AER Category Expenditure Justification – Zone Substation Other Buildings

April 2015

AER Category Expenditure Explanatory Statement

This document describes the expenditure justification for Zone Substation Other Building assets on the United Energy network

REPEX Road Map

1. Asset replacement – Modelled

a. 6 modelled asset categories

2. Asset replacement – Modelled & Unmodelled

a. Pole top structures + SCADA/protection

3. Other Repex - Unmodelled

a. ZSS Primary Asset Replacement

(i) CEES - Capacitor Banks + Earth Grid + Neutral Earthing Resistors

(ii) CEES - Buildings

b. Non VBRC Safety Projects

(i) Intelligent Secure Substation Asset Management (ISSAM) – UE PL 2401 e.g.CCTV

c. Operational Technology

(i) OT Safety

- Service Mains Deterioration Field Works – PJ1385
- In Meter Capabilities IMC) – PJ1386
- Light Detection and Ranging (LiDAR) Asset Management – PJ1400
- OT Security – PJ1500

(ii) OT Reliability

- Distribution Fault Anticipation Data Collection and Analytics (DFADCAA) – PJ1599
- Fault Location Identification and Application Development – PJ1600

(iii) OT Other

- Dynamic Rating Monitoring Control Communication (DRMCC) – PJ1413
- Test Harness – PJ1398
- Pilot New and Innovative Technologies – PJ1407
- DNSP Intelligent Network Device – PJ5002

d. Network Reliability Assessment UE PL 2304 – Projects

(i) Automatic Circuit Re-closers (ACRs) and Remote Control Gas Switches (RCGSs)

(ii) Fuse Savers

(iii) Rogue Feeders

(iv) Clashing

(v) Animal Proofing

(vi) Communications Upgrade

e. CEES – Environment

f. CEES – Power Quality Maintained

g. Terminal Station Redevelopment HTS and RTS - UE-DOA-S-17-002 & UEDO-14-003

4. VBRC Projects

a. HV Aerial Bundled Cable Strategic Analysis Plan - UE PL 2053

b. DMA and MTN Zone Substation Rapid Earth Fault Current Limiter (REFCL) Installation

c. Other VBRC projects

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1. EXECUTIVE SUMMARY

Project description

This document provides an explanation of United Energy's forecast replacement expenditure for zone substation buildings[1].

Project Driver

United Energy is required to maintain a safe working place and operate a safe network. During the current regulatory period, United Energy commissioned a number of reports assessing the structural integrity and safety of the buildings. From these condition assessments, United Energy is proposing to replace one building at Springvale Zone Substation, and decommission another building at Dandenong Zone Substation. These reports are provided as attachments to this justification.

The selection and timing of these works is determined on the basis of alignment with other major capital works at these zone substations in order to maximise expenditure efficiency.

Both of the reports identify serious hazards with the buildings. On this basis of these assessments, the other proposed works at these zone substations, and the requirement to provide a safe workplace for employees and contractors, United Energy has determined that the most prudent and efficient rectification is the removal of these buildings and the replacement of the building at Springvale.

Benefits

The proposed expenditure provides the following benefits:

- Provision of a safe work place for employees and contractors
- Prevention of damage to equipment and resultant outages due to water ingress

Cost forecast

Table 1 shows the forecast expenditure for zone substation building replacement. Expenditure is in real 2015 dollars.

