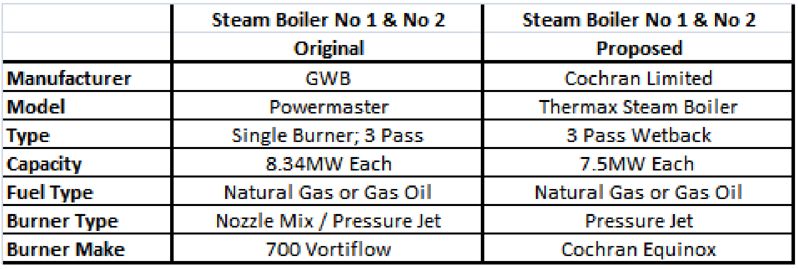
NOTIFICATION TITLE Proposed Replacement of Steam Boiler No 1 and Steam Boiler No 2 at Coatings II Complex
INSTALLATION NAME Shotton Works
PERMIT NUMBER Permit BR7321
AUTHOR Shaun McKenna
DATE 08/05/2014

1.0 BACKGROUND / PROCESS DESCRIPTION

It is proposed to replace two existing GWB Powermaster steam boilers, each having a capacity of 8.34MW, located within the Coatings II Boiler House with two brand new Cochran Thermax 10210 boilers each having a capacity of 7.5MW.

Each boiler will be fitted with an economiser sized to provide a nett efficiency of up to 93.5%. The selected boiler make and model is listed on the Energy Technology List. The selected burners are dual fuel, capable of efficient combustion and low NOx emissions throughout the firing range and fitted with O2 trim. The manufacturer guarantees that the boilers comply in every respect with the requirements of the Clean Air Act. It is important to note that whilst the burners have a dual fuel capability there are no short term plans to utilise fuel oil.

Manufacturer datasheets for both the boiler and the associated burner are provided within **Appendix 1** to this notification document. Specifications for both the new and existing boilers and burners have been summarised in **Table 1**.



	Steam Boiler No 1 & No 2 Original	Steam Boiler No 1 & No 2 Proposed
Manufacturer	GWB	Cochran Limited
Model	Powermaster	Thermax Steam Boiler
Type	Single Burner; 3 Pass	3 Pass Wetback
Capacity	8.34MW Each	7.5MW Each
Fuel Type	Natural Gas or Gas Oil	Natural Gas or Gas Oil
Burner Type	Nozzle Mix / Pressure Jet	Pressure Jet
Burner Make	700 Vortiflow	Cochran Equinox

Table 1: A comparison of original and proposed boiler specifications

The new boilers will be connected to existing utilities and site infrastructure as per the current system.

Combustion gases from each boiler will continue to be discharged to atmosphere from dedicated 27.5m chimney stacks, listed in the existing environmental permit as emissions points A5 and A6. The existing stacks have an internal diameter of 762mm. A schematic of the existing chimney stack is included within **Appendix 2** to this notification. It is proposed to fit a cone to the end of each stack to reduce the cross sectional area of the stack to 660mm to achieve calculated flue gas efflux velocities of 9.9m/s (natural gas) and 12.77m/s (gas oil) as required by the Clean Air Act 1993.

The replacement works are scheduled to be completed by July/August 2014.

2.0 ENVIRONMENTAL IMPACT

The proposed changes will have a positive environmental impact i.e. a reduction in both fuel usage and mass release of pollutants to air from the Shotton installation brought about by; 1) a more energy efficient steam raising boiler with integral economiser and 2) low NOX burners with variable speed forced draft motors and oxygen trim.

The manufacturer has indicated NOX concentrations of 132mg/Nm3 and 195mg/Nm3 for natural gas and fuel oil respectively. These concentrations satisfy both the current permit conditions and BAT requirements. **Table 2** provides a comparison of limit concentrations.

		Manufacturer Data		Permit BR7321		Best Practice (BAT)*	
		EQUINOX (NG)	EQUINOX (OIL)	LIQUID FUELS	NAT GAS	LIQUID FUELS	NAT GAS
SO2	mg/nm3			N/A	N/A		35
NO2	mg/nm3	132	195	300	450	200	140
CO	mg/nm3	<20	<20	N/A	N/A	150	100
Particulates	mg/nm3			N/A	50	100	5

Table 2: A comparison of typical air emissions from the new burners in comparison with existing limit values (*Process Guidance Note 1/03 (12); Statutory Guidance for Boilers and Furnaces 20-50MW thermal input.)

