Large Erecting Shed, Eveleigh NSW

Assessment of Adequacy – Structure and Electrical Services

Project no: 20618

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1.0 Executive Summary

1.1 Introduction

On the instructions of John Glastonbury of 3801 Limited, SGA Property Consultancy Pty Ltd (SGA) has carried out an inspection of the Large Erecting Shed, Eveleigh New South Wales and presents the following Assessment of Adequacy – Structure and Building Services.

In general accordance with your instructions, our team has completed this report with the principal objective of furnishing yourselves with sufficient information as to the current condition of the building in terms of its internal / external fabric, its structural adequacy and the operation of its services.

The site is on Railcorp land and is accessed via a bitumen driveway located adjacent the corner of Railway Parade and Park Street, Erskineville NSW.

Our team completed a physical inspection of the building on 24 March 2006 and gained access to the majority of internal and external areas excluding the areas listed within Section 1.3 List of exclusions within this report.

Given the intent of this inspection report we have not inspected parts of the building built-in, covered-up, locked or otherwise made inaccessible during the course of our inspection. Therefore we have been unable to comment as to whether such elements are free from defect or infestation.

We also confirm that this report has been prepared for the benefit of 3801 Limited and is not for reference by any other party. No part of this report is to be copied or reproduced, in full or in part, without the express written approval of SGA Property Consultancy Pty Ltd.

The following is the basis of information used in our investigations the survey:

- Walk through visual and audible appraisal of accessible structure and services.
- External inspection of the facades from ground level.
- External inspection of the Western (front) central roof areas via the use of a cherry picker.
- Review of Letter, dated May 2001 prepared by John Walcott of Cranetec detailing security issues with the 2 No. gantry cranes within the Premises.

1.2 Description of Premises

1.2.1 Description of Premises

The site is located to the Northern side of Railway Parade, Erskineville adjacent to the junction of Railway Parade and Park Street, approximately 4 kilometres South West of Sydney's CBD. We understand that the building was constructed on the property circa 1890 and was purpose built as an erecting shed for the use of the railway corporation.

The building is located to the South Western corner of the site leading to Railway Parade. The site is generally level, sloping toward the South along the entrance driveway.

The subject building is a rectangular building constructed in load bearing masonry with central cast iron columns, supporting a double pitch metal truss roof with a metal sheet roof cladding. The building has 6 No. rail tracks continuing into the building for access by locomotives, all of which have inspection pits beneath.

The perimeter walls have large inward projecting brickwork piers, which together with the central columns support the overhead steel rails for the gantry crane.

The ground slab is of concrete construction with recessed inspection pits along the buildings length, beneath the six (6) sets of rail tracks that extend into the building.

1.3 General Property Condition

1.3.1 Roof

The roof is constructed from double pitched metal trusses that bear between the central metal columns and the external perimeter walls. The roof falls to a central valley gutter and to the perimeter gutters.

The roof cladding consists of corrugated metal sheeting with intermediate opaque fibreglass skylights at regular intervals and a matching ridge capping section.

Overall the roof cladding is considered to be in good condition with no significant defects evident at the time of inspection.

1.3.2 External Walls

The structure of the building comprises load bearing solid masonry walls bedded in cement lime mortar. The walls are approximately 475mm thick at the base of the walls reducing down to 365mm at high level above the crane bearing rails.

The north and south main walls incorporate large solid masonry piers that support the crane steel track load. These piers have an overall internal projection of 565mm, are 1130mm wide and are at approximately 6.1m regular centres.

The walls themselves have numerous defects evident which require attention and repairs. The majority of these are considered to a result of a lack of regular maintenance within the past and whilst considered somewhat extensive can be rectified by repair and maintenance works.

1.3.3 Floor Slab

The floor slab through-out the building is of exposed concrete construction. There were a number of undulations within the slab and other defective areas where services have been laid within the slab, but otherwise the concrete slab is considered to be in a reasonable condition commensurate with its age. Never the less the floor does require a number of repair and maintenance works.

1.3.4 Electrical Installation

The electrical services installation undertaken by Services Integration Management (dated April 2006) is attached within part 5.0 of this report

The electrical installation appears consistent with the installation standards dating back to the first half of the 20th Century. There are serious concerns in relation to Operation Health and Safety issues, code compliance issues and general maintenance requirements.

The installation will require extensive renewal and repair to meet current safe standards of installation.

1.3.5 Structural Adequacy

The Structural report undertaken by Low & Hooke Consulting Engineers (dated 3rd April 2006) is attached within part 5.0 of this report

Their initial observation was that the building was generally in good condition given the age of the building. There was some minor cracking and damage to the gable end walls. In their opinion, the structure had not deteriorated to any great extent and the structure was in a condition very similar to its original construction. If it is assumed that the building was structurally adequate when it was erected and in accordance with the standards of the day, its present condition is not much different to this and any minor deterioration will not affect its condition.

Clearly there are some areas of cracking and damage to the building, particularly in the gable end walls that will require repairs and possible stiffening but we do not believe that this work significantly affects the overall performance of the building.

The building is over 100 years old and the building standards at the time were most likely empirical or quite prescriptive without being able to resort to the technology that we have now. It was usual for old buildings to be heavily designed for vertical downward (gravity) loadings with little regard to lateral loadings from wind loads or any upward loadings particularly on the roof.

The areas of the building that would be of concern on face value with regard to the manner and style of building design that is carried out today are as follows:

- The side brick walls may have a stability problem for earthquake loadings and wind loadings.
- The gable end walls are higher than the side walls and have less mass due to the large openings and windows, and hence is less stable than the side walls
- The main roof trusses have tension rod bottom chords. This design is inadequate for any possible upward loading due to wind loads.
- The under-purlins similarly have a tension rod as the bottom chord and similar comments in relation to any possible upward wind loads apply.
- The side brick walls and the central steel column and beam structure support the main roof trusses. This connection is required to resist the upward loadings due to the wind loads and it is possible that there may be inadequate tie down capacity.
- There may be insufficient vertical loading to resist crane loads from lateral loading due to skewing of the crane or off centre lifting.

The extent of recommended repairs / upgrade works is described within the structural report and the costing's included within the rectification cost schedule.

1.4 Estimated Required Expenditures

For full details of recommended repairs (rectification and upgrading costs) see rectification cost schedule contained within Section 4.0 of this report.

1.5 List of Exclusions

The following exclusions are noted for your information in relation to our inspection and this report;

- The high load exposed power cables and wiring to the underside of the ceiling and to the crane prohibited any inspection of the head of the walls, piers and columns.
- The service pits could only be inspected for the initial 30m of service pit to rail lines 1 & 2 from the Western entrance doors. Rolling stock and boarding covered the remaining service pit areas preventing any further inspection.
- Access was not available to the Eastern end or south side of the roof by way of the cherry picker.
- The mezzanine structure to the south elevation was not inspected internally.

2.0 BUILDING STRUCTURE & FABRIC

2.1 External Walls

The main building has over-all approximate internal dimensions of 183.00m long x 31.82 m wide.

The side walls (north and south) are approximately 11.0m high over-all and 470mm thick upto the crane steel support rails (approximate height 6.2m above floor level), and above this line the walls are 360mm thick to the underside of the roof trusses.

The external walls are of solid masonry construction constructed in a mixture of red and yellow stock bricks, bedded in a cement/lime mortar with flush pointing. The brick walls are in an 'English bond' and are complete with decorated brick bands such as corbelled banding and soldier courses and brick arches in contrasting brickwork.

Window heads are constructed traditionally in red stock soldier courses and arches.

There are large brick piers to the perimeter north and south walls that support the steel structure rails for the overhead gantry cranes. These piers (29 No.) are at 6.1m regular centres and are 1129mm wide x 565mm internal projection from the internal wall line. The piers are 6.2m high above floor level and support the weight of the steel crane rails. These rails are also tied back to the perimeter walls via cone and circular restraint cast iron heads.

There are extensive glazed openings within each of the elevations and large timber side hung doors to the front and rear elevations (west and east elevations). There are further single exit and double access doors to the north and south elevations.

There are a number of defects within the external walls that will require attention and repairs. These are separate to the recommendations and areas of concerns that are related to and referred to within the Low & Hooke structural report. The majority of the items of repair are considered to be a result of a lack of general / routine maintenance and can be rectified as such. These defects noted include;

- High level vertical cracking within the external walls particularly to the north elevation.
- High level stepped vertical cracking to the rear eastern walls (north side) above the middle door opening arch. .
- Low level vertical cracking to south elevation.
- Low level horizontal crack within mortar course to south elevation within south west corner, at approx height of 900m above floor level.
- Areas of probable impact damage to ease elevation above door openings.
- Minor movement to brickwork piers at line of damp-proof course noted to north elevation.
- Areas of external brickwork require raking out and re-pointing where mortar currently spalling and loose.
- Reconstruction of external brickwork where deformed by loadings from crane restraint ties to North elevation.
- Cut out and renew damaged bricks where impact damaged.
- Minor horizontal cracking noted within mortar course to north and south walls above piers.
- There are a number of areas of brickwork that have not been made good following removal of previous structures to the outside, resulting in open joints and partiality painted areas.

The majority of these repairs are a result of a lack of general maintenance to the property over the years. We would recommend that a full repair programme be undertaken to the external walls. This work will require scaffolding and will comprise the following repairs;

- Rake out and re-point to 25mm in cement / lime mortar areas of damaged brickwork.
- Large cracks to perimeter walls are to be cut and replaced with new stock bricks to match existing. Cracks to be tied with stainless steel rods.
- Smaller cracks where bricks are not damaged are to be raked out and re-pointed to match.
- Possible part reconstruction of damaged brick arch to rear door opening to east elevation.
- Cut out and replace damaged/cracked bricks.
- Remove all parts of previous structures and make good back to match existing.

2.2 Roof

The roof structure comprises metal roof trusses with a roof pitch of 25º, with two trusses supported off the external north and south walls and off the central metal columns.

The roof trusses are at 6.1m centres and have an RSJ top chord, rod bottom cord and diagonals of either rods or RSJ's. The central vertical and diagonal web members are rods.

There are simple steel trusses spanning between the roof trusses acting as under-purlins to support a mid rafter.

The roof cladding finish comprises of corrugated metal sheeting with intermediate opaque fibreglass skylights at regular intervals. The roof drains to a central roof valley gutter and to the perimeter roof gutters.

We understand that the roof finish was renewed in the 1990's and the roof was noted where seen via cherry picker from the front (west) elevation as being in a good condition free from significant defect.

The metal flashing at the junction of the western front elevation and roof sheeting was in good condition where inspected.

There is no roof protection beneath the opaque fibreglass skylights and there are no warning signs restricting access to the roof, although it was noted that the access ladders were closed off at the time of inspection. There is no safe roof access system or safe roof restraint facilities and such provision is recommended.

2.3 Stormwater Drainage

The stormwater from the roof runs and discharges into the central roof valley gutter and to the perimeter gutters, and hence into the below ground stormwater system via external downpipes and internal downpipes to the valley central gutter.

The perimeter gutters where inspected to the north elevation are generally in good condition, although in need of some repair where a number of brackets are broken and the gutter line is somewhat displaced.

The external downpipes to the north and south walls are in poor condition and comprise a mixture of different materials and ad-hoc repairs in the past. The original cast iron downpipes are corroded and damaged in a number of areas, and we would recommend the complete renewal of the downpipes complete.

The gutters where inspected had general debris within requiring cleaning.

We would also consider it prudent to carry out complete cleaning of the below ground storm water drainage system.

There is a dilapidated steel framed blockwork clad mezzanine office structure connected into the building midway along the Southern elevation. The steel frame structure is corroded. We recommend the complete overhaul of the structure of the building including the removal of all corrosion and repainting the steel structure with corrosion inhibiting paint.

2.4 Floor Slab

The floor slab is of concrete construction and where seen was noted to be in a reasonable condition relative to its original age.

The floor slab as stated elsewhere within this report was heavily covered and concealed by way of rolling stock, general equipment, boarding and other debris. This prevented a close inspection of the complete surface and as such our inspections was generally limited to the floors adjacent to the perimeter walls.

We saw no evidence of movement joints to the slab although this does not appear to have resulted in any further deterioration as a result.