Table 1: Capital expenditure – Zone Substation Others Buildings

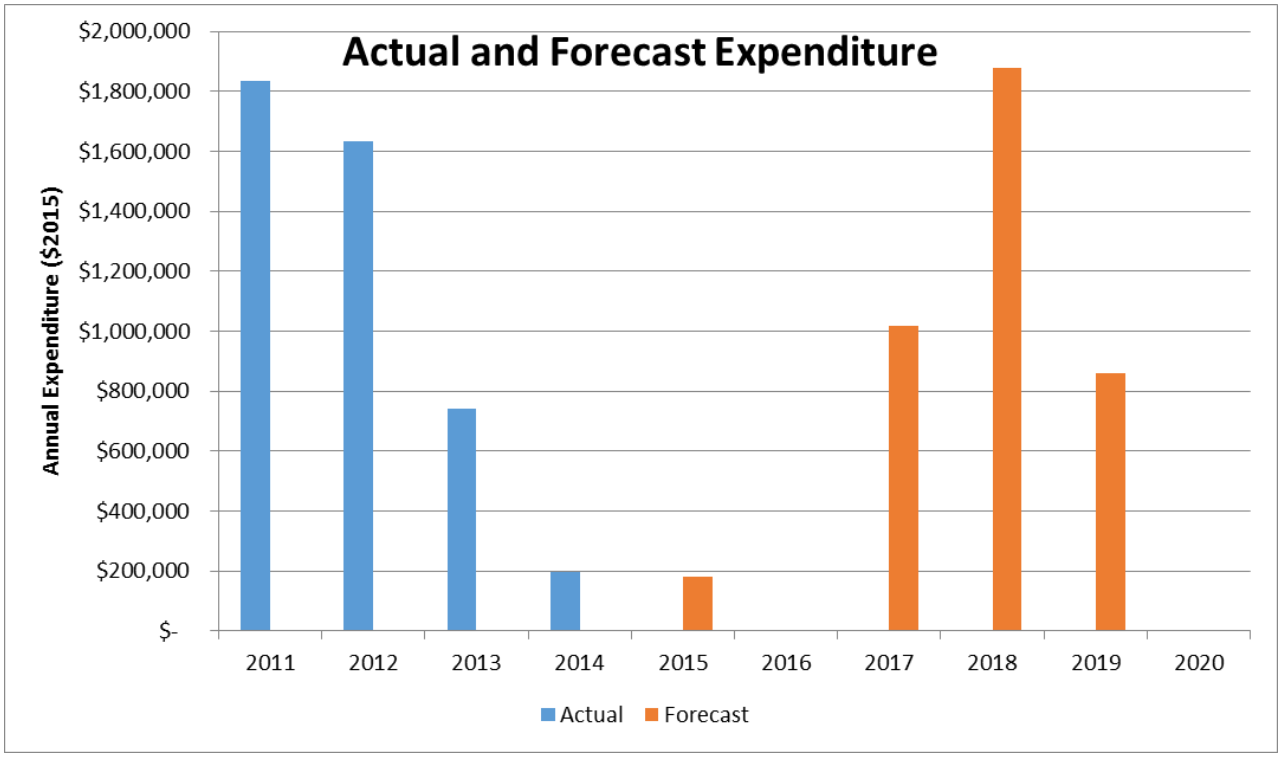
	2016	2017	2018	2019	2020	Total
Forecasts ($M)	0.0	1.0	1.9	0.9	0.0	**3.8**

Figure 1 below compares the historical and forecast expenditure for zone substation building replacement. The chart shows annual expenditure during the current period decreasing slowly over the first two years and then dramatically for the last three. This is attributed to the nature of the life cycle strategy where expenditure is driven by building deterioration, faults, defects and scheduling of building works with correlated projects. In 2014 and 2015 no replacement projects have been or will be undertaken and expenditure has been spent primarily on fence repair and building upgrades. The total expenditure for the current period (actual historical and forecast for 2015) was $4.0M (real 2015 dollars).

For the 2016-2020 period, United Energy has forecast expenditure at $3.8M. This is $0.2M less than the current period which represents a reduction of 5% in repex.

[1] How UE manages Buildings is set out in the Zone and Non-Pole Substations Buildings and Grounds Life Cycle Strategy (Document No UE PL 2019).

