



**Historic Building Recording of Gasholder 1
at the former Effingham Street Gasworks
Sheffield, South Yorkshire
January 2018**

Report No. 18/11

Author & illustrator: Amir Bassir



© MOLA Northampton 2018
Project Manager: Anthony Maull
NGR: SK 3636 8803

MOLA Northampton
Kent House
30 Billing Road
Northampton
NN1 5DQ
www.mola.org.uk
sparry@mola.org.uk

Historic Building Recording of Gasholder 1 at the former Effingham Street Gasworks Sheffield, South Yorkshire January 2018

Project Manager: Anthony Maull

Report No. 18/11

Quality control and sign off:

Issue No.	Date approved:	Checked by:	Verified by:	Approved by:	Reason for Issue:
1	29.01.18	C Finn	R Atkins	A Maull	Draft for client review

Author & Illustrator: Amir Bassir

© MOLA (Northampton) 2018

MOLA Northampton
Kent House
30 Billing Road
Northampton
NN1 5DQ
01604 809 800
www.mola.org.uk
business@mola.org.uk

OASIS REPORT FORM

PROJECT DETAILS		OASIS molanort1-307373
Project title	Historic Building Recording of Gasholder 1 at the former Effingham Street Gasworks, Sheffield, South Yorkshire, January 2018	
Short description	MOLA (Museum of London Archaeology) carried out a programme of historic building recording of Gasholder 1 at the former Effingham Street Gasworks, Sheffield. The gasholder was a spiral-guided four-lift holder constructed in 1963 by C & W Walker of Donnington, and was fairly typical of gasholders of this period, comparable to other contemporary gasholders recorded previously in Sheffield.	
Project type	Historic Building Survey	
Previous work	Unknown	
Future work	Unknown	
Monument type and period	1960s spiral-guided Gasholder	
PROJECT LOCATION		
County	South Yorkshire	
Site address	Effingham Street, Sheffield	
NGR	SK 3637 8803	
Area	0.28ha	
PROJECT CREATORS		
Organisation	MOLA Northampton	
Project brief originator	Atkins Ltd on behalf of National Grid	
Project Design originator	MOLA Northampton	
Supervisor	Amir Bassir	
Project Manager / Director	Anthony Maull	
Sponsor or funding body	Atkins Ltd on behalf of National Grid	
PROJECT DATE		
Start date	January 2018	
End date	January 2018	
BIBLIOGRAPHY		
Title	Historic Building Recording of Gasholder 1 at the former Effingham Street Gasworks, Sheffield, South Yorkshire, January 2018	
Serial title & volume	MOLA report,18/11	
Author(s)	Amir Bassir	
Page numbers	31	
Date	29/01/2018	

Contents

1	INTRODUCTION	1
2	OBJECTIVES AND METHODOLOGY	3
3	HISTORICAL BACKGROUND	4
	3.1 The Sheffield Gas Company	4
	3.2 Development of the Effingham Street Works	7
4	HISTORIC BUILDING RECORDING	12
	4.1 Gasholder 1	12
5	DISCUSSION	15
	BIBLIOGRAPHY	
	APPENDIX I	

Figures

Front Cover: View of the gasholder

Fig 1: Site location

Fig 2: The recording area (image © Google Earth)

Fig 3: Sheffield Town Map of 1837, showing the site prior to the construction of the gasworks

Fig 4: Sheffield Town Plan of 1849, showing the early gasworks prior to expansion

Fig 5: Bacon's Plan of 1885, showing the partial expansion and rearrangement of the works

Fig 6: First edition Ordnance Survey map of 1890, showing the completed gasworks

Fig 7: Ordnance Survey map of 1935

Fig 8: Aerial view of the site, 1963-1975, showing Gasholder 1 and the two earlier holders (NGA ref XG0036)

Fig 9: View of the gasworks, 1963-1975, looking north-east (NGA ref XG00914)

Fig 10: Detail of the outer roller carriages

Fig 11: General view of the gasholder, looking south-west

Fig 12: General view of the gasholder, looking south-east

Fig 13: Detail of the tank fabrication

Fig 14: Detail of brackets carrying lagged pipes

Fig 15: The concrete base exposed at the north-west side of the gasholder

Fig 16: The external brackets supporting the tank walkway

Fig 17: The main stair located at the south-west side of the gasholder

Fig 18: General view of the tank walkway and crown, looking north from the main stair landing

Fig 19: The top curb and outer sheeting, also showing railing and unknown pipework (oil application pipe?)

Fig 20: General view of the crown, looking east

Fig 21: Gas valve and manhole at the south side of the crown

Fig 22: Detail of manhole in the crown

Fig 23: Stencilled N (North) located on the walkway at the north side of the gasholder

Fig 24: Antifreeze pylons at the south-west side of the gasholder

Fig 25: Example of the spiral stairs

Fig 26: Detail of spiral stair base and roller carriage

Fig 27: Example of the outer roller carriages

Fig 28: The arrangement of roller carriages, also showing manual valve controls on the antifreeze pylon

- Fig 29: Detail of the lift grips with valved pipes protruding through (recent additions?)
- Fig 30: Detail of trip / alarm
- Fig 31: The common inlet and outlet pipes at the north-east side of the gasholder
- Fig 32: Detail of Donkin flow valve
- Fig 33: The sump pit over the blanked inlet and outlet pipes at the south-west side of the gasholder
- Fig 34: First World War memorial plaque located adjacent to the site entrance
- Fig 35: General view of the wall to Sussex Street, showing blocked doors and windows at two levels
- Fig 36: General view of the wall at the corner of Sussex Street and Sussex Road
- Fig 37: Plan of the site, showing photograph locations

Tables:

- Table 1: Gasholder 1, lift dimensions

Historic Building Recording of Gasholder 1 at the former Effingham Street Gasworks Sheffield, South Yorkshire January 2018

Abstract

MOLA (Museum of London Archaeology) carried out a programme of historic building recording of Gasholder 1 at the former Effingham Street Gasworks, Sheffield. The gasholder was a spiral-guided four-lift holder constructed in 1963 by C & W Walker of Donnington, and was fairly typical of gasholders of this period, comparable to other contemporary gasholders recorded previously in Sheffield.

1 INTRODUCTION

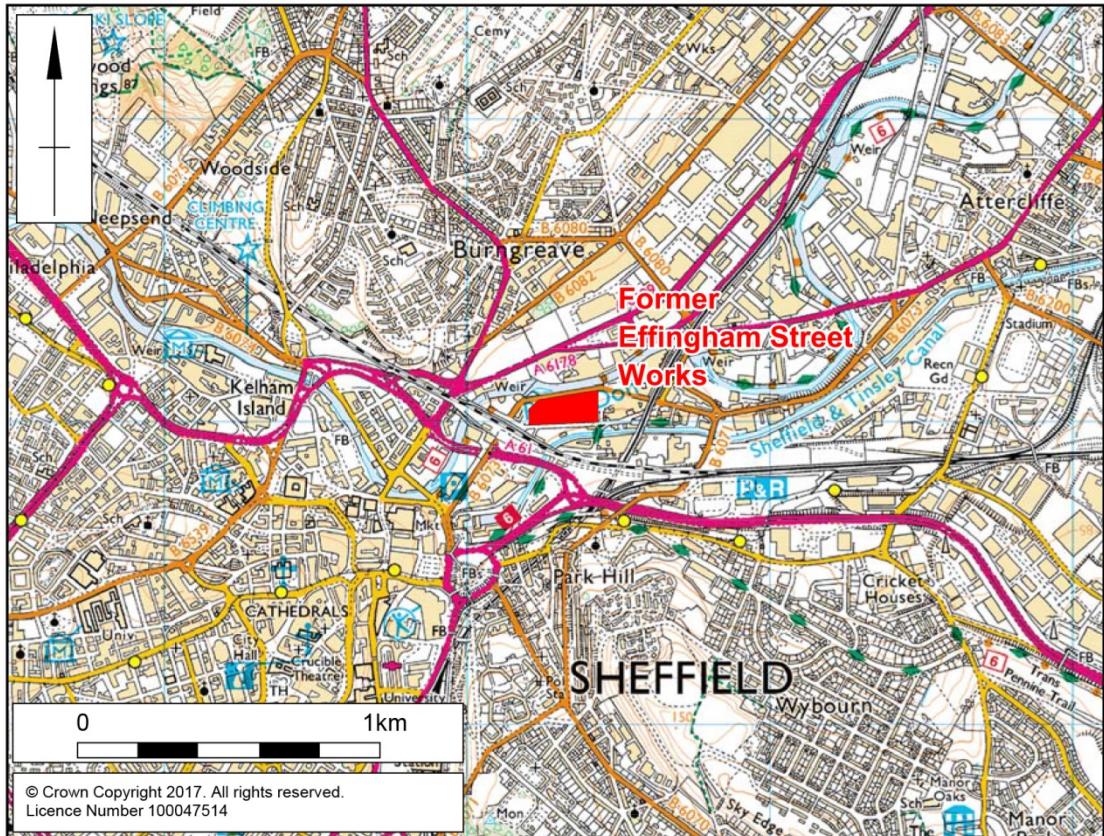
MOLA (Museum of London Archaeology) was commissioned in December 2017 by Atkins Ltd, acting on behalf of National Grid, to undertake a programme of historic building recording of Gasholder 1 at the former Effingham Street Gasworks, Sheffield (NGR SK 3637 8803, Figs 1 and 2).