Service conduits laid in the top of the slab were noted in a number of locations. These have been shallow laid with the result that the concrete infill has spalled and lifted above. If these services runs are to be retained then these cables should be ducted into the floor.

There are a small number of undulations within the floor slab that will require re-levelling to avoid any potential future trip hazards. These can be rectified by cutting out and re-levelling of the surface via a high performance topping after extensive cleaning and de-greasing.

The sunken inspection pits within the floor slab beneath each of the rail lines were purpose built as inspection pits for the maintenance of the locomotives and stock beneath.

There inspection pits could not be safety accessed due to rolling stock over. The service pits have accumulated grease, oil, mechanical fluids, rubbish, etc. over time which could possibly cause a fire / chemical hazard. Consideration needs to be given to their continued use by way of a health and safety risk assessment being undertaken. In the short time we would recommend the grease, oil and mechanical fluids accumulation be chemically removed, collected and removed from the service pits.

We are not aware as to any method of drainage of the pits. This should be verified by further investigation.

2.5 Windows & Doors

The six large pairs of main entrance doors to the west and east elevations (for locomotive access) comprise timber framed, ledged, braced and boarded hardwood doors hinged of the brickwork walls via built in metal cup and socket heavy duty hinges. The majority of these doors are in a very dilapidated condition.

These entrance doors have undergone various ad-hoc repairs over the past and the timber boarding has been overlapped / replaced with galvanised corrugated sheeting. The hinges have surface corrosion and require repair. We would recommend you budget for the complete extensive overhaul and refurbishment of the doors.

Likewise the pairs of side doors to the building are in a similar dilapidated condition and require overhaul; and repair.

Exit doors should be fitted with suitable emergency exit hardware.

The high and low bay window frame construction comprises of metal casements/ frames and louvred opening casement lights, with feature bullseye window to the high level gable walls. There are numerous occurrences of damaged window panes and corrosion to the frames requiring full repair and refurbishment.

The low level window sub-cills are of sandstone construction. Many of these stone sub sills are damaged and spalling. We recommend specialist stone repairs be undertaken by way of splicing of new matching stone sections.

2.6 First Floor Extension to South Elevation

Although not considered to be part of the original building there is a first floor single storey extension to the south elevation with concrete stair access to the same.

The extension is supported off steel structural beams that are showing sighs of surface corrosion. Further investigation is recommended to these beams. The building construction is poor with loose and dangerous block work to the west side of the building requiring urgent attention. The handrails are open and in need of renewal and there is some minor spalling of the concrete stairs.

Given the condition of this extension we would recommend that this ad-hoc addition be removed and the main building be made good.

2.7 General

Potential asbestos cement panels were noted to the south elevation, some of which were damaged and potentially friable. There was no asbestos register available for inspection. We would recommend that a survey be undertaken and an action plan be prepared, and any recommended works instigated.

It was noted that the external fire hydrants had not been serviced for at least three years. This should be rectified as a matter of urgency.

We understand that the hydraulic air pipework is in disrepair and needs full renewal.

3.0 Conclusion

Structurally the building is considered to be in a satisfactory condition relative to its age and in a similar structural condition relative to its original construction.

Never the less whilst the structural condition is relative to its original construction it does not comply with current standards and design, and is in need of upgrade / repair works to address a number of items of concern raised by the Engineer.

These works should be carried out to prolong the use of the building and to address potential risks within the original design and construction to meet current standards and design.

The building has also suffered from a lack of maintenance and repair over the years, and whilst these have not currently affected the structural adequacy of the building, they have affected the weather tightness and fabric and finishes of the building and are required to be addressed in the immediate / short time.

There are a number of such building maintenance works that have imposed current risks to health and safety and these should be addressed as a matter of urgency.

The electrical services in particular are considered poor and are in need of a full refurbishment and renewal to meet current standards, and to achieve a safe working environment.

4.0 Rectification Cost schedule

RECTIFICATION COST SCHEDULE

Large Erecting Shed, Eveleigh
April 2006

Item	Element / Location	Inspection / Review Comments	Action / Comments	Code	Short Term (within 1 year)	Medium Term (2 to 5 years)	Long Term (6 - 10 years)	Estimated Rectification Cost
	ELEMENTAL BUILDING AUDIT							
	IDENTIFIED ISSUES REQUIRING FUTURE EXPENDITURE							
	Note: The cost information detailed below is for guidance only and should not be relied upon other than for indicative budget purposes.							
1.00	**BUILDING STRUCTURE & FABRIC**							
1.01	External Walls	High level cracking to external walls	Restitch brickwork	E	$ -	$ 60,000	$ -	$ 60,000
1.02	External Walls	High level stepped cracking to rear eastern walls	Cut out and restitch brickwork	E	$ 25,000	$ -	$ -	$ 25,000
1.03	External Walls	Low level cracking to external walls	Restitch brickwork	E	$ -	$ 15,000	$ -	$ 15,000
1.04	External Walls	Stepped cracking to external walls	General re-pointing to walls.	E	$ -	$ 30,000	$ -	$ 30,000
1.05	External Walls	Spalling brickwork pointing	Rake out & repoint walls	D	$ 20,000	$ -	$ -	$ 20,000
1.06	External Walls	Previous structures not fully removed	Remove existing structures and make good	D	$ -	$ 10,000	$ -	$ 10,000
1.07	External Walls	Damaged bricks	Cut out and renew damaged brickwork	D	$ -	$ 5,000	$ -	$ 5,000
1.08	External Walls	Damaged wall around crane support	Reconstruct damaged wall	E	$ 3,000	$ -	$ -	$ 3,000
1.09	Roof	Damaged gutter brackets	Renew damaged brackets	E	$ -	$ 4,000	$ -	$ 4,000
1.10	Roof	No safe roof access or roof restraint	Provide safe roof access/restraint system	D	$ -	$ 25,000	$ -	$ 25,000
1.11	Stormwater drainage	Corroded/damaged rainwater downpipes	Renew downpipes	E	$ 1,000	$ -	$ -	$ 1,000
1.12	Stormwater drainage	Debris to rainwater system	Clean out gutters & below ground drainage	D	$ -	$ 3,000	$ -	$ 3,000
1.13	Floor Slab	Spalling concrete around service conduit	Cut out and make good	D	$ -	$ 20,000	$ -	$ 20,000
1.14	Floor Slab	Undulations in floor slab	Relevel slab and make good	D	$ -	$ 5,000	$ 35,000	$ 40,000
1.15	Floor Slab	Inspection pits	Clean out inspection pits	E	$ 11,000	$ -	$ -	$ 11,000
1.16	Windows and doors	Window overhaul / repairs	Overhaul & repair windows	E	$ -	$ 110,000	$ -	$ 110,000
1.17	Windows and doors	Main door overhaul/repairs	Overhaul main double doors	E	$ -	$ 60,000	$ -	$ 60,000
1.18	Windows and doors	Side access doors	Overhaul side access doors	E	$ -	$ 10,000	$ -	$ 10,000
1.19	Windows and doors	Lack of fire exit hardware	Provide new exit hardware	E	$ 3,000	$ -	$ -	$ 3,000
1.20	Windows and doors	Spalling stone sub-cills	Stone cill repairs	E	$ -	$ 25,000	$ -	$ 25,000
1.21	First Floor extension to south elevation	Dilapidated first floor addition	Take down & clear away structure & make good	D	$ -	$ 25,000	$ -	$ 25,000
1.22	Structure	Lack of restraint to end gable	provide gable end bay bracing	E	$ -	$ 350,000	$ -	$ 350,000
1.23	Structure	Lack of stiffening to truss bottom cords	Provide steel stiffening to bottom cord of roof trusses	E	$ -	$ 650,000	$ -	$ 650,000
1.24	Structure	Lack of stiffening of underpurins	Provide roof stiffening to underpurlins	E	$ -	$ 320,000	$ -	$ 320,000
1.25	Storm water drainage	Silted up drainage	Clean out drainage and test	D	$ 1,000	$ -	$ -	$ 1,000
2.00	**ELECTRICAL SERVICES**							
2.01	Main switchboard	Main switch-board reached end of life	Renew main switchboard	E	$ -	$ 45,000	$ -	$ 45,000
2.02	Submain Installation to Distribution board	Submain distribution to boards reached end of life	Upgrade submain distribution to boards.	E	$ -	$ 39,000	$ -	$ 39,000

RECTIFICATION COST SCHEDULE

Large Erecting Shed, Eveleigh
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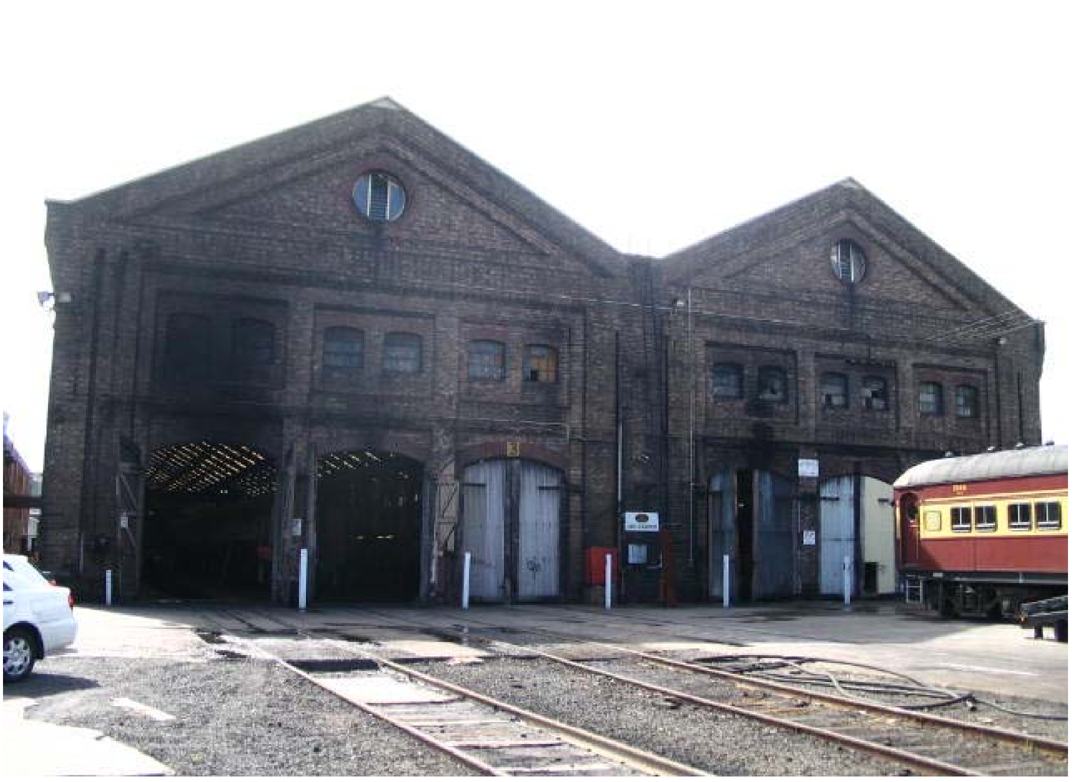
Item	Element / Location	Inspection / Review Comments	Action / Comments	Code	Short Term (within 1 year)	Medium Term (2 to 5 years)	Long Term (6 - 10 years)	Estimated Rectification Cost
2.03	Sub circuiting to lighting system	Sub circuiting to lighting system non-compliant	Upgrade/renew lighting circuits complete	E	$ -	$ 96,000	$ -	$ 96,000
2.04	Lighting	defective fittings	Renew light fittings	E	$ -	$ 250,000	$ -	$ 250,000
2.05	Sub circuiting to power system	Sub circuiting to power system non-compliant	Upgrade sub circuiting to power system	E	$ -	$ 90,000	$ -	$ 90,000
2.06	Exit & emergency lighting	Non-existent	Provide exit & emergency lighting complete	E	$ -	$ 24,000	$ -	$ 24,000
2.06	Crane supply	Existing supply non-compliant	Upgrade supply to cranes	E	$ -	$ 165,000	$ -	$ 165,000
2.07	Power Distribution	Existing distribution non-compliant	Provide Busduct power distribution installation	E	$ -	$ 300,000	$ -	$ 300,000
3.00	**GANTRY CRANE**							
3.01	Crane	Crane control system	Upgrade controls to remote	E	$ 40,000	$ -	$ -	$ 40,000
4.00	**GENERAL**							
4.01	Asbestos	No asbestos register	Carry out asbestos register and implement action plan	D	$ -	$ 15,000	$ -	$ 15,000
	TOTALS				**$ 104,000**	**$ 2,751,000**	**$ 35,000**	**$ 2,890,000**
			Total - Essential		$ 83,000	$ 2,643,000	$ -	**$ 2,726,000**
			Total - Desirable		$ 21,000	$ 108,000	$ 35,000	**$ 164,000**
					$ 104,000	**$ 2,751,000**	**$ 35,000**	**$ 2,890,000**