Figure 1: Actual and forecast expenditure



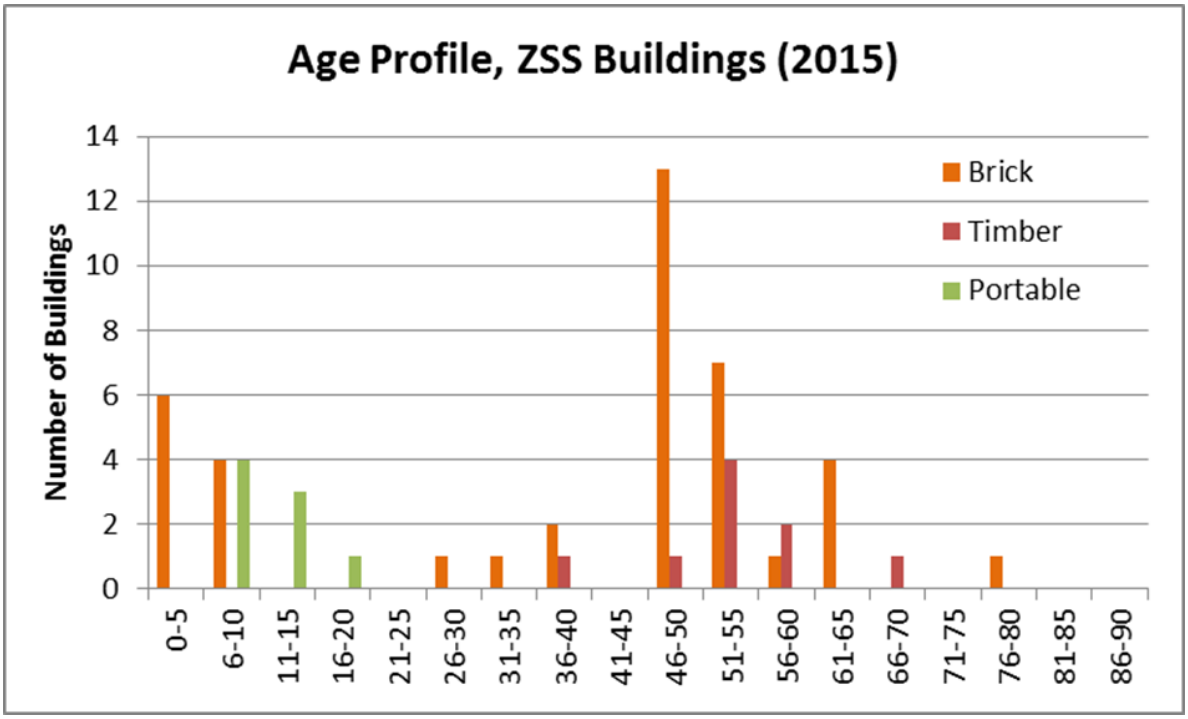
2. Background

2.1 Management of Buildings and Replacement Decisions

Zone substation (ZSS) buildings provide whole-of-life protection of substation assets and protection systems from environmental elements, whilst ensuring the security of substation assets, and the provision of safety for the general public and the workforce.

Zone substation buildings are generally expected to last as long as or longer than the major electrical assets. UE's ZSS buildings range from 1939 construction (~75 years old) to 2014. This can be seen in the figure below.

Figure 2: Age Profile of Buildings



The brick and portable buildings generally do not need replacing; rather minor refurbishment works are required for upkeep.