This survey is a voluntary exercise commissioned by National Grid as part of their commitment to the heritage of their broader estate. This report is in accordance with current best archaeological practice as defined in the Chartered Institute for Archaeologists' *Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings or Structures* (ClfA 2015).

The former Works is located to the north-east of Sheffield City Centre, on the south side of Effingham Street, immediately adjacent to the southern bank of the River Don and in close proximity to the converging branches of the Sheffield to Lincoln and Midland Rail Lines. The site is bound to the west by Furnival Road, to the north by Effingham Street and to the south by Sussex Street.

The surveyed gasholder was the only remaining holder of the former gasworks which during the mid 19th century accommodated five small holders and when later expanded in the late 19th century were replaced by three much larger ones. The site has been largely redeveloped though a National Grid compound remained active at the north-western side.

EFFINGHAM STREET, SHEFFIELD



Site location Fig 1



The recording area (image © Google Earth) Fig 2

2 OBJECTIVES AND METHODOLOGY

The objectives of this survey were to:

- Produce an illustrated, written document detailing the fabric, appearance and form of the gasholder and associated infrastructure;
- Provide historical survey drawings (or sketches) for comparable investigation relating to building form and function, identification of fixtures and fittings where visible or accessible;
- Provide an account of historic fixtures, fittings and architectural features where visible or accessible;
- Provide a photographic record of the structure in context.

The level of recording was specified as basic Level 2 in accordance with the Historic England document *Understanding Historic Buildings, A Guide to Good Practice* (HE 2016), and as specified in the site specific *Heritage Review* (ME 2017) which concluded that the gasholder is of low heritage significance.

Recording was carried out on the 17th January 2018 and encompassed the gasholder and its related pipework.

The site was photographically recorded to include general views of the gasholder and its setting, as well as detailed views of any structural, historic or architectural features. Measured sketches were made of an example roller carriage and a photogrammetric survey was also made of a roller carriage which is attached to this report as a digital appendix (Appendix II). Access to the upper part of the gasholder was limited by strong winds and rain.

Photography was carried out using a Nikon D7200 DSLR equipped with Sigma 10-20mm and Nikon 18-105mm lenses. Photographic scales were included in views where practical.

The National Grid Archive was searched for relevant historic images and documentation relating to the site, and a visit was made to the Sheffield Archives. Documents from both of these sources are referenced in this report.

3 HISTORICAL BACKGROUND

3.1 The Sheffield Gas Company

Much of the following history of the Sheffield Gas Company is condensed from *The Sheffield Gas Undertaking, 1818-1949* by D E Roberts, a highly detailed account of the history of the company and the economic and practical factors which affected both the company and the town of Sheffield, as well as the personalities who drove the industry at that time.

Among the East Midlands towns in which gas companies were formed, Sheffield was second only to Nottingham in taking the necessary steps to establish a gas company, and then only by a matter of months. Following the lead of London, Exeter, Glasgow, Manchester and Nottingham, a group of notable townsmen...called a public meeting which was held at the Cutlers Hall on 6 March 1818. Here it was resolved to seek an Act of Parliament to form a company by adding gas lighting to an Improvement Bill which was pending in the House of Commons. The Sheffield Gas-Light Company was in due course incorporated by an Act passed on 23 May 1818 (Roberts 1979, 7).

The newly incorporated gas company had its offices in Haymarket Lane and situated its gasworks at Shude Hill, near Sheaf Bridge, a location chosen for its close proximity to the River Sheaf and canal wharves which greatly facilitated the transportation of the raw materials and equipment needed for the works. This was an extremely compact site with three closely spaced gasholders located in a rectangular parcel of land surrounded by residential houses. The United Gas-Light Company's office was located immediately adjacent to the gasholder compound and the works was on the other side of the road to the gasholders. The company encountered numerous problems from the outset, many caused by the lack of experienced gas engineers and the rudimentary state of the gas industry at this time. "Bad workmanship in stonework, serious delays in the delivery of ashlar stone, imperfect casting, etc., proved frustrating. It is also evident that the second gasholder was defective and had to be replaced in 1820" (Roberts 1979, 8).

The Sheffield New Gas company, previously known as the Consumers' Gas Company, was formed under the Sheffield Gas Act of 1835 as a rival to the Sheffield Gas-Light Company. The emergence of this rival company was in part a response to a perceived insufficient expansion in the gas supply and high gas prices.

By 1835 Sheffield had expanded considerably in every direction. The population had risen from about 60,000 in 1818 to around 105,000... Sheffield Gas-Light Company was selling insufficient gas of poor quality at a high price...by 1835 Sheffield required nearly double the quantity of gas used in 1828 to provide an equal amount of light (Roberts 1979, 12).

The Sheffield New Gas Company was supported by a number of industrialists and manufacturers and the proposed new gas company was entered as a Bill into Parliament in 1835. The Bill was opposed by the Sheffield Gas-Light Company. During a House of Commons committee meeting it was highlighted that

[T]he [Sheffield Gas-Light Company] was failing to remove completely the ammoniacal liquour and sulphuretted hydrogen from the gas before distribution... the Company had never... inspected any work done by pipefitters, and a great deal of shoddy work was being undertaken (Roberts 1979, 13).

The Sheffield New Gas Company gained the support of Parliament...Under the Sheffield Gas Act of 1835, the New Company was authorised to raise £80,000 in capital with which to establish works at Effingham Street to supply gas in competition with the Old Gas Company (Roberts 1979).

Shortly thereafter the Sheffield Gas Act of 1844 the Sheffield New Gas Company and the Sheffield Gas-Light Company were amalgamated as the Sheffield United Gas-Light Company.

The merger led to improved profits for the proprietors and a reduced price of gas for consumers...Considerable saving resulted from having only one management, the removal and replacement of old and decayed pipes, the connection of services to one set of new mains, and the collection of accounts on a quarterly basis (Roberts 1979, 17).

The Shude Hill works were improved and added to and additional land was purchased on which to erect a new gasholder to meet the increased demand. This gasholder was operational by 1850. A rival to the Sheffield United Gas-Light company emerged in 1850 when the Highways Board and Town Council, along with certain members of the public formed the Gas Consumers' Company. The company obtained a Board of Trade licence to operate and a new gas works was opened in August 1852 at Neepsend. Due to a lack of Parliamentary sanction, the Gas Consumers' Company acted somewhat illegally and were opposed by the United Company who took it upon themselves to act outside of the law and place obstructions in the way of the Consumer's Company's workmen such as filling in pipe trenches during the night which had been dug by the United Company's labour force during the day.

The Sheffield United presented a Bill to Parliament in 1855, presenting a deed for amalgamation. This amalgamation became law under the Sheffield Gas Act of 1855.

One of the first actions of the newly established Board was to authorise re-arrangement of the mains based on the extension of the Effingham Street site, including the erection of two large gasholders, and the running down of the Neepsend station. The disused gasholder at Neepsend was sold to the contractor of the Effingham Street development (Roberts 1979, 22).

By 1890 the gasholders and the works at Shude Hill had been dismantled and a new Company office built over the former gasholder compound. The new office building, which still stands, was designed by M.E. Hadfield & Son in the style of a Venetian palazzo (Binfield *et al* 1993).

The onset of war in 1914 presented a considerable challenge to the Sheffield United Gas Company and indeed gas companies throughout Britain. Among the problems faced by the company were a reduction in the quality of gas caused by the extraction of toluol and benzol (chemicals required for high explosives), an increase in demand from the steel industry and a shortage of labour.

In the face of inflationary rises in wages and the price of coal and other raw materials, gas companies suffered losses in the markets for residuals. The main markets were overseas, the German chemical industry being a major buyer...In terms of revenues from gas and coke sales, however the Sheffield Gas Undertaking was in a more favourable position than most other gas companies...The Sheffield steel industry was at the heart of the munitions drive, so that the Sheffield Gas undertaking, which provided a growing

quantity of fuel power necessary for the output of armaments, became a crucially important cog in the war machine. (Roberts 1979, 30).

Friction between the steel industry and the gas company over the provision of good quality gas at high pressure was compounded by labour shortage. The men offered to the company by the Supply Department of the Ministry of Munitions were unsuitable for the heavy labour required and of the 600 men initially seconded to the gas company only 61 remained by 1917. The Company had begun employing women to meet the labour shortage but these were unable to carry out the heavy work required. Strike threats and complaints from the munitions producers led to an intervention by Winston Churchill, then Minister of Munitions, as a result of which, the company director, Wilson Mappin, resigned from his post.

In 1919 Ralph Halkett succeeded the Managing Director Hanbury Thomas as General Manager, then as General Manager and Secretary from 1925 to 1940, then as Director and General Manager until 1945. From 1917, a long term decision was made to “change over from being primarily a gas maker to being predominantly a collector and re-distributor of gas” (Roberts 1979). This goal required the “collection, purification and re-distribution of coke oven gas, and... the gradual merger of small gas undertakings within an extended area” (Roberts 1979). The Sheffield Gas Grid as it became known was the means by which the large quantities of gas were collected from the various coking plants within the Gas Company’s collection zone. This plant was located at various sites throughout South Yorkshire and the gas was pumped at high pressure to Sheffield for purification and re-distribution.

