey, South and
	North Site and location of G403 within South Site.
Dwg No: G403/1A	Ground Floor plan of G403
Dwg No: G403/2	Section through G403

## Introduction

Following the recent announcement by the Epping Forest District Council to grant planning permission for a development on the South Site the Essex County Council Planning Department's Archaeological Advisory Group has called for a survey of the Guncotton Factory Power House G403. The development proposals for the South Site will probably result in the firing and demolition of this building so this report aims to provide an accurate and permanent record of this historically important structure.

The initial survey report of the South Site at Waltham Abbey with component sheets for each building and a computer generated CAD plot has been completed (Chaddock 1996). The report outlines the history of the site, provides a description of each area and outlines appropriate manufacturing techniques to allow fuller comprehension of the archaeological remains. Those buildings of major importance that did not have a 'documentation pack' have been selected for further recording; they include a part of the Guncotton Factory G431, the Boiler House G403, the Box Store M349, the Guncotton Drying Stove M351 with its attendant Fan House 495, the Cordite Mixing House 486 and the gas-proof Air Raid Shelter SS113. This report provides a more detailed record of the building, complementing the initial survey, and placing the structure in its wider context. A copy of this report, the archive comprising plans and photos will be deposited in the Essex Records Office.

## **Survey Method**

Measured surveys of the buildings were carried out using tapes for both vertical and horizontal measurement throughout. In G403 and G431, where health and safety problems were encountered in gaining access to the full interior height of the roofs, reference was made to surviving architects' drawings in the site archive. Copies of these drawings, converted photographically to metric scales, were used as reference for details, and checked for accuracy wherever possible. Original drawings for M349 and M351 were also referred to and checked, but did not form a significant element of the survey of those buildings.

A Kern GK-O level was used to establish floor levels, etc, in the buildings. Reference to Ordnance Survey datum levels was provided by information from plans of the site supplied by Royal Ordnance (RO).

All plans and sections were drawn in pencil on permatrace. Plans and main sections were drawn at scales of 1:50 or 1:100, depending on the size of the building concerned. Detailed sections were drawn at 1:50, and sections through the passageways in 486 and M351 were recorded at 1:10. A total of 17 drawings were produced, all on A1 or A2 sheets. Following approval by RO and Essex County Council Archaeological Advisory Group (AAG) these were digitised (CAD 12), and A3 copies printed for archiving and the final reports.

A detailed written description of each structure was prepared on proformas prepared in conjunction with the AAG, and is presented in this fashion. Reference was made to the measured surveys for major dimensions: more detailed measurements were made as required with a 5-metre steel tape. The fieldwork notes also contain many sketches of various elements of the buildings. The descriptions were subsequently word-processed, and are presented in hard copy and on disk (Word 6).

The photographic survey was carried out using two Pentax ME 35m SLRs, fitted with 28-70mm zoom lenses. The flash photography was carried out with a professional Metz 60 GT-1 flash, though natural light was used wherever possible. 400ASA film (colour slide and B&W) was used throughout. The photographic registers are presented in hard copy and on disk (Word 6).

The video surveys of 486 and M351 were carried out by a professional cameraman under HAT's direction. Given their similarity, both buildings were recorded in a similar sequence, and structural details, etc, were singled out en route for special attention. Both buildings

were filmed in natural light, with the exception of the NG delivery tunnel in 486, where a portable floodlight was used.

## **History of the Site**

The Royal Gunpowder Factory at Waltham Abbey was a centre of gunpowder production, and latterly chemical-based explosives manufacture, for more that 300 years. There is documentary evidence that gunpowder was being produced at North Site by mid 1660's. The mills were acquired by the government in 1787, and expanded greatly as a result of the demand for powder generated by the Napoleonic wars. After a period of retrenchment for the 1820's, the RGPF returned to prominence in the second half of the 19<sup>th</sup> century, playing a leading role in technical innovation, meeting demand for cannon powders for guns of ever increasing size, and manufacturing moulded powders in large quantities (RCHME 1993). From the 1890s into the early twentieth century the site was a leader in the development of manufacturing technologies for the new chemical propellants and explosives that were extensively utilised in the First and Second World Wars.

