

RNAD BROUGHTON
MOOR
Broughton
Cumbria

Roger JC Thomas, drawing by Allan T Adams

RNAD BROUGHTON MOOR

Broughton

Cumbria

ROYAL COMMISSION ON THE HISTORICAL MONUMENTS OF ENGLAND

HISTORIC BUILDING REPORT

**Royal Naval Armaments Depot Broughton Moor
Great Broughton
Broughton
Cumbria**

April 1997

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ROYAL COMMISSION ON THE HISTORICAL MONUMENTS OF ENGLAND

Cumbria

Broughton

NGR: NY 059 317

Great Broughton

NBR No: 94852

RNAD/NAD Broughton Moor

SUMMARY

Royal Naval Armament Depot (RNAD) / NATO Armament Depot (NAD) Broughton Moor was built in a number of phase between 1938 - 90. It is located between the towns of Cockermouth, Maryport and Workington, bordering the village of Great Broughton. It consists of a large complex of dispersed magazines that were built in two phases, an inspection and laboratory area, a factory area, an administration area, two groups of exchange sidings and transit sheds, 'standard' and 'narrow' gauge locomotive maintenance buildings, and a motor transport hangar.

HISTORY

The history of RNAD Broughton Moor extends back to 1938, when work commenced on the construction of a new armament depot, as a part of the Admiralty's pre-war expansion plans. The site chosen was located on an area of bleak moorland to the northwest of Great Broughton village. Pre-existing rail access from Workington was provided by the northern extension of the Cleator & Workington Railway, which had previously served the Buckhill Colliery and Coke Ovens, upon which the new depot was geographically centred.

The original site occupied 323.75 hectares (800 acres) and the first phase of construction was completed in 1939. At that date, the depot consisted of one hundred and thirty-two timber-framed corrugated-asbestos clad magazines of five and nine bay designs, three transit sheds, eight light traversed shell inspection rooms, a broken seal room, six light traversed laboratories, a proof house complex, two non-explosive stores, a locomotive shed, three canteens, a section house, a police post, fifty-eight bungalows, and a variety of ancillary structures.

As the Second World War progressed, the ever-growing demands for ammunition resulted in a progressive expansion of RNAD Broughton Moor. By 1944, the site covered an area of 490 hectares (1210¾ acres), within a 10.46-kilometer (6¾

mile) Daicoit 'unscaleable' perimeter fence. The increased storage was provided by thirty-seven double-piled, nine-bay, brick-built magazines, an isolation magazine, two detonator store, four non-explosive stores, and one hundred and twenty-eight pre-cast concrete 'Stanton shelters'. In addition, further space was obtained by the requisitioning of Camerton Isolation Hospital, which was adjacent to the north-west corner of the site, and by the setting up of three external Sub-depots - Kelbarrow (above ground), Knockmurton Fell (above ground) and Camerton (underground).

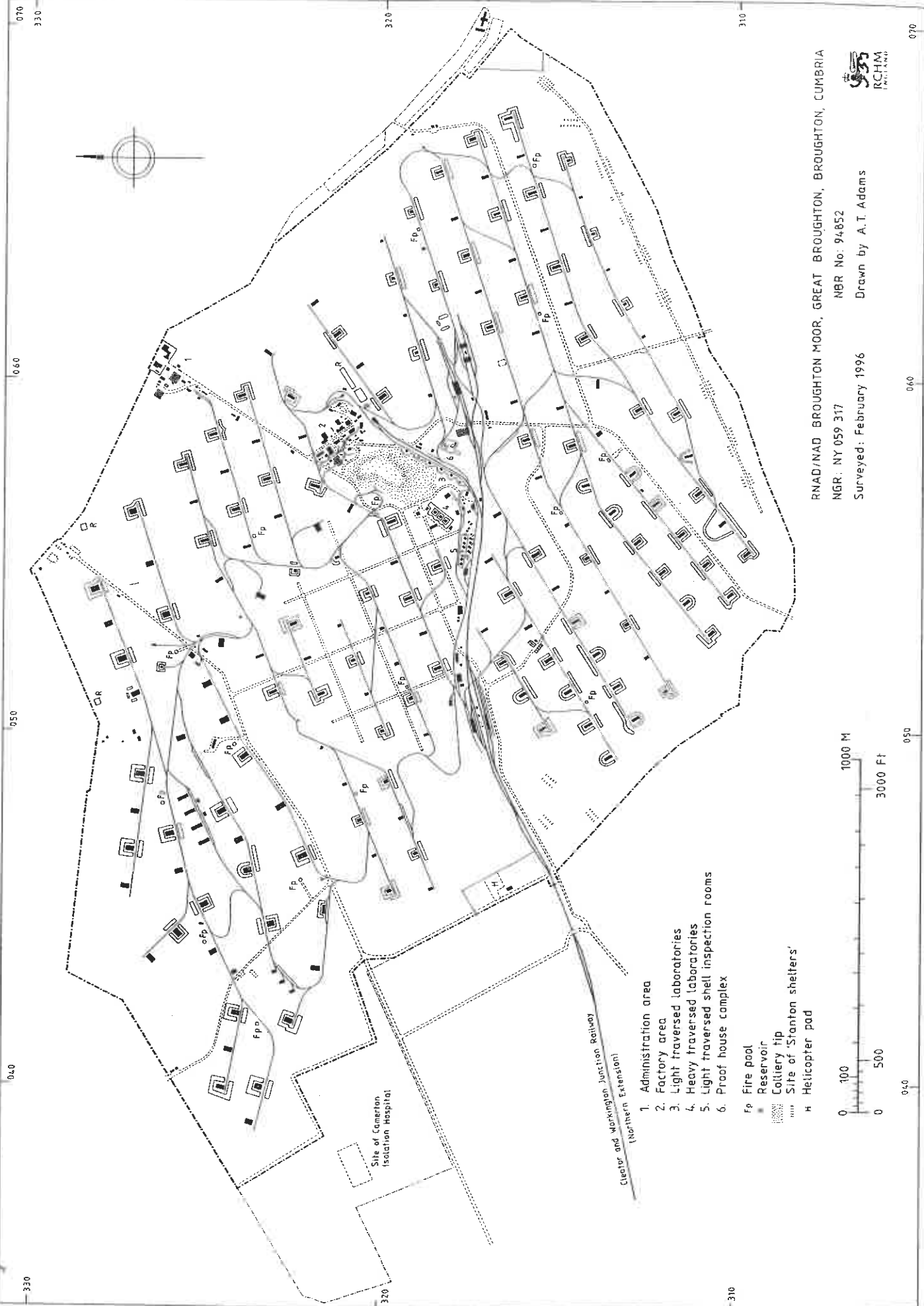
This dramatic increase in storage capacity necessitated the building of a variety of additional ancillary structures, including: four light traversed shell inspection rooms, a shell scraping room, a small arms ammunition (SAA) laboratory complex, shifting rooms, two narrow-gauge locomotive sheds, two broken seal rooms, offices, a boiler house, a shipping store, and a variety of workshop buildings and stores located on the site of Buckhill Colliery.