By 1929 the contribution of coke oven produced gas to the total supply had been increased to 68 per cent, so about a third only of the gas supplied to customers was manufactured town gas (Roberts 1979, 35).

The Gas Company’s works were fortunate to escape the brunt of the damage from air raids during the Blitz. This was in part due to the Company’s control system which had been developed during the inter-war period and consisted of a fully equipped underground control room from which the Company could control the Grid System throughout the area of its authority. Direct lines allowed the various gasworks to be rapidly notified of any impending attacks. On 12 December 1940, the Neepsend and Grimesthorpe works were hit by bombs.

No direct hits were reported at Wincobank, but a high explosive bomb completely destroyed the central laboratory at Grimesthorpe and wrecked No.2 holder, the 1.5 million cu.ft. of gas burning out in a matter of seconds in a gigantic mountain of fire (Roberts 1979, 41).

The Gas Company passed into public ownership in 1949, following the Gas Act of 1948 which nationalised the UK gas industry.

3.2 Development of the Effingham Street Works

The Effingham Works was constructed following the Sheffield Gas Act of 1835 which authorised the Sheffield New Gas Company to raise £80,000 capital to establish a works and supply gas in competition Sheffield Gas Light Company (Roberts 1979).

The Sheffield Town Plan of 1849 (Fig 4) and the more detailed Ordnance Survey town plan of 1853 (not reproduced) show the early arrangement of the works which occupied roughly half of its later extent, being bound to the east by Roper Street which no longer exists although its southern entrance was retained as the site entrance. The early works had entrances to Effingham Street and Sussex Street and comprised a large gas house, separate coal shed, and a range of buildings including condensers which fronted onto Roper Street. The works had five small gasholders with a valve house or governor building located among the holders. The works was situated adjacent to the River Don which was channelled so that a wharf passed underneath Effingham Street and to the gasworks, allowing materials to be transported directly to the site. The Manchester, Sheffield and Lincolnshire Railway passed a short distance to the south of the site but had no sidings to the works.

To the east of Roper Street was the Sheaf Island Brewery and associated lands and buildings. The Sheaf Works, one of the largest of the Sheffield steel works, was located to the south of the gasworks, taking advantage of the railway and the Sheffield Canal. The Sheaf Works is shown as having at least one gasometer on the site. Other steelworks located in this area were the Don Steel Works, Imperial Steel Works, Vulcan Iron Works and Pond Hill Steel Works, all located on the opposite side of the river to the gasworks.

By 1890, following the passing of the Sheffield Gas Act, the Effingham Street Works had been considerably expanded. Bacon's Plan of c1885 (Fig 5) shows that this expansion was a staged one, requiring first the partial clearance of the Sheaf Island Brewery buildings and the construction of two new holders in their place. Roberts has suggested that one of the disused gasholders at Neepsend was sold to the contractor of the Effingham Street development and may have been relocated here. Bacon's Plan shows the earlier five gasholders still *in situ* at this date. The gasworks would need to be able to continue to function until the new holders were operational. Roper Street fell out use as a through road by this date and provided only access to the site.

By 1890 the rearrangement of the works had been completed and the old gasholders and buildings had been removed (Fig 6). In addition to the two gasholders on the eastern side of the site, a single large holder was built on the western side of site, likely having a storage capacity equivalent to both of the smaller holders combined. The old gasworks buildings were replaced by a large building which spanned between Effingham Street and Sussex Street. The former lime kilns adjacent to the Sussex Street were also removed and replaced by another large gasworks building.

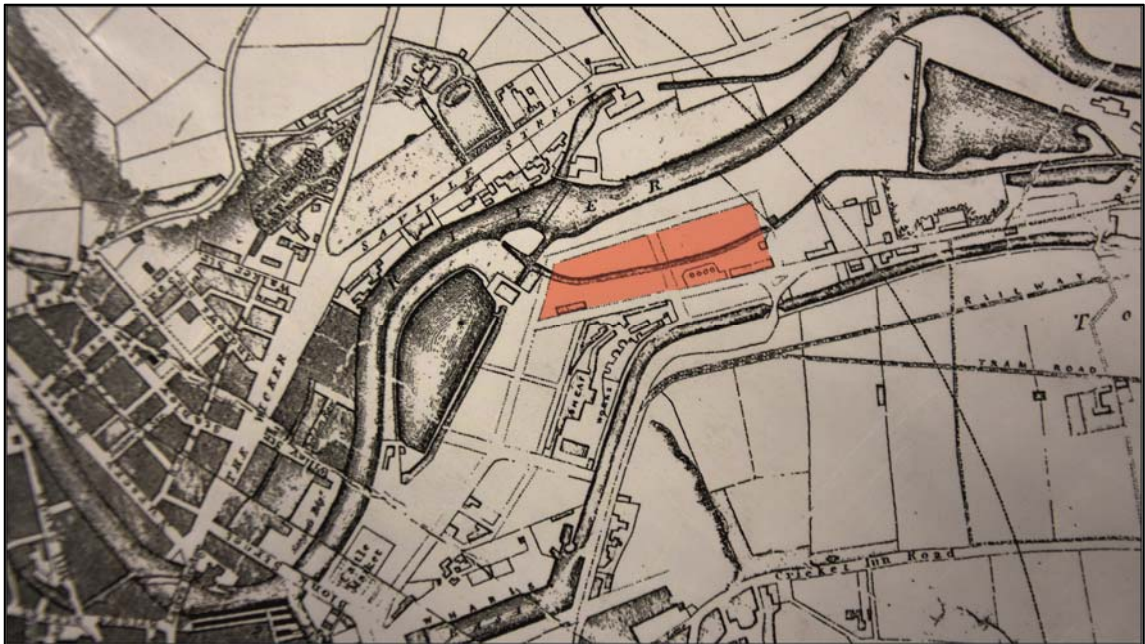
This general arrangement of the gasworks continued into the mid 20th century, though with some changes to the buildings and plant. Between the 1950s and 1960s the large gasworks buildings were replaced by a series of much smaller disconnected buildings. The new gasholder (now designated Gasholder 1), was constructed in 1963 replacing one of the earlier gasholders and being partly sited on the footprint of a former works building.

An explosion occurred at the gasworks on the 27th November 1930 during the lifting of a lid of one of the gas purifiers (Sheffield Daily Telegraph 1930). Six men were badly burnt during this incident. Another explosion occurred in October 1973.

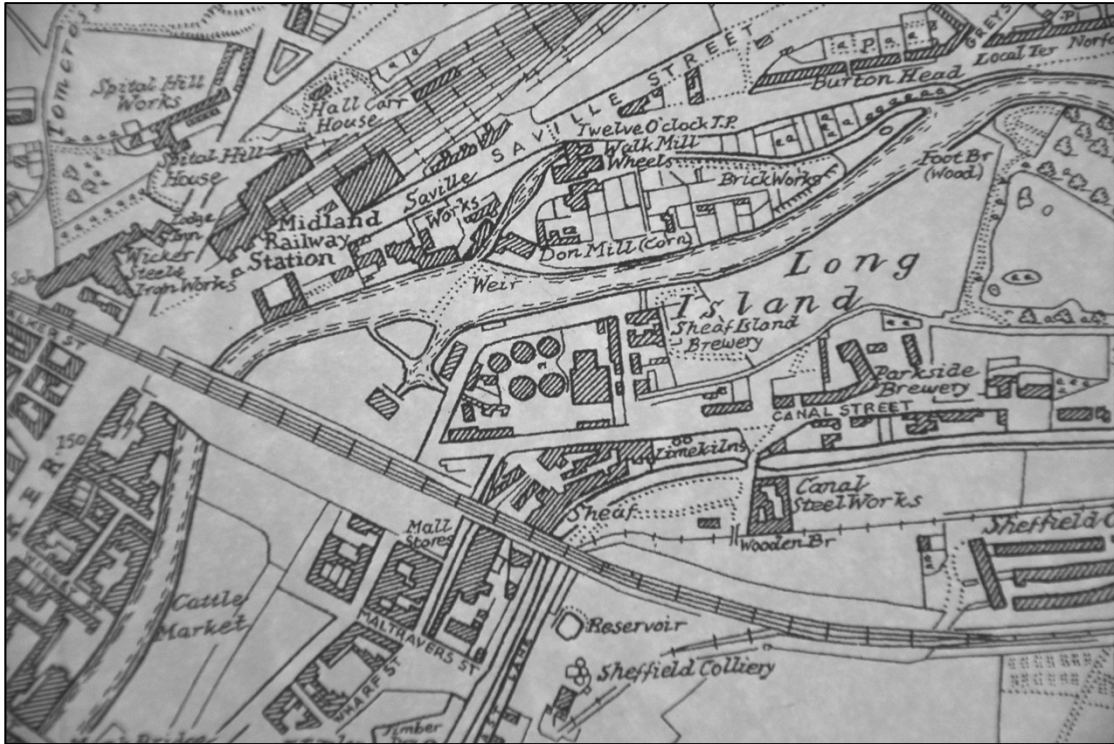
Although not shown on any maps, an underground tank was located outside of the main gasworks compound on a piece of land immediate to the north of the former Drill Works / Vulcan Inn, bound by the junction of Effingham Street and Effingham Road at the north and Sussex Road to the south. This tank was disused and filled with water and was in the process of being converted for diesel storage. Unfortunately the tank still contained some amount of petroleum flash distillate which ignited when workers used flame cutting equipment (Mullins 2008).