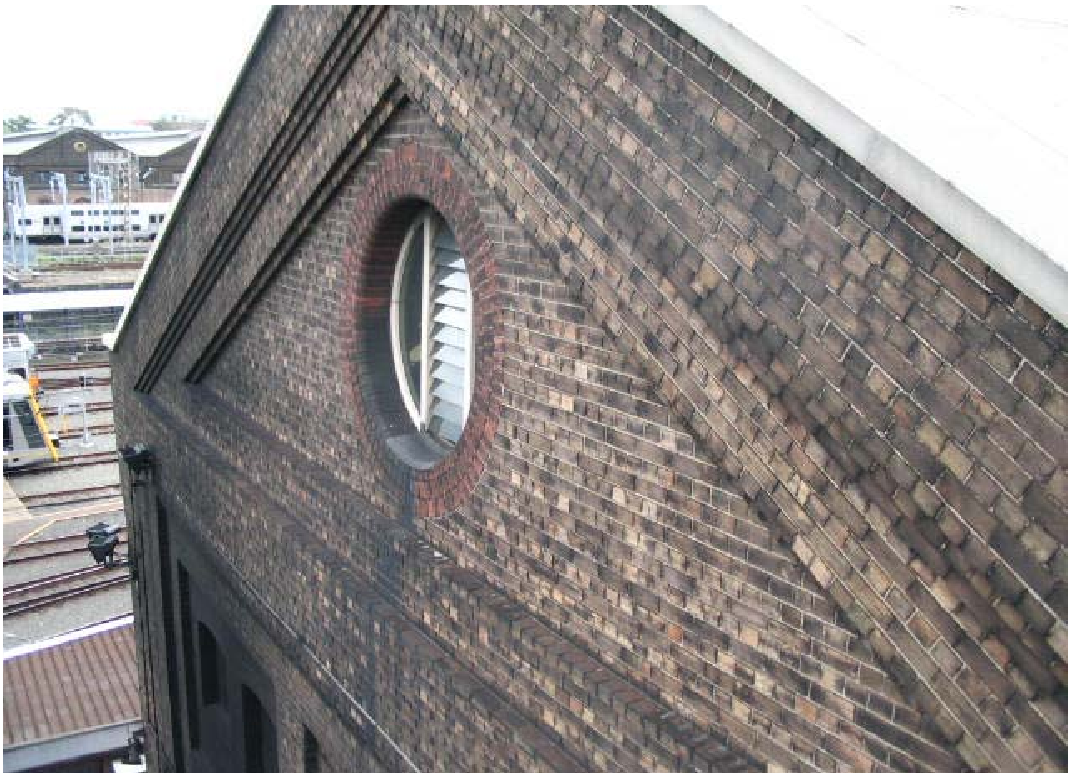
5.0 Appendix



1 Front (Western) elevation.

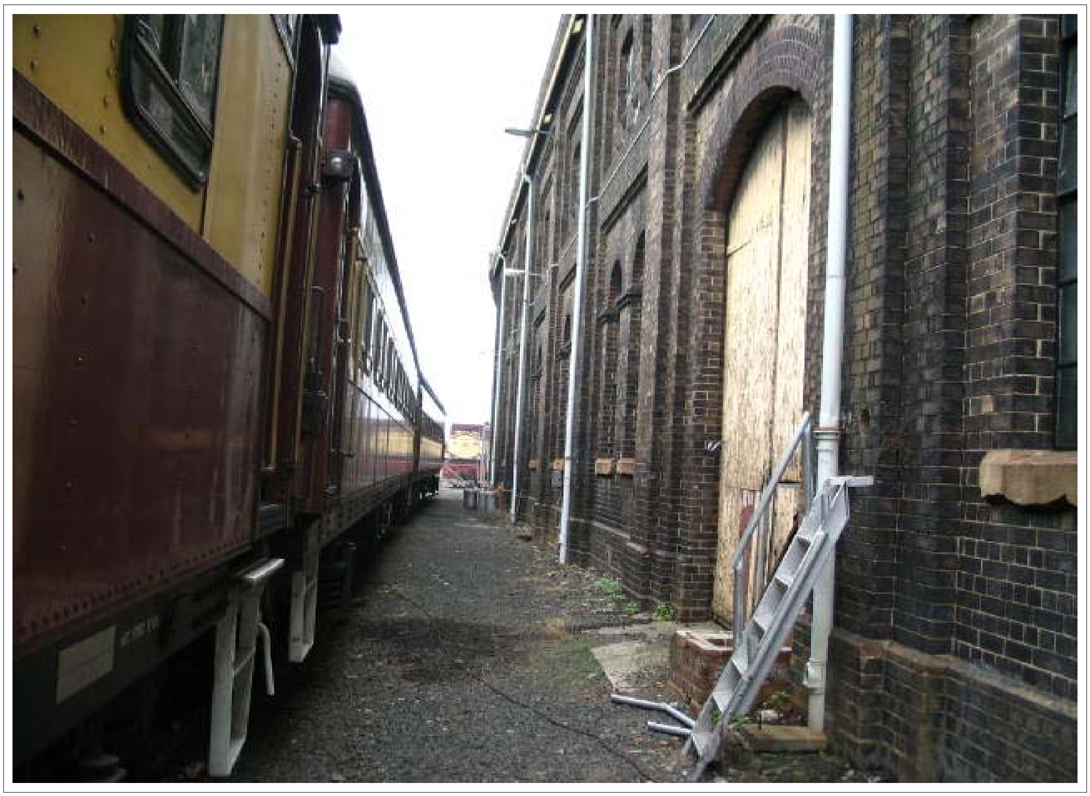
2 Main entrance doors to the Western front elevation.

3 Northern elevation.

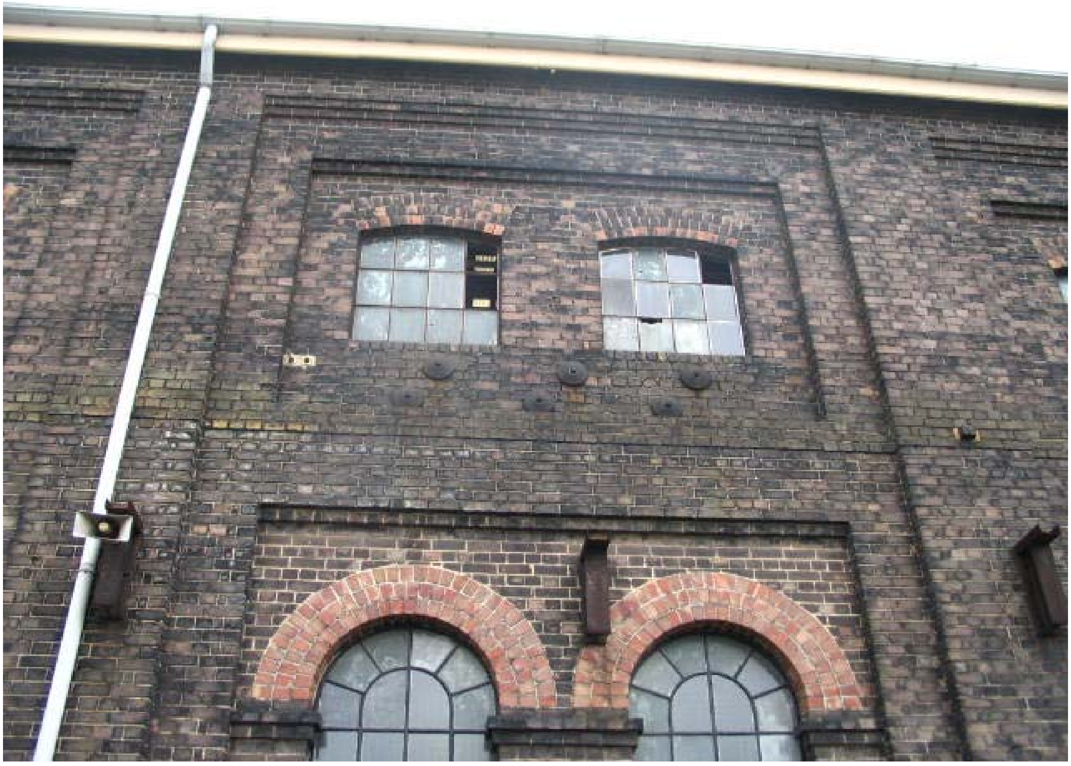


4 Main left hand side front gable wall.

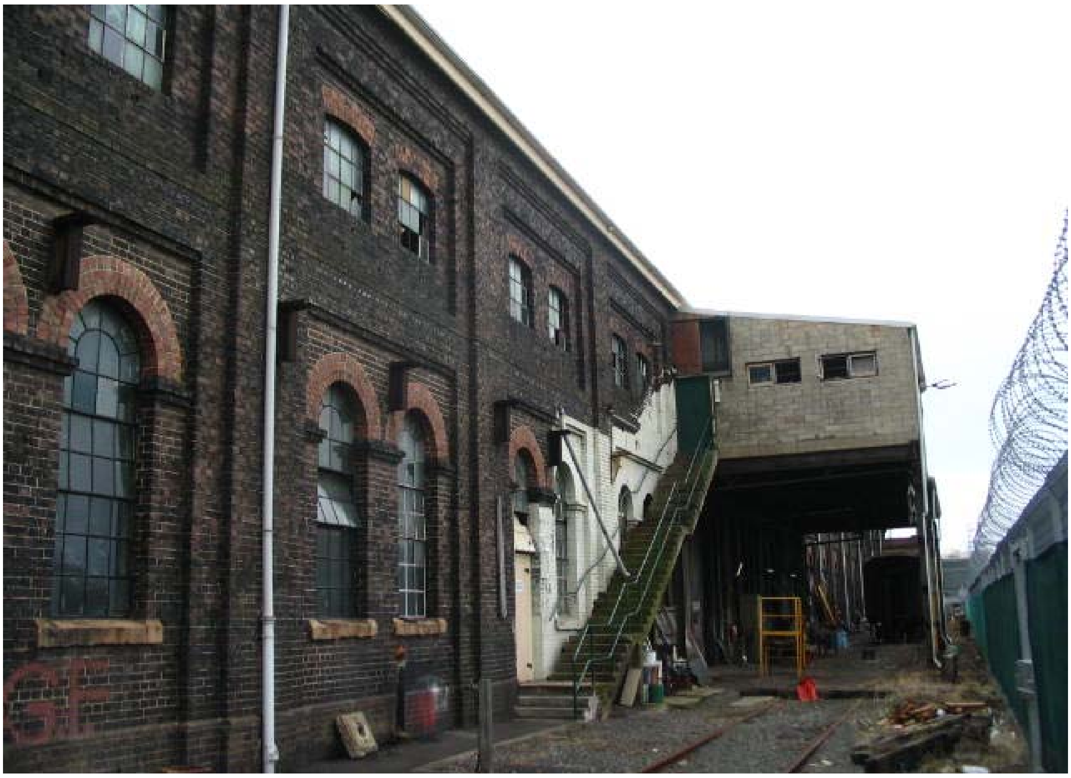
5 Northern elevation.



