APPENDIX 8

Copy Archival Record and Statement of Heritage Impact, DC Substation

STATEMENT OF HERITAGE IMPACT

PROPOSED DEMOLITION OF THE DC SUBSTATION

Figure 0.1 240 volt switchboard inside DC substation.
Source: Author. Digital 24/03/2000.

Prepared By:

EJE
ARCHITECTURE

NEWCASTLE

412 King Street
Newcastle West NSW 2302

Telephone: (02) 4929 2353
Facsimile: (02) 4926 3069
e-mail: mail@eje.com.au
Web Site: www.eje.com.au

Project No. 3882.04 **April 2000**

CONTENTS

1.0 THE PROPOSAL

Major changes have occurred in Newcastle and the Hunter Region over the past 20 years. The downsizing and eventual decision to close BHP steel making operations and the rationalisation of the coal industry are a reflection of these changes. The BHP steel making site is strategically placed, not only on a local and regional level, but on a State and National level. It has been proposed that the existing site be redeveloped as a major Multi Purpose Terminal servicing the east coast of Australia. The area to be developed as the Multi Purpose Terminal, would require the demolition of all above ground structures located within this area (see Appendices for location plan) to enable remediation of the land and redevelopment of the site. Development of the remainder of the site at a later stage for industrial / commercial purposes is also proposed. The buildings proposed for demolition are:

1. No. 1 Blast Furnace
2. No. 1 Blower House
3. Open Hearth Building
5. No. 1 Bloom & Rail Mill
6. Steel Foundry
10. DC Sub Station
11. Wharves
14. No. 3 Blast Furnace
15. AC Pump House
16. Power House
19. Open Hearth Change House
20. Mould Conditioning Building
21. BOS Plant
23. No. 4 Blast Furnace

2.0 THE CONTEXT OF THE PROPOSAL

2.1 Physical Context

The D.C. Substation is located at the north eastern sector of BHP's Waratah Works immediately to the south of the Tundish Repair building and to the north east of the Steel Foundry.

2.2 Statutory Context

The D.C. Substation is identified within the group identification forming Part B of Schedule 4 (Port Waratah – BHP Steelworks and Office) of "The Hunters Heritage" – Hunter Regional Environmental Plan 1989. It is identified individually within Schedule 4 of The Newcastle Local Environmental Plan 1987 as being an item of State – level heritage significance. (This ascribed level of significance is consistent with the level of significance determined in the Port Waratah Steelworks Conservation Plan prepared by EJE Architecture in 1991). The item does not fall within a Conservation Area and is not included on the State Heritage Register. Under the EP and A Act, if an item is of State level heritage significance, the Approval Authority is required to obtain the consent and concurrence of the Department of Urban Affairs and Planning to any major intervention into the item. Under the Integrated Approvals Amendment Act 1998, "Integrated development" is development (not being complying development) that, in order for it to be carried out, requires development consent and approval under other, listed environmental legislation (s 91 (1)). The "other listed environmental legislation" includes the Heritage Act 1977. Under the new legislation, (in Section 91a):

(2) Before granting development consent to an application for consent to carry out the development, the consent authority must, in accordance with the regulations, obtain from each relevant approval body the general terms of any approval proposed to be granted by the approval body in relation to the development. Nothing in this section requires the consent authority to obtain the general terms of any such approval if the consent authority determines to refuse to grant development consent. A Consent granted by the consent authority must be consistent with the general terms of any approval proposed

to be granted by the approval body in relation to the development and of which the consent authority is informed. For the purposes of this Part, the consent authority is taken to have power under this Act to impose any condition that the approval body could impose as a condition of its approval.

(3) A consent granted by the consent authority must be consistent with the general terms of any approval proposed to be granted by the approval body in relation to the development and of which the consent authority is informed. For the purposes of this Part, the consent authority is taken to have power under this Act to impose any condition that the approval body could impose as a condition that the approval body could impose as a condition of its approval.

3.0 HISTORICAL REVIEW

This building now commonly known as the DC Substation was the first powerhouse on the steelworks site and initially housed the steam driven Direct Current Generators which provided power for cranes, ancillary equipment and lighting.

When the steelworks was established most larges pieces of equipment were driven by steam engines. The steam was generated in a number of sets of boilers located in various parts of the plant close to where the steam would be used.

The other source of power was DC electricity, generated at the 1915 Power Plant which was later to become known as the DC Substation.

In its early years of operation as the main Power Plant it was equipped with

- 1 x 1,000 kw steam turbine (Southwark Turbo-Generator)
- 3 x 5 kw Bellis AEG Generators, each driven by a vertical high speed steam engine of Bellis Morcom construction
- 1 x 250kw DC generator for lighting purposes, driven by a Bellis Morcom high speed steam engine.

David Baker's reminiscences record that the Power Plant was purchased in England from the lowest bidder, the Bellis Morcom Company. The original plans of the steelworks envisaged the future extension of both the boiler plant and the Power House.

Power from the Power House was used to provide lighting and to operate cranes in various parts of the plant. The open hearth charging machines were also DC powered. In 1921 there were 10 men directly employed in the Power House – 3 drivers, 3 greasers, 3 switchboard attendants and 1 youth.

With the continued expansion of the plant there was increasing demand for electric power and in 1920 the Company began to plan the installation of an AC Power House. By May 1924 work was underway on the new A.C. Power House, and the installation of two 1,000 kw motor generators in the D.C. Power House was progressing.

With the commissioning of the Alternating Current Powerhouse in 1923, Motor-Generator sets replaced steam driven units for the generation of DC power although steam units were retained on standby for many years. Twenty five cycle AC power was progressively used for most smaller equipment and lighting and by the early 1960's the building took on its present substation role and as distribution centre of AC power and DC power produced using static converters.

Maintenance work in 1933 included painting the interior of the building, now referred to as the D.C. Sub-station. Wooden steps to the condenser room were renewed in steel and the condenser room platforms, drain tanks, etc. were reorganised.

1935 a BHP publication marking the 20th year of steelworks operation recorded that the DC Substation contained:

- The original 3 x 500 kw 250 V DC generating sets, each driven by a vertical steam engine. These sets were not operating and were maintained for standby purposes.
- 3 x 1000 kw motor generator sets producing DC. Two of the generators were driven by 6,600 V salient pole synchronous motors, and one by an auto-synchronous motor, excitation being obtained from the DC generator.

A further extension to the plant was authorised in November 1935, for the purpose of converting more AC current into DC current to cope with increasing power demands. Building extensions were completed in the middle of November 1936, followed by the installation of two 1500 kw Motor Generator sets, which replaced steam driven units for the generation of DC power although steam units were retained on standby for many years. The H.T. switchgear was transferred to a new location as required by the extensions, and the main D.C. switchboard was extended and altered. Also at this time, a Bellis-Morcom engine in the D.C. building was converted into an air compressor set to provide extra compressed air for the works.

250 volt DC Generators were still being driven by steam engines until 1939 when the No. 7 MG Set was installed. The use of the MG sets enabled the progressive replacement of the steam engines whilst retaining the more versatile DC voltage for many important variable speed drives. The remaining MG sets from 1924 demonstrate the important link between the new alternating current and its earlier DC counterpart. The MG sets were replaced by the low maintenance rectifier systems but not before they had played an important role in the power systems of the Steelworks.

The No. 1 M.G. set was transferred from this building in the mid 1950's to the AC Salt Water Pumphouse to provide power for the wharf luffing cranes. The No.2 Motor Generator set, using a 6,600 volt AC motor and a 259 volt DC generator, remains fully installed and in excellent condition. The 1915/1924 marble switchboard is still in use and well maintained, and is a fine example of early electrical technology.

DC power was an essential element for the efficient operation of the early Steelworks. Whilst the larger mill rolling machines were driven directly by steam engines, ancillary equipment particularly crane drives and crane lifting magnets, required electricity. The 240 DC power generated in the DC Substation was distributed to various sections of the works from the elevated switchboard. Using marble as an insulating material, the switchboard, modified only slightly to conform with improved safety standards, is representative of the electrical giant which was to come.

Associated with the large industrial buildings found on site, are smaller buildings housing engines, turbines and other machinery necessary for the operation of the steelworks. These buildings such as the No. 1 Blower House, the DC Power House, the AC Salt Water Pump House and the Engine Houses of the Mills, have different functions to the Steel Making and Mill buildings. These buildings were required to keep the machinery clean in a reasonably stable environment. This was not easy to achieve within the hot grimy conditions of the steelworks. For this reason substantial brick construction has been used. Maintenance and repair work on the machinery required an extremely good lighting level, this necessitating large glazed windows.

Speed of construction would have been another factor determining the architectural qualities of these buildings. The Georgian manner of treating brick walls has been used and in order to be economic has been kept flat and simple.

4.0 SUMMARY CONDITION ASSESSMENT

Although unattractive and visually chaotic because of its associated compressed air (and other) pipe work, both masonry and galvanised iron-clad walls of the building are generally in sound condition. There is some intrusively –coloured face brick infill to the skillion extension on the western façade and some earlier infill to former, upper-level windows in the eastern elevation, but generally, the building structure remains intact, as built. Original structure includes external masonry walls and engaged piers, (excluding the single-storey, skillion-roofed extensions) the double – gable roof form with central box gutter and corrugated iron cladding and the highlight windows to the northern façade.

It should be noted that there has been substantial brick infill of former arched openings on the northern

elevation, with associated, brick blade walls, concrete plinths and galvanised pipe and mesh gates forming discreet bays along that elevation. There has been some limited replacement of highlight windows. Brick walling on the northern elevation, has been penetrated to provide for pipe exhausts/vents. The original multi-paned windows and lintels on the south elevation remain intact. There is a recent roller door to the major opening in this elevation and a relatively recent hood to the adjacent secondary door. There are two skillion roofed, single-storey extensions on the western elevation - the more northerly one taller, the lower, more southerly one being more recent. Internally, the original unrendered walls and steel roof truss remain clearly visible, but substantial brick – based mezzanines have been installed on the southern and eastern walls, with associated handrails. That on the southern wall, is more recent, with much simpler (i.e. non silver-frosted) railings. All internal switchboards remain intact, and indicate different periods of installation. The No. 2 Generator and marble switchboard remain intact and in fully interpretable condition.

The condition of each of the subject buildings is fully described in written and photographic form in the Archival Record document produced to accompany this Statement of Heritage Impact.

5.0 ASSESSMENT OF SIGNIFICANCE

The DC Substation has been assessed (1991 Port Waratah Steelworks Conservation Plan) as having State aesthetic significance within the context of the development of the Steelworks.

The following detailed Assessment of Significance has been undertaken to reflect current NSW Heritage Act, Heritage Amendment Act and Burra Charter requirements.

Historic Significance

As with the other early, major buildings, the DC Substation represents both a significant contribution to the development of steel making in NSW and an important item which traces the development of electricity as an industrial power source in NSW.

Further, because the DC Substation is still in use, it can be seen to show the continuity of both a supporting element in the iron and steel making enterprise and as a continually developing industrial process of greatest significance. For this reason the building has STATE – level HISTORIC significance.

Aesthetic Significance

Archival, written information and photographs clearly track the power systems development at the BHP. The building is representative of type with its northern elevation bays having been compromised aesthetically. It has no particular Aesthetic significance.

Social Significance

The DC Substation has significance for its association with the development of steel making in Newcastle but it also has high level State significance for the development of specialist skills, and input into the social fabric of the region resulting from those activities. It has significance and associated value to generations of regional families and as such has LOCAL SOCIAL significance.

Technical Significance

Because of its potential to contribute to greater understanding of the technological growth of electrical power generation, distribution and use in the development of heavy industry, the DC Substation has STATE level TECHNICAL significance.

Further, since some of the equipment has been in continuous operation since 1915, the DC Substation has highest level potential to provide evidence of the evolution of technology unavailable elsewhere in NSW. This factor contributes to its HIGHEST – level STATE TECHNICAL significance.

6.0 OPTIONS FOR PHYSICAL INTERVENTION

The Conservation Plan BHP Port Waratah Site Addendum 1999 described the following options:

"After closure of steel making, the 27 items of heritage significance identified in the Newcastle LEP 1987 (as well as all other heritage items identified in this Conservation Plan), will remain in situ until:

a) the item becomes unsafe and/or uneconomic to maintain; or
b) the item is to be removed to facilitate remediation of the site; or
c) the item is sold; or
d) the item is to be removed to facilitate the proposed redevelopment

Where "Front End" items are to be demolished they should, where easily transportable and relocatable, be relocated, to a low impact, operating environment within the overall Steelworks site. Components/elements of existing structures/buildings should be similarly relocated or preferably, be relocated to either the proposed Interpretation Centre or, (if that is not appropriate), to the proposed State Industrial Archaeological Repository, both being within the existing Steelworks site. Items capable of continuing to provide service within a steel-making operation, should be relocated to Port Kembla Steelworks or other iron and steel making operation elsewhere in Australia or the world. Where buildings/structures of higher level significance are demolished and removed, interpretation of the building form at ground level is required (Burra Charter and NSW Heritage Act – As Amended).