As well as the three main gasholders, there also smaller tanks on site, including a butane sphere and water tanks. The large western holder appears to have become disused by this time and by the late 1960s or early 1970s had been dismantled and the tank infilled. The other smaller holder located in the northeast corner of the site remained standing until around the mid 1980s by which time all remaining gasworks buildings had been cleared.

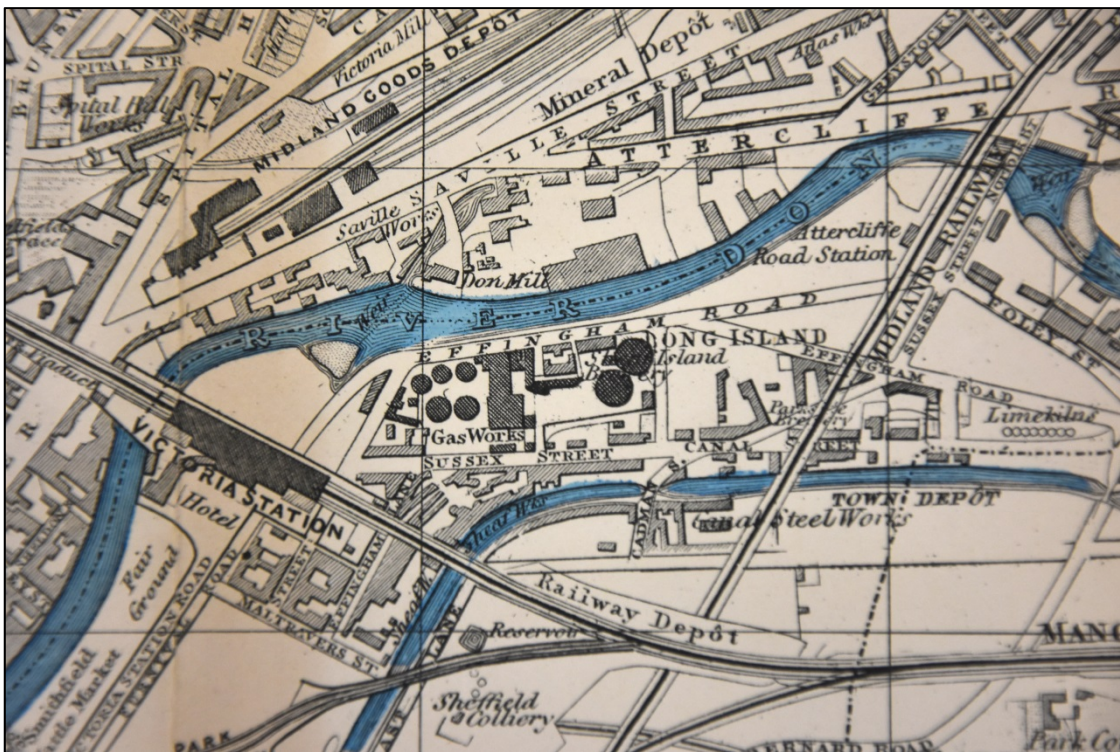
Following the discovery and exploitation of North Sea natural gas, town gas production was ceased and Effingham Street, in common with other gasworks across the UK, was converted to process and distribute natural gas. At Effingham Street the contractor for the installation of new gas plant was Humphreys & Glasgow Ltd who were commissioned on 1st December 1963 at an estimated cost of £2,000,000. The construction of the new Gasholder 1 was undertaken by C & W Walker in the same year (Appendix I).



Sheffield Town Map of 1837, showing the site prior to the construction of the gasworks Fig 3



Sheffield Town Plan of 1849, showing the early gasworks prior to expansion Fig 4

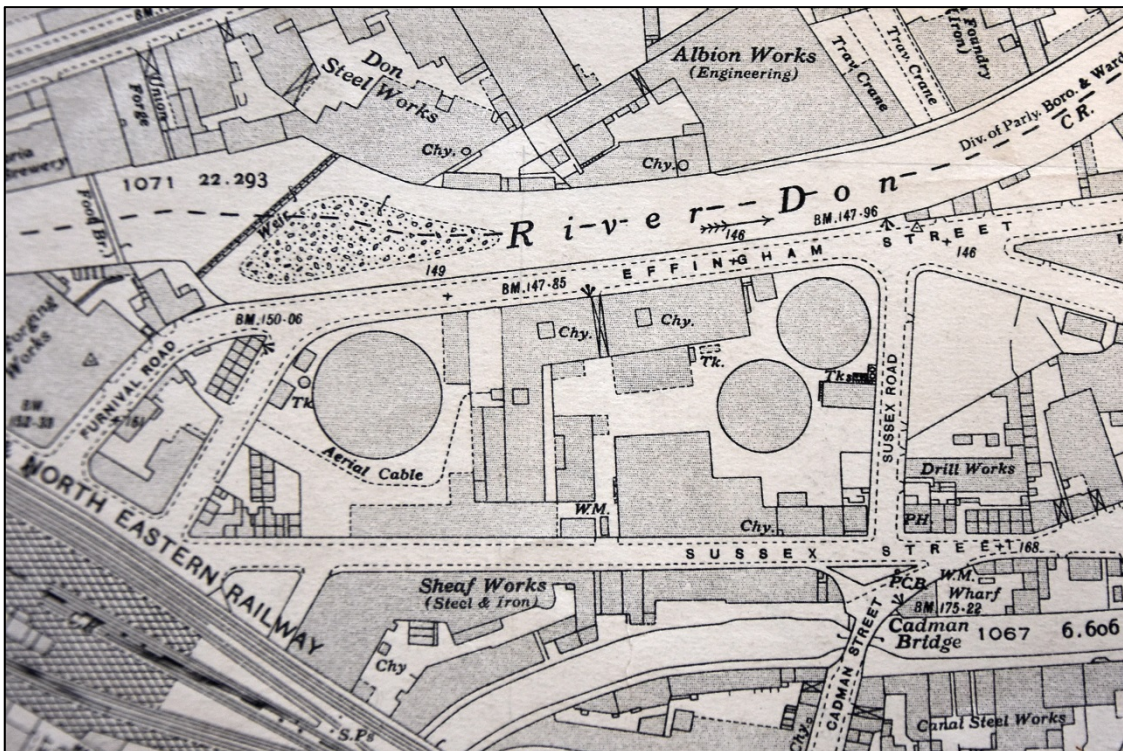


Bacon's Plan of 1885, showing the partial expansion and rearrangement of the works Fig 5

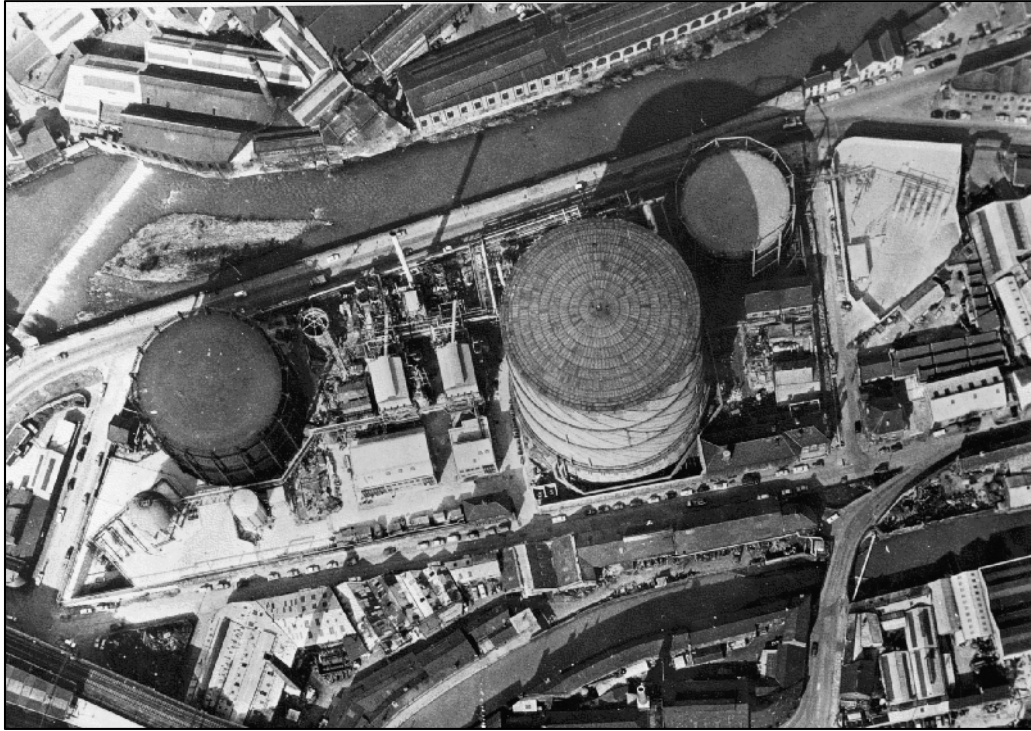
EFFINGHAM STREET, SHEFFIELD



First edition Ordnance Survey map of 1890, showing the completed gasworks Fig 6



Ordnance Survey map of 1935 Fig 7



Aerial view of the site, 1963-1975, showing Gasholder 1 and the two earlier holders (NGA ref XG0036) Fig 8



View of the gasworks, 1963-1975, looking north-east (NGA ref XG00914) Fig 9

4 HISTORIC BUILDING RECORDING

The recording area was focussed primarily on the gasholder and its immediate surroundings, the other plant and buildings of the former gasworks having been almost entirely cleared and redeveloped. The gasholder was located immediately adjacent to the site entrance from Sussex Street. The area of the former works was enclosed around its north-western side by mid to late 19th-century stone walls with more recent pre-cast concrete around the north and south-west. Stone walling was also present along the works boundary to Sussex Street where the blocked doorways and windows of the former gasworks buildings remained *in situ* in the stone work. The road level appears to have been raised as many of the windows which would formerly have acted as light wells are almost completely buried. This walling continued as an apparently single-phase span along the eastern site boundary to Sussex Road and around the corner of Effingham Street where it continued partway along the northern boundary.