3.0 MANAGEMENT SYSTEMS

A comprehensive operating and maintenance manual will be provided with the new boiler. This will be utilised to develop procedures for inclusion within the installations Integrated Management System which is accredited to ISO14001, ISO9001 and ISO18001. During commissioning the Cochran Engineer will instruct boiler house personnel in the safe operation of the plant.

Air emission monitoring will be undertaken upon commissioning of the boiler plant as per the requirements of the existing permit.

APPENDIX 1 – MANUFACTURERS DATASHEETS

COCHRAN

Thermax Package Steam Boiler

ENERGY SOLUTIONS WORLDWIDE

For larger applications the Cochran Ltd Thermax range offers the right combination of performance and integrity for steam users world-wide. The Thermax 3 pass wetback design is compliant with European specifications in outputs of up to 21.2 tonnes on a single furnace. Cochran Thermaxes can be found in distilleries, chemical plants, hospitals, CHP and a host of other applications requiring reliable and flexible steam production. The Thermax range comes with a wide range of combustion and control packages, superheater and economiser options.

Ratings (F&A 100ßC):

From 5000 kg/hr to 21200 kg/hr

(11023 lb/hr to 46738 lb/hr)

(3134 kW to 13289 kW)

Standard Working Pressures:

10.34 BAR and 17.2 BAR

(DESIGNS AVAILABLE UP TO 25 BAR)

Design concept:

- 3- pass conventional wetback
- Manufactured to B.S. 2790 (or equivalent international standards i.e. EN 12953, PD 2790). Products are normally CE marked
- Robust design and construction for long life
- Total package incorporates combustion equipment, feed water pump and controls, control panel, all necessary valves and fittings

Quality:

- Procedures are third party audited to ISO 9001; boilers are third party inspected before dispatch

Efficiencies:

- Typical 88% nett (80% gross) gas firing*
- Typical 89% nett (83% gross) oil firing*

* Efficiencies based upon
N.C.V. of 34828 kJ/m^3 (gas)
N.C.V. of 35863 kJ/l (oil)

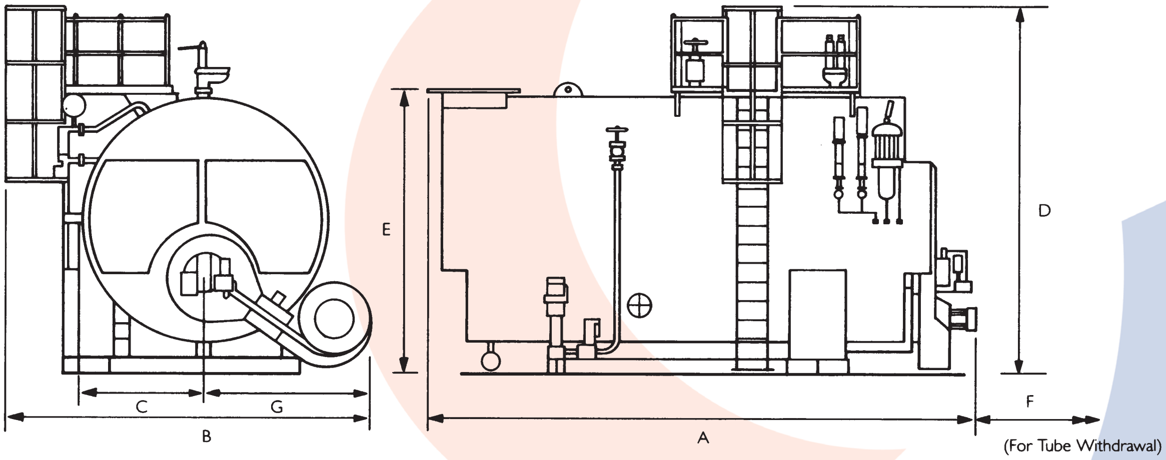
Full range of support services available including:

- Turnkey boilerhouse supply
- Installation and project management
- International commissioning & maintenance service
- Full spares support