This item is to be removed to facilitate this proposal. Therefore in accordance with Burra Charter and NSW Heritage Office requirements, recording and interpretation must be undertaken.

It would be preferable for the building to remain. However, with the Development of the Multi Purpose Terminal this proposition is considered untenable given:

a) If the DC Substation remains, it will conflict with the layout of the rail network at the MPT.
b) Remediation of this area of the site is required. The remediation proposal involves capping the proposed Multi Purpose Terminal site with flexible wearing pavement.

Off-site (i.e. not in-site) interpretation, will only be undertaken at last resort and will involve samples of highest-level fabric/fittings/equipment.

Possible re-use or interpretation items include:

No. 2 Motor Generator Set
259 Volt DC Generator
1915/192A Marble Switch Board

As part of the overall interpretation strategy it is proposed to identify the location of the DC Substation and the layout of significant equipment using coloured glass bead trafficable applied surface to the MPT pavement.

7.0 THE HERITAGE IMPACT OF THE PROPOSAL

This item is substantiated as having STATE level significance, therefore demolition of the item to enable development of the Multi Purpose Terminal will impact on the significance of the item. The closure of operations at the Newcastle Steelworks impacted on the interpretation of the processes of iron and steel making, demolition of the item changes the interpretation of the processes and the significance of the item. This impact will be ameliorated by fully recording the item in accordance with the NSW Heritage Council Guidelines and interpretation and protection of the in-situ remains below the pavement of the proposed Multi-Purpose Terminal. The individual site will be interpreted using pavement treatment that can identify the extent of the item and accommodate the operation of the Terminal. The processes associated with the item will be further interpreted on the main site at Port Waratah via the Delprat Interpretive Centre and supplemented by selected items being deposited in the proposed State Archaeological Repository. However, the physical site will remain and its location will be identified through interpretive design within the pavement of the Multi Purpose Terminal.

8.0 APPENDICES:

Appendix 8.1 **Site Development Masterplan – showing area of proposed Multi Purpose Terminal in yellow**

Appendix 8.2: Site Development Master Plan – showing identified Heritage items.

Appendix 8.3: Conceptual Paving Patter to existing Heritage items.

ARCHIVAL RECORD

WATERFRONT PRECINCT HERITAGE BUILDINGS, MAIN SITE BHP PORT WARATAH STEELWORKS, NEWCASTLE

DC SUB STATION

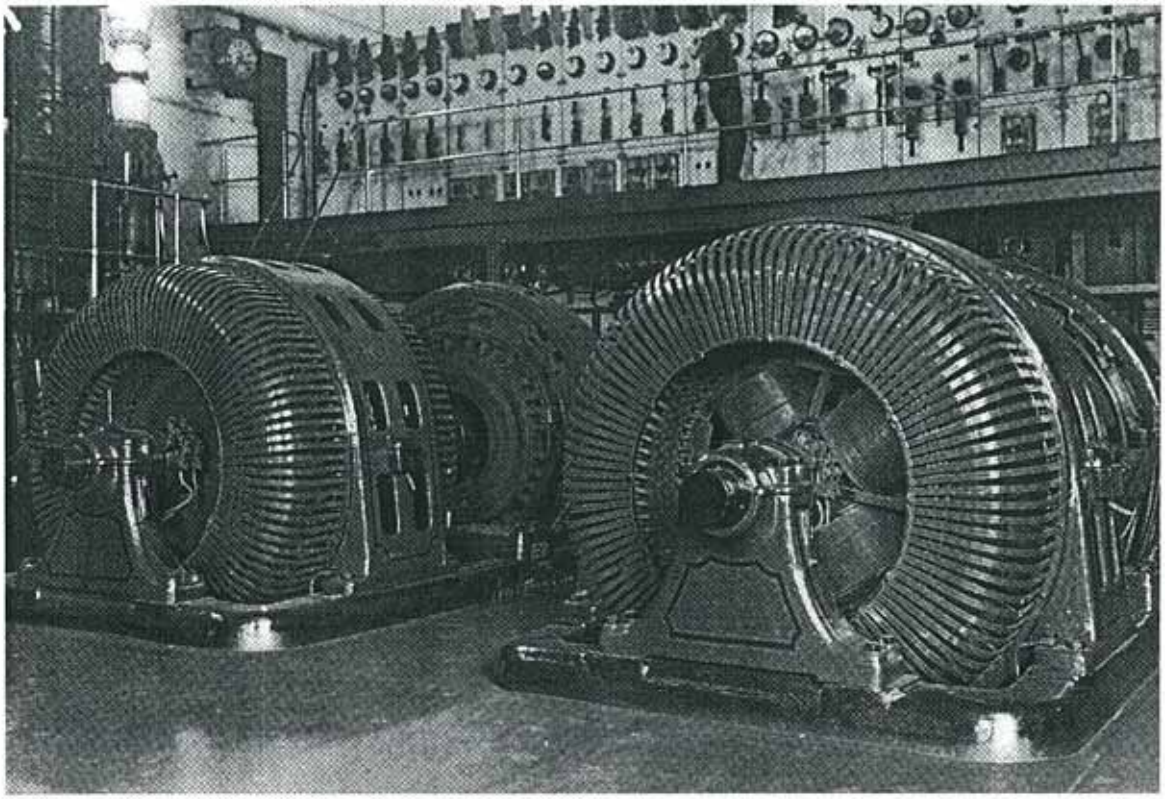


Figure 0.1 Two 100 Kilowatt Motor Generators (1934)
Source: Turner, Dr. J. (1999: 93)

Prepared by:

EJE ARCHITECTURE

In Association with:

Rosemary Melville – Historian
Bill Jordan – Heritage Engineer
Austral Archaeology Pty Ltd

NEWCASTLE

412 King Street
Newcastle NSW 2300

Telephone: (02) 4929 2353
Facsimile: (02) 4926 3069
E-mail: mail@eje.com.au
Web Site: www.eje.com.au

September 2000
Our Ref: 3882-04-rec-013

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background to the project

Major changes have occurred in Newcastle and the Hunter region over the past 20 years. The downsizing and eventual decision to close BHP steel making operations and the rationalisation of the coal industry are a reflection of these changes. The BHP steel making site is strategically placed, not only on a local and regional level, but also on a State and National level. It has been proposed that the existing site be redeveloped as a major Container Handling Terminal servicing the east coast of Australia. The area to be developed as the Container Handling Terminal would require the demolition of all above ground structures located within this area to enable remediation of the land and redevelopment of the site. Development of the remainder of the site at a later stage for industrial /commercial purposes is also proposed.

In light of the above, EJE Architecture has been commissioned to prepare detailed archival records of the buildings proposed to be demolished that are considered to have heritage value. These records involve documenting the relevant buildings and items they contain as well as the industrial processes that took place within them. Designed to help ascertain the heritage significance of the buildings and associated processes, these archival records also form a statement for the future interpretation of this now redundant part of Newcastle's industrial culture.

The following document constitutes the Archival Record of the DC Sub Station - an item classified as having a 'State level of heritage significance'

1.2 Archival Recording Methodology

The approach taken in recording these heritage items and the document format is based on heritage consultant input and current NSW Heritage Office's guidelines including those relating to the preparation of archival records and their photographic recording.

A number of important aspects have been identified in the statement of heritage significance included in the report whose recording was necessary to reflect the item's character and value described. Hence it is this statement that drives the rationale for the report and determines the relevance of information collected. Derived from three main elements - buildings (structure and fabric), the individual items they housed and the processes that took place within them - these aspects are elaborated on in a number of different ways, which reflect their respective social, technical and aesthetic qualities.

As a way of dealing with the items various facets of heritage value, the report is broken into 3 main components:

-Written descriptions (history, process and heritage statement),
-Pictorial descriptions (photographs and working drawings)
-Inventories and other supporting information

Together these components create a comprehensive account of the chronological development of both the buildings and the industrial technologies held within them that have invariably changed throughout their lives. At times the components are incorporated into each other to provide a more coherent and illuminating description. All material is cross-referenced to each other and referenced to archival registers and source publications.

The written descriptions provide a background to the building and the functions that it housed and incorporate relevant photographs. As an essential part of the written component, a statement on the item's heritage significance details why the item is valued.

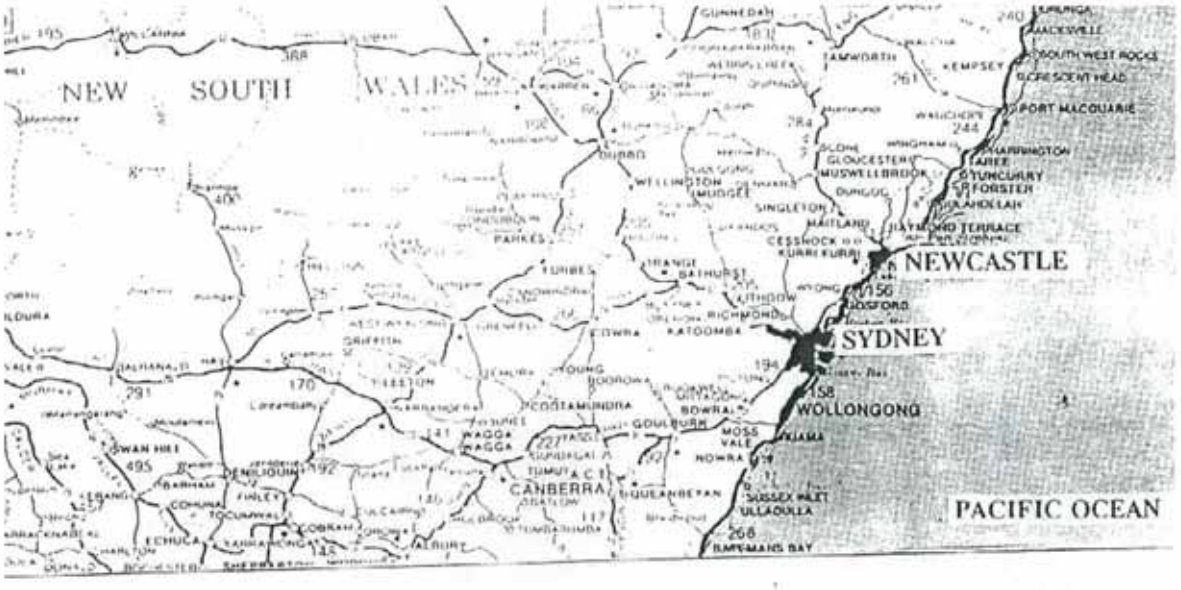
The bulk of the information in this report comes from the pictorial descriptions. Comprising of both historic and contemporary photographs, an account of the building fabric, the various industrial processes contained and the changes that have taken place through time is made. In addition, a

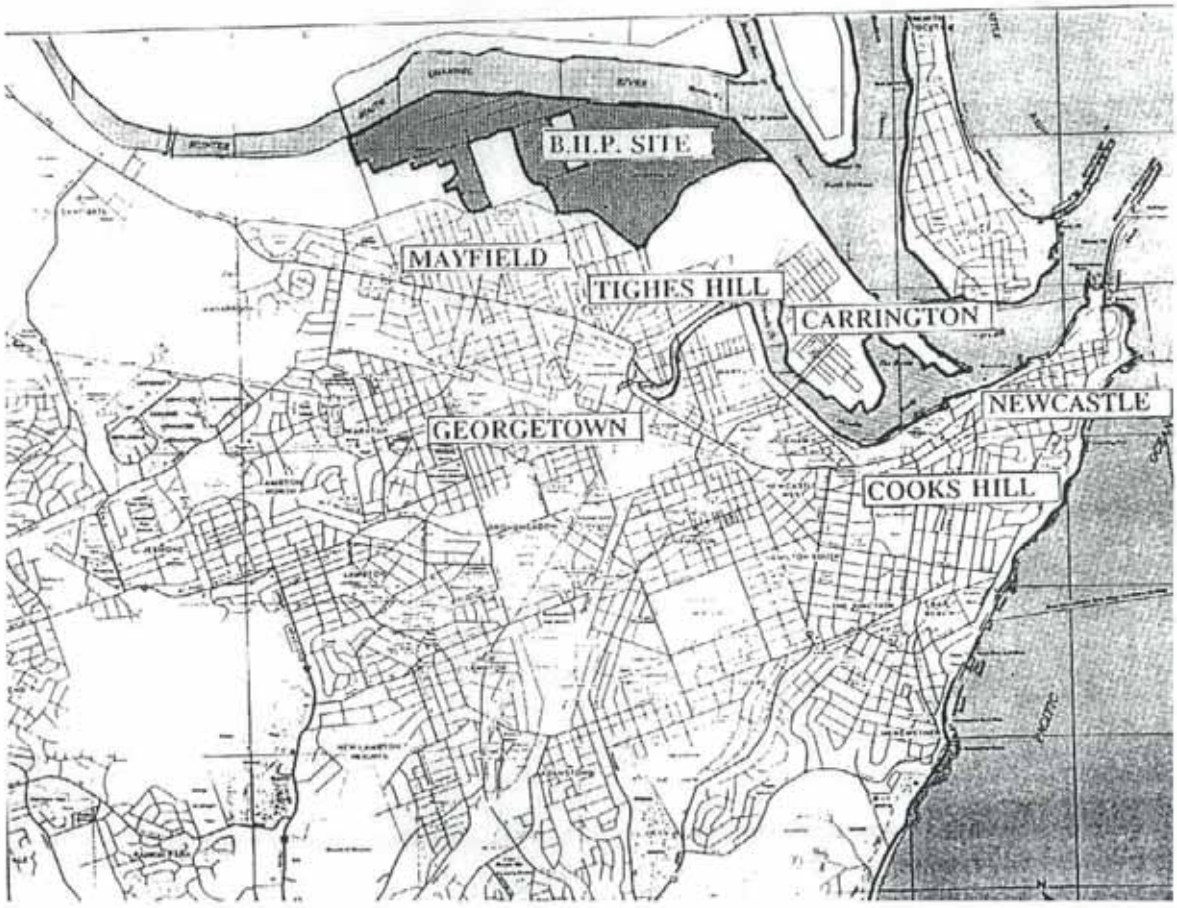
selection of original working drawings provide a detailed picture of the construction techniques, structure and fabric details and offer substantial dimensions and measurements, making largely redundant any requirement for contemporary measured drawings or scaled photographs.