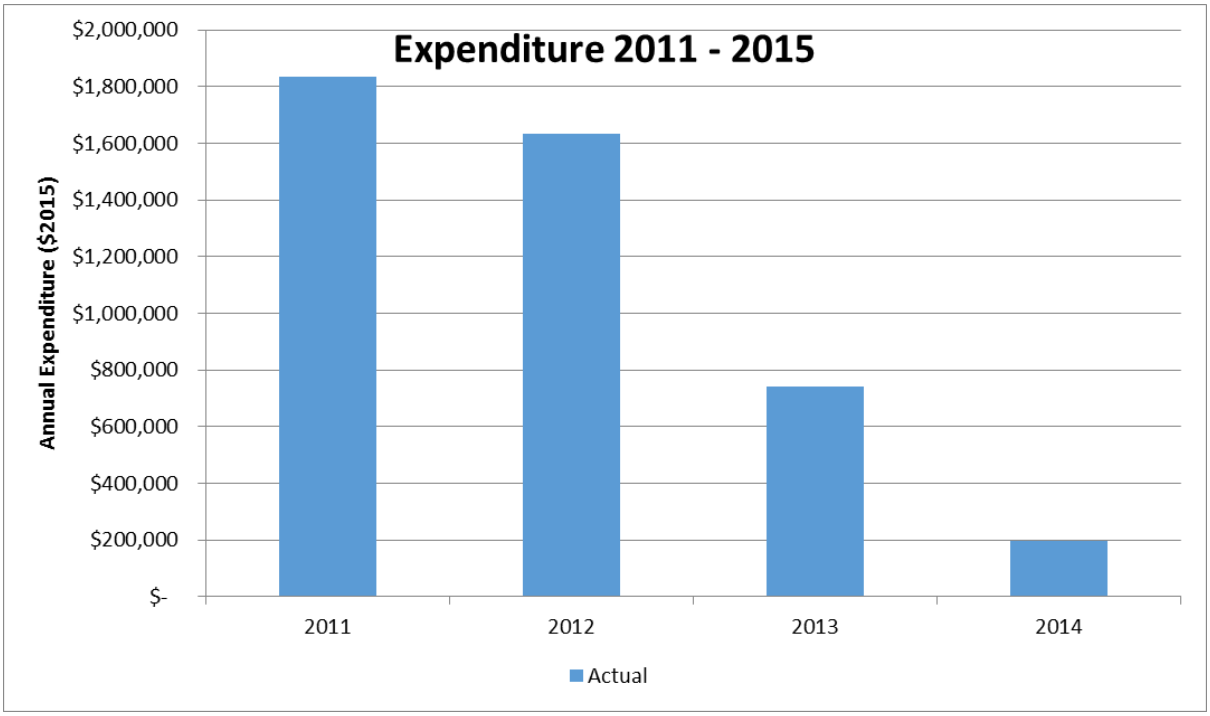
The category 'Timber' buildings constitute combinations of weather board and asbestos sheeting construction types and are prone to deterioration. These buildings are in need of regular condition monitoring (via routine inspections). They do not fail in the typical sense but experience significant defects such as internal ceiling and/or roof collapses. Because of the materials used in their construction, these defects pose significant risks to personnel entering the buildings and the ZSS assets housed within. In addition, these defects also hinder UE's operations and reliability due to the associated inaccessibility of the assets. Consequently, replacements of timber buildings will be driven by these significant defects and are often unplanned and reactive in nature.

UE replaces buildings by aligning their replacements with other related capex replacement programs/projects i.e. switchgear and protection and control replacements. This strategy maximise project efficiencies and minimises cost duplication.

2.2 Historical Expenditure

Historically, the expenditure on ZSS buildings does not exhibit a linear trend. This is shown below.

Figure 3: Historical Expenditure of Buildings



This is attributed to the nature of the life cycle strategy where expenditure is driven by building deterioration, defects, failures and scheduling of building works with correlated projects.

Most of the expenditure in the current period was on the repair of ceiling and roof collapse/failures - roofs are repaired on failure, where equipment housed within the building cannot be accessed.

The expenditure profile correlates with major Capex replacement programs/projects i.e. switchgear and protection and control replacements. When new switchgear was installed, a new building is typically constructed in order to house the modern equipment, due to housing issues with the old building (lack of available space, construction staging requirement) and the existing facilities being not fit for purpose. In 2014 and 2015 no replacement projects have been or will be undertaken. Expenditure will be spent primarily on fence repair and building upgrades.