COCHRAN : A LIFETIME SOLUTION

REF NO. COC / 1211 / 004

Cochran Thermax Package Steam Boiler



Contact us for details of sizes above 16,000 kg/hr

Evaporation		**kW**	3134	3510	3761	3949	4263	4551	4833	5121	5404	5686	6400	7109	8532	9955
F.&A. 100ßC(212ßF)		**kg/h**	5000	5600	6000	6300	6800	7260	7710	8170	8620	9070	10210	11340	13610	15880
		lb/h	11023	12345	13227	13888	14991	16005	16997	18011	19003	19995	22509	25000	30005	35009
Dimensions	**A**	**mm**	5497	5591	5731	5756	5856	5941	6088	6167	6223	6328	6854	6980	7414	7795
	B	**mm**	3915	4235	4245	4255	4292	4407	4317	4347	4398	4403	4755	4809	4980	5062
	C	**mm**	1206	1236	1246	1256	1297	1337	1337	1352	1398	1403	1485	1540	1652	1728
	D	**mm**	3844	3904	3924	3945	4027	4107	4107	4137	4230	4202	4506	4516	4740	4892
	E	**mm**	2755	2815	2835	2855	2938	3018	3018	3048	3141	3151	3417	3427	3651	3803
	F	**mm**	2993	3054	3194	3234	3284	3358	3494	3563	3604	3756	3639	3789	4149	4499
	G	**mm**	1631	1921	1921	1921	1917	1917	1917	1917	1922	1922	1922	2190	2250	2275
Minimum Transport Width		**mm**	3006	2799	2819	2840	2921	3001	2986	3031	3123	3133	3300	3409	3632	3766
Minimum Transport Height		**mm**	2865	2925	2945	2965	3048	3158	3158	3188	3331	3291	3457	3617	3841	3993
Recommended Chimney Dia		**mm**	455	510	510	535	560	560	600	610	635	635	660	710	815	865
Safety Valve Exhaust Dia.		**mm**	80	80	80	80	80	80	100	100	100	100	100	100	125	125
Steam stop Valve Dia.		**mm**	125	125	125	125	125	150	150	150	150	150	200	200	200	200
Blow Down Valve Dia.		**mm**	32	50	50	50	50	50	50	50	50	50	50	50	50	50
Feed Pump Inlet Dia		**mm**	32	32	40	40	40	40	40	40	50	40	65	65	65	65
Boiler Weight-Empty		**Tonne**	14.2	16.0	16.7	17.1	18.1	18.8	19.5	19.9	21.2	22.2	26.4	28.7	32.0	36.1
Boiler Weight-To N.W.L.		**Tonne**	23.3	25.5	26.5	27.1	29.0	30.8	31.5	32.3	34.8	36.0	42.8	46.0	54.8	61.8
Boiler Weight-Full of Water		**Tonne**	25.1	27.5	28.5	29.2	31.3	33.3	34.0	35.0	37.7	39.0	46.3	49.9	59.7	67.6
Fuel Consumption (Oil)		**l/h**	351.1	392.4	421.3	442.7	477.2	509.1	541.5	572.6	604.1	635.6	714.9	794.6	956.4	1112
Fuel Consumption (Gas)		**m^3/h**	368.0	411.5	441.8	463.8	500.0	533.7	567.4	600.2	632.9	666.6	748.7	832.8	1003.4	1165.1