A First World War memorial plaque was located adjacent to the site entrance.

The main part of the site was occupied by Cadent offices and carpark and storage areas. An active National Grid gas compound was located at the western extent of the former gasworks.

4.1 Gasholder 1

Gasholder 1 was a four-lift, spiral-guided holder with above-ground tank and a total storage capacity of approximately 148,900 cu m inclusive of the crown (5.25 million cu ft). It was constructed in 1963 by C & W Walker of Donnington, Shropshire, a company founded in 1837 and which manufactured gasholders and gas production plant, as well as other structural steelwork (Grace's Guide 2018). Much of the technical information and specific measurements below are sourced from the gasholder data sheet (Appendix I).

The static base tank stood at a height of c14m (46'6") and had a diameter of c61m (200'), occupying a footprint of 2922 sq m (0.29 hectares). The tank was formed of welded mild steel sheets arranged in ten courses, each course overlapping or being overlapped by those above and below, and with closely spaced 60mm (head) rivets at the edges. The welded joints of the sheets were strengthened by additional octagonal steel plates, c1.5 x 1.0m, which fully covered the seams and which attached via 50mm (head) rivets to matching plates on the inner face of the tank. The lowest course was 1.16m in height, the second 1.12m and the third 1.3m, this variation in coursing height being continued the full height of the tank. The two uppermost courses did not have strengthening plates and the sheet seams were riveted rather than welded.

The gasholder was built onto a c0.5m thick concrete platform which was visible around the west and north sides of the holder but due to the site topography was covered by mixed gravel elsewhere.

The upper part of the tank was encircled by 48 projecting brackets, these being formed of tapered steel plates with cross members. Each of the brackets was aligned with the outer roller carriages and as well as supporting the walkway; they provided an attachment point for the roller carriage supports which were affixed to the inner face of the tank.

The gasholder had four lifts as follows:

Table 1: Gasholder 1 lift dimensions

	Inner Lift	2nd lift	3rd lift	4th lift
Diameter	57.15m (187'6")	58.14m (190'9")	59.13m (194'0")	60.12m (197'3")
Depth	13.86m (45'6")	13.86m (45'6")	13.86m (45'6")	13.86m (45'6")
Number of carriages	24	24	36	48

The gasholder was given its distinctive striped paint scheme in 1993, having being approved by the Don Valley Development Corporation. The paint appears to have begun as a blue and white colour but later photographs of the gasholder available online show a yellow colour, likely the original colouration having been tarnished by the filming oil in the water.

The lifts had square cup and grips with a 12" x 3.5" channel, and were formed of 7/16" thick cup skirt plate, reinforced with 3" x 1/2" flat bead to cup and 3/8" thick dip skirt plates reinforced with 3" x 1/2" flat bead (see Appendix I). The depths between the cups and dips were 40mm on the inner cup, 50mm on the 2nd cup and 60mm on the 3rd cup.

Each lift had 48 vertical stays, these being affixed to the inside face of each lift. Those of the inner lift were 24" x 7 1/2" RSJs and those of the 2nd, 3rd and 4th lifts being 10" x 1 1/2" channels.

The tank and lifts were fitted with manholes which aligned when the gasholder was grounded, thus allowing access through the tank and lifts and into the gasholder.

The top of the tank was accessed via a main stair located at the south-west side of the tank. The stair was comprised of two rises with an intermediate landing supported on a freestanding stanchion and at the top connected to a bracketed attached to the tank walkway. The stair was fitted with safety railings and a cage at the bottom of the stair prevented unauthorised access.

Spiral stairs were fitted to each of the lifts, these moving with the lifts as the gasholder rose and fell. The stairs were inclined at 45° and comprised of side plates tied together by the stairs and supported over stanchions set at the end and middle of each stair. The stanchions in turn were formed of steel bars, between which were set steel plates with circular cutaways. The stanchions were braced to each other by pairs of diagonal and horizontal bars. Short spiral rails were attached to the inside of each stair and connected to outward facing roller carriages. In order to provide an even weight distribution which was essential for the correct rotation of the lifts, counterbalance weights were fitted on each lift diametrically opposite to each stair.

The lifts rotated in a clockwise direction via 60lb flat bottom section spiral guide rails riveted to 3/8" rail plates. The roller carriages were cast steel C and W Walker fixed-centre type dual rollers, and each was bolted onto compact steel footings and bracketed to the base tank and lifts. Those of the outer lift also connected to the external brackets. The outer rollers and those on the lifts were of the same design but with more compact footings on the lifts grips.

The gasholder utilised a steam antifreeze system and lagged pipes encircled the gasholder base around most of its perimeter, held c1.0m from the ground by steel brackets and rising in several places to the lifts. The pylons were of the pyramidal type and were formed of lengths of welded steel-plate open-fronted boxes with regular horizontal bars across the open face. Lagged antifreeze pipes were secured

to the side of each pylon and from there were connected via flexible pipes to the bottom of the adjacent pylon where manually operated valves were located. An electrical alarm or switch was fixed to each pylon.

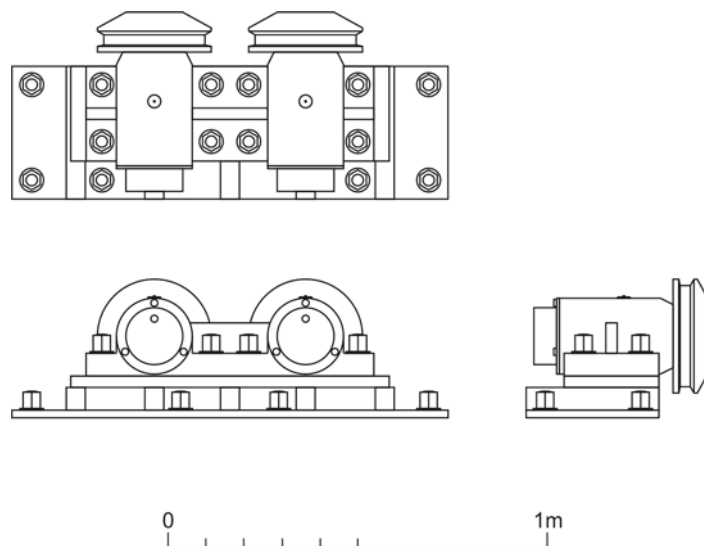
The top of the tank was encircled by a walkway or balcony which projected outwards and carried over the external brackets. The inner side of the walkway projected a short distance over the space between the tank and outer lift as a safety precaution. The walkway was formed of steel plates with a textured non-slip surface and was fully enclosed by steel safety rails. The cardinal compass points were stencilled in yellow paint to the walkway surface.

At the north-east side of the gasholder was a 36" common inlet and outlet pipe which connected to a Donkin 674 automatic holder valve. The pipe rose from the valve to the top of the tank and descended again to a syphon pit; this steep bend providing protection against flooding of the system.

At the south-west side of the holder were 48" and 36" inlet and outlet pipes which had been blanked prior to this survey. A large covered syphon pit was located close to the main stair and the truncated pipes could be seen below the safety cover.

The crown appeared to be in fairly good condition though displaying a slight undulation in the surface and flaking of the paintwork. The sheeting was welded rather than riveted, with bolts marking the positions of the underlying rafters. The data sheet provides details of the crown frame as follows. The outer row of crown sheeting, or top curb, was 7/8" thick, this thickness diminishing toward the centre of the crown. The curb was supported by 18" x 12" x 7/8" steel angles and 6" x 7/8" flat plates. To these were connected the 24 main rafters, 8" x 5" RSJ upper booms and 5" x 9/16" lower booms. These were supplemented by 24 secondary rafters, these being 24" x 3" channels. There were four rings of channel purlins. The rafters radiated from a central 30" welded plate king post, 12.6m (41'4") in height. The crown had four oval manholes and two gas valves at the outer edge as well as one at the centre.