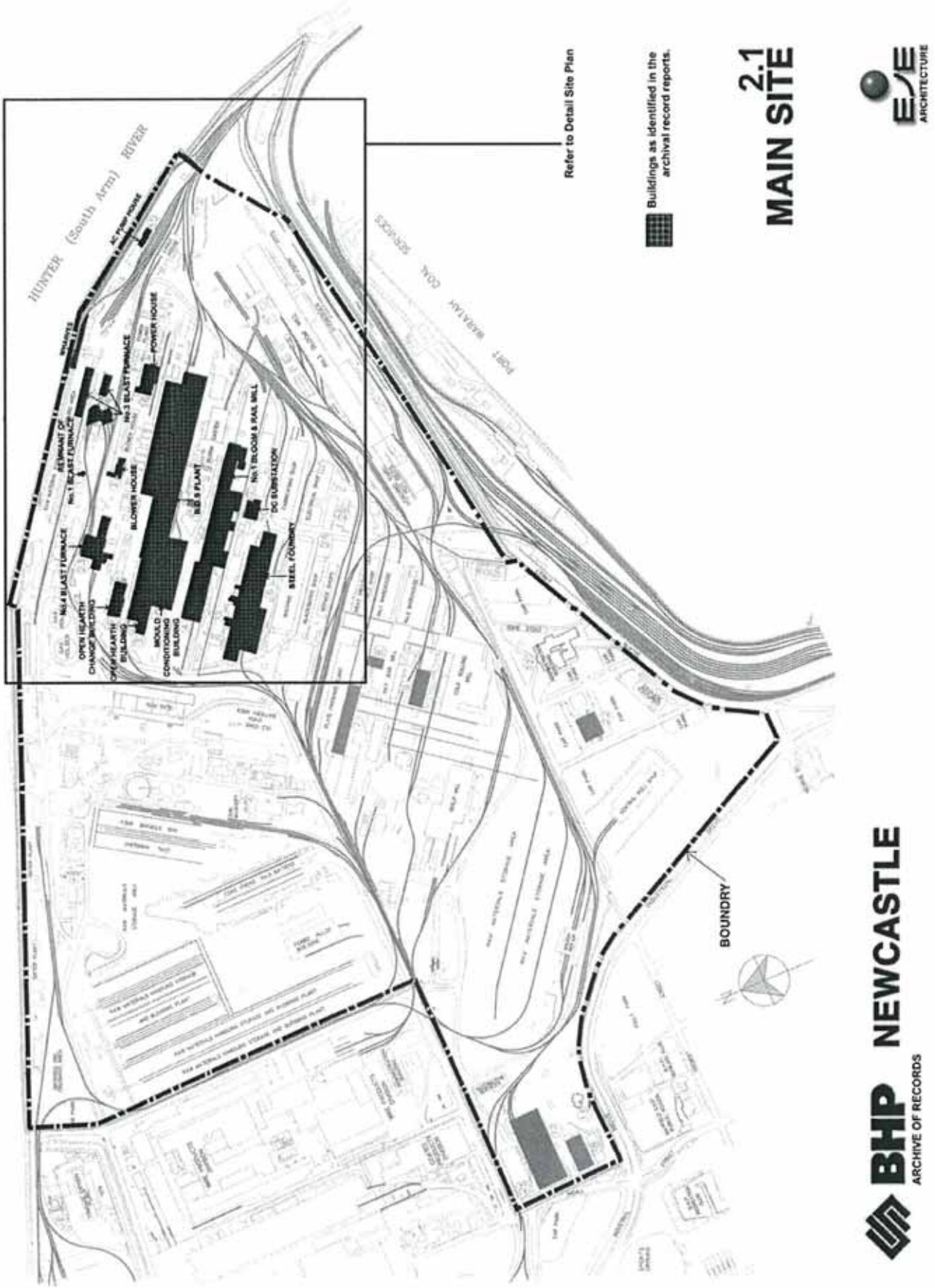
Supporting both the written and pictorial information is a series of inventories and tables which provide details of equipment contained within the building, cross referenced descriptions of photographs and shot locations, and bibliographical information.

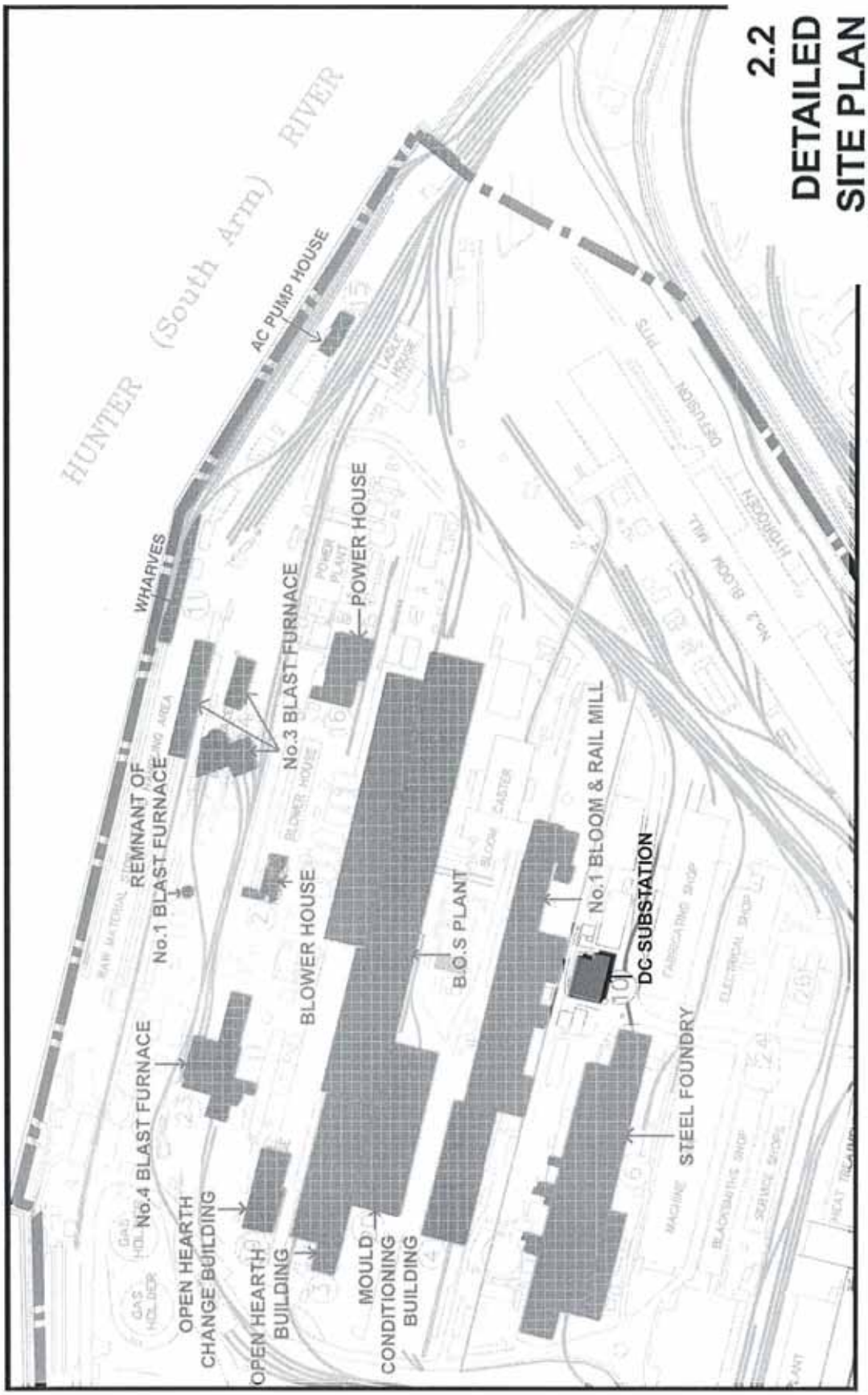
The process of documenting the heritage items involved a number of input teams, of which EJE was the coordinator.

2.0 LOCATION PLANS






2.1
MAIN SITE
Refer to Detail Site Plan
Buildings as identified in the archival record reports.
BOUNDRY
HUNTER (South Arm) RIVER
BHP NEWCASTLE
ARCHIVE OF RECORDS
EJE ARCHITECTURE



2.2
DETAILED SITE PLAN
DC SUBSTATION

EJE ARCHITECTURE

BHP NEWCASTLE
ARCHIVE OF RECORDS

3.0 OUTLINE OF HISTORY, INDUSTRIAL PROCESS & DESCRIPTION

When the steelworks was established most larger pieces of equipment were driven by steam engines. The steam was generated in a number of sets of boilers located in various parts of the plant close to where the steam would be used.

The other source of power was DC electricity, generated at the 1915 Power Plant which was later to become known as the DC Substation.

In its early years of operation as the main Power Plant it was equipped with

- 1 x 1,000 kW steam turbine (Southwark Turbo-Generator)
- 3 x 500kW Bellis AEG Generators, each driven by a vertical high speed steam engine of Bellis Morcom construction
- 1 x 250 kW DC generator for lighting purposes, driven by a Bellis Morcom high speed steam engine.

David Baker's reminiscences record that the Power Plant was purchased in England from the lowest bidder, the Bellis Morcom Company. The original plans of the steelworks envisaged the future extension of both the boiler plant and the Power House.

Power from the Power House was used to provide lighting and to operate cranes in various parts of the plant. The open hearth charging machines were also DC powered.
In 1921 there were 10 men directly employed in the Power House – 3 drivers, 3 greasers, 3 switchboard attendants and 1 youth.

With the continued expansion of the plant there was increasing demand for electric power and in 1920 the Company began to plan the installation of an AC Power House. By May 1924 work was underway on the new A.C. Power House, and the installation of two 1,000 K.W. motor generators in the D.C. Power House was progressing.[1]

Maintenance work in 1933 included painting the interior of the building, now referred to as the D.C. Sub-station. Wooden steps to the condenser room were renewed in steel and the condenser room platforms, drain tanks, etc. were reorganised.

In 1935 a BHP publication marking the 20th year of steelworks operation recorded that the DC Substation contained:

- The original 3 x 500 kW 250 V DC generating sets, each driven by a vertical steam engine. These sets were not operating and were maintained for standby purposes.
- 3 x 1000 kW motor generator sets producing DC. Two of the generators were driven by 6,600V salient pole synchronous motors, and one by an auto-synchronous motor, excitation being obtained from the DC generator.[2]

A further extension to the plant was authorised in November 1935, for the purpose of converting more AC current into DC current to cope with increasing power demands.[3] Building extensions were completed in the middle of November 1936, followed by the installation of two 1500 KW Motor Generator sets, which replaced steam driven units for the generation of DC power although steam units were retained on standby for many years. The H.T. switchgear was transferred to a new location as required by the extensions, and the main D.C. switchboard was extended and altered.[4]

[1] Report for half year ended 31 May 1924.
[2] *BHP Review, Jubilee Number*, BHP, June 1935, p.83.
[3] Report for half year ended 30 November 1935, p.15.
[4] Report for half year ended 30 November 1936, p.141.

Also at this time, a Bellis-Morcom engine in the D.C. building was converted into an air compressor set to provide extra compressed air for the works.[5]

Twenty five cycle AC power was progressively introduced for most smaller equipment and lighting, and by the early 1960s the building took on its present substation role, acting as a distribution centre of AC power and DC power produced using static converters.

The No.1 M.G. set was transferred from this building in the mid 1950s to the AC Salt Water Pumphouse to provide power for the wharf luffing cranes. The No.2 Motor Generator set, using a 6,600 volt AC motor and a 259 volt DC generator, remains fully installed and in excellent condition. The 1915/1924 marble switchboard is still in use and well maintained, and is a fine example of early electrical technology.

[5] P.P. Cranney, *Fuelling the Fires of Steel: A History of the Coke and Energy Department, Newcastle*, 1999, p.92.