Notes

1 Oil Fuel Consumption based on Class D:BS 2869 N.C.V. 35863 kJ/l (15422 BTU/lb)

2 Gas Fuel Consumption based on Gas N.C.V. 34828 kJ/m^3 (935 BTU/Ft^3)

3 Fuel Consumptions based on boiler working pressure of 10.34 Bar g

4 All Dimensions and weights are approximate based upon boiler working pressure

COCHRAN

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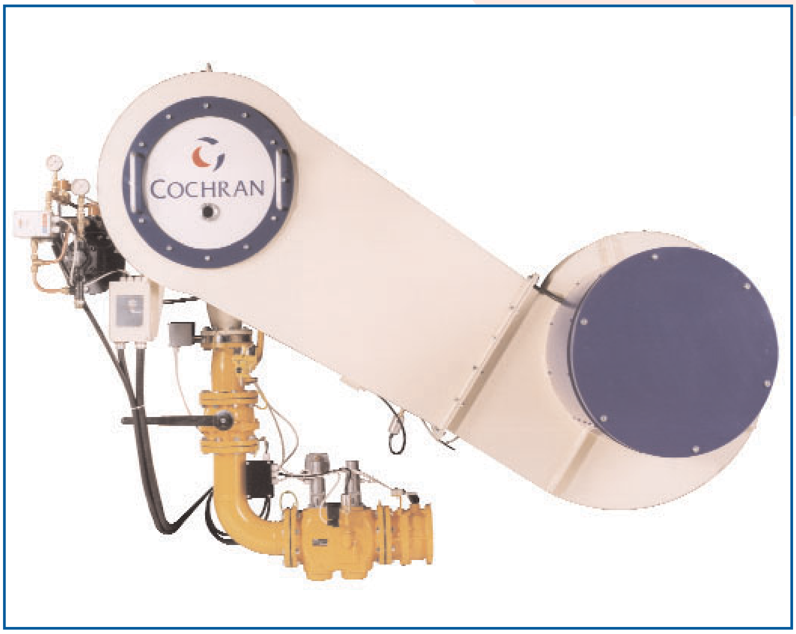
COCHRAN

4000 - 16000 kW EquiNox Oil and Gas Fired Packaged Burners



ENERGY SOLUTIONS WORLDWIDE

Combustion and control equipment suitable for firing oil and gaseous fuels.

Efficient combustion of fuel and low NOx emissions throughout the firing range.

Direct drive to all fuel and air valves via independent servo motors.

Options for:

- **Remote monitoring and data logging - accessible via Internet**
- **O_2 Trim**
- **Exhaust Gas Monitoring**
- **Integral Gas Leak test**

Design concept:

- Pressure Jet Design
- Digital Control System
- Modulating on all fuels

Emissions:

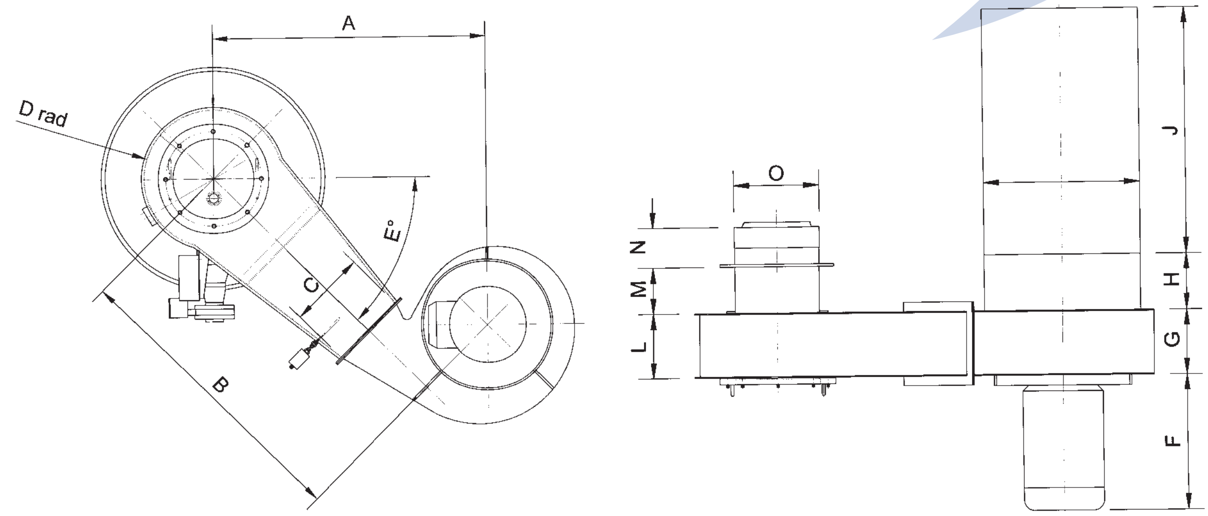
- <110mg/Nm3 on gas firing
- <220mg//Nm^3 on DFO firing
- Low O_2
- Low CO
- Noise Levels 85bB(A) at 1 M

Performance:

- 6:1 turndown on gas
- 4:1 turndown on oil
- Low air pressure drop

Cochran 4000 - 16000 kW Oil & Gas Burners

Boiler Ratings		kg/hr	5600	6000	6300	6800	7260	7710	8170	8620	9070	10210	11340	13610	15880
Boiler Frame Size			6	7	8	9	10	11	12	13	14	15	16	17	18
Dimensions	A	mm	1199	1199	1199	1293	1293	1293	1320	1320	1363	1363	1498	1583	1656
	B	mm	1320	1320	1320	1400	1400	1400	1440	1440	1500	1500	1580	1650	1770
	C	mm	330	330	330	378	378	378	378	378	378	378	374	584	654
	D	mm	295	295	295	315	315	315	340	340	365	365	390	390	440
	E	mm	45°	45°	45°	45°	45°	45°	45°	45°	45°	45°	40°	38°	33°
	F	mm	495	495	495	495	495	495	495	495	495	495	495	495	557
	G	mm	264	264	264	302	302	302	302	302	302	302	302	315	412
	H	mm	258	258	258	269	269	269	269	269	269	269	269	275	274
	J	mm	900	900	900	1120	1120	1120	1120	1120	1120	1120	1200	1200	1250
	K	mm	550	550	550	710	710	710	710	710	710	710	762	762	780
	L	mm	264	264	264	302	302	302	302	302	302	302	302	318	412
	M	mm	190	190	190	190	190	240	240	240	240	240	240	240	265
	N	mm	180	180	180	180	180	180	180	180	180	180	180	180	187
	O	mm	323	323	323	356	356	356	406	406	406	406	457	457	508



Notes

1 Oil Fuel Consumption based on Class D: BS2869 N.C.V.35863 kJ/l (15422 BTU/l)

2 Gas Fuel Consumption based on Gas N.C.V.34828 kJ/m^3 (935 BTU/Ft^3)

3 All Dimensions and weights are approximate only based upon boiler working pressure of 4.5 Bar g

4 Fuel Consumption based on boiler flow temperature of 77°C and working pressure

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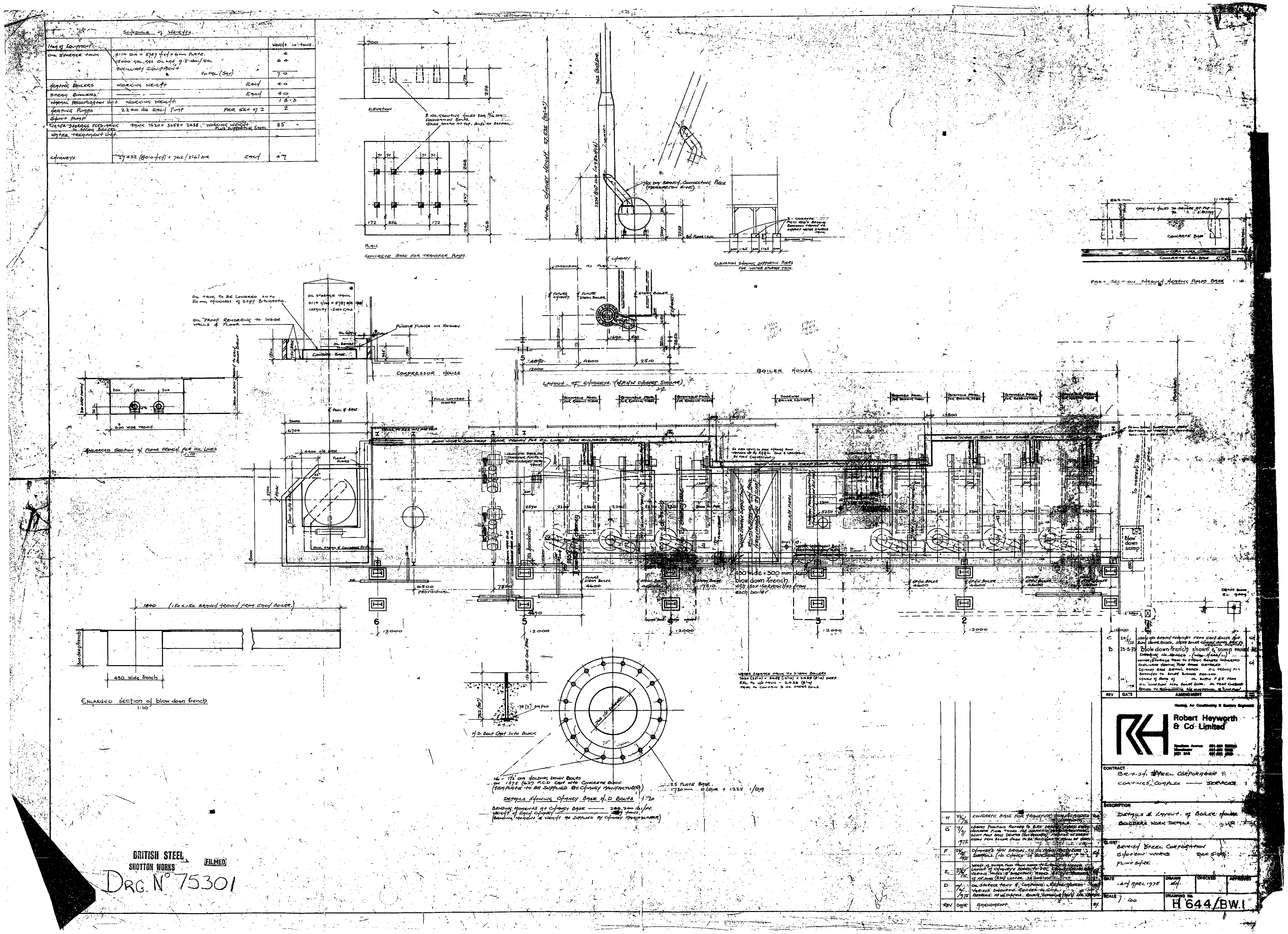
APPENDIX 2 – EXISTING CHIMNEY SCHEMATIC