## History of G403

The Power House G403 was constructed on the South Site in 1905 as the main supplier of steam to the recently remodelled factory. Developments suggested by the Thompsons at Waltham Abbey concerning the nitration of cellulose for the manufacture of guncotton led to an expansion in the manufacturing facilities for which the need for more steam was met by the power house.

## **Description of Power House 403**

Building no: G403 Power House NGR: TQ 3798 9978

#### 1. General

A steel-framed brick building,  $36.5 \times 16.1$ m, aligned north-south (Plate 4). Encloses an undivided single room, height to eaves 8.1m. Slated hipped gable roof, with clerestory along ridge. Annexes added to north and east sides, both brick-built with felted roofs. The north annexe is  $15.9 \times 6.8$ m, and 3 storeys high. The east annexe covers an area  $42.9 \times 9.5$ m, and is single-storey. A pitched skylight area runs along the junction between the main building and the east annexe.

Internally, a gantry crane runs the length of the building. Access to the crane is by means of a fixed metal ladder in the south-west corner.

The internal colour scheme consists of cream walls and ironwork below gantry height and pale grey above. The roof trusses and boarding are also grey. The crane gantry is a bright green, and the crane itself is orange.

The lower part of the inner north wall of the power house is painted grey rather than cream below a height of *c*.3m. Apart from the change of colour, a distinct line of holes in the wall at this height suggests the removal of a sizeable structure from within this end of the building.

*Power House:* Steel frame, consisting of 13 uprights along each side at 3.2m intervals (Plate 5), and 3 uprights at each end, at 4.2m intervals(Plate 4). Each upright is c.460mm (18") deep and 'I' section, made up of 12mm plate. The central web consists of a 'Z' lattice, its bars 150mm wide, the horizontal strips at 610mm (24") centres. The outer flanges, 150mm wide, are composed of strips of plate welded to both sides of the edges of the lattice. The uprights at each corner have a solid central web, visible in the end walls (Plate 6). At a height of c.5.5m above the internal floor, above the oversail forming the top of each brick panel, each upright tapers to a depth of c.250mm, the thickness of the upper part of the

brickwork. The uprights are linked internally by two ring-beams of steel channel. The lower ring beam is c.6.0m above floor level, at the same height as the internal gantry, and the upper is c.480mm below the eaves.

The intervals between the uprights are filled with pier and panel brickwork, consisting of buff bricks laid in English bond. Each pier is centred on an upright: between the piers are recessed panels, rising to two-thirds of the height of the building. At the base of each panel is a plinth, edged at the top with chamfered 'blue' engineering bricks. At the top of each panel is a red brick oversail. Window apertures in the panels consist of semi-circular brick arches with gauged voussoirs at the head, and stone sills (Plate 7). There are four different sizes of window in the building.

South Elevation: Four bays, each with a recessed panel. The east panel (Bay S1) contains a 24-light window. Bay S2 has a loading door  $3.8 \times 2.8$ m. This has a concrete lintel, and the jambs are edged with curved blue engineering bricks. The bricks comprising this panel are of a slightly lighter colour than the surrounding brickwork. Bays 3 & 4 contain 24-light windows, and the latter also has an access door with a concrete lintel (Plates 4 and 8).

*East Elevation:* The lower part is obscured externally by the east annexe (Plate 9). 12 bays, each with a recessed panel. Taking the south bay (which has no trace of a window) as Bay E1, Bays E2, E6 and E11 originally had 48-light windows, all now blocked and replaced by access doors with concrete lintels, leading into the east annexe. The remaining bays have 48-light windows except Bay E3, which has a narrow 32-light window (Plate 10), and Bay E12, which has a 24-light window. Along the eaves runs a metal-framed boarded walkway, bracketed to the main structural girders.

*North Elevation:* Totally obscured by the north annexe (Plate 11). As with the south elevation, there are four recessed brickwork panels (Plate 12), the lower parts of which are still visible in the ground floor of the annexe. The east panel (Bay N1) is pierced by a doorway 1.5m wide, with a concrete lintel, leading to the north annexe. Above this at first floor level, reached by an iron stair (Plate 13) running up the east and north walls, is a passageway beneath a concrete lintel, leading to offices, a washroom and a first-floor fire escape on the west side of the annexe, reached by a steel staircase. Bay N2 appears to be blank. On the internal face of Bay N3 a semicircular window has survived in situ, blocked on the outside and painted over on the inside. In Bay N4 are traces of a blocked 24-light window.