2.3 Review of Historic Asset Performance

UE has conducted a review of the performance of the ZSS building during the current period. The key purpose of this review is to understand whether the performance of assets has been maintained.

ZSS buildings provide UE personnel with ready operational access to substation assets. They also provide whole-of-life protection of substation assets from environmental elements, whilst ensuring the security of substation assets, and the provision of safety for the general public and the workforce.

Failure to inspect and maintain ZSS buildings and grounds on a regular basis is likely to result in prolonged security infringements, threats to public safety, asset damage leading to mal-operation of equipment, and supply reliability issues.

For ZSS control buildings, UE reviews asset performance in two ways.

Firstly, UE records instances of major failures of ZSS control buildings. This is defined as an event where a building fails to provide a safe sheltered environment for switchgear and control assets. This can include a roof collapse and a major flooding event, among others. Failures of UE's ZSS buildings for the current period are presented below.

Table 2: ZSS Building Failures

	2011	2012	2013	2014
ZSS Building	1	1	1	1

The primary causes of these building failures were internal ceiling collapses and leaky roofs. It is pertinent to note that only remedial works were needed to render the buildings serviceable.

Secondly, UE engages the services of civil engineers to inspect the condition and structural integrity of all components of the ZSS control buildings. Two ZSS buildings have been found to be nearing failure and will be replaced in the next reset period.

UE is satisfied with the asset performance in the current period. The number of ZSS building failures remained constant and very low, indicating that the level of expenditure on this asset class is appropriate.

2.4 Review of Previous Forecasting Methodology

To inform our selection of the most appropriate forecasting methodology for ZSS buildings asset replacements, UE has conducted a review of the forecasting methodology UE used to prepare the capital expenditure forecast in our previous proposal to the AER.

UE's forecast for the current regulatory period was developed by using a combination of (a) civil engineering reports – detailing the condition and structural integrity of all components of the ZSS control buildings and (b) aligning building replacements with other related capex replacement programs/projects.

UE believes this methodology is suitable for the 2016-2020 regulatory period. UE also believes it manages this asset class in a cost effective, prudent and efficient manner resulting in maximising project efficiencies and minimising cost duplication over multiple projects.

3. Forecast Methodology

UE has used the same forecasting methodology as the current period for the 2016-2020 forecast.

UE has identified ZSS building replacement works by consulting the civil engineering reports received on each of the ZSS buildings across the network. For ZSS buildings found to be in an unsatisfactory condition, UE has determined if they need to be replaced as standalone projects or can be aligned with other related capex replacement programs/projects. The forecast replacement projects for the 2016-2020 period are discussed in section 4.

UE is confident of its forecast methodology and believes it is appropriate for the 2016-2020 period.

4. UE Forecast Expenditure

A summary of the Capex expenditure relating to the ZSS Buildings replacement works is presented below:

Table 3: UE Forecast Capex Expenditure

	2016 ($,000)	2017 ($,000)	2018 ($,000)	2019 ($,000)	2020 ($,000)	Total
ZSS Building Replacements	-	1,023	1,897	872	-	3,792

4.1 Standalone Projects

As a result of unsatisfactory civil engineering report findings (detailed below – and attached) for ZSS buildings at Springvale and Dandenong, UE will replace two aged buildings between 2017 and 2019.

Dandenong ZSS

The report identifies that roof and floor renovation works (for the control room) will need extensive and costly attention and has to be completed carefully due to the presence of asbestos material. The roof of the building at Sub DN has collapsed twice in the current period.

There is another building already at this site. The forecast cost is to relocate existing feeder protection relays to the new building site and demolish the older building. UE considers this to be a safe and prudent and efficient use of expenditure. The cost estimate to complete this work is approximately $0.9M.

Springvale ZSS

The report considers the control building to be high maintenance where weatherboards require extensive repair and replacement.