6 South elevation.

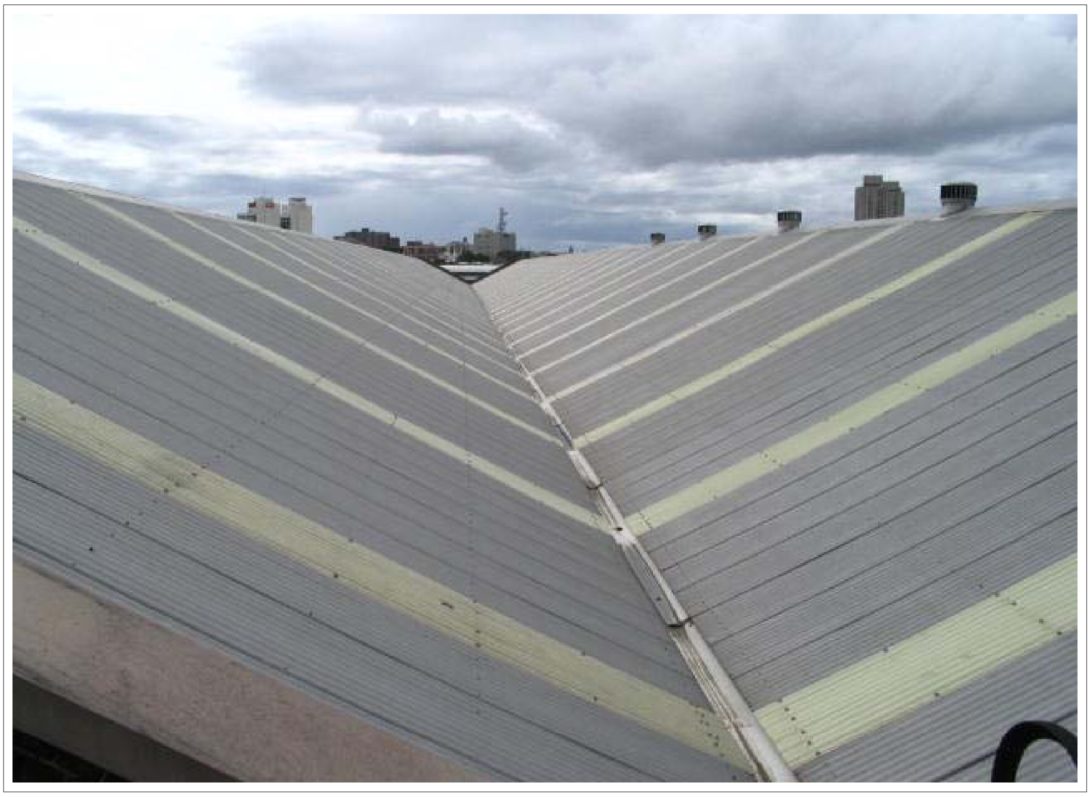


7 South elevation. General missing window panes.



8 Dilapidated first floor extension to South elevation.

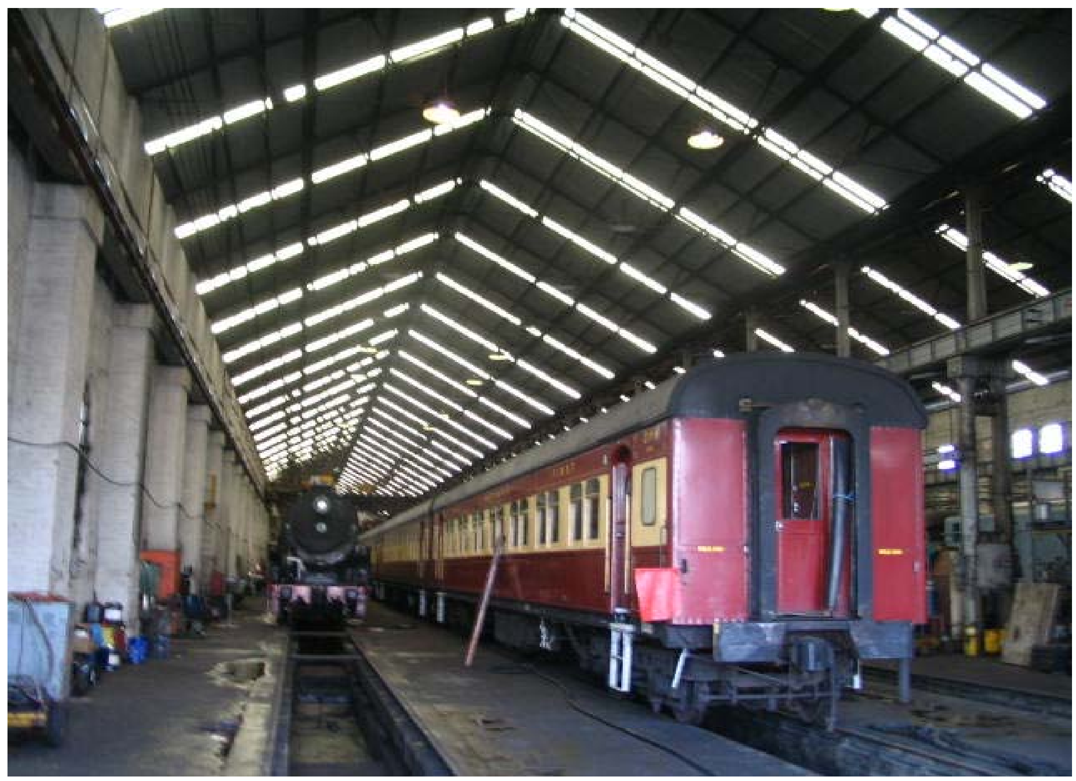
9 South - West elevation.



10 Main central roof valley.

11 Roof flashing in good order.

12 Roof gutter requires realignment.



13 Internal view of building.

14 End truss to North side. Note exposed electrical cables and slender bottom truss rod.

15 Internal central column.

16 General internal view of truss.

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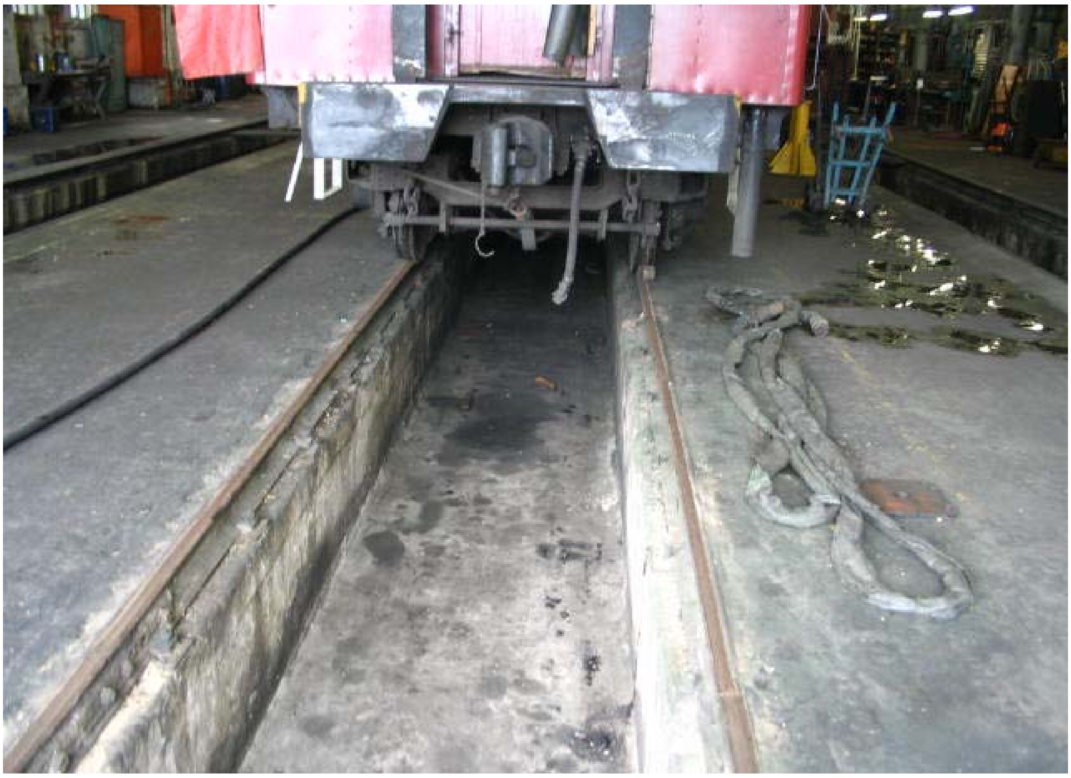
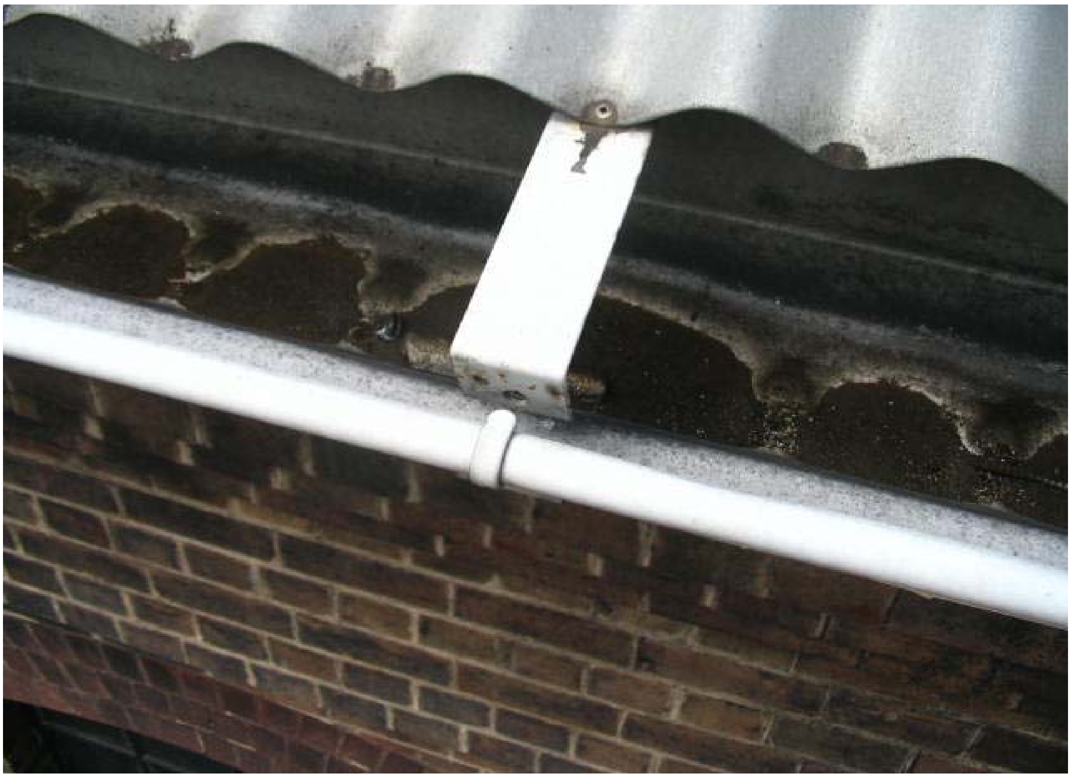


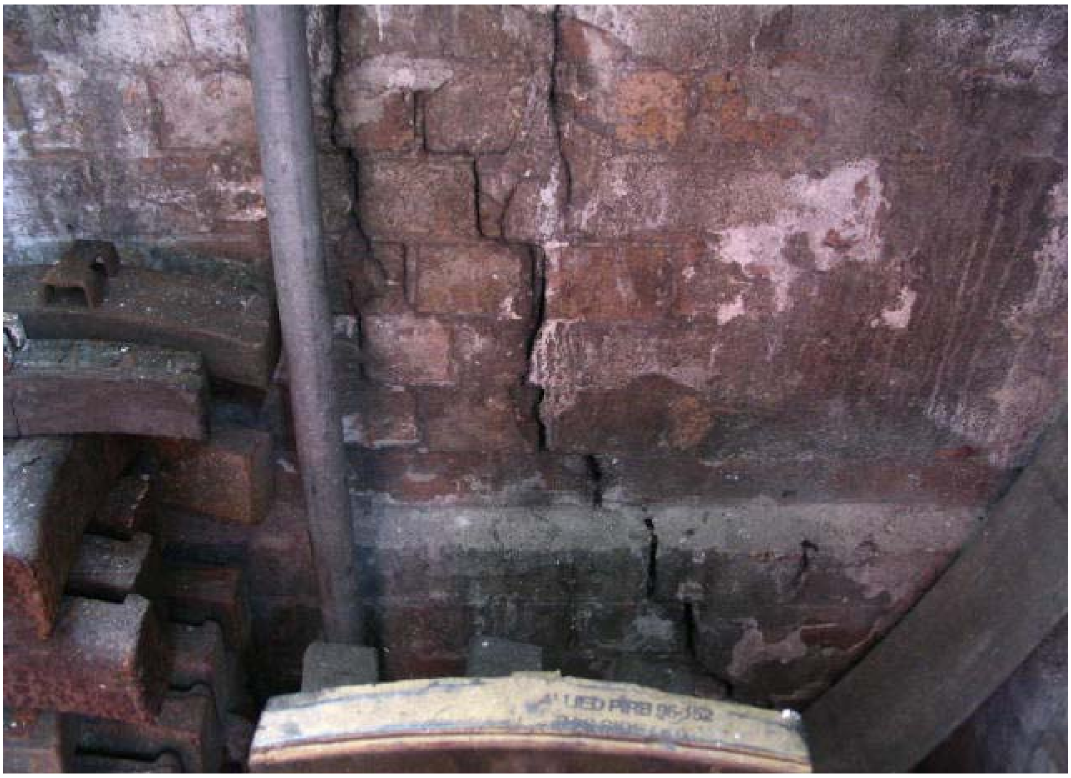
17 Open internal inspection pits.