*West Elevation:* As with the east elevation, there are 12 bays, each with a recessed brickwork panel originally containing a window. The northern bay (Bay W1) has a 24-light window. The next ten bays have 48-light windows except for Bay W3, where the window has been blocked and replaced by an access door to the corridor leading to the modern building to the west (G416), and Bay 12, which has a 24-light window.

*East Annexe:* Constructed of plain buff brick (Plate 9). Its south elevation has two large 20light rectangular windows with concrete lintels and tile sills, and an access door with 10-light fanlight above at its east end. The east elevation has a continuous concrete lintel running along its eastern face, above all doors and windows. From the south, there are four 20-light windows, then four more windows alternating with double doors. One of the latter has a rectangular fanlight above, presumably original. The north elevation has two windows.

Internally the east annexe was originally divided into four areas. A drawing in the site archive, dated to the 1950s, shows three of these as being for various tradesmen involved in maintenance work, the fourth, at the south end, being subdivided into a 'materials in use' store and a compressor room. A detailed inspection of the southern interior of this annexe was not possible, though sufficient could be seen through the east windows of the power station to reveal that nothing of interest remained internally.

*North Annexe:* 3-storey, but of similar build to the east annexe, which butts onto its east side (Plate 14). The third storey consists only of a single small room in its south-east quarter,

butted to the power station north wall. Apart from a window in the third storey, there are no features in the east elevation of this annexe. Its north elevation has four 15-light windows with concrete lintels and tile sills on the ground floor, with an access door and single-light window at the west end. On the first floor are five 15-light windows (Plate 11). The west elevation has single 15-light windows on the first two floors, and a fire escape door on the first floor leading to a staircase of welded steel construction. On the ground floor was originally a changing room and toilets, while on the upper floor are further toilets, washing facilities and offices.

#### 2. Services

*Steam:* There are numerous steam pipes running along the west side of the power station, across and below the windows, some entering the building (Plate 15).

*Electricity:* The power station presently contains a number of machines connected with woodworking, and many of the systems present appear to be connected with supplying these. The main concentration of switch panels, fuse boxes etc. is located in the south-east corner of the power house. From this point, a metal box duct runs along the east and west walls, below windows and above access doors, to a number of subsidiary control boxes.

The power supply to the gantry crane enters the building at the south-east corner, from a large cast control box mounted externally on the south wall (Plate 16). The box is made by Simplex, and is rated at 500 volts and 300 amps. The supply to it comes from an underground cable, and four armoured cables pass from its top into the building.

#### 3. Passageways & Traverses

None

#### 4. Door & Window Details

Loading Door: The loading door in the south wall of the power station consists of two leaves, matchboarded, hung from a rail above the door. These and all other external doors are painted mid-blue (Plate 17). The doors were open throughout the survey, so details of their external face could not be observed.

Access Door: The access door in the south wall is flush panelled on the outside, though the panelling (plywood) is not original. The door opens outwards: the brickwork of the plinth on the east side of the door has been chamfered to accommodate this. The inside face of the door was hidden by stacks of timber.

*Power Station Windows:* Metal-framed arched windows, frames painted white. There are three sizes of window present, essentially all of the same design. The most numerous measure  $1.5 \times 2.9$ m, and have 48 lights ( $6 \times 8$ ), of which the central twelve open on a central pivot (Plate 18). A narrowed version of this,  $1 \times 2.9$ m, has 32 lights ( $4 \times 8$ ), 6 of which open (Plate 10), and a half-height version,  $1.5 \times 1.8$ m, has 24 lights ( $6 \times 4$ ), of which the central eight open (Plate 7). The opening panels in the windows in the west wall have been replaced by glass louvres. (Plate 15).

Annexe Windows: These are all rectangular metal-framed units, painted white. There are two sizes:  $1.93 \times 1.62m$ , 20-light (5 x 4), with four opening lights (east annexe), and  $1.47 \times 1.62m$ , 15-light (5 x 3), also with four opening lights (north annexe).