The gasholder retained a range of trips, switches, alarms and telemetry around the walkway. Other equipment identified were an oil application pipe installed at the west side of the holder.



Detail of the outer roller carriages (1:20) Fig 10

5 DISCUSSION

Gasholder 1 was a late example of spiral-guided gasholders, the first of which was constructed in 1890 in Northwich, Cheshire by Clayton Son & Co of Leeds. The design was first proposed by Mr William Gadd and presented Mr W. H. Webber of London at a meeting of the Gas Institute in Glasgow in 1887 (Newbigging 1888). Spiral holders were generally of two varieties, having either above or below-ground tanks, though partially buried examples have been recorded, one at Wincobank, Sheffield (Bassir 2016a). Those with below-ground tanks are often found replacing earlier column-guided gasholders and utilise the existing tanks, while above-ground tanks are generally new-builds.

The gasholder was typical of above-ground spiral-guided gasholders of the mid-late 20th century. Comparable examples recorded locally include Gasholder 1 at Wincobank (1938) and Gasholder 6 at Neepsend (c1950) with which that at Effingham Street shares many similarities (Bassir 2016b). Among the more obvious differences in the gasholders is the external vertical framing which supports the tank walkway and outer roller carriages. At Neepsend and Wincobank these supports comprise full-height pilasters which span from the ground to the top of the tank. At Effingham Street these supports only span the top three courses of the tank. Other spiral-guided holders are an intermediate between the two. Another noticeable difference between the gasholders is the variety of roller carriage and spiral stair designs which vary according to the manufacturer of each gasholder.

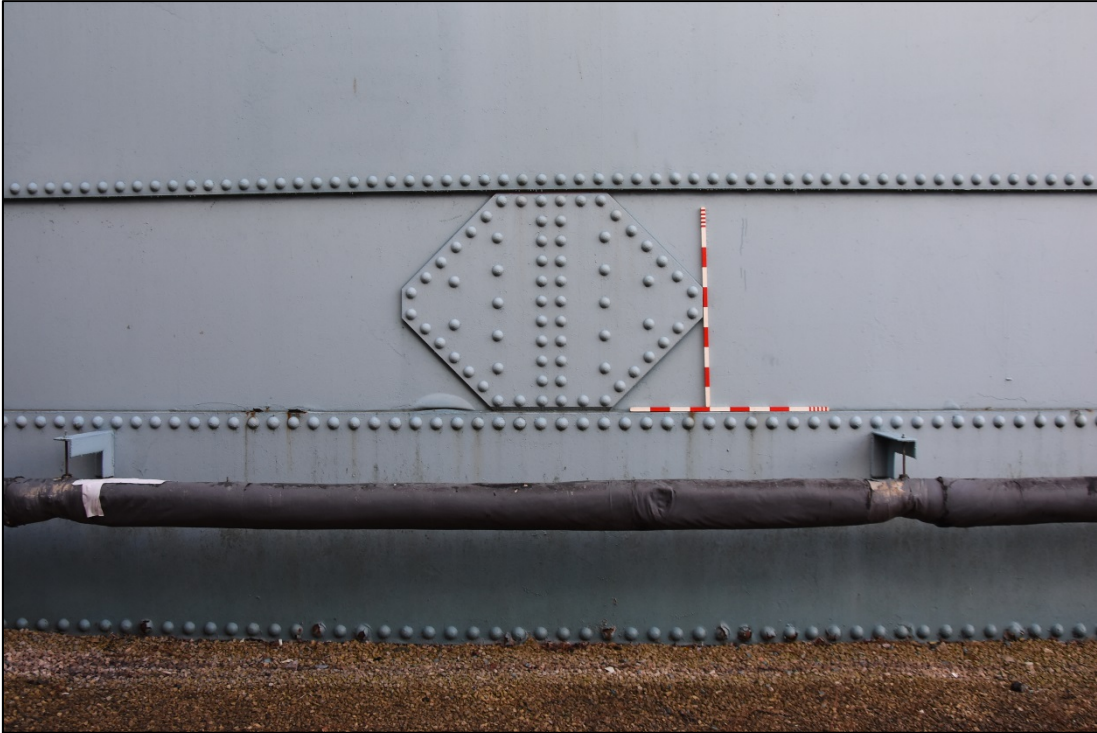
Effingham Street is not included in the 151 sites covered in the *Step 3 Report for Monuments Protection Programme* (Trueman 2002). The other formal survey of gas sites, *The London Gasholder Survey*, focusses primarily on the classification and typology of column and frame-guided gasholders (Tucker 2000).



General view of the gasholder, looking south-west Fig 11



General view of the gasholder, looking south-east Fig 12



Detail of the tank fabrication Fig 13



Detail of brackets carrying lagged pipes Fig 14



The concrete base exposed at the north-west side of the gasholder Fig 15



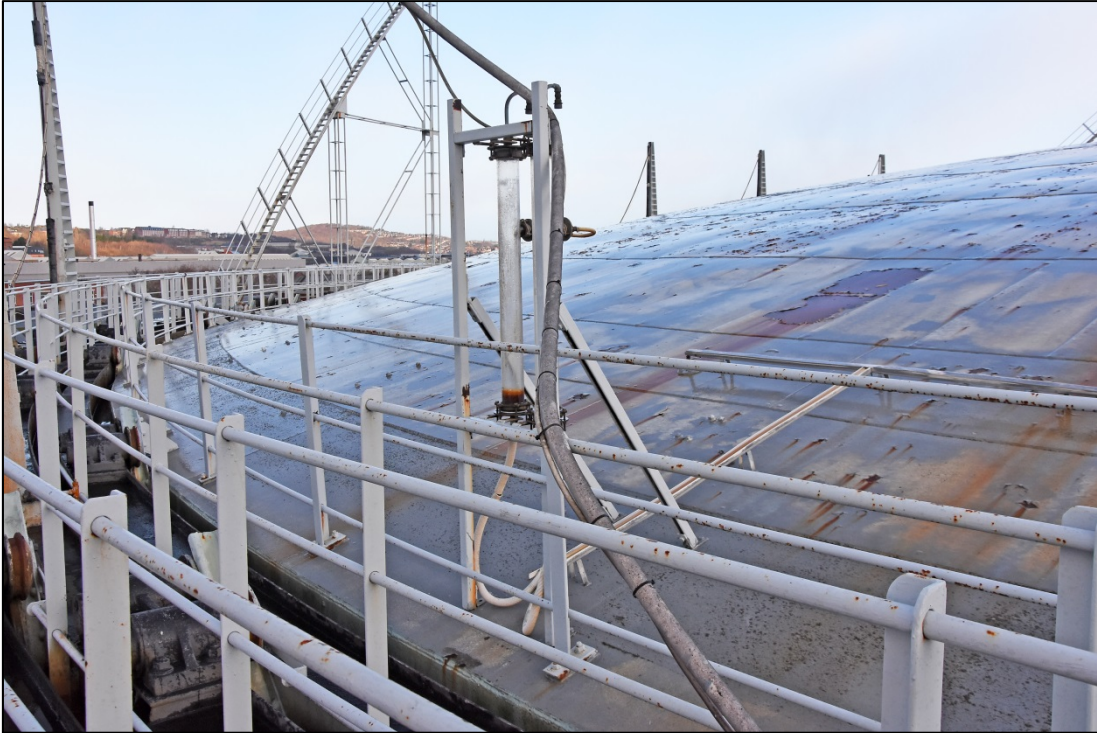
The external brackets supporting the tank walkway Fig 16



The main stair located at the south-west side of the gasholder Fig 17



General view of the tank walkway and crown, looking north from the main stair landing Fig 18



The top curb and outer crown sheeting, also showing railing and unknown pipework (oil application pipe?) Fig 19



General view of the crown, looking east Fig 20



Gas valve and manhole at the south side of the crown Fig 21



Detail of manhole in the crown Fig 22



Stencilled N (North) located on the walkway at the north side of the gasholder
Fig 23