18 Internal overhead crane.

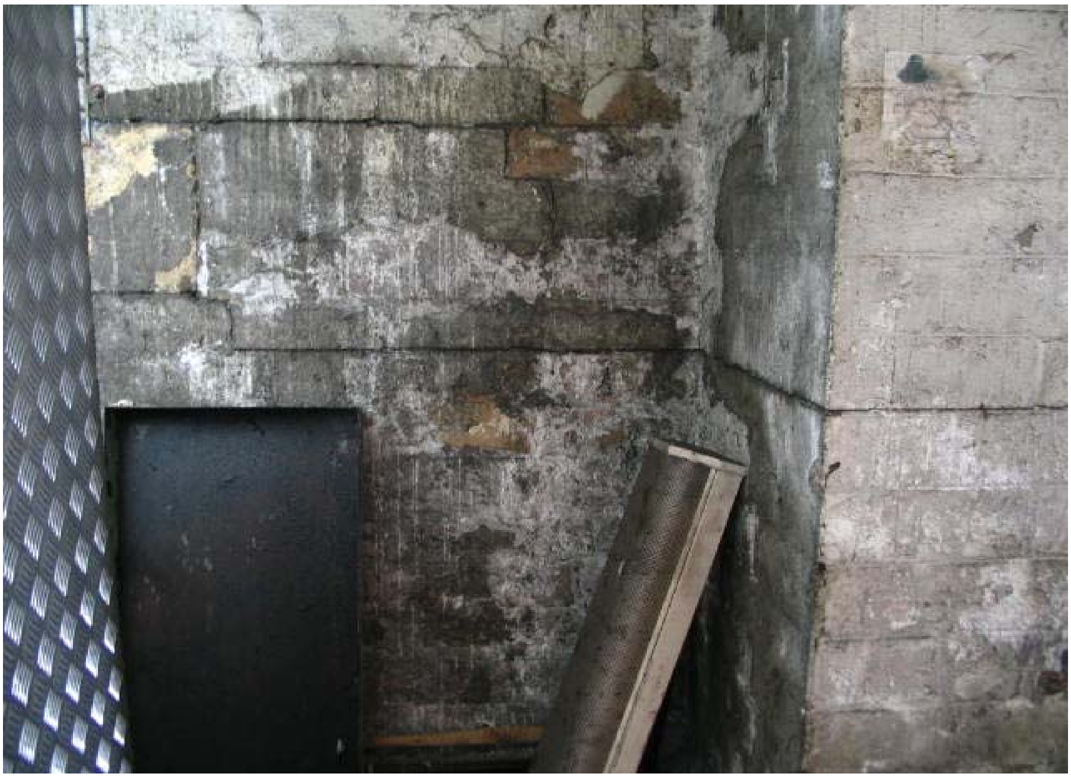
19 Main distribution board.



20 Broken gutter fixing bracket.

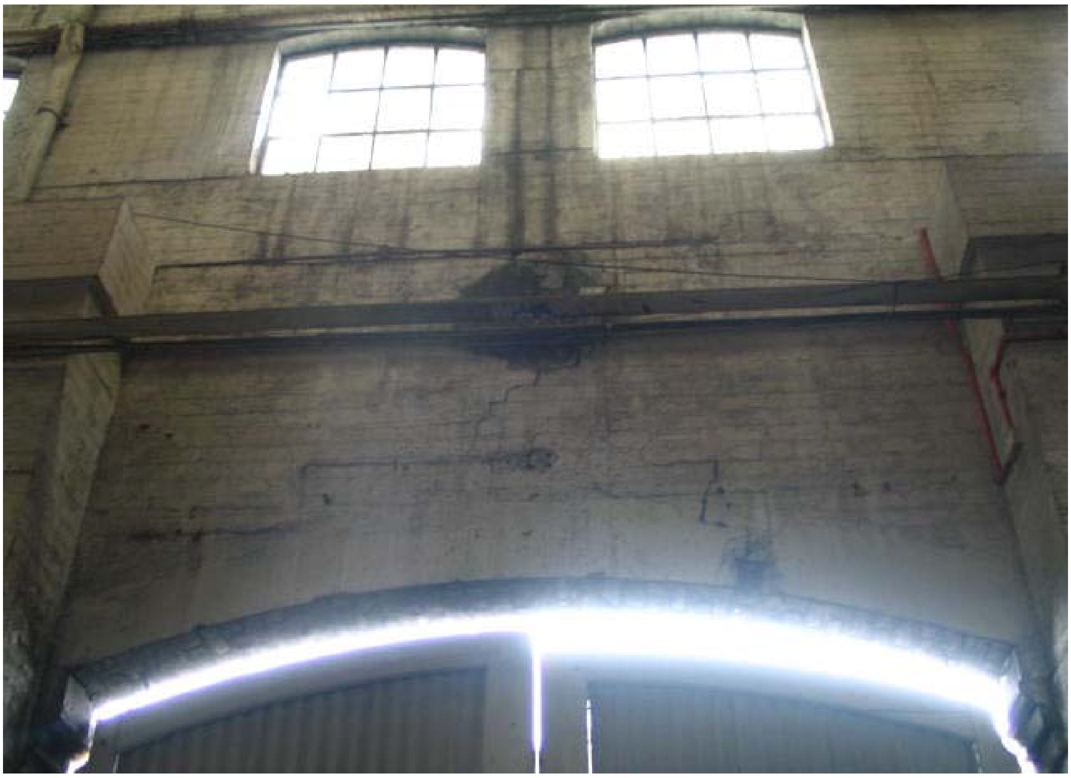


21 Internal cracking to bay 1 of the Southern wall.

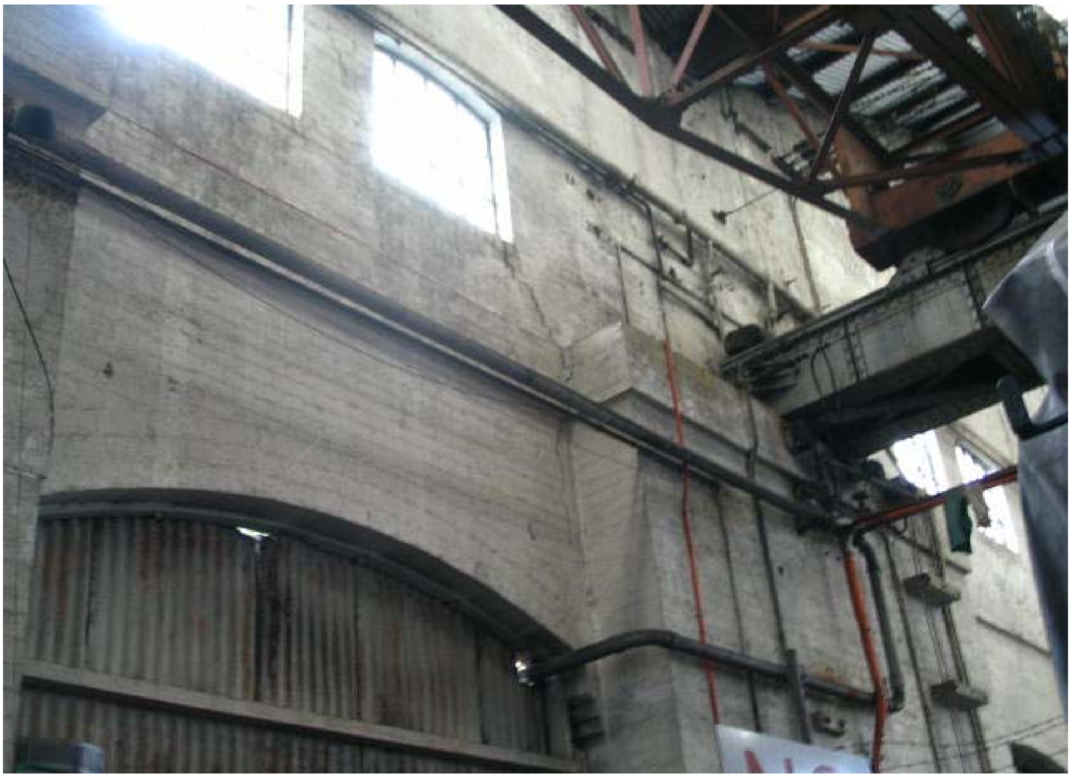


22 Low level internal horizontal crack line to Southern wall.

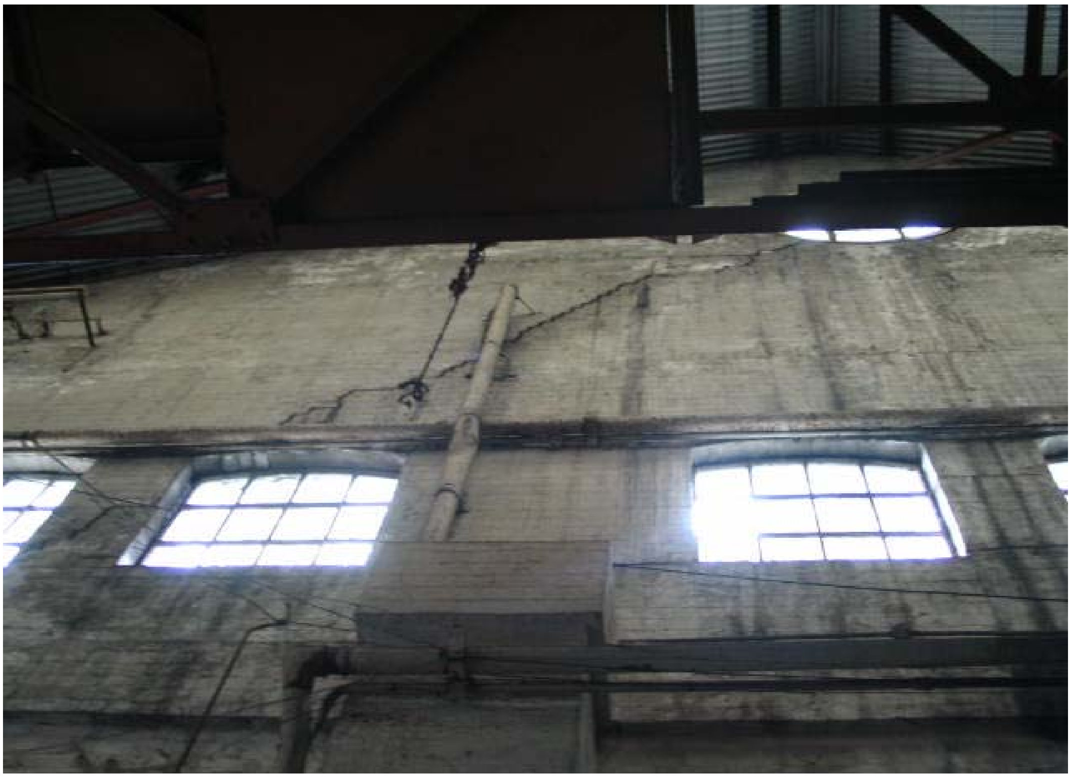
23 General high level cracking to South wall.