*Annexe Doors:* Of the three double doors in the east annexe only one appears to be original. This has two matchboarded leaves, and is 1.99m wide and 1.95m high, with an 8-light rectangular fanlight above.

#### 5. Signs & Instruction Boards

*External:* Alongside the southern access door is a weathered plywood board with the building number painted on in white (Plate 8).

#### Internal:

In Bays E2, E6, E11, centrally placed below the crane gantry, are notices reading



Red lettering on a white background

(Plate 19)

2. Fastened to the foot of the access ladder, barring access to the gantry, is a white board with the following text in red:

WARNING HIGH TENSION CABLES KEY AT ELECTRICAL FOREMANS OFFICE

#### 6. Roof

1.

*Power Station:* Steel framed hipped gable roof, boarded and slated, with louvred glassroofed central lantern clerestory running the length of the ridge (Plate 20). The trusses are constructed of 102mm, 76mm and 64mm angle, riveted together with plates at the joints, and are fully triangulated. The hipped gables are supported by jack trusses of identical construction. The lantern clerestory is also framed with angle, supported on 150 x 50mm 'I' beams running the length of the ridge, and on vertical posts rising from the apex of the roof trusses. The louvred sides of the clerestory have been boarded up. Above the trusses run two rows of purlins, 150 x 250mm overall section, consisting of angle supporting timber beams, to which the roof boards are nailed. The roof boards are 38mm thick, covered with slates. Lead flashings cover the sloping ridges. The roof pitch is 27°.

The roof drains to cast iron guttering, with downpipes (3 each side) inset into the upper brick oversail and bracketed to the outer walls.

*East annexe:* There are two parts to this roof. The western half, against the east wall of the power station, is fully glazed, the glass set on steel angle framing supported by  $200 \times 100$ mm 'I' beams set at a 27° pitch into the power station wall at gantry height, resting in turn on a north-south concrete beam at their lower (east) end. This concrete beam also supports the eastern half of the annexe roof, which consists of a flat concrete roof covered with roofing felt, supported on horizontal concrete beams and concrete pillars, as well as on the walls described in Section 1.

#### 7. Interior Fixtures & Fittings

*Gantry:* Runs along the east and west walls of the power station (Plate 21). Each side is supported on 13 upright  $300 \times 150$ mm 'I' beams, riveted to the main steel framing of the power house. The beams are marked:

#### LEEDS STEEL WORKS

Along the top of these uprights runs a 150 x 450mm 'I' beam, marked

#### GLENGARNOCK STEEL

The horizontal beams are bolted to heavy gusseted brackets riveted to the sides of the uprights, and to smaller angle brackets in the web of the uprights (Plate 22). Rows of rivets in the web of the horizontal beams above the uprights point to further plates or brackets behind them, but these are against the wall and are not visible. On top of each horizontal beam is bolted a length of flat-bottom steel rail, and at each end of the beams is a buffer post, constructed of steel (Plate 23).

Access to the gantry is provided by a vertical steel ladder in the south-west corner of the power house, fitted with safety hoops and bracketed to the west wall.

Power to the gantry crane is supplied by four live cables running the length of the east gantry, along the inner face of the horizontal beam. These cables end at ceramic insulators

bracketed to the ends of the beam, and are supported en route on elongated ceramic bobbins, also bracketed to the beam.

Also bracketed to the east gantry, to the north, south and central uprights, are pairs of red operational warning lights, which flash when the crane is in motion (Plate 23).

*Gantry Crane:* Constructed of steel angle (Plate 22). Fully triangulated riveted joints with reinforcing plates. Two bridge sections, between which runs the traverse carrying the hoist motor, joined at their east and west ends by the carriage sections which run along the gantry. In each carriage section are two double-flanged wheels. The southern wheel on each side incorporates a radial gear, linked to a drive-shaft running to an electric motor mounted in the centre of the south bridge section. This motor moves the crane along the gantry. Power for the crane is obtained from the cables on the east gantry through pickups on the east carriage section, protected by a mesh screen. A similar arrangement of live cables suspended between brackets above the north bridge section conveys power to the hoist motor. The traverse is driven by a third electric motor mounted at the west end of the crane, through a series of cables and pulleys.