Rather than carryout expensive repairs for this building this site has already been identified where considerable upgrade will take place and therefore refurbishment works are planned which includes the replacement of 22kV switchgear, control and protection relays and the replacement of the building.

Therefore the cost includes the removal and replacement of the building at this site. The new building is not a like for like replacement. The new building will be required to house a considerable amount of network equipment such as switch gear and relays. Previously equipment of this type was installed outside – all refurbishments and new zone subs house equipment of this type indoors. Therefore the structural requirements of the building need to be considered as part of the cost build up.

The least cost option is to replace the buildings at the same time as the primary and secondary works. UE has prioritised the construction of a new building in this ZSS as a more efficient use of expenditure and to provide longevity of protection for the assets housed within the building. The cost of the buildings component of the work has been estimated at $2.892M.

Table 4: Zone Substation Buildings Forecast Expenditure

Project	2016	2017	2018	2019	2020
Sub DN Control Building		$447,473	$452,255		
Sub SV Control Building		$575,102	$1,444,739	$872,322	
Total	**-**	**$1,022,575**	**$1,896,994**	**$872,322**	

The total forecast expenditure is approximately $3.8M which is lower than the current period's expenditure of $4.0M. UE believes it continues to manage this asset class in a cost effective, prudent and efficient manner resulting in maximising project efficiencies and minimising cost duplication over multiple projects. UE is confident of its forecast and believes it is suitable for the 2016-2020 period.

5. Summary and Conclusion

In this document, UE has explained how it has prepared the forecast of the replacement and refurbishment capital expenditure for the ZSS Building class.

UE believe that this document and its supporting references provide a compelling justification that the AER should accept that these program-level forecasts should form part of our capital expenditure forecast in our building block proposal.

In summary, the AER can be confident that this forecast (at the asset class level) is in accordance with the NER capital expenditure criteria and objectives because:

- The forecast for ZSS Buildings uses the most appropriate methodology.
- UE's methodology was developed by using a combination of civil engineering reports – detailing the condition and structural integrity of all components of the ZSS control buildings and aligning building replacements with other related capex replacement programs/projects To develop our estimates we have used a bottom-up building block approach; identifying projects, developing SOWs and obtaining estimates.
- Our forecast expenditure of $3.8M is 5% less than spent in the current period. This reduction is significant considering UE will replace two standalone buildings (2017 to 2019) as compared with no standalone replacements in the current period.

UE believes this methodology manages the asset class in a cost effective, prudent and efficient manner resulting in maximising project efficiencies and minimising cost duplication over multiple projects.

6. Attachments

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9 December 2014

ENGINEERS REPORT

ZONE SUBSTATION SV SPRINGVALE
INSPECTION OF CONTROL BUILDING

DATE OF INSPECTION : 1 DECEMBER 2014

INTRODUCTION :

A visual inspection of the Control Building was carried out to check the condition and structural integrity of all components of the building.

ITEM	DESCRIPTION	CONDITION	RECOMMENDATION
<u>Control Building</u> Roof –	Galvanised corrugated sheet roof with centre ridge and roof sloped to longitudinal walls.	Roof in satisfactory condition.	
	Quad gutters and round Metal down pipes.	At S-W corner roof gutter is corroded. **Refer To Photo No.1** Down pipes are corroded. Top Corrosion of DP **–** **Refer To Photo No.2** Base corrosion of DP's causing wash away of yard surface fines. **Refer to Photo Nos.7 & 8**	Replace all corroded gutters and downpipes.
	<u>Eaves</u> Lined with bird wire held in place with spaced timber battens nailed to the underside of roof joists. **Refer To Photo No.2**	There are holes and gaps in eaves mesh allowing or vermin to nest in roof cavity.	Block all openings in eaves .
	<u>Ceiling</u> 'Canite' sheeting.	'Canite' ceiling sheets have dropped and distorted. **Refer To Photo No.3** Remainder if ceiling is in good condition.	Panels needs to be replaced with plaster or cement sheets.