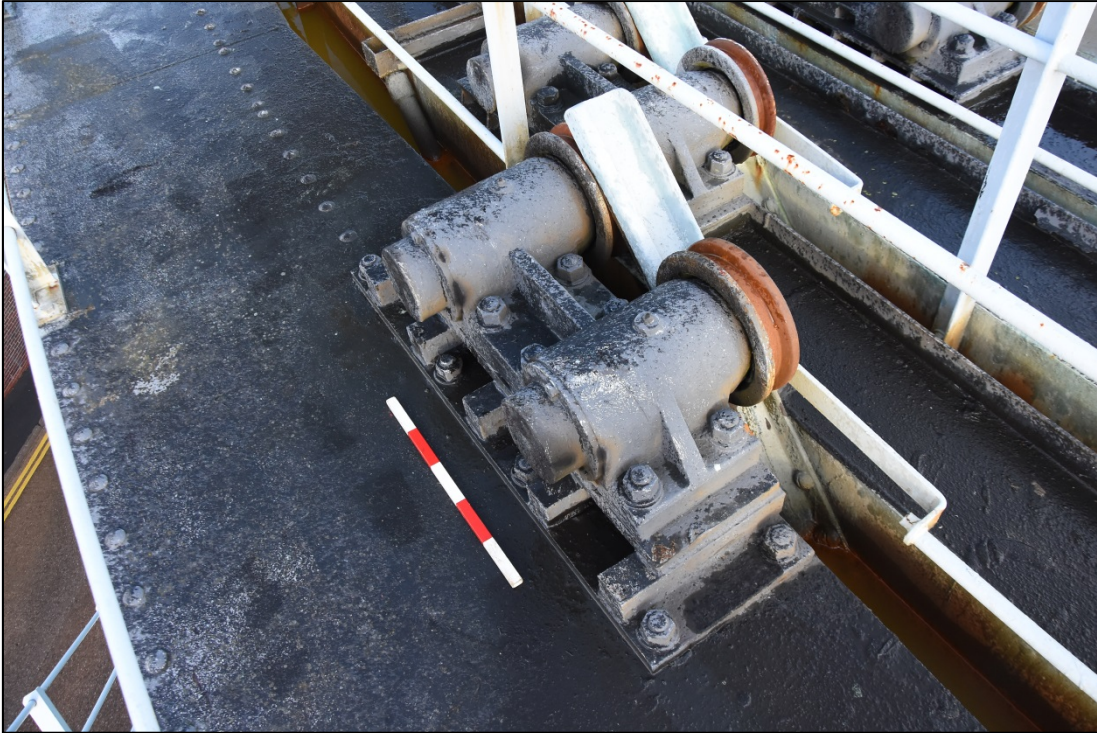
Antifreeze pylons at the south-west site of the gasholder Fig 24



Example of the spiral stairs Fig 25



Detail of spiral stair base and roller carriage Fig 26



Example of the outer roller carriages Fig 27



The arrangement of roller carriages, also showing manual valve controls on an antifreeze pylon Fig 28



Detail of the lift grips with valved pipes protruding through (recent additions?)
Fig 29



Detail of trip / alarm Fig 30



The common inlet and outlet pipes at the north-east side of the gasholder Fig 31



Detail of Donkin flow valve Fig 32



The sump pit over the blanked inlet and outlet pipes at the south-west side of the gasholder Fig 33



First World War memorial plaque located adjacent to the site entrance Fig 34



General view of the wall to Sussex Street, showing blocked doors and windows at two levels Fig 35

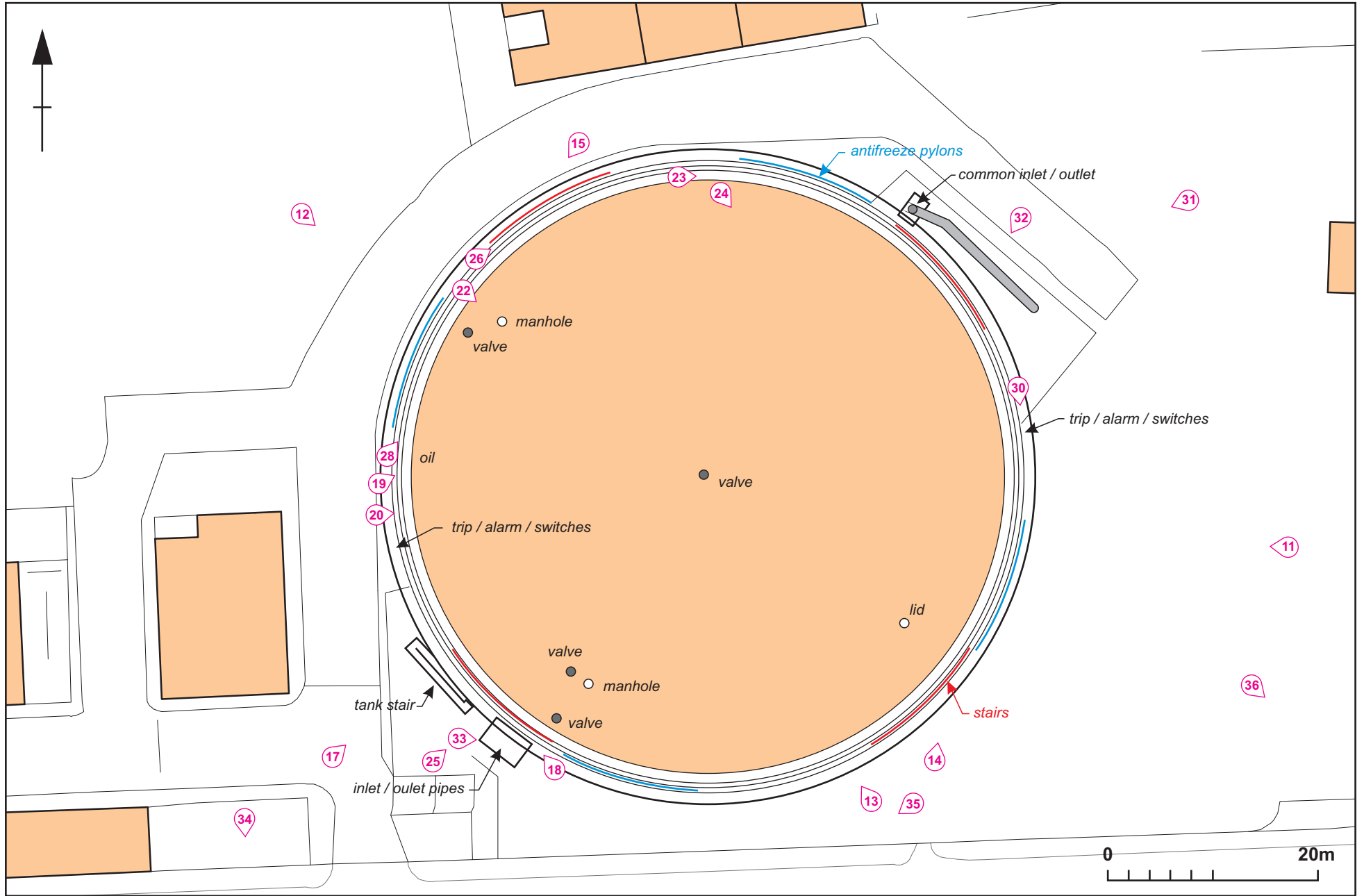


General view of the wall at the corner of Sussex Street and Sussex Road Fig 36

Scale 1:500 (A4)

Plan of the site, showing photograph locations

Fig 37



BIBLIOGRAPHY

Bassir, A, 2016a *Historic Building Recording of Gasholders at the former Wincobank Gasworks, Barrow Road, Sheffield, October 2015-March 2016*, Museum of London Archaeology report, **16/52**

Bassir, A, 2016b *Historic Building Recording of Gasholder No.6 at the former Neepsend Gasworks, Neepsend Lane, Sheffield October 2015-March 2016*, Museum of London Archaeology report, **16/54**

Binfield, C, Childs, R, Harper, R, Hey, D, Martin, D, Tweedale, G, 1993 *The History of the City of Sheffield 1843-1993*, Sheffield Academic Press

CIfA 2015 *Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings and Structures*, Chartered Institute for Archaeologists

Grace's Guide 2018 C. and W. Walker, available online at <https://www.gracesguide.co.uk/C. and W. Walker> , accessed 18/01/2018

HE 2016 *Understanding Historic Buildings: A Guide to Good Recording Practise*, Historic England

ME 2017 94. *Effingham Street Gas Works, Sheffield S4, National Grid – National Sites Heritage Review*, Montagu Evans

Mullins, E, 2008 *25 October 1973 – Major Incident, Effingham Street Gas Explosion*, The History of Sheffield Fire Brigade, available online at <http://www.sfbhistory.org.uk/Pages/SubPages/News1967.html>, accessed 19/01/2018

Newbigging, T, 1888, Gas-holders Without Upper Guide-Framing, *The Engineer*, Sept 14 1888, **216**

Roberts, D, E, 1979 *The Sheffield Gas Undertaking 1818-1949*, British Gas PLC (East Midlands)

Sheffield Daily Telegraph, Friday November 28 1930 *Six Men Injured in Gas Explosion*, available online at <https://www.britishnewspaperarchive.co.uk/> [accessed 19/01/2018]

Tucker, M, 2000 *London Gasholders Survey, The Development of the Gasholder in London in the Later Nineteenth Century, Part A General*, English Heritage

Trueman, M, 2002 *Gas Industry Step 3 Report for Monuments Protection Programme*, English Heritage

Williams, T, I, 1981 *A History of the British Gas Industry*, Oxford University Press

MOLA
January 2018

Appendix I – Gasholder data sheet

GASHOLDER DATA - SECTION D

DATA TAKEN STRAIGHT FROM EXISTING MANUAL

Location: Effingham St. No. 1

General: 4 lift spiral guided – above ground tank

Lift Construction: All welded mild steel construction

Tank Construction: All welded mild steel construction.

Construction Date: 1963

Constructed By: C & W Walker Ltd.

1. DIMENSIONS

	Inner Lift	2 nd Lift	3 rd Lift	4 th Lift	Tank
Diameter	187'6"	190'9"	194'0"	197'3"	200'0"
Depth (overall)	45'6"	45'6"	45'6"	45'6"	46'6"
No. Guide Rails	24	24	36	48	N/A
No. Guide Carriages.	N/A	24	24	36	48
Lift Rotation	CW	CW	CW	CW	N/A
Lift Pressures	9.0"wg 22mbar	12.7"wg 32mbar	15.8"wg 40mbar	18.56"wg 46mbar	N/A
Crown rise.	13'6"	N/A	N/A	N/A	N/A

2 STRUCTURAL DETAILS

a) CROWN FRAME

Top Curb:- 18" x 12" x 7/8" angle (plate fabrication) and 6" x 7/8" flat.