The crane is controlled remotely, from a control box suspended on a steel cable below the west end of the crane (Plate 24). The control box, which has nine buttons controlling all functions, is marked

#### ENGINEERING BRANCH PERSONNEL ONLY

The hoist pulley block and hook, suspended from the traverse by four steel cables, is painted red, and marked

#### BARNSLEY SWL 2 TONS

(Plate 24)

On the centre of each bridge are fixed two cast plates, one above the other. Both plates have silver lettering against a black background. The upper plate is T-shaped, and reads

#### SWL BARNSLEY 2 TONS NETHERTON DUDLEY

The 'S' of 'Barnsley' is inclined at *c*.45°. The lower plate reads

#### HOIST SLOW 2 TONS AT 2.1 FT/MIN HOIST FAST 2 TONS AT 21 FT/MIN

*Clock:* Mounted on the brick infilling of the window in Bay E6 is a large electric clock, mounted on a square plate. The clock face is *c*.750mm diameter, white with black sans serif numbers. On the face is the maker's name:

ENGLISH CLOCK SYSTEMS, LONDON

(Plate 19)

Power for the clock comes from the wiring ducting on the wall below.

#### 8. Lighting

There are three rows of lights down the length of the building (Plate 20). The outer rows are fastened to the roof boarding, the middle one to the central horizontal roof trusses. All wiring is in pipe conduits. Two types of shade differentiated by size are present, both with enamelled metal shades, green on the top, white on the reflective surfaces. The smaller type has the bulb enclosed in a glass surround: the larger type has no enclosure. There is no pattern to the spread of the two types, suggesting a replacement over time of damaged units with whatever was in stock.

#### 9. Heating

Mounted on the roof trusses of the power station are 3 roughly cubic metal boxes (>1m a side), connected to steam and electrical supplies (Plate 20). The bottom face of each box is mainly taken up with a large metal fan. These boxes are believed to be heater blowers, heated by steam with fans powered by electricity.

#### 10. Buildings Close by with Obvious Relationship to this Building

G403 was linked to G416, to the west, by a single-storey roofed brick passageway.

#### 11. Communications

A line of brackets each carrying a pair of insulators runs along the west wall of G403, *c*.2m below the eaves (Plate 25). Insulators are of two types: a white ceramic insulator, with two grooves below a rounded cap, and a brown ceramic insulator with a single groove below a more conical cap.

#### 12. Floor

Floors are concrete throughout. Some beds and mounting bolts are partially visible in the floor, but were too obscured by modern machinery, piles of timber etc. for recording or interpretation.

#### 13. Additional Observations

*Phasing:* The power house itself became operational in 1905. Of the two additions, the north annexe is structurally the earliest, though both are of a similar build, and were apparently constructed in the 1950s. Most of the smaller-scale changes to the fabric of the power station are related to the construction of the annexes, or to G416.

## Acknowledgments

I would like to acknowledge the assistance of Royal Ordnance staff G.G.Vincent, Trevor Wilson, Ed Andrews and Lynne Lennard. Wayne Cocroft of the RCHME Keele office. Malcolm McLaren once head of management services RGPF Waltham Abbey. The Hertfordshire Archaeological Trust recording team led by Bob Zeepvat. Amanda Kennedy and Melissa Eyears for research work at the PRO.

Photographs are reproduced here by kind permission of the Waltham Abbey Trust Company Limited whose collection is at present administered by the Epping Forest District Museum in Sun Street, Waltham Abbey.

## Bibliography

### UNPUBLISHED SOURCES

CRDD 1947 The Chemical Research and Development Department 'Its Programme and Facilities' Internal Report 21 May 1947

Drayson.F. 1830 Treatise (PRO Supply 5/762, Drawings M.P.11.15)

Fraser and Chalmers Ltd 1908 The Quinan System of Drying guncotton. Trade pamphlet Lord Sandhurst Committee. Report of the Committee appointed to enquire into the explosion of the 7th May 1894 at the nitro-glycerine Factory, Waltham Abbey. Together with minutes

of evidence and appendices. HMSO London. 1894.