ITEM	DESCRIPTION	CONDITION	RECOMMENDATION
Walls –	Timber stud walls - External Lining – Timber weatherboards sheeting.	West wall has peeling paint and rotting weatherboards. **Refer to Photo No.4**	Weatherboards on this wall need replacing. Consideration to using an alternative colorbond profiled wall sheeting could be considered.
		Weatherboards at N-E corner are rotting. Metal sheet repair covers have previously been installed at corner but rot has extended past these repairs. **Refer to Photo No.5**	Further metal sheet repairs required or remove sections of damaged weatherboards back to sound timber and install new weatherboards.
	Internal Lining – 'Masonite' and Cement Sheeting - may be 'Asbestos Cement " sheet.	Internal Linings in good condition.	
Floor -	Timber floor structure – bearers and joists supported on stumps. Flooring – T &G Timber floor.	Floor structure is considered sound. There is no movement and floor appears level. Floor boards are in good condition.	
Doors –	Metal clad solid core doors with timber door frames..	Doors generally in good condition. The door on West wall – door and timber sill loose. This door is not considered secure.	The West wall door and sill requires maintenance to ensure they are firmly and securely fixed in place.
		Door frames are satisfactory.	
		Door hardware – standard dead locks (except WC) - satisfactory.	
Windows –	Timber framed windows External fly wires attached.	Window and frames are considered to be in good condition.	
Base Boards to sub-floor area -	Spaced Timber boards spanning between and fixed to exterior stumps.	Some base boards are missing . **Refer to Photo No.6**	The base boards are more for aesthetics and restrict access to exposed cables under the floor. Missing boards can be replaced if considered necessary.

SUMMARY

This building is considered a high maintenance building, particularly with external timber weatherboards. Where indicated weatherboards require repairing or replacement.
West wall door requires attention to ensure safe and secure operation of the door.

All other recommendations can be done as part of the general maintenance program.

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Photo No.1 - Control Room - Corrosion of roof gutter.

Photo No.2 – Control Room – Corroded downpipe.

Photo No.3 – Control Room - ‘Canite” ceiling panel sagged and distorted.

Photo No.4 - Control Room – West wall peeling paint and rot in weatherboards.

Photo No.5- Control Room – N-E corner weatherboards rotting.

Photo No.6 – Missing base boards.

Photo No.7 – Control Room – Leaking Down Pipe causing yard surface wash away.

Photo No.8 – Control Room – Corroded Down Pipe causing wash away of yard surfacing fines.

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22 December 2014

ENGINEERS REPORT

ZONE SUBSTATION DN DANDENONG
INSPECTION OF CONTROL BUILDINGS

DATE OF INSPECTION : 18 DECEMBER 2014

INTRODUCTION :

A visual inspection of the Control Building was carried out to check the condition and structural integrity of all components of the building.

ITEM	DESCRIPTION	CONDITION	RECOMMENDATION
<u>Control Building</u>			
Roof –	Corrugated asbestos cement roof sheeting with asbestos cement gable flashing over timber barge boards.	Top of corrugations on roof sheeting are weathered and possible asbestos residue could be deposited in roof gutters. **Refer to Photo No.1** – for typical exterior of building. Roof sheeting is probably brittle due to age and a small section of roof has been repaired with bent galvanised sheet. **Refer to Photo No.1** Asbestos gable flashing has broken away at bottom ends of East gable. **Refer to Photo No.2** Roof timber fascia severely rotted at N-W corner of Control Room. **Refer to Photo No.3**	Gutters should not be cleaned until inspected by an Contractor authorised in identifying and handling asbestos residue. Clean, Seal or paint roof by an authorised Contractor to prevent further weathering, could also be considered. Precautions would need to be taken not to damage roof. Install patch length of galvanised angle flashing to protect barge board ,eaves frame and battens from rotting. Sections of fascia boards which have rot should be cut out and replaced.
	Metal gutters and Downpipes.	Gutter has dropped on southern side of building. Water will collect in this section of gutter. Some downpipe outlets are broken allowing water to flow onto yard surfacing and possibly under building. **Refer to Photo No.4**	Difficult to fix, consider replacing gutter. (State of gutter internal surface unknown.) Repair outlets to ensure all run-off is directed to stormwater drain.
	Eaves – bird mesh covered with spaced timber battens.	Appears in satisfactory condition. Residue in eaves may indicate infiltration of birds or vermin.	