Main rafters:- 24 @ 8" x 5" x 28lb RSJ upper boom, 5" x 9/16" flat lower boom with tubular struts.

Secondary rafters:- 24 @ 8" x 3" x 15.96lb channels with tubular struts and flat ties to main trusses.

Main tension bars:- Each formed of two 4" x 1/2" flats supported with 5/8" dia slings.

Purlins:-
1 @ 6" x 3" x 14.49lb channel outer ring.
15 @ 5" x 2.1/2" x 10.22lb channel intermediate rings.
1 @ 6" x 3" x 14.49lb channel inner ring
1 @ 9" x 3.1/2" x 25.63lb channel secondary support

ring.
 Lateral (wind) bracing :- 8 sets (each 2 bays) diagonal bracing formed from
 :- 3" x 3" x 5/16" angles
 King post:- 30" dia welded plate – 41' -4" long overall

b) CROWN SHEETING:

i) Curb (outer) Row	7/8" thick
ii) 2nd Row	1/2" thick
iii) 3rd row	5/16" thick
iv) Centre plate	3/8" thick
v) Intermediate rows	3/16" thick

c) LIFT FRAME

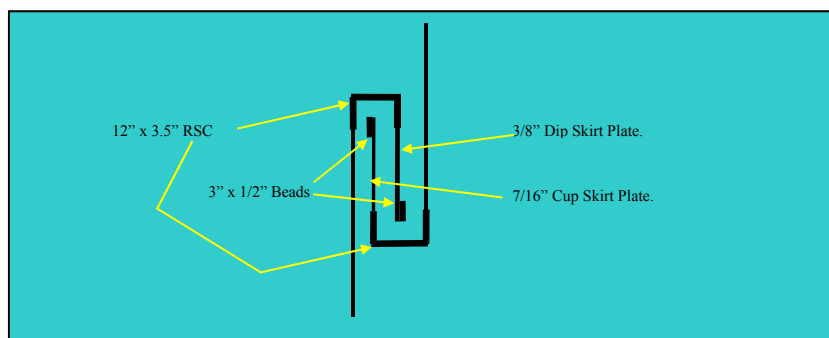
Inner lift vertical stays – 48 @ 24" x 7.1/2" x 95lb RSJ's
 2nd lift vertical stays – 48 @ 10" x 3.1/2" x 28.54lb channels
 3rd lift vertical stays – 48 @ 10" x 3.1/2" x 28.54lb channels
 4th lift vertical stays – 48 @ 10" x 3.1/2" x 28.54lb channels

d) LIFT SHEETING:

Inner lift	top row	3/4" thick
	Bottom row	3/8" thick
	Intermediate rows	3/16" thick
(All other lifts)	Top row	3/8" thick
	Bottom Row (Curb Row)	3/8" thick
	Adj bottom row	3/16" thick
	<i>Intermediate rows</i>	<i>9SWG</i>

e) CUPS AND DIPS

Fabricated from 12" x 3 1/2" x 30.45lb RSC with 7/16" thick cup skirt plate reinforced with 3" x 1/2" flat bead to cup and 3/8" thick dip skirt plate reinforced with 3" x 1/2" flat bead. (See diagram).



Outer lift bottom curb – 2 rings 8" x 3" x 18.68lb channels

f) GUIDE RAILS (all lifts)

60lb/yard flat bottom section riveted to 3/8" thick rail plates.

g) SPIRAL STAIRCASES

These are fitted to tank balcony, 4th, 3rd and 2nd lift dips. All inclined at 45° and shaped to lift circumference and have passing platforms. Counterbalance weights are fitted on each lift diametrically opposite the staircase. There is a static staircase with intermediate rest platform between ground level and the tank balcony.

h) MANHOLES

4 oval manholes are fitted to the crown and there are other manholes fitted to the tank and lift sides which line up when lifts are grounded.

i) INLET/OUTLET CONNECTIONS (WITHIN TANK)

1 @ 48" and 1 @ 36" at WSW (both blanked off)

1 @ 36" at ENE which is a common inlet/outlet main external to the holder between the Donkin 678 automatic holder valve which rises above the tank balcony to provide anti-flood protection to the downstream system.

3 CAPACITIES

a) Gas

Nominal 5,00,000 scf (141,600m³) Grounding to Blowing

Calculated 5,072,000 scf (143,600m³) **Excluding crown volume**

Crown Volume 187,690 scf (5300m³)

Max Useable Stock (Winter): 4.218 x 10⁶ scf (120,000m³) (Subject to hydrostatic switch settings - see holder control calibration sheet)

Water (tank only): Approx 9,017,627 imperial gallons if absolutely full (40,994,130 litres). As the overflow is below balcony level then the more realistic figure of 8,952,936 imperial gallons should be used.

4. GENERAL INFORMATION

- a) All external surfaces (crown, lifts and tank) painted to T/SP/PA10 Painting Standards.
Finished colour – Major Surfaces – BS4800.14.C.39
Handrails and Standards – BS4800.10.E.53
Stairtreads and walkways – Black M.1.0
Cup and tank wind and water lines treated with non-drying grease paint

- b) Gasholder internally oil filmed to minimise vapour pick-up. Oil application pipe located at tank balcony level near to top of ground to balcony staircase.

NB TO a) AND b) ABOVE :

Oil applied internally affects external painted surfaces during holder operation. To minimize contamination it is essential that oil is periodically returned from the annular surface of the tanks to the inside of the holder.

It is also essential that all external surfaces are decontaminated before repainting is undertaken.

c) Tank water pH value maintained at above 6 to reduce effect of rust staining on painted surfaces. This is achieved by periodic application of caustic soda solution as necessary. Prior to painting projects the pH must be raised to 9 at minimum of 6 months prior to the painting commencing and not be dosed again for at least 6 months following painting.

d) Water seals (inner, 2nd, 3rd and 4th lift cups) overflow externally. Oil skimmers, ducts and plastic down pipes are fitted to the 2nd, 3rd and 4th lifts to transfer water and migrating oil into tank.

e) Extension plates fitted to inner edge of 2nd, 3rd and 4th lift dips. Tank balcony plates are shaped to partially cover the annular water space between tank and outer lift. This was done to prevent people falling into the tank.

f) No special arrangements for crown drainage.

g) Tank overflow –6" dia. set at 10" below tank top curb. Discharges via connecting pipework into foul sewer through interceptor vessel. Quality and quantity of discharge is subject to condition of 'Consent to Discharge' issued by the Environment Agency. The consent is held in Asset Safety and Environment section.

Sampling facilities to monitor condition of discharge are provided for use by the Environment Agency and National Grid.

h) Carriages are all G and W Walker fixed centre type with 2 cast steel rollers.

i) Tank and lift plates laid horizontally.

j) All lifts rise in clockwise direction. This is important where considering replacement of hydrostatic oil tubes or antifreeze pipework.

k) Inlet/outlet main external valve pit is self-draining.

Second main (now abandoned and blanked) valve pit drainage is achieved by submersible pump with automatic float switch stop start as necessary. Float switch in valve pit. Pump starter incorporated in site main control panel.

l) The castle depths (the clearance between the bottom of the cup and the bottom of the dip plate) on this holder is as follows: 40 mm on the Inner Cup, 50mm on the 2nd Cup, 60mm on the 3rd Cup.

NOTE:-

Structural details, where given, are taken from the East Midlands Region records originally retained as the "General register" referred to in Section 39 of the Factories Act 1961 and which remained in force under the Health and Safety at Work etc. Act 1974 and no doubt still remain in force. (See Legislation Section of IGE/SR4).

5. APPROXIMATE SHEETING AREAS:-

CROWN –	3 300 sq. yards. (2759 Sq.m)
INNER LIFT SIDE -	2 814 sq. yards. (2353 Sq.m)
2 ND LIFT SIDE -	2 865 sq. yards. (2395 Sq.m)
3 RD LIFT SIDE -	2 912 sq. yards. (2435 Sq.m)
4 th LIFT SIDE -	2 755 sq. yards. (2303 Sq.m)
TANK SIDE -	3 246 sq. yards. (2714 Sq.m)

The above areas are approximate and do not include:

- a) Handrails and Supports.
- b) Staircase Structures.
- c) Antifreeze Pylon.
- d) Walkway Surfaces.
- e) Carriages.
- f) Inlet/Outlet Main.
- g) Lower 6'-0" (approx 1.83m) of outer lift which remains under water to avoid blowing.

6. HISTORICAL NOTES

The striped paint effect and colour of this particular holder was agreed with the Don Valley Development Corporation in approximately 1993. They made a substantial contribution to the cost and maintenance the following year. Future painting schemes should verify that this body has no influence on the colour and effect of future painting schemes.



MOLA Northampton
Kent House
30 Billing Road
Northampton
NN1 5DQ
01604 809800
www.mola.org.uk
sparry@mola.org.uk