3.1 Building Description & Structure

The original section of the building, designed and constructed in 1915 as the Power Plant is, like many others of that period on the site, constructed using a riveted steel frame with the columns encased in brickwork and with brick infill walls.

Unlike other buildings noted, it differs in using bolts for field assembly of pre-riveted sections. This is possibly an indication that parts of the structure were fabricated well away from the site, perhaps even by an external contractor, and assembled from large modules (e.g. complete roof trusses, built-up columns). An alternative explanation could be that the building was partly demolished to remove and replace machinery and that the bolted joints date from that time. Further research may clear up this matter.

Also of interest is the 10 ton portal crane made by Herbert Morris Ltd, Empress Works, Loughborough. This appears to have been purchased complete with the crane beams and rails which are also stamped as being of English manufacture. One of the crane beams is of particular interest, having a tapered web with the flange having been re-welded to the web. This could be a very early example of the welding of steel sections.

Condition

As in buildings of similar construction, corrosion of the steel members encased in brickwork has led to brick cracking. Remediation of this damage to ensure a continuing life for the structure would be very costly.

Steel conditions & protection at BHP Steelworks site

The BHP site in Newcastle is in a "Marine" to "Severe Marine" zone in accordance with AS/NZ 2312:1994 — "Guide to protection of iron and steel against exterior atmospheric corrosion". Now that the localized micro-climate from the operation of the plant has been removed, protection of the steelwork needs to be considered in terms of this Standard.

Observation at the site indicates that none of the steelwork on site has a coating system complying with this Standard for a design life of greater than 5 years. Some of the steelwork, such as the blast furnaces, is not protected at all and has been designed to operate in a hot environment where corrosion is inhibited by high temperatures driving off moisture; other steelwork was designed with extra thickness to form a sacrificial layer. In almost all buildings and in areas nearby the high temperature operations have been successful in keeping the corrosion under control except where steel has been insulated by brickwork which has trapped moisture and corrosion has been severe. There does not appear to be any general galvanic protection (i.e. galvanizing or zinc-rich coating) on major structural elements.

If major structural elements were to be retained on the site for a period in excess of 10 years the Standard gives the following coating systems:

(i) galvanizing plus a two coat paint system (not possible in situ);

(ii) various two and three coat paint systems applied after abrasive blast cleaning and having either a zinc based primer or high-build epoxy;

(iii) a sprayed metal coating followed by a two coat painting system.

Of these, only (ii) is likely to be practical. All would be extremely expensive and require continuing maintenance.

4.0 STATEMENT OF HERITAGE SIGNIFICANCE

The D.C. Substation is identified within the group identification forming Part B of Schedule 4 (Port Waratah – BHP Steelworks and Office) of "The Hunters Heritage" – Hunter Regional Environmental Plan 1989. It is identified individually within Schedule 4 of The Newcastle Local Environmental Plan 1987 as having an item of State – level heritage significance. (This ascribed level of significance is consistent with the level of significance determined in the Port Waratah Steelworks Conservation Plan prepared by EJE Architecture in 1991). The item does not fall within a Conservation Area and is not included on the State Heritage Register. The following detailed Assessment of Significance has been undertaken to reflect current NSW Heritage Act, Heritage Amendment Act and Burra Charter requirements.

Historic Significance

As with the other early, major buildings, the DC Substation represents both a significant contribution to the development of steel making in NSW and an important item which traces the development of electricity as an industrial power source in NSW.

Further, because the DC Substation is still in use, it can be seen to show the continuity of both a supporting element in the iron and steel making enterprise and as a continually developing industrial process of greatest significance. For this reason the building has STATE – level HISTORIC significance.

Aesthetic Significance

Archival written information and photographs clearly track the power systems development at the BHP. The building is representative of type with its northern elevation bays having been compromised aesthetically. It has no particular Aesthetic significance.

Social Significance

The DC Substation has significance for its association with the development of steel making in Newcastle but it also has high level State significance for the development of specialist skills, and input into the social fabric of the region resulting from those activities. It has significance and associated value to generations of regional families and as such has REGIONAL SOCIAL significance.

Technical Significance

Because of its potential to contribute to greater understanding of the technological growth of electrical power generation, distribution and use in the development of heavy industry, the DC Substation has STATE level significance.

Further, since some of the equipment has been in continuous operation since 1915, the DC Substation has highest level potential to provide evidence of the evolution of technology unavailable elsewhere in NSW. This factor contributes to its HIGHEST – level STATE TECHNICAL significance.

5.0 INVENTORY OF ARCHIVAL DOCUMENTS

The Following list constitutes the archival documents used for this report and other documents that contain related material for this archival record. For archival drawings, the BHP drawings document register (documents located in the BHP archive, Melbourne) may be found on the computer disk located in the appendix.

Cranney, P.P. *Fuelling the Fires of Steel: A History of the Coke and Energy Department, Newcastle,* 1999.

BHP Review, Jubilee Number, BHP, June 1935

Newcastle Steelworks Half Yearly Reports, May 1924, November 1936, November 1936.

6.0 SELECTED PHOTOGRAPHS

EXTERNAL:

Figure 6.1 West Elevation

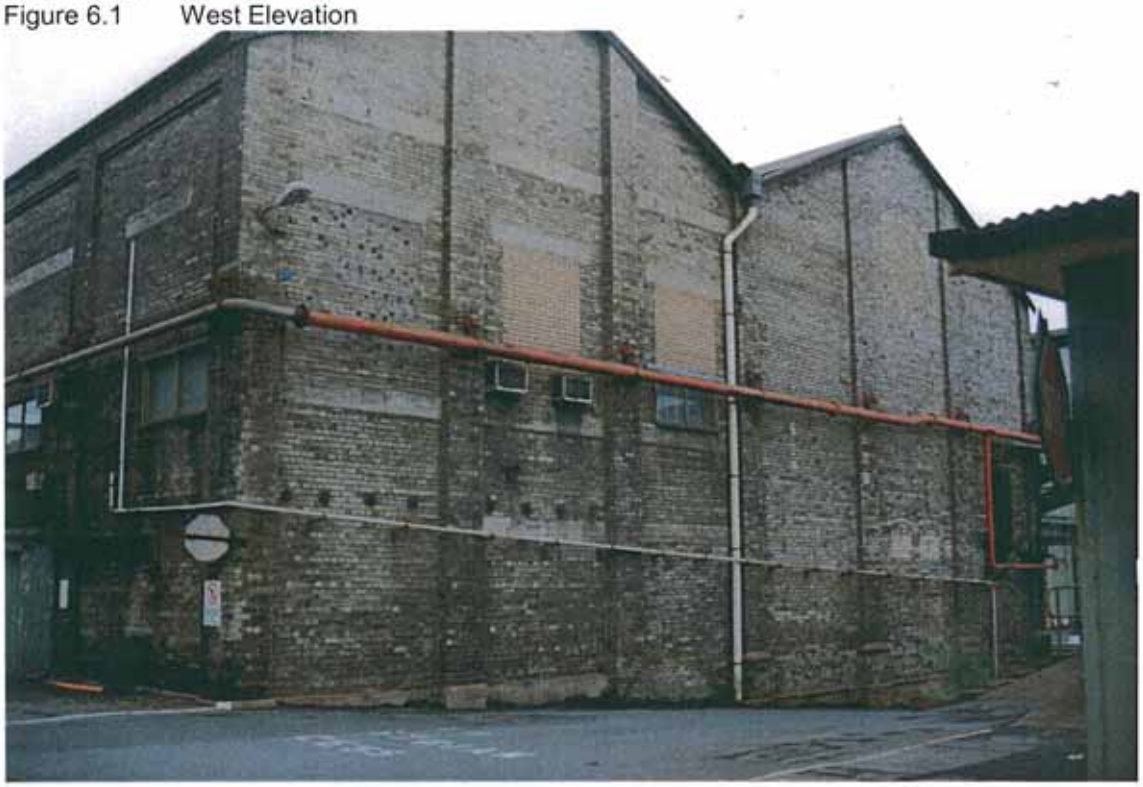
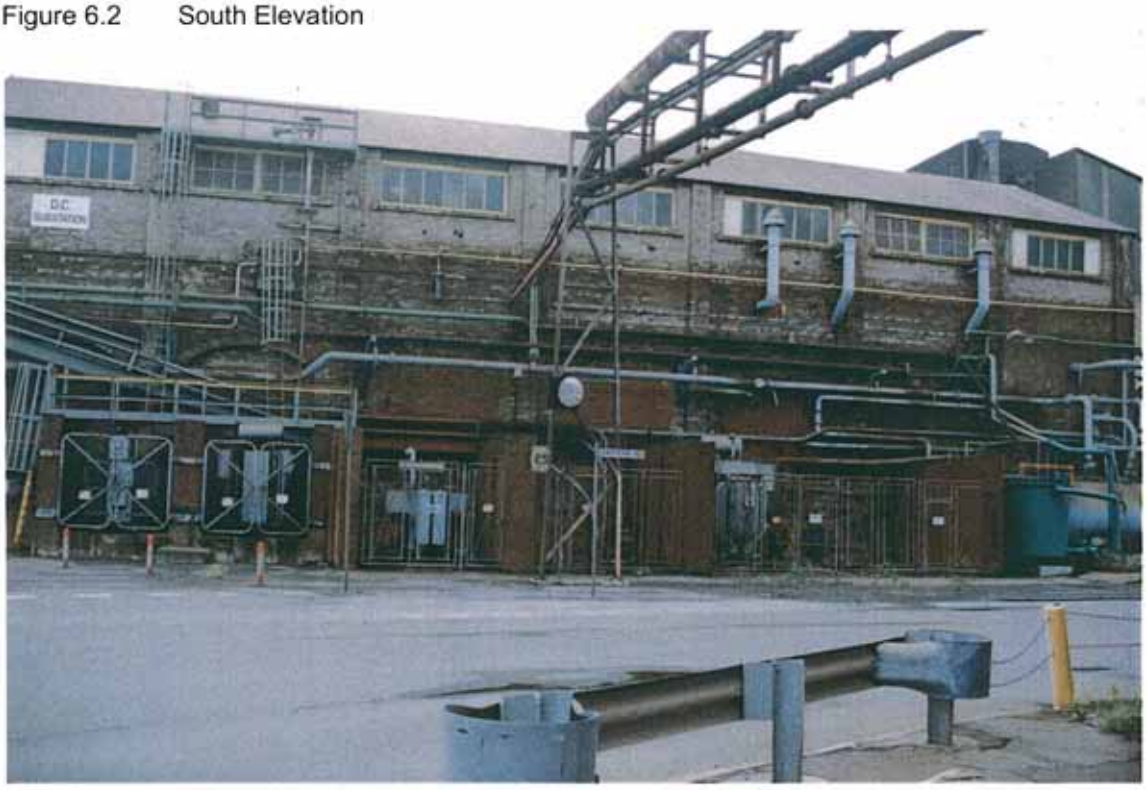


Figure 6.2 South Elevation



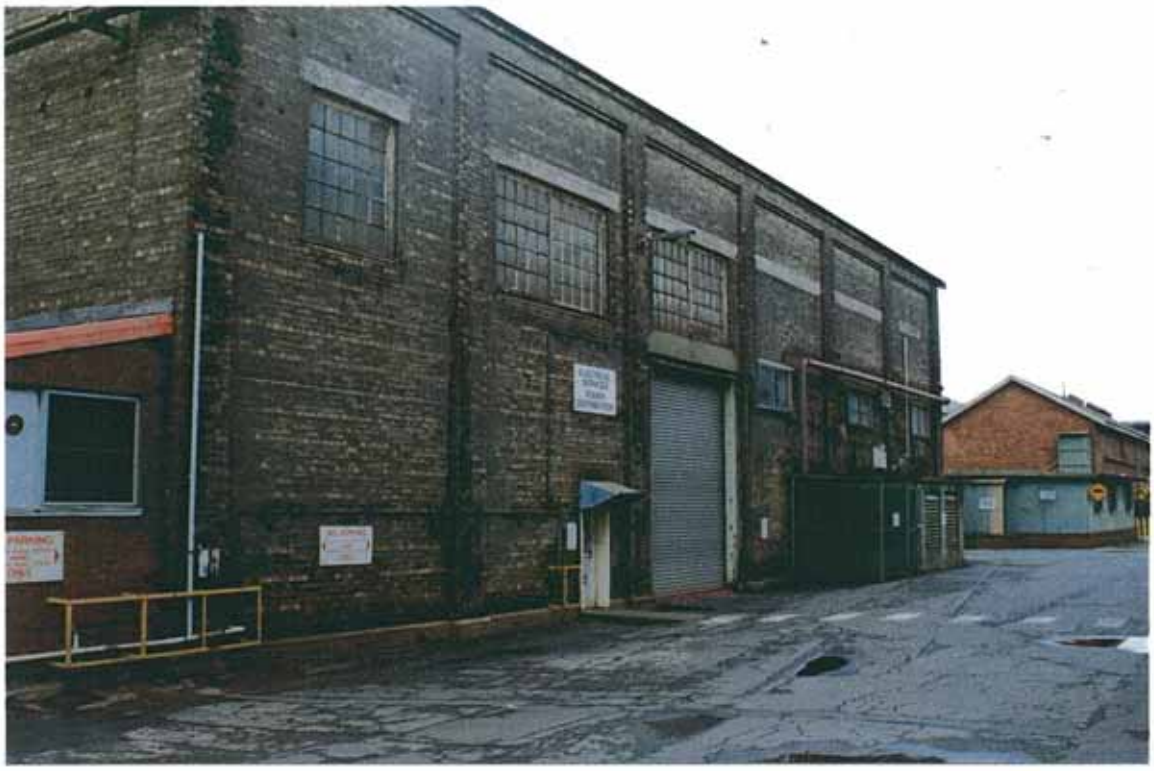
EXTERNAL:
Figure 6.3 South West Corner Detail