ITEM	DESCRIPTION	CONDITION	RECOMMENDATION
Roof – (continued)	Ceiling Control Room -'Canite' sheeting. Battery Room – Asbestos Cement Sheeting	There is some distortion and cracking of ceiling panels, some panels have been replaced and it has been necessary to install extra battens in the Control room. **Refer to Photo No.5**	Ceiling will require attention on a needs basis. Currently the ceiling in the Control Room is serviceable but unsightly.
Walls –	Timber stud walls - External Lining – Profiled Asbestos Cement (AC) sheeting.	External lining generally satisfactory. There are some broken sections under North wall doors. **Refer to Photo No.7**	
	Internal Lining – Control Room - Masonite	Masonite generally satisfactory.	
	Battery Room – Asbestos Cement Sheet	Lining satisfactory.	
	Vents to Battery Room – Lower metal vents to external wall.	External face of vents have extensive corrosion. **Refer to Photo No.6**	Thoroughly clean external face of vents by wire brushing, apply anti-rust agent and 2 coats of zinc rich paint.
Floor -	Timber floor structure – bearers and joists supported on stumps. Flooring – T &G Timber floor.	The floor has dropped at the West end of the building with an obvious fall from the Control Room into the adjoining rooms containing operators desk and battery chargers. Possible deterioration of stumps at this end of the building. T & G flooring appears to be in satisfactory condition.	A more thorough investigation may be required to determine the state of stumps at this end of the building and if re-blocking of the floor is required.
Doors –	Timber doors with T & G external lining.	External paintwork on doors and frames is in poor condition sand exposed timber will be prone to rot if left in this condition. On South wall - door sills and timber under sills are weathered and in poor condition. Door hardware – standard dead locks - satisfactory.	Doors and frames require sanding to remove all loose and peeling paint. Prime timber and apply 2 coats of exterior enamel paint. Consideration to replacing sills and base boards needs to be considered.
Windows –	Timber framed windows.	Window frames are considered to be satisfactory.	
Base Boards to sub-floor area -	Spaced Timber boards spanning between and fixed to exterior stumps.	Some rotting at corner joints and base board miss at N-E corner. **Refer to Photo No.8**	Install new board.

SUMMARY

Most of the electrical equipment in the Control Room Building inspected has been moved to or replaced by equipment in the new building.

Recommendations can be done as part of the general maintenance program.

Roof and floor recommendations will be difficult and costly.
Work associated with any asbestos materials shall be done by a qualified Contractor licensed to inspect, monitor and remove asbestos material.

The building has a high content of asbestos material and any ongoing maintenance, which is not related to the asbestos material in the building, would need to ensure there is no disturbance to any of the asbestos materials.

Consideration could be given to transfer all remaining electrical equipment to the new building and demolish the old building. Ongoing maintenance and repair to the building will offset this cost.

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Photo No.1 – Control Room Building – Typical exterior (South side of building).

Photo No.2 - Control Room – Asbestos roof gable flashing broken.

Photo No.3 – Contol Room Building – Rotting timber fascia..

Photo No.4 – Control Room Building – Broken downpipe outlet.

Photo No.5 – Control Room Building – Typical “Canite” ceiling.

Photo No.6 - Battery Room Vents – Corrosion on external face of metal vents.

Photo No.7 – Controll Room Building – T & G Timber doors (North wall)

Photo No.8 – Control Room Building – Missing Base Board at N-E corner.