REP01 EAB/1,/2,/3 Short report on R.O. Factory, Waltham Abbey. 18.3.86

Supply 5/327 1894-1898 Relating to the Explosions at Waltham Abbey. Supply 5/332 1916-1929 Home Office Reports in connection with the Standing Committee on the Cause of Explosions. Supply 5/466 1891-1895 Guncotton General. Supply 5/491 1892-1902 Nitroglycerine General. Supply 5/710 1902-1907 Quinton Hill NG Factory Annual Reports. Supply 5/760 1861-1904 Photograph Album - RGPF Explosions and Plant Supply 5/861 1903-1938 Photograph Album - RGPF Explosions and Plant Supply 5/862 1903-1930 Photograph Album - RGPF Various Supply 5/863 1940-1941 Photograph Album - Damage by Enemy Action WASC 1508 c.1945 RGPF Buildings Ledger WASC 1680 c.1925 RGPF Buildings Ledger WASC 1764 1908 RGPF Buildings Ledger WASC/1506/1 1972 Explosives Research and Development Establishment List of building numbers and functions Younghusband.C (WASC 20) 1873 'Description of the Manufacture of Abel's Pulped and Compressed Guncotton at Waltham Abbey' Unpublished typescript dated 13.11.1873

### **PUBLISHED SOURCES**

Clarke. B. *The Eighteen Inch Gunpowder Factory Railway at Waltham Abbey*. Privately published. E.C.C.F.A.G. *Nitroglycerine Washing House, South Site, Waltham Abbey Royal Gunpowder Factory, Essex.* Survey Report. June 1996.

Encyclopaedia Britannica 1950 Encyclopaedia Britannica Vol.11.

Englebach. F.G 1899 'Her Majesty's Ordnance Factories Waltham Abbey - 11' The Army and Navy Illustrated. 30 Dec 1899.

Fitzgerald. W.G 1895 'How Explosives are Made' The Strand Magazine Vol. IX p307-18.

Gordon. Dr.S 1987 'IMI Summerfield Rocket Motors and Propellants History and Development' in Journal of the British Interplanetary Society. Vol 40 pp311-322. 1987.

Guttman. O. 1895 'The Manufacture of Explosives' London.

Hogg O.F.G. 1963 'The Royal Arsenal.' Vol. II London

Jenkin C.F 1891 'The Electric Lighting of Danger Buildings' Proc. of the Institution of Civil Engineers. 110. 367-79.

Jenkins. J.M 1989 'The Railways of the Royal Gunpowder Factory, Waltham Abbey' Industrial Railway Record 117. 385-415.

Johnson. C.H 1965 'The Explosives Research and Development Establishment, Waltham Abbey' Chemistry and Industry. 20 Feb 320-27.

McLaren. M 1975 'The Explosives Research and Development Establishment, Its Historical Background' Journal of Naval Science Vol. 1 No.2 April 176-83.

Nathan. F.L 1909 'Guncotton and Its Manufacture' Journal of the Society of Chemical Industries 28. 177-187.

Nathan. F.L and Rintoul. W 1908 'Nitroglycerine and Its Manufacture' Journal of the Society of Chemical Industries Vol. XXVIII No.5 193-205.

RCHME 1993 Survey of the Royal Gunpowder Factory, Waltham Abbey, Essex. Cocroft report, A4 report and A3 book of maps. RCHME Publications, London.

Simmons. W.H 1963 'A Short History of the Royal Gunpowder Factory at Waltham Abbey' Privately published Controllerate of Royal Ordnance Factories.

Sobrero. Prof. A 1847 Concerning some new explosive compounds obtained by means of the action of nitric acid on organic substances. Memoirs of the Royal Academy of Science of Turin. Feb 21 1847.

Walton. J 1977 'ERDE Waltham Abbey Monks Mills and Missiles' The Soldier 26. 8 Feb. War Office 1895 Treatise on Service Explosives. HMSO London.