On the whole, the wartime safety record of RNAD Broughton Moor was very good, with the exception of one major accident, which occurred in January 1944. A Mk 2 anti-submarine mortar (Hedgehog) round was being inspected in one of the light traversed shell inspection rooms (building 416 in 'C' Line), when an explosion took place, scattering building debris and explosive stores for some distance, killing eleven people and injuring a further seventy.

After the Second World War, RNAD Broughton Moor continued to be used by the Royal Navy for the storage, inspection and minor repair of a variety of types of ammunition. In general, very little new building occurred during this period, with the notable exception of a complex known as 'H' Line, consisting of three heavy traversed laboratories, two waiting rooms and a garage. The depot eventually became surplus to requirements in 1963, but did not become redundant, as it was transferred to the Federal Republic of Germany. The depot was used by the Germans for the storage of naval ammunition (principally mines) and later for limited inspection and repair of naval munitions.

Responsibility for the depot changed hands again in 1977, when it became an ammunition storage site for USA forces attached to NATO. Four years later, it was formally adopted as a NATO establishment, becoming NATO Armament Depot (NAD) Broughton Moor. During this period it was used for storing up to 20,325 tonnes (20,000 tons) of munitions, approximately half of the US Navy's pre-positioned stock of ammunition for use in the Norwegian Sea. The depot remained in NATO hands until its closure in 1992. Only five new structures were built during this period: three steel-framed, corrugated-asbestos clad, narrow-gauge railway-to-road transit sheds, a helicopter pad, and its associated control building.

The run down of the site commenced in 1991 and by July of that year an explosive ordnance disposal (EOD) search had commenced. The last train to leave the depot was loaded at the Admiralty Sidings (west transit sheds) by Scooby, Willy, Freak, and J. Nicol on 3rd June 1992, and a certificate of search/clearance of explosive materials and other dangerous substances was issued in December 1992, allowing the depot to be placed on the disposal list.



RNAD/NAD BROUGHTON MOOR, GREAT BROUGHTON, BROUGHTON, CUMBRIA
 NGR: NY 059 317 NBR No: 94852
 Surveyed: February 1996 Drawn by A.T. Adams



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DESCRIPTION

Royal Naval Armament Depot (RNAD) Broughton Moor was built c1938 on the sites of Buckhill Colliery and Greengill Pit No.3. The site is situated on moorland and low-grade agricultural land, approximately 84-m (275-ft) above Ordnance Datum. It is located immediately north-west of the village of Great Broughton, approximately 4 kilometres (2½ miles) south of Maryport and 5 kilometres (3 miles) north-east of Workington. The depot occupies an area of 490 hectares (1210¾ acres) contained within a 10.46-kilometer (6¾-mile) chain-link perimeter fence.

At its peak, the complex comprised of a total of one thousand structures; including one hundred and thirty-two timber-framed corrugated-asbestos magazines (explosive storehouses ESH), twenty-seven brick built magazines (ESH), an isolation magazine, two detonator stores, eight non-explosive stores, three heavy traversed laboratories ('H' Line), six light traversed laboratories ('A' Line), twelve light traversed shell inspection rooms ('B' & 'C' Lines), two proof houses, five Ministry of Defence police posts, six transit sheds, three locomotive sheds, two gun barrel stores, three broken seal rooms, seventeen air raid shelters, seven trailer pump houses, twenty-five fire pools (static water tanks), two reservoirs, seven canteens, a main kitchen, two motor transport hangars, and various administrative, technical and engineering buildings.

Originally, the perimeter fence consisted of Daicoit unscalable steel fencing, with forty projecting bastions, which permitted an enfilade view along the outer face. At the time of recording, a 2.10-m (7½-ft) high, cranked chain-link fence, topped with three strands of barbed wire encloses the perimeter. Access to the depot is provided by a total of eight gates: Workington Gate, North Gate, West Gate, Main Gate, Railway Gate, Residence Gate, South West Gate, and Walker Gate.