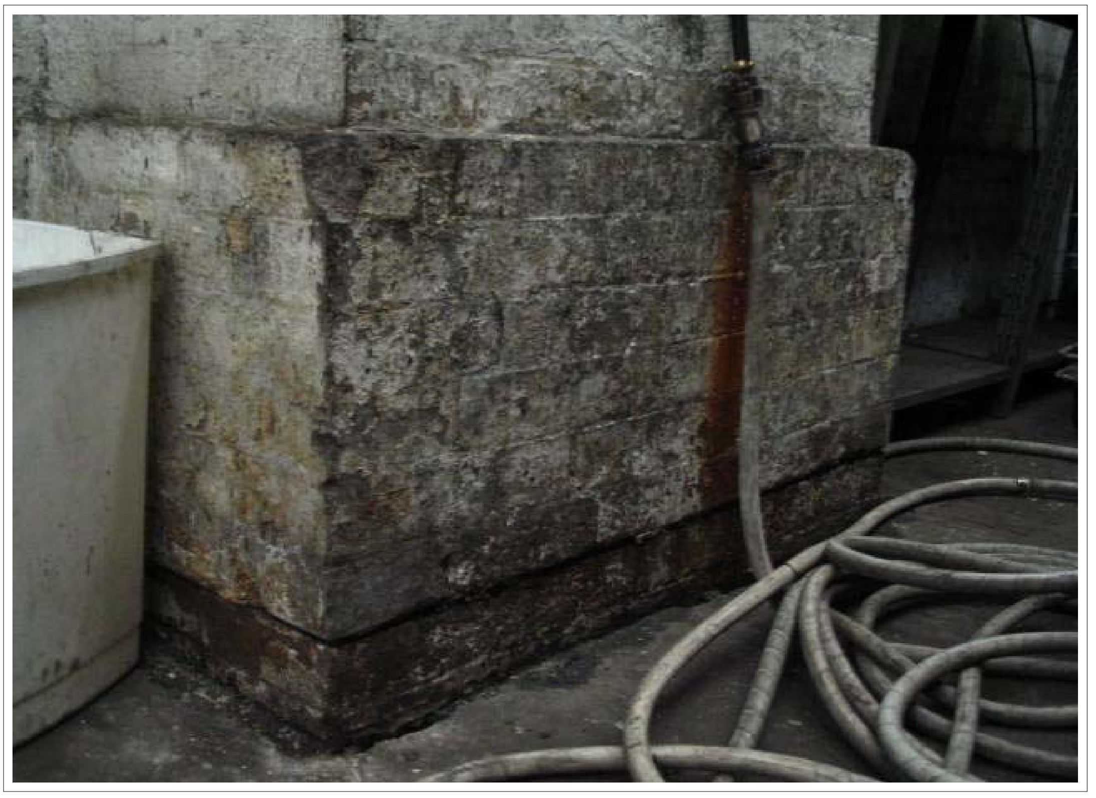
24 General cracking over Eastern rear gable wall.



25 Stepped cracking to right hand side of rear gable window.

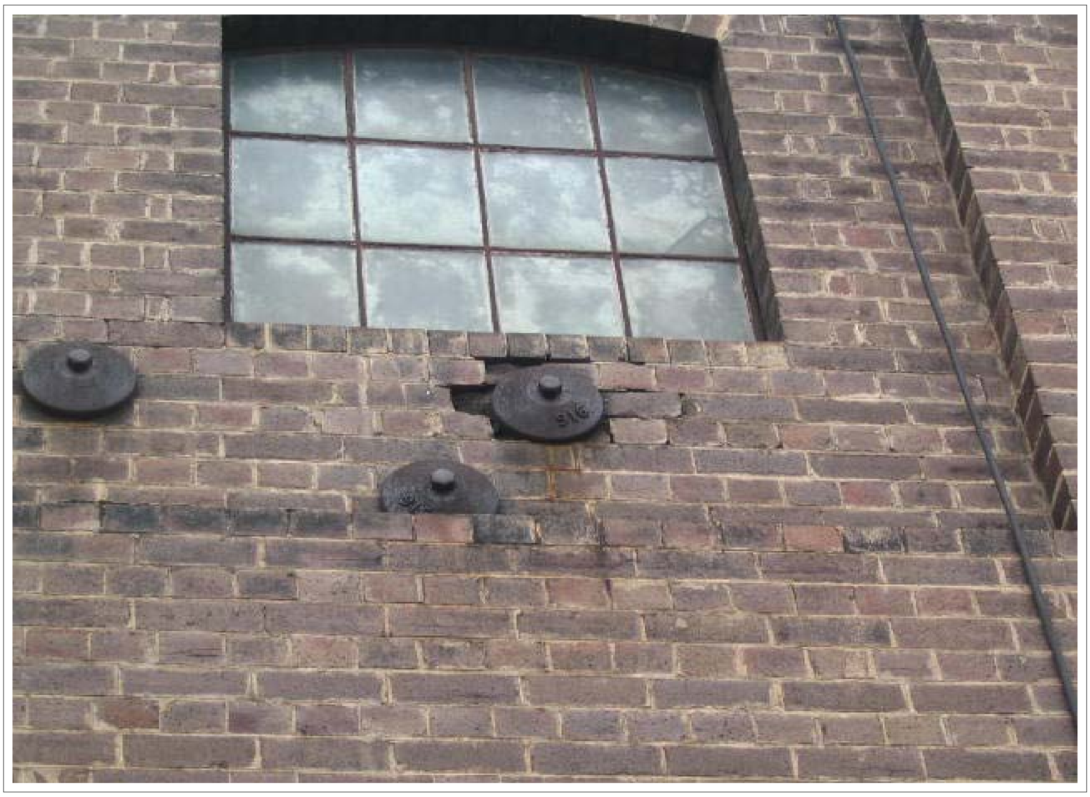


26 Large stepped crack to rear eastern gable wall.

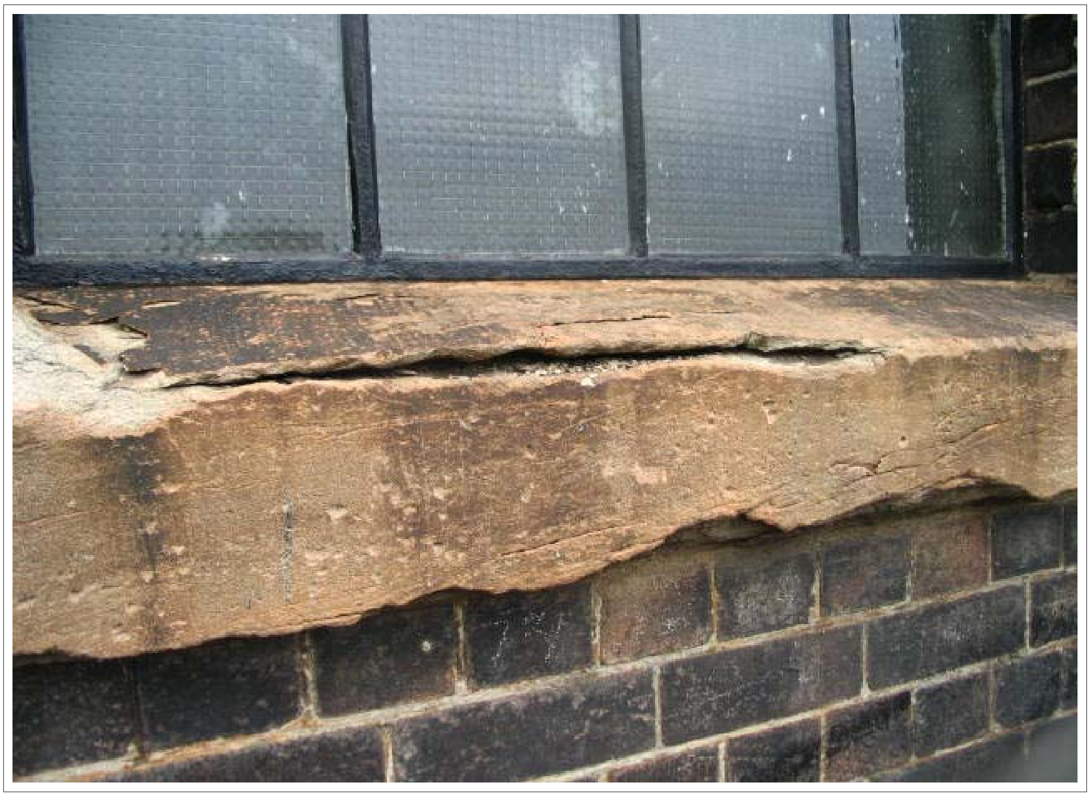


27 Horizontal cracking / minor displacement on damp proof course line.

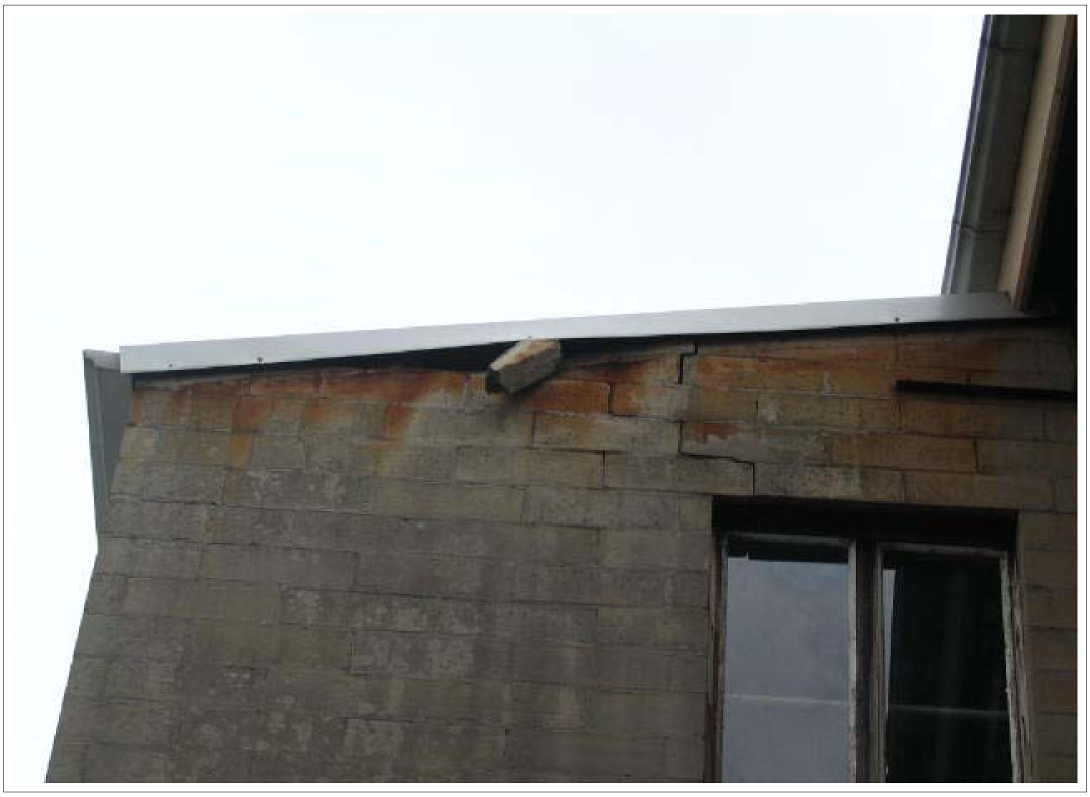
28 Horizontal cracking to the head of the window to the northern wall.