# **Appendix 1: Photographic Register**

# Photographic Register

WALTHAM ABBEY RGPF SOUTH SITE	Date: August 1997	Initials: RJZ
Building: G403 Power House	Film: 400ASA Colour Slide &	
	Monochrome	

Shot No.	Description	Scale	Neg. No.
B/W+Col		used	B/W
1	Power house from south	-	0
2	West elevation, from south	-	1
3	Power house and east annexe, from south-east	-	2
4	Detail: window in south wall of power house	-	3
5	Detail: window in west wall of power house (central opening	- 1	4
	section replaced by louvres)		
6	Detail: steel framing at south-west corner, south elevation	-	5
7	Detail: access door and building number, south elevation	-	6
8	East annexe: south-east corner	-	7
9	Power house and east annexe, from north-east	-	8
10	North annexe, from north-east	-	9
11	Detail: main electricity supply box, south elevation	-	10
12	Detail: 'small' window, north end of west elevation	-	11
13	Steel framing and catwalk, south-east corner of power house	-	12
14	Interior of power house (east side), from south	-	13
15	Interior of power house (west side), from south	-	14
16	Interior of power house, from north-east corner	-	15
17	Detail of roof structure, from north-east corner	-	16
18	Detail of north end of east travelling beam for gantry crane	-	17
	(rail, buffer, power cables, warning lights, notice)		
19	East side of travelling beam and supports	-	18
20	Interior of unaltered 'standard' window in east wall	-	19
21	East wall: clock, warning notice, electrical conduits	-	20
22	Gantry crane, from north	-	21
23	Gantry crane: maker's plates	-	22
24	Gantry crane: east end (pickups and guard, carriage)	-	23
25	Gantry crane: west end (carriage, traverse and hoist)	-	24
26	Gantry crane: access ladder to travelling beam, south-west	-	25
	corner		
27	Interior of south elevation (loading doors)	-	26
28	Gantry crane: hook and control box	-	27
29	Power control boxes and conduits, south-east corner	-	28
30	Narrow standard-height window, south end of east elevation	-	29
31	North wall (steelwork, blocked window, traces of ?mezzanine	-	30
14. 	floor)		
32	Detail of interior face of east wall	-	31
33	Interior of east annexe (north end)	-	32
34	Steel stairway to north annexe, north-east corner	-	33
35	Detail of roof structure	-	34

# **Appendix 2: Archive Contents**

## **Archive Contents**

Survey plot of the Power House at 1:100 Surveyed section of the Power House at 1:50 Survey data on zipped disc using CAD12 Bound copy of typescript report One set of monochrome prints from 35mm film One set of Colour slides (35mm) 3 1/2" floppy disc with text and photographic registers

# Appendix 3: Essex Sites and Monuments Record Summary Sheet

# **Essex Sites and Monuments Record**

# **Summary Sheet**

Site name/Address: Power House G403, South Site, Waltham Abbey Royal Gunpowder Factory, Essex		
Parish:	District:	
Waltham Abbey	Epping Forest	
NGR:	Site Code:	
TQ 3798 9978	WASS 97	
Type of Work:	Site Director/Group:	
Building record/survey	Steve Chaddock / Prince Research	
Date of Work	Consultants Size of Area Investigated	
Dule of work: 01 07 97 - 31 08 97	size of Area Investigatea:	
Location of Finds/Curating Musaum:	- Funding Source:	
Essex Records Office	Environmental Services Group	
	Royal Ordnance plc	
Further Seasons anticipated?:	Related SMR Nos:	
NO, as site is due to be developed and this is last stage of	-	
recording.		
Final Report:		
-		
Periods Represented:		
1905 to 1989		
SUMMARY OF FIELDWORK RESULTS:	to Currentton Eastern included a	
A recording blief, carried out on the Power House of the South Si	nd photographic coverage	
survey of the building in plan and sections through the building, a	nd photographic coverage.	
The Power House was constructed in 1905 to supply steam power to the newly expanded Guncotton Factory along Cobbins Brook in the north part of the South Site, Waltham Abbey. It is now used as a carpenters workshop and has modern (1960s) extensions to the north and east which obscure the building on those sides. Boilers were screw fed with coal to produce steam. The steam was piped around the site in lagged steam mains of varying diameter to be used for heating or power at the spread out buildings on the explosives site. It continued to be used until the 1960s when a more modern steam boiler was installed close by.		
A steel-framed brick building, $36.5 \times 16.1$ m, aligned north-south. Encloses an undivided single room, height to eaves 8.1m. Slated hipped gable roof, with clerestory along ridge. Annexes added to north and east sides, both brick-built with felted roofs. The north annexe is $15.9 \times 6.8$ m, and 3 storeys high. The east annexe covers an area $42.9 \times 9.5$ m, and is single-storey. A pitched skylight area runs along the junction between the main building and the east annexe.		
Previous Summaries/Reports: 1996 ECC FAG Nitroglycerine Washing House Report by Stuart Foreman 1996-7 Archaeological Evaluation of South Site by S. Chaddock including Site Survey in CAD Environment, Component Sheets for all buildings and text report detailing remains and processes carried out on site.		
Author of Summary:	Date of Summary:	
S. UNAUQUCK	04/09/1997	