The Main Gate is located centrally in the eastern perimeter, on passing through the gate; a visitor enters a rectangular chain-link fence enclosure, which has an inner gateway in its western perimeter. The enclosure contains a pair of interconnected sectional timber huts, which functioned as the Medical Centre and the Public Services Agency Office (formerly the Ministry of Public Buildings and Works), a large sectional timber hut, which functioned as a Staff Canteen and a modern brick-built Ministry of Defence Police (MDP) post (Bldg 966). Beyond the inner gateway, 'Buckhill Road' passes through the Administration Area in a southwesterly direction, towards the Factory Area located on the site of Buckhill Colliery, approximately 0.5 kilometer (1/3 mile) away.

Clocking Station

Immediately adjacent to the inner gate is the Clocking Station (Bldg 671) (former Admiralty Constabulary Police office), a tall single-storey, rectangular plan, asbestos-clad timber-framed structure, with a gable roof. A projecting porch runs the whole length of the south elevation, with double access doors at the eastern end and a single exit door to the west.

The area to the rear of the clocking station is occupied by a motor transport section, which consists of a four-bay motor transport (M/T) maintenance shop (Bldg 551), a steel vehicle inspection ramp and a plant (M/T) hangar. A further plant hangar once stood adjacent to the North Gate: this has been demolished.

Plant Hangar

The remaining hangar is a T3 Transportable Shed, conforming to an Air Ministry Works Directorate drawing 3505/42. It is a tall single-storey, 22.85 x 20.11-m (75 x 66-ft) rectangular plan, corrugated-steel clad, pre-fabricated steel-framed structure, with a gable roof. The north and south gables are each closed by five corrugated-steel clad rolling doors. Steel guide rails are set in the concrete floor below, and are carried on the framing above the doors. In order that all the doors can clear the full span of the gable openings, the upper guide rails project beyond the side walls of the hangar on cantilevered gantries. Vertical glazing panels once ran the full length of both side walls, but they have all been painted over or replaced. Internally, the steel lattice girder frames are set at 3.80 m (12 ft 6 in) centres, forming six bays. The end bays are all diagonally braced.

Main Office

Returning to the 'Buckhill Road', the next building to be encountered is the Main Office (Bldg 600), which consists of a pair of inter-linked, single-storey, corrugated-steel clad, timber-framed huts, with gable roofs. To the rear of the Main Office is a semi-sunken, brick-built air raid shelter, with a flat reinforced concrete roof (Bldg 649). A short distance to the southwest, and at right angles to the Main Office is a structure of similar construction, which functioned as the Cash Office. To the southwest of the Cash Office are a number of minor buildings, including the Main Halt on the narrow-gauge rail system that served the depot.

Factory Area (Engineering)

The Factory Area is located on the site of the former Buckhill Colliery. A number of the original colliery buildings were re-used. For example, the brick-built electricity sub-station, located between the Joiners Shop (Bldg 500) and the Engineers and Wagon Repair Shop (Bldg 501). The majority of the buildings in this area were built after September 1942. A wide variety of designs and building materials were used, including corrugated-asbestos clad timber framing (Dockyard

Store Bldg 200), steel frame with brick walls (Fitter's Shop Bldg 502), brick construction with corrugated asbestos gable roof (Boiler House Bldg 510), pre-fabricated 'Turner's' curved asbestos hut (Contractors Store Bldg 706), '24 span Nissen' hut (Factory Canteen Bldg 628), and a six bay Ministry of War Production (MOWP) '18ft 6in Standard' hut (Electrical Workshop).

Joiners Shop and the Engineers / Wagon Repair Shop

The Joiners Shop and the Engineers / Wagon Repair Shop are superficially very similar in appearance, being tall single-storey, double-pile, 30.47 x 20.76 m (100 x 68 ft) rectangular-plan, fair-faced brick buildings, with corrugated-asbestos clad gable roofs, carried on steel-frame Fink Trusses. The Engineers / Wagon Repair Shop has a pair of large timber railway access doors in each of the southwest gable walls, and the interior is served by a gantry crane.

The southeast boundary of the Engineering/Factory Area is defined by a pre-existing masonry retaining wall, and the former coal drops of Buckhill Colliery. A locomotive fuel point and the Factory Locomotive Shed (Bldg. 518) occupy the former coal sidings.

Light Traversed Laboratories ('A' Line)

Six frangible Light Traversed Laboratories, built along the southeast flank of the coal tip served the depot. All were set back into excavated recesses with the spoil having been raised into traverses to the rear and sides of each of the laboratories, to reduce the risk of accidental blast damage.

The most northerly of the laboratories has been demolished. The remaining Light Traversed Laboratories (Bldgs 400 - 404) are all built to the same basic frangible design; single-storey, 9.14 x 5.68 m (30 x 18 ft 6 in) three bay rectangular plan, corrugated-asbestos clad, spaced-board, timber-framed structure, with a corrugated-asbestos clad gable roof, carried on timber trusses, with steel king posts. A small cat-slide annexe, which functioned as a shifting room, is built against the rear end of the northeast elevation of each building. All electrical switchgear and an 'Arctic' compressor were located outside the shifting room.

The southeastern bay functioned as a roofed loading-bay, served by a 76 cm (2 ft 6 in) gauge railway. The laboratory room occupied the remaining two bays. Natural lighting was provided by three-light timber casement windows, two in the south-west, one in the north-east elevation, and one in the north-west wall of the shifting room. Pedestrian access into the laboratory was provided by a door from the shifting room, with a 'Yellow Way' 2 cm (¾ in) gritless asphalt floor. A double doorway in the northwest gable wall acted as an emergency exit. Explosive materials were brought into the laboratory room from the through-loading bay, using a pulley running on a loading gantry attached to the tie beams, which passed

through a double timber doorway in the southeast wall. All moveable metal fittings, which could potentially cause a spark; hinges, gantry runners etc. were of non-ferrous metals.