Schedule of Weights.

Item of Equipment		Weight in tons.
Oil Storage tank.	4114 Dia × 5787 high × 6mm plate. 15000 Gal. Gas Oil at 9.5 lbs/gal Ancilliary Equipment total (say)	4 64 70
Heating Boilers	Working Weight Each	40
Steam Boilers	" Each	40
Warmac Pressurisation Unit	Working Weight.	18·3
Heating Pumps	2240 lbs each pump per set of 2	2
Shunt Pump		
Water Storage Feed tank to Steam Boilers	tank 7620 × 3658 × 2438. Working Weight plus supporting steel	85 "
Water treatment Unit.		
Chimneys.	27432 (90'0" high) × 762 (2'6") Dia. Each	47

Rev	Date	Amendment
C	28/5/75	150×150 branch trenches from each boiler for blow down added. Steam boiler chimney moved back to original position.
B.	23.5.75	Blow down trench shown & sump moved. Drawing No. revised. (was H644/1) Water storage tank to steam boilers indicated. Duplicate heating pump base detailed. Chimney base detail added. Oil trench for branches to boiler burners revised.
A	14/5/1975	Change of route of oil supply F & R from oil line flow into boiler house. Oil tank compound revised to [illegible]

Rev	Date	Amendment	By.
H	22/6/76	Concrete base for transfer pumps added [illegible]	
G	19/9/1975.	Chimney positions revised to B.S.C. [illegible] concrete piers added for [illegible] shunt pump base deleted (not required). [illegible] supply from boiler house to [illegible]	
F	26/8/1975	Chimneys now drawn to [illegible] details. (No change in [illegible])	
E.	27/7/75.	Weight of water feed tank added to schedule [illegible] Layout of chimneys added to DRG. [illegible] Various notes & dimensions added [illegible] of Mr. Jones (BSC) letter 22 June 1975	
D	10/6/1975	Oil storage tank & compound [illegible] Various dimensions revised to [illegible] Reference: Mr. W. Suffield [illegible]	

Heating, Air Conditioning & Sanitary Engineers

Robert Heyworth & Co Limited

CONTRACT
British Steel Corporation
Coatings Complex — Services.

DESCRIPTION
Details & Layout of Boiler House
Builders Work Details.

CLIENT
British Steel Corporation
Shotton Works
Flintshire

DATE	DRAWN	CHECKED	APPROVED
14th April 1975			

SCALE 1:100

DRAWING No. H 644/BW.1

BRITISH STEEL
SHOTTON WORKS
FILMED
DRG. No 75301