**Appendix 4: The Plates** 









G403 PLATE 4 - POWER HOUSE FROM SOUTH

# INTENTIONALLY BLANK



### G403 PLATE 5 - WEST ELEVATION FROM SOUTH



# G403 PLATE 6 - STEEL FRAMING AND CATWALK, S/E CORNER OF POWER HOUSE



G403 PLATE 7 - DETAIL: WINDOW IN SOUTH WALL OF POWER HOUSE



# G403 PLATE 8 - DETAIL: ACCESS DOOR AND BUILDING NUMBER, STH. ELEVATION



G403 PLATE 9 - POWER HOUSE AND EAST ANNEXE, FROM SOUTH EAST

# INTENTIONALLY BLANK



# G403 PLATE 10 - NARROW STANDARD HEIGHT WINDOW, S/E OF EAST ELEVATION



## G403 PLATE 11 - NORTH ANNEXE, FROM NORTH EAST



G403 PLATE 12 - NORTH WALL (STEELWORK, BLANK WINDOW, TRACES OF MEZZANINE FLOOR)



G403 PLATE 13 - STEEL STAIRWAY TO NORTH ANNEXE, NORTH EAST CORNER



G403 PLATE 14 - POWER HOUSE AND EAST ANNEXE, FROM NORTH EAST

# INTENTIONALLY BLANK



G403 PLATE 15 - DETAIL : WINDOW IN WEST WALL OF POWER HOUSE (CENTRAL OPENING SECTION REPLACED BY LOUVRES)



### G403 PLATE 16 - DETAIL: MAIN ELECTRICITY SUPPLY BOX, SOUTH ELEVATION



G403 PLATE 17 - GANTRY CRANE FROM NORTH

# INTENTIONALLY BLANK



### G403 PLATE 18 - INTERIOR OF UNALTERED STANDARD WINDOW



G403 PLATE 19 - EAST WALL: CLOCK, WARNING NOTICE, ELECTRICAL CONDUITS



G403 PLATE 20 - DETAIL OF ROOF STRUCTURE

# INTENTIONALLY BLANK



### G403 PLATE 21 - EAST SIDE OF TRAVELLING BEAM AND SUPPORTS



### G403 PLATE 22 - DETAIL OF INTERIOR FACE OF EAST WALL



G403 PLATE 23 - DETAIL OF NORTH END OF EAST TRAVELLING BEAM FOR GANTRY CRANE (RAIL, POWER CABLES, WARNING LIGHTS, WARNING NOTICE )

# INTENTIONALLY BLANK



### G403 PLATE 24 - GANTRY CRANE: HOOK AND CONTROL BOX



G403 PLATE 25 - DETAIL: STEEL FRAMING AT S/WEST CORNER, SOUTH ELEVATION

Appendix 5: The Figures





	100
Z	<
DFF-CENTRE)	
N-CENTRE OF PILASTER)	:
N-CENTRE)	
DFF-CENTRE}	
BRITISH AERO Royal Ordnance	

ROYAL GUNPOWDER	MILLS
WALTHAM ABBEY	
SOUTH SITE	
Drawing prepared by: Hertfordshire Archaeological Trust	
The Seed Warehouse, Maidenhead Yard,	65-7

The Seed Warehouse, Maidenhead Yard, The Wash, Hertford. SG14 1PX.

**BUILDING No.G403 POWER STATION** 

Ground Floor Plan ORIGINAL SCALE : Drawn By:KH,DR 1:100(A2)ORIGINAL

DWG No:G403/1A DATE: 24.07.97