Internally, fibreboard panels lined the laboratory room, with a cavity of 14 cm (5½ in) to provide heat insulation. Heating was provided by exposed steam pipes, carried on brackets from the tie beams. Magazine-standard fluorescent safety lighting provided artificial lighting. Timber working benches were located against the southwest wall.

Although built to the same basic design, Building 400 does differ from the other light traversed laboratories. An aluminium dumping chute passes through the southwest wall, to an external concrete lined sump. In addition, concrete blast walls were built against the central bay of both of the side walls and the southeast gable, occupied by the through-loading bay. Building 400 was certified in April 1968 to receive up to 453.59 kg (1000 lbs.) of Category X explosives, 453.59 kg (1000 lbs.) of Category Y explosives, or 158.75 kg (350 lbs.) of Category Z/ZZ explosives at any one time.

Laboratory Office

A track bed for both standard-gauge and narrow-gauge railways runs past the laboratories to the Engineering Area, and the Factory Locomotive Shed. The Laboratory Office (Bldg 457) is located to the east of the track bed, opposite Laboratory 403. The office is a single-storey, 7.31 x 9.14 m (24 x 30 ft) rectangular plan, Ministry of War Production (MOWP) 'Standard 24 ft. Hut', constructed using a reinforced concrete transverse frame of rafters bolted to cranked concrete wall posts, set at 1.82 m (6 ft) centres. The walls are of concrete slab panels, lined internally with brick. The corrugated asbestos clad gable roof is carried on light timber purlins, lined on the underside with fibreboard. The interior is lit by crude, nine-light, softwood casements in the second and fifth bays of the northern and southern walls, and one either side of the doorways in the east and west gable walls. The office was served by a narrow-gauge siding, which passed through a simple lean-to loading bay built against the western gable. The loading bay consisted of a flat corrugated- asbestos roof carried on timber joists, supported by three brick pillars.

Proof House

The Proof House complex is located a short distance to the southeast of the Laboratory Office. It consists of two roughly rectangular reinforced concrete walled enclosures. The northernmost enclosure contains the Proof House (Bldg 461) and an Expense Magazine, while the southern enclosure is the Proof House Yard, which contains a camera hut, a timber lined explosive proof butt, a sump

with a heavy steel rolling cover, and an incinerator building.

The Proof House is a single-storey, square plan, fair-faced brick structure, with an asphalted flat reinforced concrete roof. The Proof House is sub-divided into four square chambers, rooms 461A - 461D. The doorways to the chambers are in the north and south elevations. Natural lighting is provided to each room by a single four-light, top hung timber casement window. The roof rests on the northern blast wall forming a porch over the entrances to the northern two chambers, rooms 461A and 461D, it also projects beyond the south elevation forming a veranda, carried on two concrete pillars over the doorways to rooms 461B - 461C.

The Expense Magazine is a low single-storey, fair-faced brick chamber, with a flat reinforced concrete roof; it is approx. 2.43 x 3.05 m (8 x 10 ft) in plan. The structure is set into a projection at the northeast corner of the blast wall enclosing the Proof House. The only entrance is in the north elevation and all walls are blind.

The reinforced concrete blast walls of both enclosures are battered, and stand 3.65 m (12 ft) high. They were poured in four lifts of 0.91 m (3 ft). The Proof House enclosure is entered at the northwest corner and access to the Proof House Yard is via an opening at the southeast corner.

The Proof House Yard is 6.09 m (20 ft) to the southeast of the Proof House and is accessed via a baffled entrance at its northwest corner. The Camera Hut is a 2.13-m (7-ft) high single-storey, fair-faced English bond brick structure, 3.05-m (10-ft) square in plan. The mono-pitch roof consists of a pair of steel angle iron rafters and three purlins. The upper ends of the rafters rest on the northern blast wall and the lower ends are raised on 30-cm (1-ft) high concrete pads. No evidence of the roof cladding remains. A doorway in the east wall provides access to the interior of the hut. Outside of the hut, but aligned with the doorway at 45°, are two 1.06 m (3 ft 6 in) high brick pillars, which were used to mount mirrors for filming test explosions within the Proof Butt.

The Proof Butt is located in the angle between the north and east walls of the enclosure. It consists of a sump covered with a rectangular floor of timber baulks, enclosed by 1.21-m (4-ft) high walls of timber plank, slotted into steel posts. The south wall consists of two timber gates. The sump access is a circular steel tube approximately 29 cm (9 in) in diameter, which has a heavy square steel plate cover carried on rollers.

A further baffled entrance is located in the blast walls at the southeast corner of the yard, allows access to the Incinerator House, which is built against the outer face of the baffle wall. The Incinerator House is a single-storey, rectangular plan,

fair-faced English bond brick structure, with a mono-pitch corrugated-asbestos roof. A large opening in the north elevation allows access to an enclosed incinerator, which is served by a steel loading tray set into the concrete floor outside.

Light Traversed Rooms Laboratory 'B' & 'C' Lines

The Light Traversed Rooms are a complex of twenty-one structures, located some 150 m (492 ft) to the south-west of the coal tip. These rooms were used for the inspection, and minor repair, of returned munitions of various natures. The complex consists of a Broken Seal Room (Bldg 410), thirteen Shell Inspection Rooms (Bldg. 406 - 411, 413 - 417 and 419 - 420), a Latrine, a Boot Lobby / Shifting Room (Bldg 422), and a number of small ancillary structures.