29 Brickwork repairs required around crane restraint fixing.

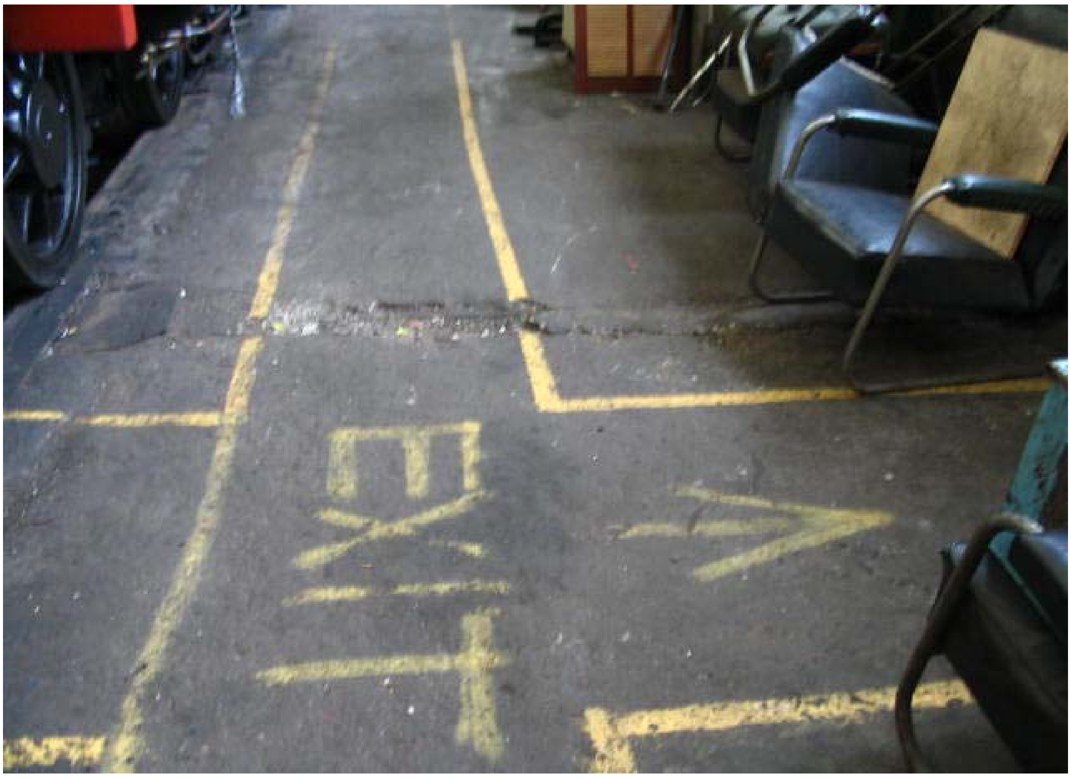


30 Spalling stone window sub-cill.



31 Loose block to South elevation.

32 General condition of windows.



33 Floor slab displaced around service conduit.

Low & Hooke Partners
consulting engineers

Our Ref: 7763_1
3rd April 2006

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SGA Property Consultancy
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Attention: **Mr Simon Tillbrook**
Senior Building Consultant

Dear Sir

Re: Large Erecting Railway Shed, Eveleigh

At your request, an engineer from this office inspected the above brick building at Eveleigh on the 25th March 2006 with instructions to undertake a structural inspection and comment on any defects of significant structural concern.

No existing structural or architectural drawings were available at the time of the inspection.

Access was made available with a personnel hoist but access to the roof members was not possible due to live electrical wires that are used to provide power for the overhead travelling gantry cranes.

This is a preliminary report at this stage to indicate if there are any gross deficiencies that might prevent the building from being occupied. Should you require a more definitive report including a detailed analysis of the structure and the footings, more extensive investigations will be required to determine member sizes and connections.

Our preliminary report based on a visual inspection is as follows:

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BUILDING HISTORY AND DESCRIPTION

The railway brick shed (Victorian building) appears to be constructed around 1890. The basic structure consists of the following:

1. Two gable ended bays each 18 metres wide (for a total width of 36 metres) and 180 metres long.
2. The roof has a 25^0 slope with a central box gutter and eaves gutters.
3. Each gable end has three large door openings with windows above.
4. The building is broken into 6.1 metre long bays with two highlight windows in each bay.
5. The side walls are 11 metres high and consist of 450mm wide brickwork up to the crane beam height of 6.2 metres with 350mm wide brickwork above this level.
6. The gable ends have 2 intermediate brick piers each approximately 1000mm square topped with 350mm thick brickwork above the gutter level. The outside of this wall has corbelled brickwork to provide a design element to the building.
7. The crane beams are supported on the external walls on engaged brick piers each 550mm by 1100 mm wide. These piers are at 6.1 metre centres. The crane beams are riveted box beams with the flanges and webs connected with angles.
8. The crane beams are supported on a central steel structure consisting of a pair of 400mm diameter steel columns 1.5 metres apart with a steel headstock to support each crane beam with a single column to the roof level that is supported off the headstock. Each crane beam is supported directly by the circular columns.
9. There are roof trusses at 6.1 metre centres spanning from the external brick wall to the central column. The roof trusses have an RSJ top chord, rod bottom chord and diagonals consisting of either rods or RSJ's. The central vertical and diagonal web members are rods.
10. There are simple steel trusses spanning between the roof trusses acting as underpurlins to support a mid rafter. These underpurlins coincide with the panel points of the trusses. There are 3 intermediate underpurlins between the gutter and the ridge. The underpurlins consist of a straight top chord, a vertical downward prop at midspan with a tensioned rod as an angled bottom chord. This type of truss is sometimes called a Barret beam. The truss is orientated with its plane perpendicular to the roof sheeting.
11. The area around the central box gutter is shrouded and there was no visible support for the intermediate rafter. This area requires further checking to determine the construction but we assume that there is a beam hidden by the shrouding.
12. The rafters and trusses have purlins spanning 3 metres that support the metal deck roof sheeting.
13. The floor construction is concrete with railway tracks and cast in channels for railway locomotive and wagon maintenance and repair.

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14. No access was available for the inspection of the existing foundation or strip footings. It would be reasonable to expect that the brick walls are supported on rock foundations as this was typical construction of the era.

GENERAL OBSERVATIONS

Our initial observation was that the building was generally in good condition given the age of the building. There was some minor cracking and damage to the gable end walls. In our opinion, the structure had not deteriorated to any great extent and the structure was in a condition very similar to its original construction. If it is assumed that the building was structurally adequate when it was erected and in accordance with the standards of the day, its present condition is not much different to this and any minor deterioration will not affect its condition.

Clearly there are some areas of cracking and damage to the building, particularly in the gable end walls that will require repairs and possible stiffening but we do not believe that this work significantly affects the overall performance of the building.

POSSIBLE AREAS OF CONCERN

The building is over 100 years old and the building standards at the time were most likely empirical or quite prescriptive without being able to resort to the technology that we have now. It was usual for old buildings to be heavily designed for vertical downward (gravity) loadings with little regard to lateral loadings from wind loads or any upward loadings particularly on the roof.

The areas of the building that would be of concern on face value with regard to the manner and style of building design that is carried out today are as follows:

1. The side brick walls are 11 metres high and while constructed out of relatively thick brickwork (possibly twice as thick as used currently) may have a stability problem for earthquake loadings and wind loadings. The current design usually incorporates steel columns to stiffen the walls.

2. The gable end walls are higher than the side walls and have less mass due to the large openings and windows. The absence of mass reduces their ability to act as gravity walls to resist the wind forces and hence is less stable than the side walls. The current design usually incorporates steel columns to stiffen the wall.

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3. The main roof trusses have tension rod bottom chords. This design is adequate for downward loads where there is tension in the bottom chord. Where there is a reversal of loading in the case when the upward loading due to wind loads exceeds the self weight of the roof structure there will be compressive forces in the bottom chord. A bottom chord consisting of a tension rod is incapable of resisting any compressive force without buckling.

4. The side brick walls and the central steel column and beam structure support the main roof trusses. This connection is required to resist the upward loadings due to the wind loads and it is possible that there may be inadequate tie down capacity.

5. The underpurlins similarly have a tension rod as the bottom chord. Where the uplift loads exceed the selfweight of the roof structure, this bottom chord will buckle under the compressive forces in the bottom chord.

6. The supports for the crane beams are probably adequate for the downward loadings from the crane but any lateral loading due to skewing of the crane or off centre lifting can only be resisted by either the side walls acting as vertical cantilevers or the pair of internal columns acting as a small portal frame. The internal columns may have adequate strength but portal action will induce high uplift loadings in one of the columns and there may be insufficient vertical loading to resist these loads. This vertical reaction is usually from the size and mass of the footings.

PRELIMINARY ANALYSIS

Unfortunately, there are a number of areas where access was unavailable to allow us to measure member sizes and connection details. This includes the footings.

We have only carried out a preliminary "first pass" analysis to check if there are any gross deficiencies that might prevent the building from being occupied.

Our preliminary analysis addresses some of the concerns noted in our section above.

Side walls resisting wind loads

The building does not have steel portal frames to resist the wind loading on the side walls and the small frame in the centre of the building is relatively slender compared to the stiffness of the mass brick side walls.

The only other method for the side walls to resist the wind loads is as a mass gravity wall.

Our preliminary calculations indicate that there is a factor of safety of 20% for the wall to resist the overturning. If the engaged piers act integrally with the wall then the wall has a larger righting moment against overturning.

Gable walls resisting wind loads

The gable walls have a larger area than the side walls due to the gable and there is less mass due to the large door openings and windows.

The reduced mass is not sufficient to resist the increased loading and higher wall as a gravity wall. In our opinion the gable walls require stiffening columns tied into the roof and the braced to the side walls.

Main Roof Trusses

The uplift loading on the roof is about double the deadweight of the roof structure. This excess loading is approximately 1 tonne per roof truss.

The maximum wind speed that the building can resist against uplift with the loading being less than the deadweight of the roof with a minimal safety factor is 80km/hr. The design wind speed for a building of this type is 120 km/hr.

As previously mentioned, the bottom chord is not capable of resisting any compression forces should the truss act as a truss to resist this loading. Other mechanisms to resist the uplift loading is for the top chord to act as a three pinned arch with resulting inward and upward loadings on the side brick wall or for the top chord to span across the building for the net uplift assuming that the ridge connection is welded. The three pinned arch mechanism is possible as the inward loadings are less than the wind load on the wall but this requires that the RSJ top chord is sufficient.

The roof trusses could be stiffened by adding a member to the bottom chord that will be sufficient for the upward loading. Similarly, should other members be deficient then these could also be stiffened.

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Underpurlins

The underpurlins do not appear to have another mechanism to resist the uplift loadings to negate the compressive force in the tension tie.

These members require stiffening.

RECOMMENDATIONS

In our opinion, the building could be used to a limited extent by providing the following:

1. A more extensive inspection is required following shut down of the electrical system. In this inspection, all of the structure will need to be visually examined for any obvious deterioration and checked for its performance under extremely adverse wind loadings.
2. Any cracking and damaged brickwork will need to be rectified.
3. The gable end walls will require steel stiffening columns and roof bracing for lateral stability.
4. The crane shall not be used.

To provide unlimited usage, the following additional work would be required:

1. The tie down connection of the main roof trusses to the side brick walls requires checking for adequacy.
2. The underpurlins require stiffening.
3. The bottom chord of the truss may also require stiffening depending on the results of the detailed inspection.
4. The usage of the crane will depend on a more extensive analysis of the lateral loading on the building due to the crane loads. This may require downgrading of the load capacity of the cranes.

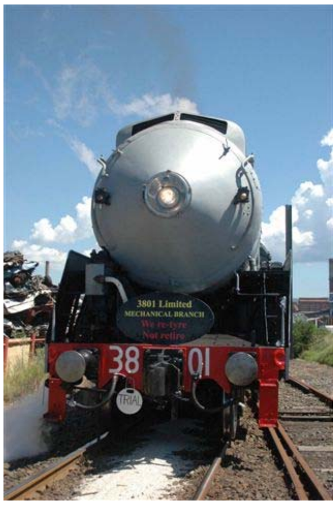
As previously stated, this is a preliminary report based on a limited amount of information and the intent is to provide an engineer's "first pass" examination of the building's structural adequacy.

We trust that this report is sufficient for your purposes at this stage.

Yours faithfully,
LOW & HOOKE PARTNERS PTY LTD

KEVIN LEEDOW

EVELEIGH WORKSHOP
ELECTRICAL SERVICES REPORT



REPORT NO. SIM0282/R001/REV.0
April 2006

Prepared For:

sga
Property
Consultancy

Prepared By:

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REVISION STATUS

Revision	Date	Description	Prepared By	Reviewed By	Approved By
0	11/04/06	Draft for Review	LG	ST	ST

TABLE OF CONTENTS

1. INTRODUCTION

Services Integration Management has been appointed by SGA Property Consultancy Pty Ltd to conduct an inspection of the electrical services serving the Large Erecting Shop at the Eveleigh Rail Workshops. The site inspection was conducted on the 24th March 2006.