EXTERNAL
Figure 6.4 South East Corner Detail

EXTERNAL:
Figure 6.5 East Elevation

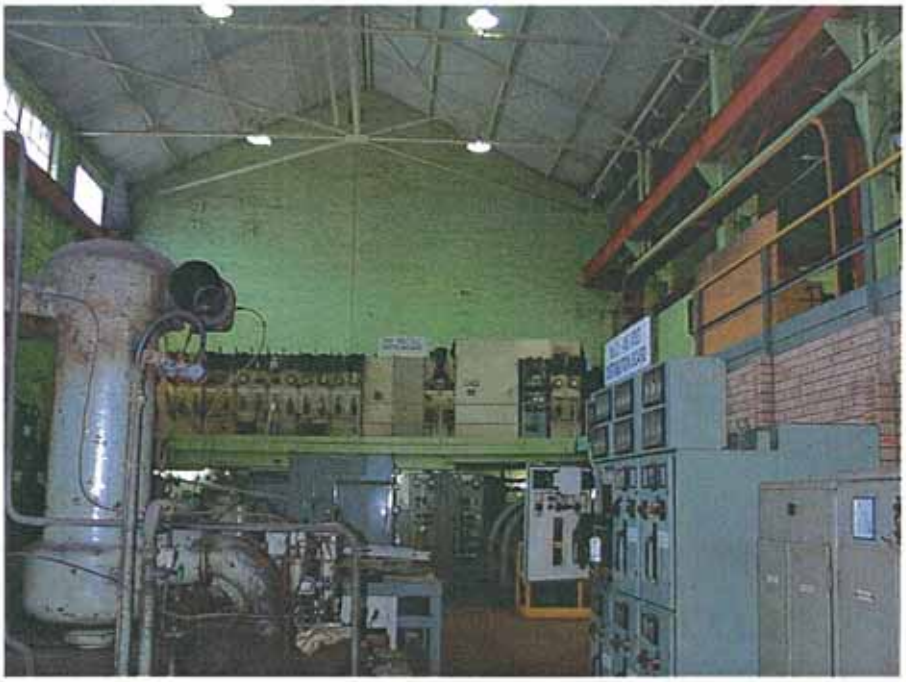
EXTERNAL
Figure 6.6 East Elevation – North East of 1st Gable

EXTERNAL:
Figure 6.7 North Elevation

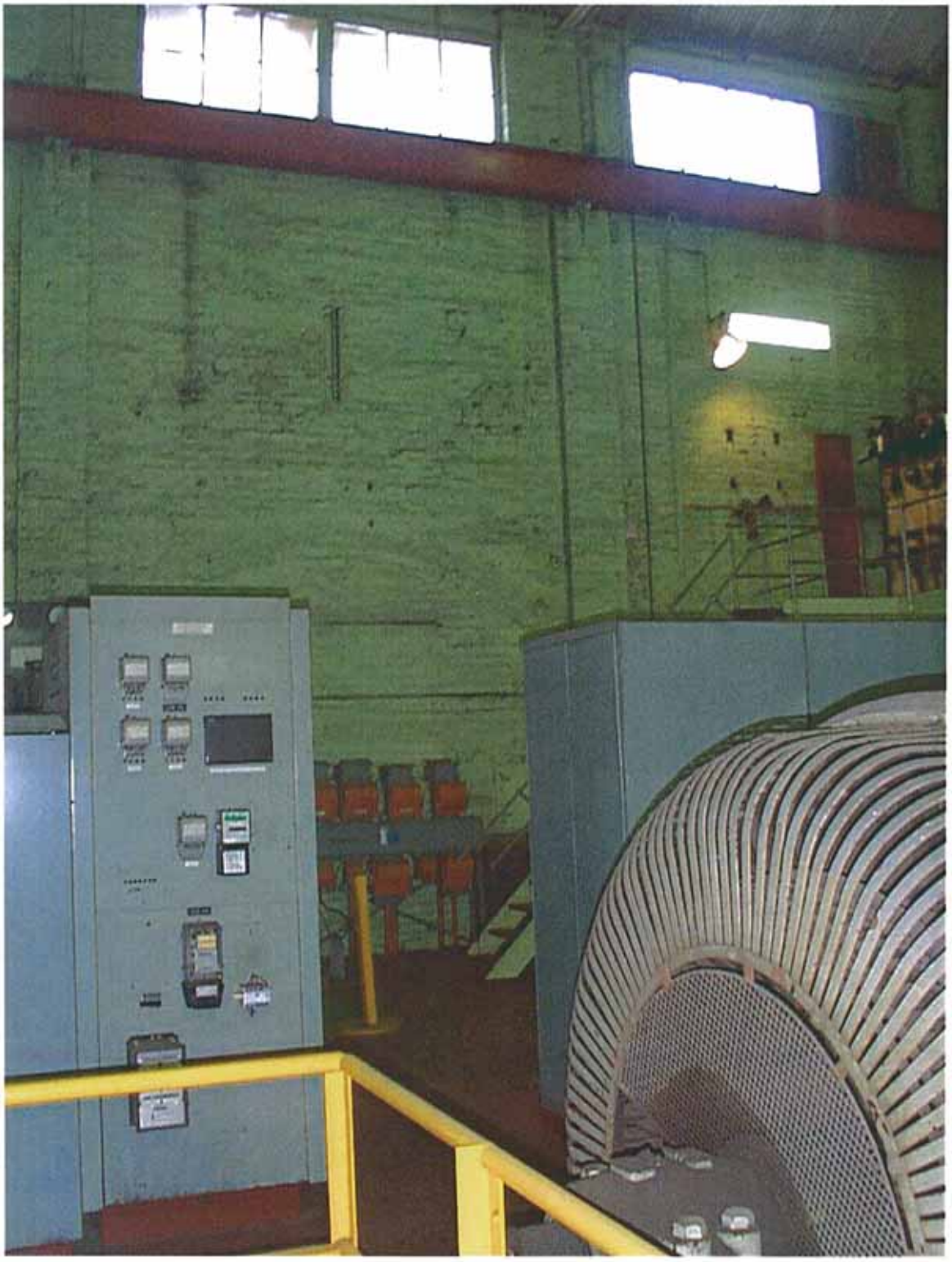


EXTERNAL:
Figure 6.8 Detail North East Corner

INTERNAL:
Figure 6.9 Western Wall Elevation



INTERNAL:
Figure 6.10 Interior (part) South Elevation

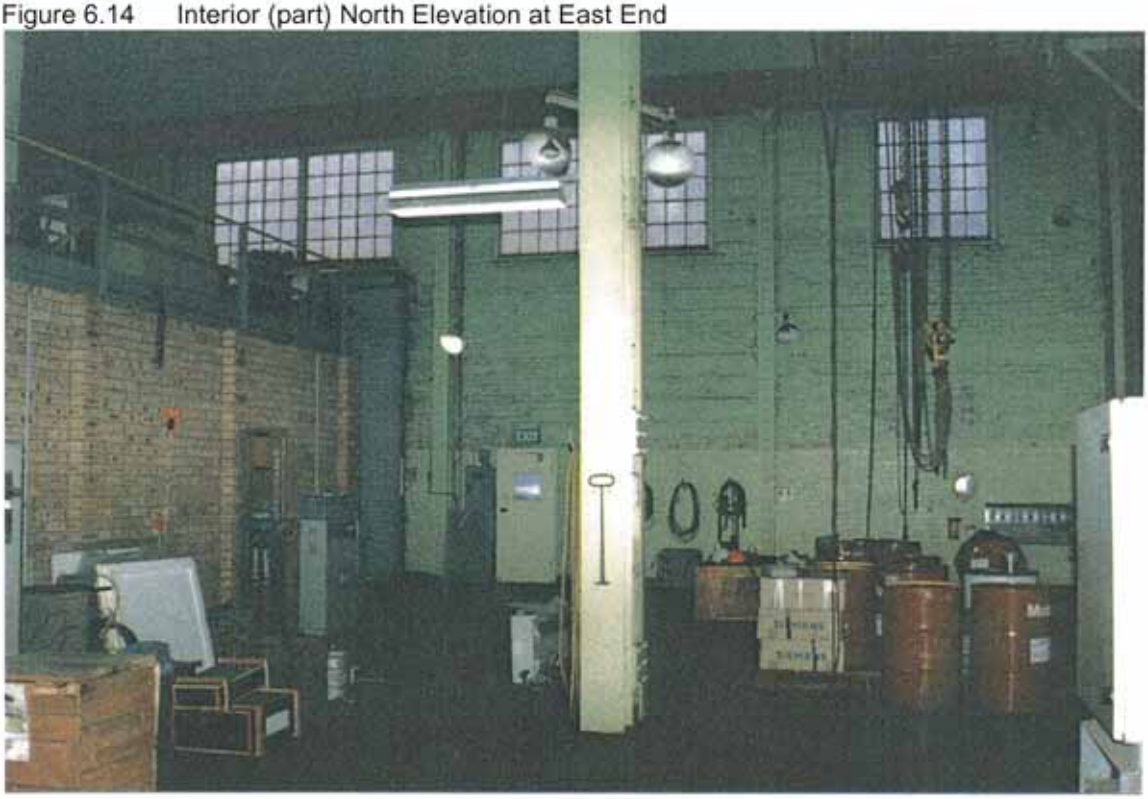


INTERNAL:
Figure 6.11 Interior (part) Eastern Elevation of Northern most Gable

INTERNAL:
Figure 6.12 Interior (part): Eastern Elevation of Southern Gable

INTERNAL:
Figure 6.13 Interior Detail: Roof Column / Crane Rail

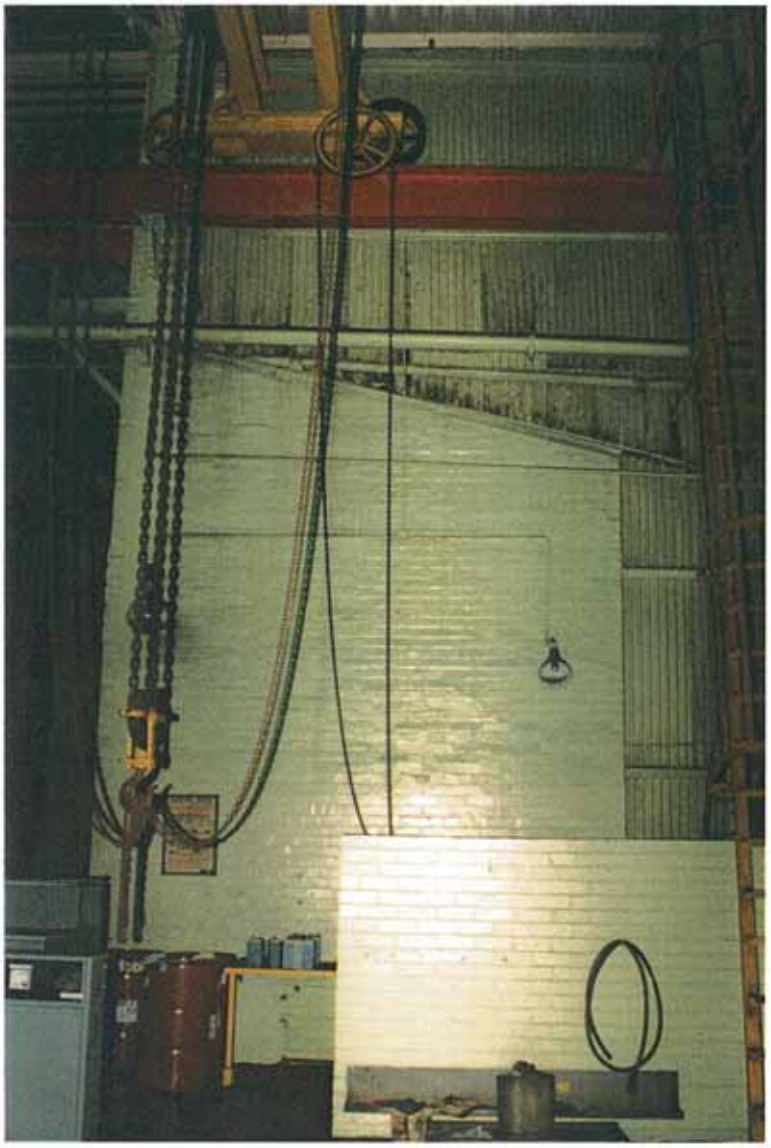
INTERNAL:
Figure 6.14 Interior (part) North Elevation at East End