As originally built, there were only eight Shell Inspection Rooms, constructed in two staggered rows of four, but due to increased demands a further four were built to the east of the northern row ('C' Line) and one to the west of the southern row ('B' Line). 'B' and 'C' Lines are mirror images; ie, the rear elevations face each other, and the rail docks are aligned to the north-west in the 'C' Line, and to the south-east in 'B' Line.

Each inspection room is aligned at 45° to the orientation of the line and is enclosed by 5.18-m (17-ft) high, reinforced concrete blast walls (traverses), laid in seven lifts. A spine blast wall, running the whole length of the complex separates the two lines from each other. A raised concrete cleanway (footpath) on either side of the spine wall provides pedestrian access to the rear of each inspection room from the Boot Lobby, passing through the traverses via open archways.

Apart for minor differences, these structures all conform to the same basic design similar to Building 413 in 'C' Line: single-storey, 9.38 x 6.95 m (30 ft 9 in x 22 ft 10 in) three-bay rectangular plan, rendered brick structure, with a frangible corrugated-asbestos gable roof. A narrow-gauge spur provides rail access to each inspection room, via a lean-to rail dock porch. This consists of a mono-pitch corrugated asbestos roof, carried on three brick pillars, built against a flanking blast wall.

A double doorway set between two brick piers in the rear gable wall provides pedestrian access from the cleanway. An emergency exit is located in the north-west wall, adjacent to the double railway doors, which permitted access to a small platform under the rail dock porch, which is flanked by a blast wall. Internally, the northern bay acted as a narrow gauge rail dock, entered by a double timber doorway in the west wall.

The floor of the room is raised 57 cm (22½ in) above the track bed to form a

platform, and is coated in 2 cm (¾ in) of gritless asphalt, which extends up the wall by 13 cm (5 in) to form a skirting. Two 1.23 x 0.59 x 0.91 m (4 ft 0½ in x 1 ft 11½ in x 3 ft 0 in) shell pits are set into the floor, with recessed edges to take timber covers. Evidence exists, in the form of a series of square depressions in the asphalt to suggest that heavy timberwork benches were situated against the side walls.

Originally the walls were bare brick painted white. Currently the walls are plastered, and painted green and white. A pair of brick piers in both gable walls carry steel beam monorails, that supported block and tackle travellers, each with a safe weight limit (SWL) of 1016.04 kg (1 ton).

The interior is provided with natural lighting from paired four-light timber casements set high in the walls, just below the eaves, two in each side wall and one in each of the gable walls. Artificial lighting was originally provided by external safety lamps shining through glazed lamp recesses. Latterly, suspended fluorescent tube safety lighting has provided artificial lighting within the inspection room. Two exposed steam pipes running around all four walls just above floor level provided heating.

Broken Seal Room

The Broken Seal Room, 'B5/6' (Bldg 410) is located at the western end of the Light Traversed Rooms. It is a single-storey, rectangular plan, fair-faced English bond brick structure, with a corrugated-asbestos roof, and lean-to loading bays to each side wall. Each loading bay has mono-pitch corrugated-asbestos roof supported by three brick pillars, which carry a timber frame to support a side covering of asbestos sheeting. A narrow-gauge loop passes to either side of the building; each is served by a 57 cm (1 ft 10½ in) high platform running the length of the structure. Internally, the building is divided into two chambers by a central spine wall. Each chamber is accessed from the platforms by double timber doors in the north and south walls. The floor of each room is of gritless asphalt. Natural lighting is provided by two six-light timber casements in the east and west gable walls.

Located to the east of the Light Traversed Rooms are group of scattered buildings, which include: the Laboratory Ovens (Bldg 423), the Battery Charging Room 'D1' (Bldg 421), Shell Painting Room 'D2' (latterly, the Ammunition Inspection Unit Store Bldg 424), a Laboratory Shifting Room (Bldg 422), Laboratory Office (Bldg 456), a Small Arms Ammunition (SAA) Laboratory 'D6', and a variety of minor structures.

The Laboratory Ovens

The Laboratory Ovens (Bldg 423) were originally the Shell Scraping Rooms,

consisting of a pair of parallel, single-storey, rectangular plan, fair-faced English bond brick structures, with corrugated-asbestos gable roofs. Reinforced concrete blast walls enclose the buildings; forming two opposed rectangular enclosures with a common spine wall. The northern enclosure is served by a narrow-gauge rail dock, which is entered from the north-west; while the southern enclosure, is served by a narrow-gauge rail dock that is entered from the south-east. The rail docks are each protected by mono-pitch corrugated-asbestos roofs, spanning the gap between the building and the flanking blast wall.

A 56 cm (22 in) high platform runs the length of each of the walls that face out onto the rail docks. Each structure is sub-divided into two rooms, accessed from the platforms by double doorways with a steel gantries over head. Internally, each room has a central walkway, flanked to either side by a 1.5 m (4 ft 11 in) wide and 56 cm (22 in) deep sunken area.

Heavy Traversed Laboratories 'H' Line

The Heavy Traversed Laboratory complex was built circa 1958, and is located immediately to the southwest of the coal tip. The complex consists of two waiting rooms (Bldg. 463 and 464), three frangible heavy traversed laboratories (Bldg. 430 - 432), and a motor transport shed. The complex is arranged in a row aligned northeast / southwest, with a waiting room at each end flanking the laboratories. The laboratories stand in three inter-linked, square plan, earthen, heavy traverses.