The purpose of this report is to provide comment in relation to the facility and report on the condition of the electrical power supply system, reticulation of the electrical supply system and comment on the power arrangements of the 600V DC crane system and any other issues related to the electrical services installation.

Walk through visual and audible appraisal of accessible electrical services was undertaken. No testing or measurement of existing services was undertaken.

This report has been prepared to cater specifically for the subject development and the needs of the client. This report is for the exclusive use of SGA Property Consultancy and is not for the reference of any third party without the prior acceptance of this office. No warranty is offered or intended to any third party that references the material contained within, without this office's prior acceptance.

Referenced Documents

- Cranetec quotation dated 25th June 2003
- We did not have access to any floor plans or electrical drawings for comment.

2. EXECUTIVE SUMMARY

The facility operates from a rail shed located at the Eveleigh Rail Workshop precinct. It is not possible to exactly establish the age of the facility, but it would appear to date back to the 1940s or 1950s. The installation appears consistent with the installation standards dating back to the first half of the 20^{th} century.

There are serious concerns in relation to the Operation Health and Safety issues, code compliance issues and general maintenance requirements.

It has been assumed the facility is approximately 183m long x 36m wide with a total area of $6,600m^2$.

There are several areas which require attention and/or rectification due to non-compliance with current standards and OH&S issues.

Listed below are the areas of concern and recommendations for rectification:

- Removal of the overhead bare conductors and replace with conventional type wiring and/or busduct type system.
- Recommend the installation of a full earth system, including to all lighting points.
- Installation of an EXIT and emergency lighting system including test switches as required to AS2293.1.
- New electrical distribution system and new main switchboard.
- New cable reticulation to comply with OH&S. Switchgear installed to provide full discrimination or fault current limitation to minimise interruptions to other parts of the facility.
- Recommend the rationalisation of all fuse panel boards and circuit breaker boards.
- Recommend the use of Earth Leakage Protection to power subcircuits.
- Recommend upgrading the crane system to provide protection from the exposed 600V DC wiring and rail system. This may include the replacement of the entire supply system to 415V AC with ELV control system wiring.

3. ELECTRICAL SERVICES

3.1 Description of System

The electrical distribution system originates from a main switch panel located in the middle of the northern wall of the structure and generally follows a classical distribution system arrangement of reticulation to distribution boards located through the facility.

However, the method of distribution does not utilise common practice methods of general insulated and sheathed submain cables. The main submain and distribution system cabling utilises bare conductors.

3.2 Main Switchboard

The main switchboard is located at the centre of the facility on the northern wall.

It consists of a parallel incoming service of 400amps (one incoming service is locked in the off position). It would be assumed that the second incoming supply would act as an emergency or backup supply. The origin of the incoming service is stated as coming from the Compressor House Switchroom located elsewhere on the Eveleigh Railyards site.

All service protection devices are fuses mounted into a fuse switch.

There are several submain switches installed. These are as noted below:

- 200amp submain to DB1
- 200amp submain to DB2
- 200 amp submain to DB3
- 100 amp submain to the District Manager DB
- 200amp submain to 415V crane (locked in OFF position)

3.3 Distribution Boards

There are three main distribution boards located within the rail shed. Each of these boards are located centrally along the spine of the shed in between each set (pair) of rail lines.

The distribution system appears to divide the facility into an eastern section, central section and western section with a dedicated distribution board supplying power to each.

Distribution Board DB1

- Located at the eastern end of the central spine of the facility.
- Supplies the 600V DC rectifier.
- Series of fuse switches of which supply the overhead 240/415V wiring systems overhead to the eastern end of the facility.
- Generally appears to be dedicated switches for overhead wiring for the lighting system to the eastern end of the facility.

- Generally appears to be dedicated switches for overhead wiring for the general power distribution system – socket outlets and sub load centres located to the external walls of the facility.
- Other miscellaneous supplies located in the central spine of the facility.
- Appear to supply a load centre located at the western end (train entry doors) of the facility.

Distribution Board DB2

- Located in the middle of the central spine of the facility.
- Series of fuse switches of which supply the overhead 240/415V wiring systems overhead to the eastern end of the facility.
- Generally appears to be dedicated switches for overhead wiring for the lighting system to the eastern end of the facility.
- Generally appears to be dedicated switches for overhead wiring for the general power distribution system – socket outlets and sub load centres located to the external walls of the facility.
- Other miscellaneous supplies located in the central spine of the facility.

Distribution Board DB3

- Located at the western end of the central spine of the facility.
- Series of fuse switches of which supply the overhead 240/415V wiring systems overhead to the eastern end of the facility.
- Generally appears to be dedicated switches for overhead wiring for the lighting system to the eastern end of the facility.
- Generally appears to be dedicated switches for overhead wiring for the general power distribution system – socket outlets and sub load centres located to the external walls of the facility.
- Other miscellaneous supplies located in the central spine of the facility.
- This board appears to have the lightest loading of the three distribution boards.

415V Crane Supply

- This supply is locked in the off position. It could not be determined, on site, the extent of this submain supply arrangement.

District Manager DB

- This supply was followed and appears to supply the training building located adjacent. The submain appears to exit the building at high level on the north-west, drop into an underground duct.
- The loading connected to this supply could not be determined

3.4 600V DC Crane System

A rectifier for the 600V DC Crane System is located in close proximity to DB1. A supply from DB1 powers the 600V Rectifier. At the time of inspection, the rectifier system was locked in the off position.

From the rectifier, a 600V DC supply services a switchboard located at the eastern end of the facility. Switchgear is installed within this switchboard with a fused supply for each of the northern and southern cranes. It should be noted that the fuses have been removed from the northern crane supply.

The 600V DC reticulation system is via an exposed bare metal cabling and rail system located at the level of the crane. There is no protection installed to prevent unintentional contact with the cabling.

Signage is indicated at the DC rail system only located on the external walls at crane level.

We have reviewed the Cranetec quotation dated 25th June 2003, the nominated costs appear reasonable. The scope of work addresses the OH&S issues relating to the existing installation.

3.5 Wiring Systems

The general method of reticulation through the facility is via uninsulated wiring installed at high level.

Submains to each of the Distribution Boards located in the facility is distributed by cable to high level, then gare conductors at high level and finally a cable supply in conduit or duct to each distribution board.

Lighting and general power are distributed in a similar manner, cables to high level and then bare conductors at high level.

Several socket outlets and load centres are installed to the perimeter walls and central spine area. Cables are clamped to the overhead wiring and drop via conduits to socket outlet or load centre positions.

Lights are clamped directly to the overhead wiring to each fitting.

It should be noted that the insulated wiring installation system may have been an acceptable and permitted installation as at the time of installation. However, exposed cabling of this type in an enclosed building is not normal practice and not permitted under current code requirements.

3.6 Earthing

There does not appear to be sufficient earthing to the distribution system. The current installation appears to be unsafe and the installed protective devices would not provide adequate protection in the event of a fault or unintentional contact by a foreign body or person.

3.7 Lighting

Lighting is achieved by high discharge type fittings located at high level. Several fittings did not appear to be functioning. It is unclear whether lighting levels to the recommendation of the Australian Standards will be achieved. Lux levels were not measured during the inspection.

Each light fitting is supplied via the overhead bare conductor distribution system.

Local task lighting has been installed at several locations at low level. The task lighting is generally supplied via a local load centre, utilising standard wiring methods.

3.8 Emergency Lighting & Exit Signage Systems

There is no emergency or EXIT lighting installed to the facility.

3.9 Lightning Protection

There is no evidence of a lightning protection system installed to the facility.

3.10 Emergency Power Generation

There is no evidence of Emergency Power Generation to the facility.

3.11 Communications

It was not clear in determining the extent of the communications systems to the facility. A basic telephone service may be available, but it was not observed if there was any telephony service in use.

4. SUMMARY OF RECOMMENDATIONS

It is considered that all recommendations listed within the report should be adopted and budgetary allowances made for all recommendations.

4.1 Compliance with Regulations and Standards

There are several areas that require attention and/or rectification due to non-compliance with current standards and OH&S issues.

Items noted that require budget allocation, additional documentation or clarification include:

- New electrical distribution system to comply with current Australian Standards and provide appropriate protection to equipment and persons utilising the facility. This included the supply and installation of the new main switchboard and distribution boards to AS3439.1 and AS/NZS3000.

- Recommend the supply and installation of new cable reticulation, including full insulation to all cabling and/or busducting and all earthing requirements to AS/NZS3000 and AS/NZS3008.1. Current system is an OH&S issue.

- Recommend the removal of the overhead bare conductors and replace with conventional type wiring and/or busduct type system to comply with the requirements of the AS/NZS3000. Bare conductors are not permitted for internal usage and are to be utilised for external use only, and are required to be spaced to specific distances as outlined in AS/NZS3000. The current system is also an OH&S issue.

- Recommend the installation of a full earth system, including to all lighting points.

- Installation of an EXIT and emergency lighting system including test switches as required to AS2293.1.

4.2 Condition Appraisal

The following areas of the electrical services installation which require attention:

- Submain and subcircuit system consists of exposed overhead conductors. This poses an occupational health and safety concern in relation to services.

- To our knowledge, the switchgear used at the facility is no longer available due to its age. Servicing of the switchgear may prove difficult.

- Some general wiring systems do not appear to be safe.

- Several power socket outlets located around the perimeter of the building are in disrepair. Due to the age of these outlets, it is unlikely that they can be repaired.

- The earthing system appears incomplete. There does not appear to be any earthing to the lighting systems.

- Due to the mix of switchgear installed, it appears unlikely that the system is fully discriminate and protects the occupiers from a significant fault.

- Current supply arrangements allow for a maximum of 23VA/m2 for the area. Please note this assumes that the entire 400amp supply is available to the facility. Currently, there appears to be a supply to a building located adjacent.

Items noted that require budget allocation, additional documentation or clarification include:

- Switchgear installed to provide full discrimination or fault current limitation to minimise interruptions to other parts of the facility.

- Recommend the rationalisation of all fuse panel boards and circuit breaker boards.

- Recommend the use of Earth Leakage Protection to power subcircuits.

- Recommend upgrading the crane system to provide protection from the exposed 600V DC wiring and rail system. This may include the replacement of the entire supply system to 415V AC with ELV control system wiring, or retaining the 600V DC system but installing and ELV control system and protection from accidental contact to the 600V DC reticulation cabling.

5. BUDGET

As Services Integration Management are not Quantity Surveyors, this estimate is provided to assist in the future planning and/or upgrade of the facility.

ITEM	DESCRIPTION	$BUDGET
1.0	**GENERAL**	
1.1	New switchboards to replace existing: Includes new main switchboard and three distribution boards	$ 45,000
1.2	Submain installation to distribution boards	$ 39,000
1.3	Sub circuiting to lighting system	$ 96,000
1.4	New lighting	$ 250,000
1.5	Assumes 40 off 3 phase socket outlets	$ 90,000
1.6	EXIT & emergency lighting	$ 24,000
	TOTAL	**$544,000**
2.0	**BUSDUCT INSTALLTION**	**$300,000** **Note 1**
3.0	**NEW CRANE SUPPLY OPTIONS:**	
3.1	415V + 48V controls full replacement	$130,000
3.2	600V DC system upgraded + 24V controls upgrade	$ 35,000 Note 2

Note 1: Recommended power distribution would be via a busduct system with plug in type fuse or circuit breaker protected t-off boxes. T-off boxes are movable to allow flexibility in the power distribution. Assuming four (4) off busduct runs the complete length of the facility; the estimated cost would be in the order of $300,000 (excluding t-off boxes). This price is subject to exact implementation and extent of installation. If the busduct installation was to be installed, the power system subcircuiting component would be drastically reduced as supply would only be needed to the busduct.

Note 2: Based on Cranetec quotation dated 25th June 2003

1. Budgets and estimates presented by this office are presented with the best intentions and knowledge at the time of submission. Actual costs may vary dependent on exact scope, timing, market pressure, site limitations and conditions and contractual conditions.

2. The above budgets are based on normal working hours.

3. Exclusive of GST, design fees, project and construction management fees