INTERNAL:
Figure 6.15 Detail of North - Western Office Structure

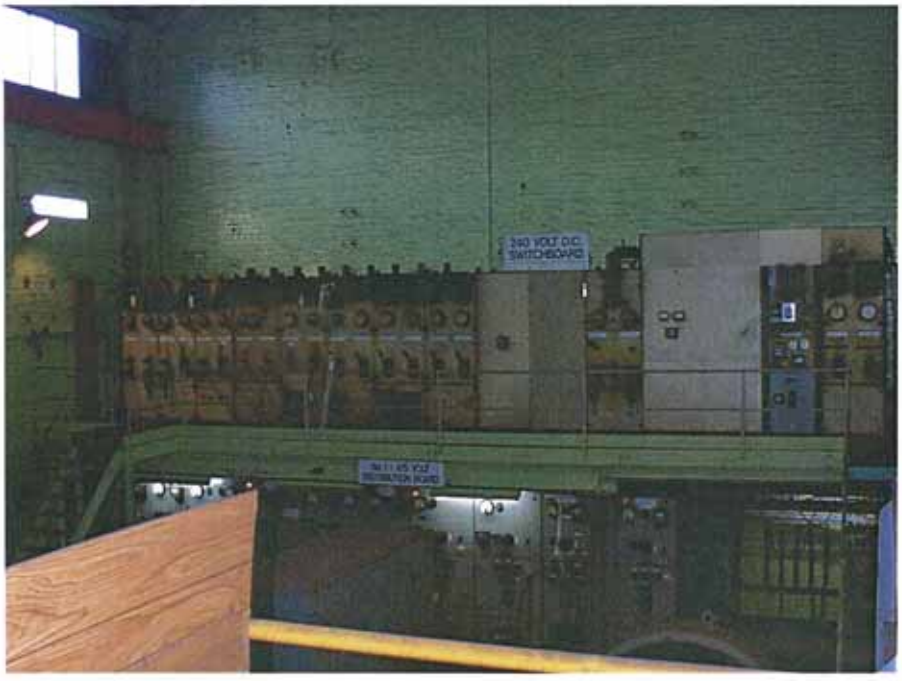
INTERNAL:
Figure 6.16: Interior view looking toward north wall showing brick built offices

INTERNAL
Figure 6.17 Interior view of north wall at far eastern end. Detail of crane rail & tyres



INTERNAL
Figure 6.18 Detail of Roof Trusses – Southern Gable

INTERNAL:
Figure 6.19 Detail Elevation of 240v D.C. Switchboard – Mezzanine

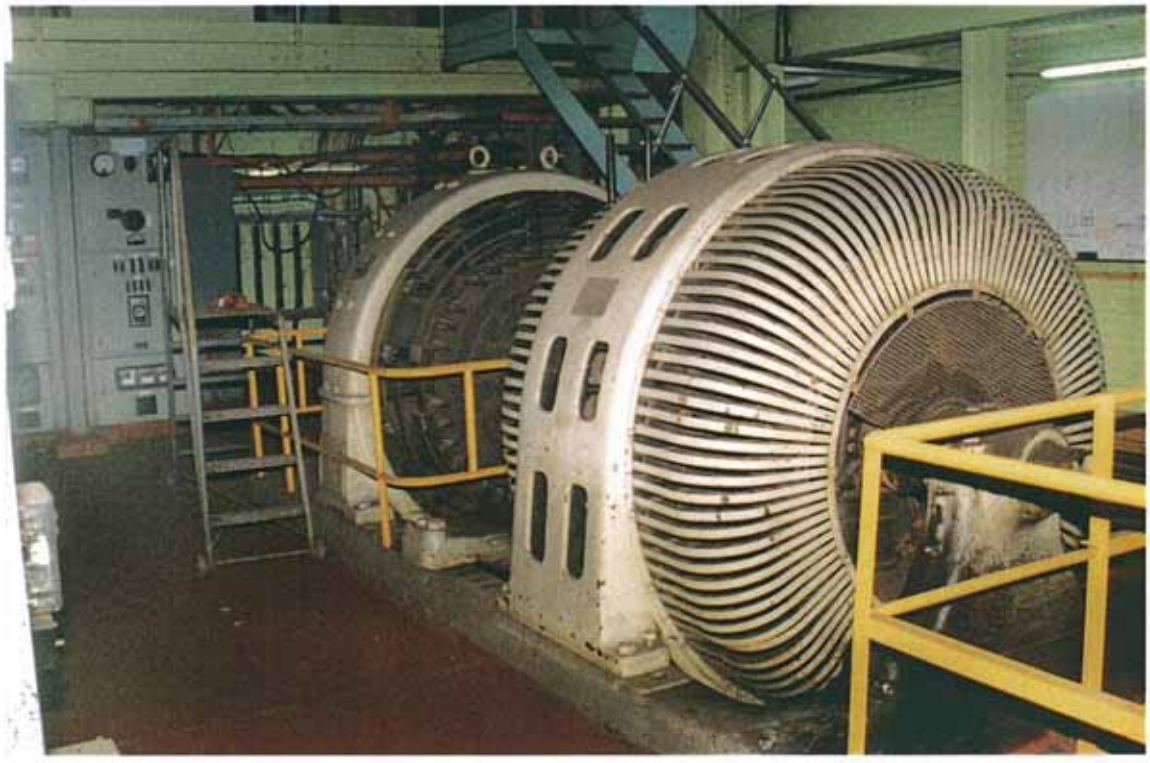


INTERNAL:
Figure 6.20 Detail of 240v D.C. Switchboard – Looking to North West Elevation

INTERNAL:
Figure 6.21 Detail of 240v D.C. Switchboard – Looking to South West Elevation

INTERNAL:
Figure 6.22 Rear Detail of 240v D.C. Switchboard – Looking to South West Elevation

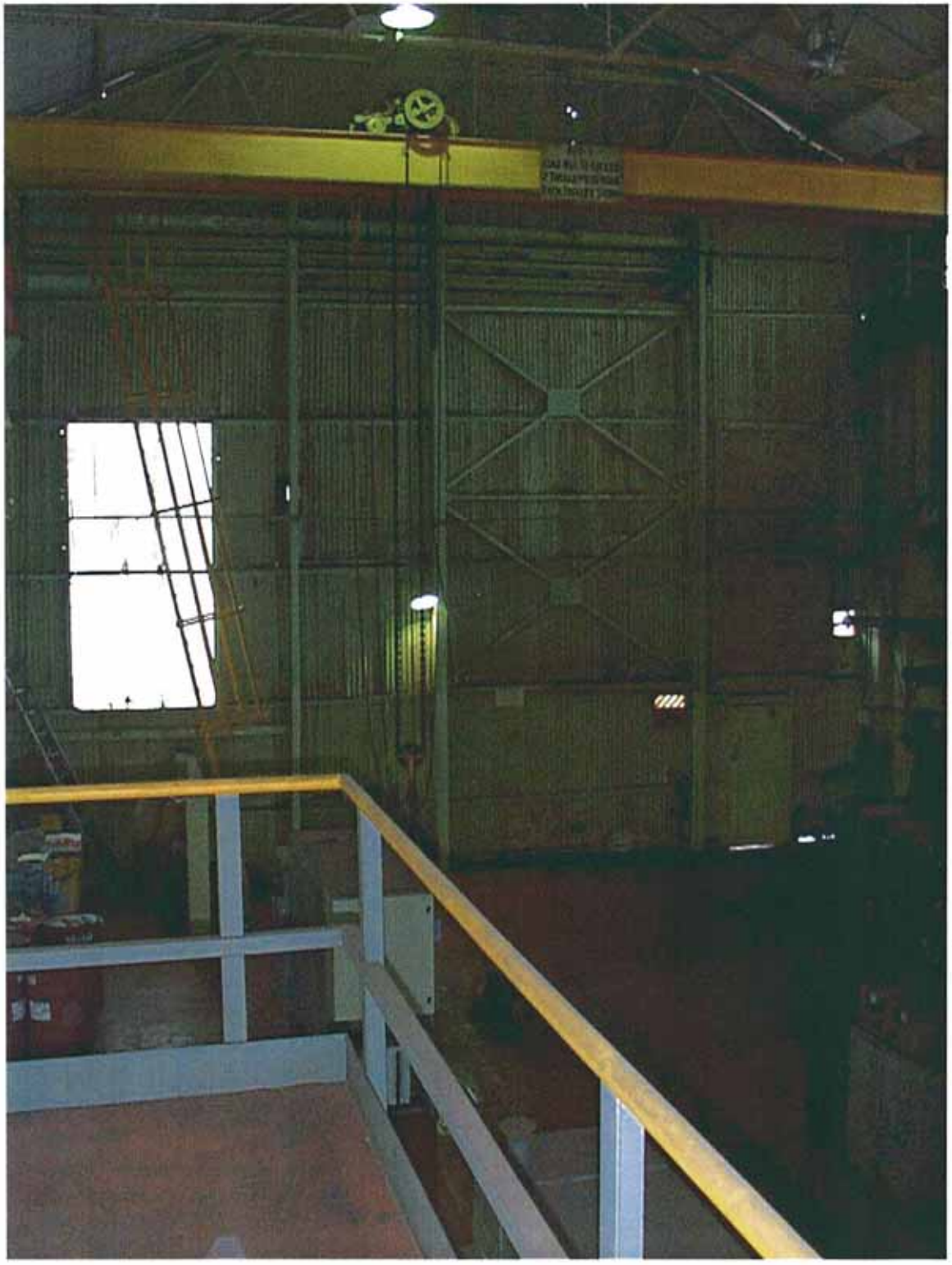
INTERNAL:
Figure 6.23 Detail of No. 2 Motor Generator – Looking to South West Elevation



INTERNAL:
Figure 6.24 Detail of Compressor AR7 "Atlas Copco" Stockholm #A150043

INTERNAL:
Figure 6.25 Detail of 11,000v Switchboard on South Elevation

INTERNAL:
Figure 6.26 East Elevation and 10 Tonne Crane – Southern Gable



7.0 NEGATIVE REFERENCE LIST

The following information relates to the complete set of negatives taken for the recording of this building. Under each Roll Number is a table containing the negative numbers and a description of each frame taken of that roll. The roll and negative numbers, position and direction of frame taken are referenced in the plan in section 9.0 – photographic reference plan. The numbers in the column titled "Figure No." relate to the selected photographs in section 7.0 of this report. Items marked with a dash in this column have prints located in the appendix along with the complete set of negatives.

Manual camera photographs

ROLL 9811 – 23-3-2000
Camera: Nikon FE. F 1:3.5
Film: Soulcolor coloured film ASA 100

Neg No.	Figure No.	Description
0	-	Interior detail of 415V distribution board looking @ south/west elevations
1	-	Interior detail of 11000V switchboard taken from mezzanine to south wall.
2	-	Interior detail of air compressor AR7 taken from mezzanine to south wall.
3	-	Interior detail of air compressor ER8 works taken from mezzanine, looking to south/east walls.
4	--	Shop floor detail taken from mezzanine looking at east wall base plate for machine now used as storage organiser.
5	-	Detail of 7 ton crane & rail @ east elevation. Note later addition of steel work to support rail bolted to steel riveted column of earlier building part.
6	6.1	West Elevation
7	6.2	South Elevation
8	6.3	South West Corner Detail
9	-	Exterior Elevation of south-east corner detail. (Note sliding corrugated sheet cladding & door for removal of equipment.
10	6.4	South East Corner Detail
11	6.5	East Elevation
12	6.6	East Elevation – North East of 1st Gable
13	6.7	North Elevation
14	6.8	Detail North East Corner
15	-	Detail of tunnel air vent at North elevation