A concrete lined emergency escape passageway, aligned at 45° to reduce the effects of blast, passes through the southeast traverse of each laboratory. A lobby, approached via a concrete lined passageway, which passes through the northwest traverse, protects the entrance of each laboratory. Each laboratory is a tall single-storey, 6.4 m (21 ft) square, timber-framed, weather-boarded structure, with a plastic-coated corrugated-sheeting clad gable roof, carried on spaced-board king-post trusses. The northeast and southwest walls are blind. The gable walls are fenestrated with four tall, eight-light, side opening, timber casements. Access is via a double timber doorway, enclosed by the porch at the southern end of the northwest gable wall. A double timber doorway at the northern end of the southeast gable wall acts as an emergency exit, permitting access to the escape passageway.

The interior walls are lined with painted fibreboard. The present floor is a gritless asphalt 'Conductifloor', laid by James Halstead Ltd., Manchester, dated 10th October 1982. A 'Supertrack' steel frame monorail 1016.04-kg (1 ton) gantry, built by George King Ltd., Hitchen, enters the laboratory from the porch and runs around the interior, suspended from a steel girder frame within the structure. An aluminium dumping shoot passes through the southeast wall into an underground sump. Artificial lighting was provided by fluorescent tube magazine safety lamps,

suspended from the roof, with all switches located externally in the porch. A pair of exposed steam pipes, bracketed high up on all four walls provided heating.

Waiting Rooms

The Waiting Rooms (trailer sheds) are located to either end of the line of Heavy Traversed Laboratories. Building 463, which is located at the southern end, is a single-storey, 12.55 x 7.16 m (41 ft 3 in x 23 ft 6 in), 4 x 2 bay rectangular plan, fair-faced, half-brick stretcher bond, pier and panel brick structure, with a corrugated-asbestos, depressed gable roof. Due to the light nature of its construction, a central brick spine wall runs the full length of the building. Nine-light galvanized steel windows light the interior. Building 464, is located at the northern end of the line of heavy traversed laboratories, it is of similar construction and appearance to the other waiting room, but differs in that it has a 4 x 1 bay rectangular plan, and has a mono-pitch roof.

Magazines (Explosive Storehouses)

Visually, the most obvious feature that strikes a visitor to RNAD Broughton Moor is the sheer volume of magazines; 169 evenly distributed throughout the 490 hectares (1210¾ acres) of the site. The magazines are constructed of either corrugated-asbestos clad timber framing or of brick and reinforced concrete, and come in two permutations of bay length, five or nine bays. Wartime green and dark-earth camouflage paint survives on many of the more sheltered magazines, particularly those in Ribton Wood.

The magazines are laid out in rows, generally on a northeast / southwest axis. A spur of the narrow-gauge railway system, which provides the only means of access, serves each row. The magazines in each row are spaced at 109.72-m (360-ft) centres and are staggered in relation to the position of the magazines in the next row. As originally built, the majority of the magazines in each row were constructed alternately with, or without an earth traverse (revetment); however, with the passage of time, ten of the un-traversed magazines have been provided with traverses, using spoil from the coal tip at Buckhill Colliery. The average height of a traverse is 3.05 m (10 ft).

A typical nine-bay timber framed magazine is a single-storey, 27.43 x 7.92 m (90 x 26 ft) rectangular plan, corrugated-asbestos clad, timber-framed structure, with a corrugated-asbestos clad gable roof, carried on spaced-board strutted timber trusses, with steel king posts. The verges of the roof are notable, as they do not have any form of guttering. Brackets are attached to the ridge at both ends of the roof to accept lightning conductors.

The first bay projects over a loop off the narrow-gauge railway spur, to form a

roofed loading bay; the end wall of which, is partially covered with corrugated-asbestos sheeting. A 57 cm (22½ in) high platform runs across the gable wall of the magazine, and access is provide to the interior by a centrally set, 1.83 m (6 ft) wide double doorway. A 1.37 m (4 ft 6 in) wide double doorway, which functioned as an emergency exit is located in the rear gable.

Internally, the concrete floor is laid with gritless asphalt, and the walls and roof are lined with fibreboard. Painted marks on the walls and floors indicate the height, and floor area within which ammunition could be stacked. A monorail gantry ran the length of the centre line of the interior. A 'Magazine Placard' giving general instructions, and a fire notice are attached to the back of the doors. Unofficial records of issues of ammunition are often written on the walls in pencil, or chalk. Some graffiti also exists: for example, a very lively chalk drawing of two children on roller-skates, entitled the "Terrible Twins", in Magazine 79.

Four, three-pane timber deadlight windows in each side wall, light the interior of the magazines. The windows are staggered and occupy alternate bays in the opposite walls. Internally, a heavy zinc wire mesh, to prevent them being accidentally broken protects the windows. There is little variation to the design of these magazines across the depot, apart from Magazine 49 (Heavy Shell Magazine), which is equipped with a 1016.04 kg (1 ton) 'A' frame lifting gantry. The five-bay timber-framed magazine is identical in construction to the nine-bay example and differs only in its length, which is 15.23 m (50 ft), and the number of windows.

The brick and concrete construction magazines are located on the slopes of Peatmere Hill, to the northwest of the main site. These magazines are single-storey, 27.43 x 15.23 m (90 x 50 ft), 9 x 2 bay rectangular plan, brick structures, with a gravel covered flat reinforced concrete roof, behind a low brick parapet. The concrete was poured between four rows of longitudinal steel joists, carried on seven RSJ crossbeams. Brick piers projecting beyond the interior face of the side walls, and on seven brick pillars set on the centre line of the structure supports the latter.