Manual camera photographs

ROLL 9792 – 22-3-2000
Camera: Nikon FE. F 1:3.5

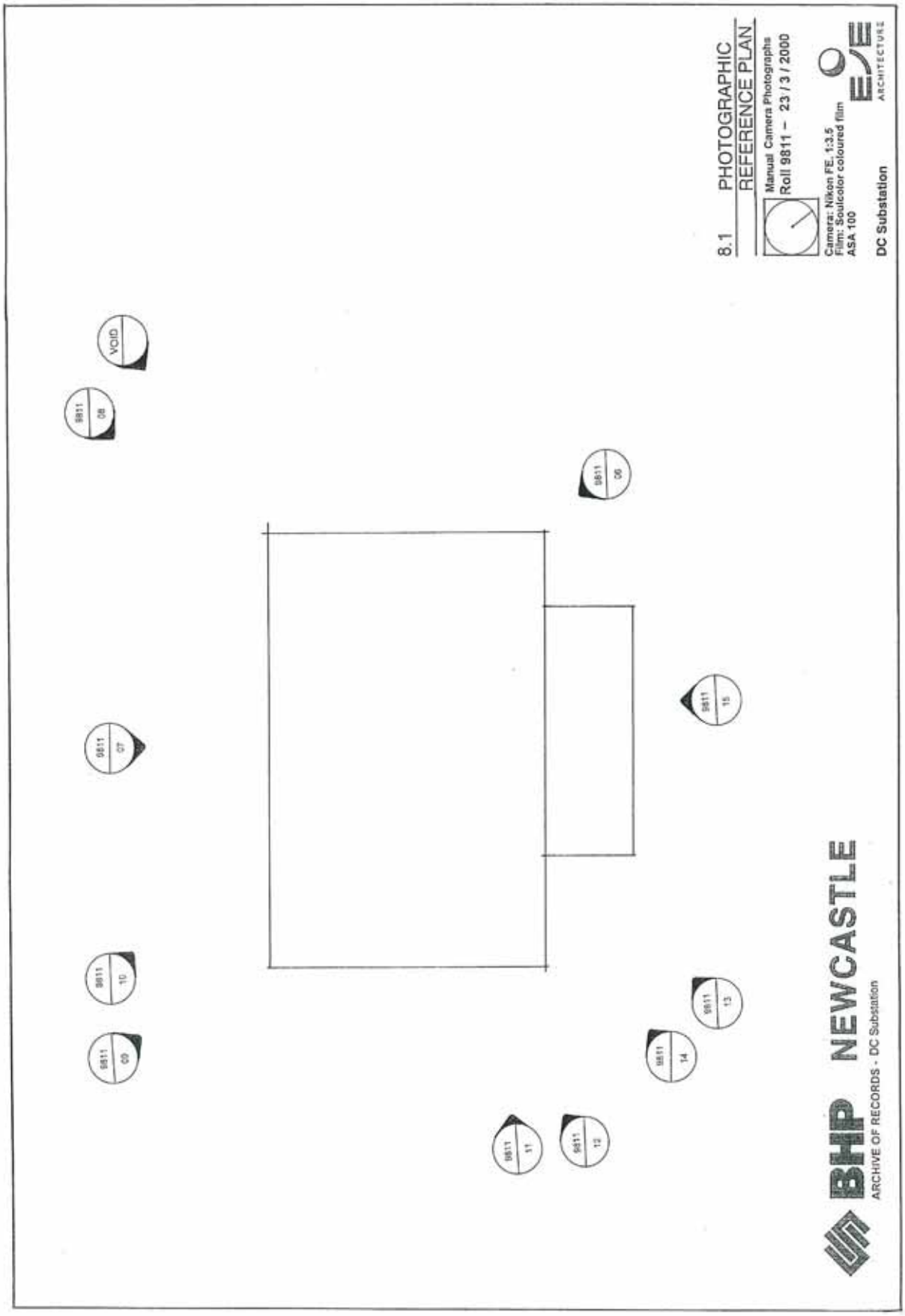
Neg No.	Figure No.	Description
10	-	Interior view looking to west wall.
11	-	Interior detail of 240V DC switch board @ west end on mezzanine.
12	-	Void
13	-	Interior view of south wall (first four bays & part 11000V switch board.
14	-	Interior of south wall & air compressors taken from mezzanine.
15	-	Interior view of east wall (part) showing 10ton crane.
16	-	void
17	-	Interior detail of No.2 1000KW motor generator from mezzanine.
18	6.14	Interior (part) North Elevation at East End
19	6.17	Interior view of north wall at far eastern end. Detail of crane rail & tyres.
20	6.16	Interior view looking toward north wall showing brick built offices.
21	6.18	Detail of Roof Trusses – Southern Gable
22	6.23	Detail of No.2 Motor Generator – Looking to South-West Elevation.
23	6.20	Detail of 240V DC Switchboard – Looking to North West Elevation
24	-	Detail of 240V DC switchboard looking west.
24A	6.22	Detail of 240V DC Switchboard from rear looking south-west.

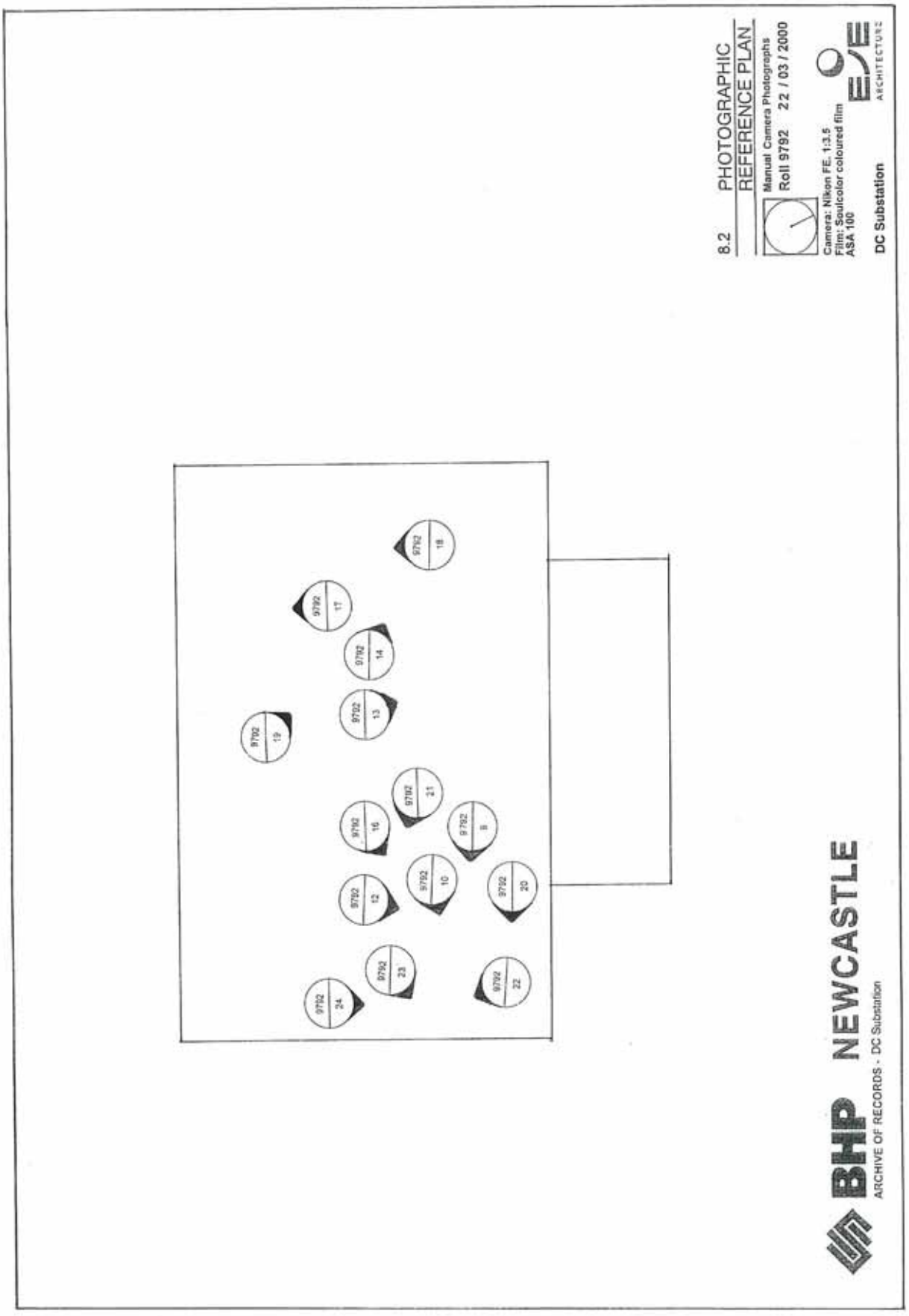
Digital photographs

24/3/2000
Camera: Kodak DC-120 Zoom 38 – 114

Photo No.	Figure No.	Description
DC-SS-01	6.9	Western Wall Elevation
DC-SS-02	6.10	Interior (part) South Elevation
DC-SS-03	6.11	Interior (part) Eastern Elevation of Northern most Gable
DC-SS-04	6.13	Interior Detail: Roof Column / Crane Rail
DC-SS-05	-	Interior elevation (part) north wall @ east end
DC-SS-06	6.15	Detail of North - Western Office Structure
DC-SS-07	6.19	Detail Elevation of 240v D.C. Switchboard – Mezzanine
DC-SS-08	-	Interior elevation view to south/east elevations showing office block. Foreground motor generator.
DC-SS-09	-	Detail of mezzanine with part 240V DC switchboard as seen from working floor viewing west (415V distribution board No.1 below)
DC-SS-10	-	Interior detail of mezzanine southern side of 240V DC switchboard.
DC-SS-11	-	Detail of motor generator No.2
DC-SS-12	6.12	Interior (part): Eastern Elevation of Southern Gable
DC-SS-13	6.24	Detail of Compressor AR7 "Atlas Copco" Stockholm #A150043
DC-SS-14	-	Detail of ER8 works air compressor – 'Dobbie Instrumentation Australia A 1349"
DC-SS-15	6.25	Detail of 11,000v Switchboard on South Elevation
DC-SS-16	0.1	Cover Page (Detail of 240v DC switchboard taken from mezzanine looking toward north elevation.
DC-SS-17	6.21	Detail of 240v D.C. Switchboard – Looking to South West Elevation
DC-SS-18	-	Detail of 11000V switchboard looking towards south / west elevations.
DC-SS-19	-	Part south elevation taken from mezzanine.
DC-SS-20	-	Part elevation of south wall looking to eastern elevation, taken from mezzanine.
DC-SS-21	6.26	East Elevation and 10 Tonne Crane – Southern Gable
DC-SS-22	-	Detail of 10 ton crane east wall elevation taken from mezzanine

8.0 PHOTOGRAPHIC REFERENCE PLAN




8.2 PHOTOGRAPHIC REFERENCE PLAN
Manual Camera Photographs
Roll 9792 22 / 03 / 2000
Camera: Nikon FE. 1:3.5
Film: Soulcolor coloured film
ASA 100
DC Substation
EJE ARCHITECTURE
BHP NEWCASTLE
ARCHIVE OF RECORDS - DC Substation
9792 18
9792 17
9792 14
9792 13
9792 19
9792 21
9792 16
9792 8
9792 10
9792 12
9792 20
9792 23
9792 24
9792 22

9.0 DIAGRAMMATIC RECORD AND DRAWINGS

Figure 9.1: Power House
Plan Sections & Views (1913)