The first bay projects over a loop off the narrow-gauge railway spur, to form a loading bay. The side wall of the loading bay is of pier and panel brick construction, pierced by four, six-light, square, painted galvanized steel windows, beneath concrete lintels. Within the loading bay, a 75 cm (29½ in) high platform runs the whole length of the front wall of the magazine. Two pairs of 3.05-m (10-ft) wide double timber doorways provide access to the interior. Two pairs of 1.5-m (5-ft) wide double doorways in the rear wall, act as emergency exits. The interior is lit by natural lighting from four, six-light, rectangular, painted galvanized steel windows, set high in each side wall.

All of the brick and concrete constructed magazines conform to the basic design outlined above, but a number of variations do occur. These variations include external cement rendering, the provision of steel doors and gantry cranes, and the lining of the inner face of the walls with concrete breezeblocks.

The magazine complexes are served by a number of ancillary structures, which can be divided into buildings certified for the storage of explosives, and those, which are not. The explosives buildings include the Isolation Magazine (Bldg. 336), two Detonator Stores (Bldg. 207 and 337), the Broken Seal Rooms (Bldg. 426/427 and 428/429), and three Untraversed Rooms (Bldg. 433 - 435). The non-explosives structures include; eight Non-explosive Stores (including two former brick and concrete magazines (Bldg. 338 and 339)), three Gun Barrel Storage Racks, four Canteens, two Reservoirs, two Booster Pump Houses, five Ministry of Defence Police Posts, a Shifting Room, and various other minor structures.

The Transport System

Transport within RNAD Broughton Moor was undertaken primarily by 76 cm (2 ft 6 in) narrow-gauge railway. The majority of goods were brought into, and left the depot by standard-gauge trains, using the northern extension of the former Cleator and Workington Railway. The Western Exchange Sidings (Admiralty Sidings) are located approximately 100 m (109 yds) to the north of Parseys Gill, while the Eastern Exchange Sidings are some 200 m (218 yds) east of the Proof House Complex. The two transit sheds of the western sidings and the one at the eastern sidings were all used for the transshipment of loads, in both directions, between the standard and narrow gauge railway systems. During the Second World War, additional handling was provided by the construction of the Shipping Store (Bldg 203), and a pair of Broken Seal Rooms, Laboratory 'F' Line, (Bldg. 426/427 and 428/429), near to the eastern sidings.

Narrow-gauge motive power was provided by electric locomotives, which were housed in one two-road locomotive shed (Bldg 566) located towards the north-east corner of the Depot at Lightfoots, and one three-road shed (Bldg 567) located adjacent to the Western Exchange Sidings. Further housing and a workshop was available in the northern road of the Factory Locomotive Shed (Bldg 518). The Factory Locomotive Shed also provided housing and repair facilities for the standard-gauge motive power, consisting of two Hunslet 0-4-0 diesel shunters. It should be noted that in armament depot terms, all 'standard-gauge' railways and rolling stock were known as 'broad-gauge'.

Factory Locomotive Shed

The Factory Locomotive Shed is a tall single-storey structure, with two parallel ranges. The southern range is of mixed construction, consisting of a the three bay, fair-faced brick built, single-road, standard-gauge locomotive shed, and a three

bay, corrugated-asbestos clad workshop. The northern range consists of a five bay, corrugated-asbestos clad, two-road, combined narrow-gauge locomotive shed and workshop. The roof over the brick built shed is at a lower level than those over the clad sections. All the roofs are of corrugated-asbestos sheeting carried on steel frame Fink Trusses. The end-stays of a steel girder gantry crane project out beyond the wall-line of the central bays of the workshops. Internally, timber workbenches line the walls, and inspection pits are located in the track-beds within the workshops, with the gantry crane passing over head. Electrical re-charging points serve both roads of the narrow-gauge shed.

Locomotive Shed West

Building 567 is a single-storey, 6 x 3 bay rectangular plan, pier and panel, fair-faced brick structure, with a steep corrugated-asbestos clad gable roof, carried on five steel trusses and the gable walls. The side walls are of stretcher bond, half brick construction, while the gable walls are of English garden wall bond. Nine-light galvanized steel windows, under concrete lintels occupy each bay of the side walls, and the three bays of the west gable. Three double timber locomotive doorways are located in the east gable. Internally, each narrow-gauge road had an inspection pit, a simple timber baulk buffer, and a battery charging point. Heating was provided by wall-mounted, electric, double-tube, oil radiators.

Locomotive Shed Lightfoots

Superficially, the locomotive shed at Lightfoots (Bldg 566) is of very similar construction and appearance to Building 567. It does however, differ in size, being a two-road, 4 x 2 bay plan structure,

West Transit Sheds

The buildings of the Western Exchange Sidings consist of two transit sheds, a number of small office buildings, and a latrine. West Transit Shed Bldg 204 is a tall single-storey, 12 x 2 bay rectangular plan, corrugated-asbestos clad, riveted steel girder-framed structure, with a gable roof. The south elevation is blind, and the north elevation is pierced by ten, tall, nine-light galvanized steel windows. The interior is accessed through one standard gauge, one narrow gauge, and one pedestrian doorway in each gable wall. The standard-gauge track occupies the southern bay, and is divided from the narrow-gauge railway by a concrete platform, that runs the full length of the building. The floor of the platform stands 1.37 m (4 ft 6 in) above the standard-gauge track-bed. The narrow-gauge track-bed on the other hand, is laid at a higher level, with the result that it is only 75 cm (29½ in) below the platform floor.