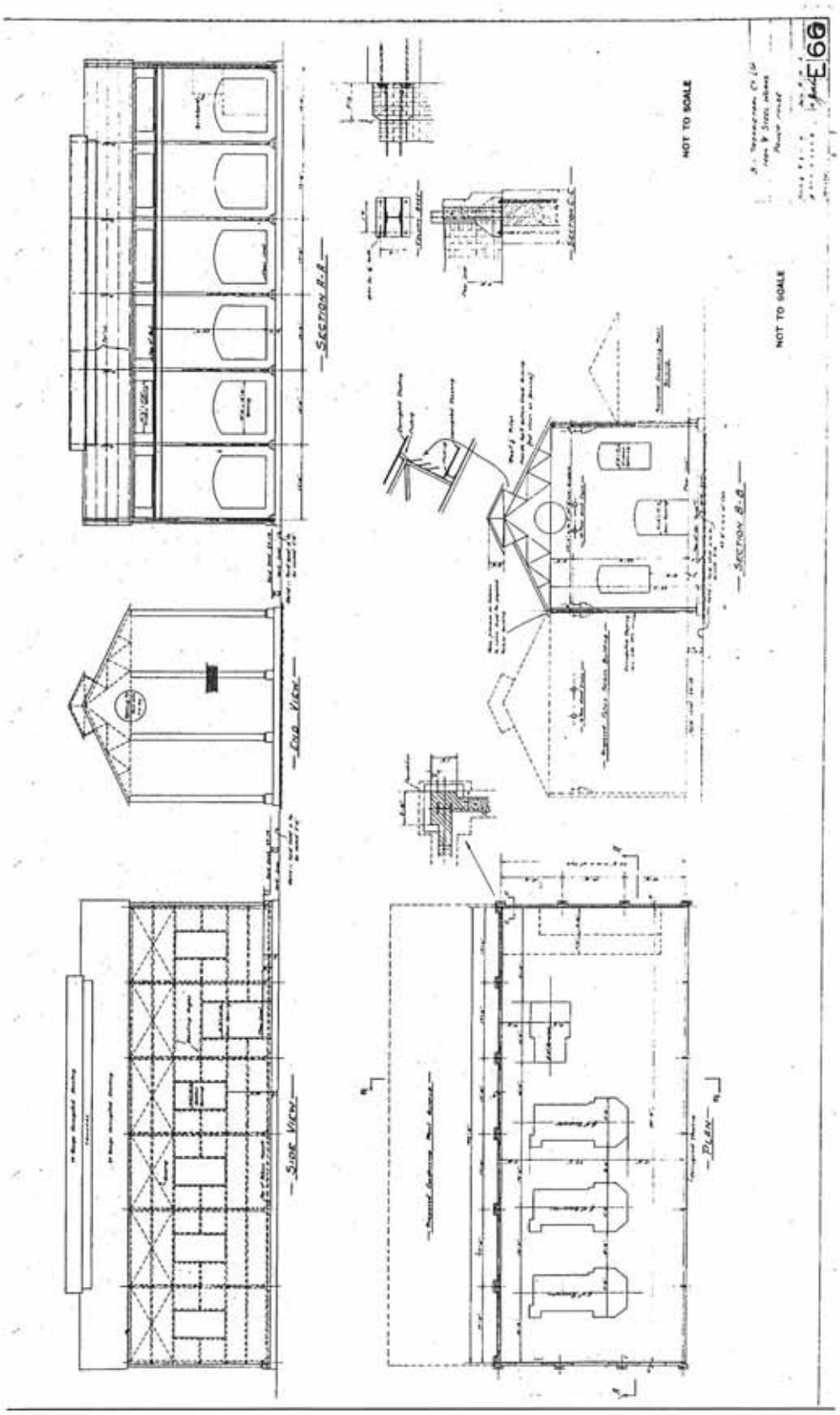
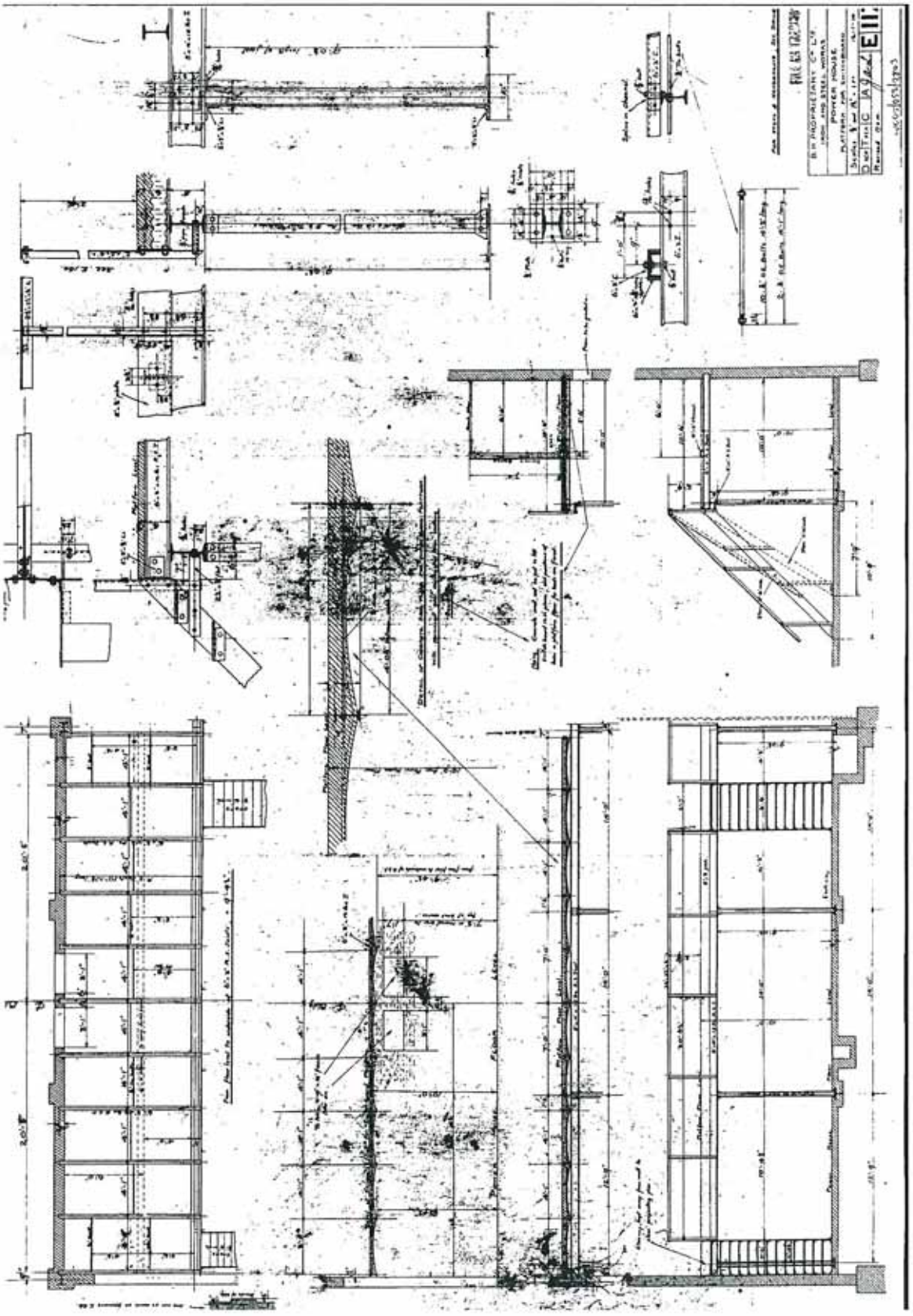


Figure 9.2: Power House
Platform for switchboard (1914)



10.0 HISTORIC PHOTOGRAPHIC RECORD

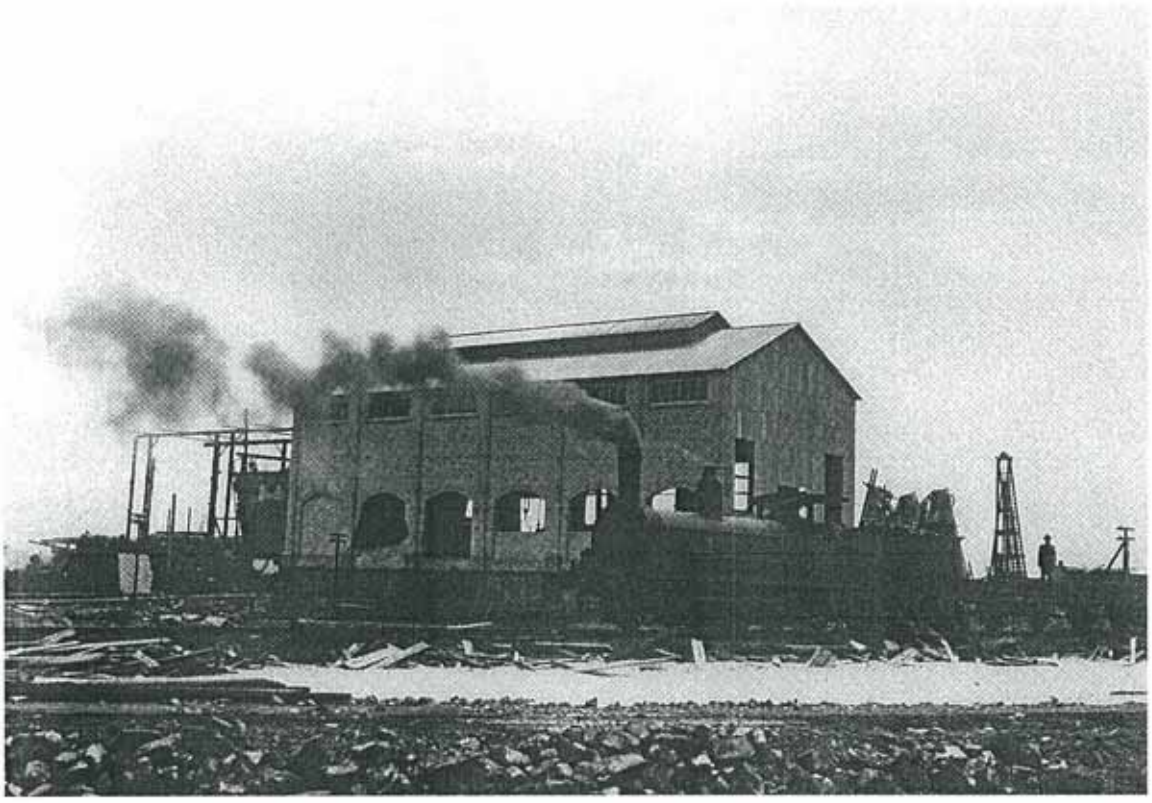


Figure 10.1: View of DC Power house from the South-East.
Source: P.P Cranney (1999:79)

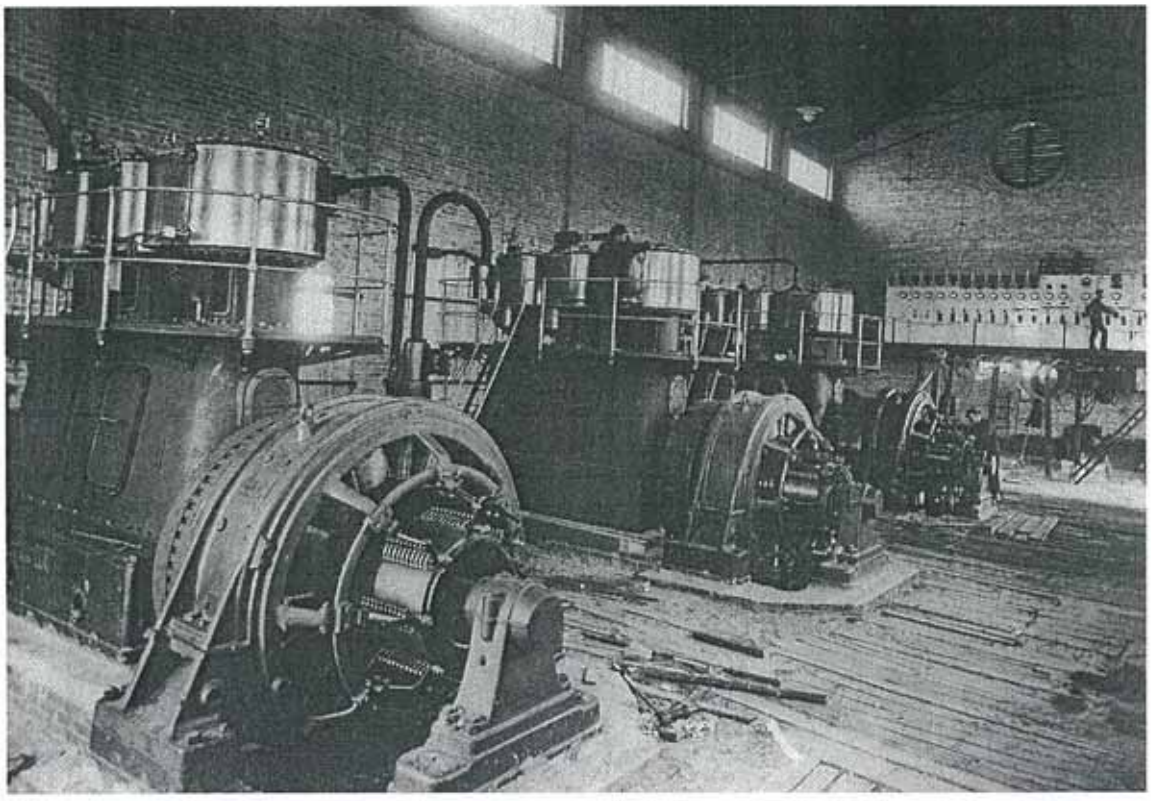


Figure 10.2: Three Steam driven dynamos (3 Cylinder Bellis Morcom – 500Kw)
Source: P.P Cranney (1999:80)

11.0 FULL FORMAT PHOTOGRAPHIC RECORD

Note: No Full Format Photographs of the DC Substation were found during the compilation of this report.

12.0 INVENTORY OF EQUIPMENT, FITMENTS & FINISHES

ITEM	DESCRIPTION
240V D.C. Switchboard (complete)	1915/1924 192A Marble Switchboard built of mezzanine platform.
11,000V Switchboard	Remains in-situ along south wall of added building.
Motor Generator	The No.2 (1000kW) Motor Generator Set remains in tact, in its original location (1924), within the building. The No.1 Motor Generator was removed in the 1950's to the AC Pump House. 259 V DC Genorator.
Air Compressors	Large Compressor: AR7 WORKS AIR COMPRESSOR "Atlas Copco" Stockholme, Sweden. "Dobbie Instrumentation" Australia (Dobros) AS1349. AR&.K6324 Serial No:A150043. Small Compressor: ER8 WORKS AIR COMPRESSOR
Crane (southern gable)	North building (original) of Substation: 10 ton hand crane. South building of Substation: 10 ton hand crane.

13.0 APPENDICES

Appendix A: Manual camera negatives and photos

Appendix B: Digital images Proof Page and disk

Appendix C: Archive Drawing Register Disk

13.1 Appendix A: Manual camera negatives and photos

Refer to the final Archive Report master copy, to be submitted to the NSW Heritage Office, for negatives and additional mounted manual photographs.

13.2 Appendix B: Digital images Proof Page

Refer to the final Archive Report master copy, to be submitted to the NSW Heritage Office, for the digital images disc.

13.3 Appendix C: Archive Drawing Register Disk

Refer to the final Archive Report master copy, to be submitted to the NSW Heritage Office, for the drawing register disk. Also accompanying the master copy shall be full size prints of the drawings as included in Section 9.0 -"Diagrammatic Records & Drawings".

NEWCASTLE PORT CORPORATION
Delivering Opportunity