West Transit Shed (Bldg 205) is basically a mirror image of Building 204, with the standard-gauge track in the northern bay. However, it does differ in construction, being built of brick, and illuminated by six, two-light windows per

side elevation. A further difference in detail, is the existence of six open doorways in the north elevation, permitting access to and from the standard-gauge track-bed.

The East Transit Shed (Bldg 206) is similar in construction to Building 204; however, it is a ten bay length structure with eight tall, twenty-five light galvanized steel windows in the south elevation. A lean-to, two-bay width extension has been added to the north elevation, with the result that this shed could operate two standard, and two narrow gauge rail exchanges.

Road System

From the outset, the road system at RNAD Broughton Moor was of minor importance to the depot's transportation system. Only two of the roads were double carriageways - North Lonnen, and Buckhill Road. The remaining roads were single carriageways with passing places, these included Residence Road, Holden's Road, and Walker Road. Use of the road system gradually increased from 1970s until the depot's closure.

Latterly, three rail-to-road transfer sheds were built one at Workington Halt (Bldg 569), one at Lightfoots Halt (Bldg 570), and one near the western end of Residence Road (Bldg 568). All three structures are built to the same design, with a resemblance to a corrugated-asbestos clad, steel-framed farm barn. In addition to the transfer sheds, a lorry marshalling area, with sufficient capacity for forty-two articulated lorries, was laid to the north of the coal tip.

One other form of transport was used at Broughton Moor. A helicopter-landing pad exists near the western perimeter, a little to the north of the Railway Gate. The pad was served by Helipad Road, which connected it to North Lonnen and there-by to the rest of the site.

Passive Air Defence and Fire Precautions

The provision of passive air defence (PAD) and fire precautions was an essential prerequisite to the safe operation of the depot, both in war and peace. A number of observation posts were established to watch for fires, or enemy activity; if either occurred, it was the observers duty to report any incident by telephone to the War/Standby Depot Headquarters. The staff of the War/Standby DHQ would have sounded the appropriate alarm, using air-raid sirens, and would then have co-ordinated the fire/rescue services, and the activities of the depot.

The only observation post that remains on site is the Central Observation Post, (Bldg 691), it is situated on the summit of the coal tip, immediately to the east of the Engineering Area / Factory. The post commands a 360° view of the whole depot. The observation post is a 2.45-m (8-ft) high, 2.55 m (8 ft 3 in) square, fair-

faced, English garden wall bond, brick structure, with an asphalted, flat reinforced concrete roof. The doorway into the structure is protected by a freestanding blastwall and is flanked by a single light window in the southwest elevation. The remaining elevations are fenestrated by side opening, three light, timber casement windows, with sloping brick sills. A truncated steel tower some 3.05-m (10 ft) high exists to the northeast of the observation post.

Air-raid Shelters

A total of seventeen air-raid shelters were built on the depot. Fourteen were built as surface air-raid shelters (Bldg. 642 - 655, 657, and 659 - 660); these are all single storey, 3.26 x 1.92 m (10 ft 6 in x 6 ft 4 in) rectangular plan, English bond brick built, surface shelters, with rounded ridge, triangular profiled concrete roofs. The entrance to each surface shelter was located in the front gable wall, and it was protected by a freestanding brick blastwall. An emergency exit consisting of a 72 x 64 cm (28½ x 25¼ in) opening infilled with dry-laid bricks was placed low in the rear gable wall.

The remaining shelters are all semi-sunken designs. Building 656, to the rear of the Main Office, is a double entry, fifty-person capacity, brick-built shelter, with a ventilated, flat reinforced concrete roof. Building 641 located adjacent to the Western Exchange Sidings, and Building 658 at the Eastern Exchange Sidings are both double-entry, dog-leg plan, cut and cover construction, pre-cast concrete panel, fifty person capacity shelters.

Fire Pools

The risk of fire, is a major concern at any armaments depot. To reduce the risk at RNAD Broughton Moor, a number of precautionary measures were taken; including the leasing of grazing to local sheep farmers, to keep the grass down. The main fire fighting system at the depot consisted of an extensive fire main, gravity feed by two large reservoirs near Lightfoots. The fire main system supplied pairs of fire hydrant stands, dispersed throughout the site. Had this system failed, trailer pumps would have been used to obtain water supplies from the depot's emergency water supplies (EWS), these included twenty-five fire-pools (static water tanks), four ponds and the three streams that flow across the site.

The fire-pools vary in size and design, the largest design consisting of a 12.19 metres (40 ft) diameter, circular plan, 1.3 m (4 ft 3 in) high reinforced concrete walled pool, with a capacity of 159109 litres (35000 gallons). The walls were cast using curved, heavy-gauge, corrugated sheeting as shuttering. Since the closure of the depot, all of the fire-pools have had a hole broken through them, to ensure there is no risk of livestock or anyone inadvertently drowning in one.

BR1 Broughton Quartz Fire (QF) Bombing Decoy

In addition to the passive air defence preparations taken on site, a more pro-active form of defence was also used. During 1941 a Royal Navy QF bombing decoy, BR1 Broughton, was established some 2 km (1 ¼ m) to east north-east of the depot (Grid Ref. NY 077 328). The decoy was erected to mimic the effects of bombing, to draw off enemy bombers from their real target. Today, there is no evidence of this site as it has been destroyed by opencast mine workings.

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35 mm Photography: Roger J C Thomas

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