
Program of Works

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Rack structures: Fall Arrest Installation

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1 Summary

PROGRAM	Installation of Fall Arrests on Rack Structures 2017/18 – 2021/22
SERVICE DATE	On-going throughout period 2017 – 2019
LOCATION	Different areas of Victorian Network
VALUE	\$ 878K

This program aims to install Fall Arrest Systems (FAS) on 38% of the sites which require fall from heights mitigation to complete the FAS installation on transmission rack structures.

It is a continuation of the XC81 project which installed FAS on 62% of the sites which require fall from heights mitigation.

By completing the FAS installation on all transmission racks which pose fall from heights risk AusNet Services aligns with the current Work Safe requirements Occupational Health and Safety Regulations 2007, No. 54 – Part3.3, on all rack structures.

This works program document should be read in conjunction with the transmission line structures AMS 10-77 Transmission Line Structures. AMS 10-77 details the background and options analyses performed in order to determine optimal fall arrest installation strategies.

1.1 Project Scope

The scope of works covers the following key activities related to the installation of the vertical and horizontal cable fall arrest system on rack structures and other ancillaries located in terminal and power station switchyards:

- Site inspection to confirm the rack and ancillary details.
- Provision of drawings and appropriate schedules to supplier and contractors for them to obtain the appropriate length of stainless steel cable, and the correct number of intermediate brackets.
- Structural review on the rack structure to model the reaction in the event of a fall and the system restraining the fall.
- Strengthening of the rack and ancillary structure by replacing or adding members if analysis identifies the need for it.
- Material purchase of the following items: stainless steel cable, intermediate brackets, top and bottom anchors, traveller, and tools & devices.
- Storage and store management for the efficient and secure handling and storage of the above materials.
- Installation of top anchors and stainless cables.
- Installation of guide wire holders on specific points (while descending the tower).
- Install the bottom bracket, with the tension ring to check cable tensions.

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1.2 Program Expenditure Forecast

2017/18 (\$k)	2018/19 (\$k)	2019/20 (\$k)	2020/21 (\$k)	2021/22 (\$k)	Total (\$k)
8	341	529	-	-	878

Table 1 – Program timing and forecast expenditure

Forecast costs shown in

2017/18 (\$k)	2018/19 (\$k)	2019/20 (\$k)	2020/21 (\$k)	2021/22 (\$k)	Total (\$k)
8	341	529	-	-	878

Table 1 are \$2014/15 P50 direct costs. These costs exclude overheads, finance charges and cost escalation.

2 Project Drivers

The installation of fall arrest devices on rack structures is driven by the requirements of the Electricity Safety Act and the Occupational Health and Safety Act specifically in relation to working at heights. Whilst the electricity industry has an excellent record with no recorded fall from a tower by a worker in the course of his duty, the general construction industry in Victoria had a very poor record. A fall from an elevated position on a tower could result in the following:

- Injury or fatality;
- Financial penalties from WorkSafe;
- Litigation for failure to provide a safe environment for workers.

Implementation of this program of work will assist AusNet Services in addressing the following business drivers:

- Safety of employees, contractors and the general public:
 - Minimise OH&S risk to employees and contractors.
- Financial risk:
 - Reduce operating costs through optimisation of works- (more productivity by providing a faster and safer way to access towers);
 - Reduce financial penalties associated with breach of WorkSafe regulations;
 - Reduce civil actions resulting from personal injury / compromised health.
- Regulatory compliance:
 - Compliance with the Electricity Safety Act;
 - Compliance with the Electricity Safety (Management) Regulations;
 - Compliance with Occupational Health & Safety Regulations 2007, No. 54 – Part 3.3;
 - Occupational Health & Safety Act (provide safe work environment).
- Corporate image maintained as prudent asset managers:
 - Manage risk so far as is practicable.

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3 Overview

AusNet Services has more than 650 rack and ancillary structures such ground-wire masts and termination masts. These are climbed at least every three years as part of the condition assessment inspections. The Occupational Health and Safety Regulations 2007, No. 54 – Part3.3 require systems installed to prevent a worker falling from heights.

This program aims to install FAS on 38% of all rack structures and ancillary structures inside terminal and power station switchyards. It is a continuation of the FAS installation program project XC81 which installed FAS on 62% of all rack structures. The implementation of this program will significantly reduce fall related risks while accessing a structure inside a station, and increase productivity by providing faster climbing rate for inspection and maintenance crews.

4 Risk Mitigation

The implementation of this program will significantly reduce fall related risks while accessing a structure inside a station, and increase productivity by providing faster climbing rate for inspection and maintenance crews. The risk reduction will primarily be obtained by reducing the likelihood of a fall that could cause serious injury and secondarily reducing the severity of consequences associated with a fall. The vertical and horizontal cable fall arrest system will prevent a worker from falling a considerable distance (i.e. the FAS will limit the worker's fall to 300mm), and therefore reduce the likelihood of a serious injury or fatality (i.e. the worker will only experience an action similar to a seat belt). The restraint system will also limit the potential for a worker to fall into the safe approach distance near a live conductor.

5 Options

Three options were evaluated to reduce the risk of falling from rack structures.

- Option 1:** Do nothing and continue to use double lanyards to access rack structures and ancillary structures inside terminal and power stations.
- Option 2:** Defer the program to begin in 2020/21.
- Option 3:** Install the cable system on remaining rack and ancillary structures starting in FY 2017/18.

5.1 Option 1 – Do nothing and continue to use double lanyards to access structures inside terminal and power stations

The Do Nothing option involves:

- Continuing indefinitely to use double lanyards to access the structures inside the stations.
- Continuing with the present level of risk of a fall from height, to ground or into steel elements of the structure.
- Increasing risk of WorkSafe fine and not meeting OH&S regulations.
- Risk of litigation if worker sustains an injury at work.
- Inconsistent with the obligations of the Electricity Safety Act.

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5.2 Option 2 – Defer the program to begin in 2020/21

Deferring the installation of FAS on the remaining structure that do not already have the system installed involves:

- Continuing to use double lanyards to access these structures.
- Continuing to put lines workers at risk of a fall from height, or a fall into steel objects of the structures.
- Increasing risk of WorkSafe fines and risk of not meeting OH&S regulations.
- Risk of litigation if worker sustains an injury at work.
- Risk of increasing labour and material costs.
- Inconsistency with obligations under the Electricity safety act.
- Inconsistency with AusNet Services' accepted Electricity Safety Management Scheme.

5.3 Option 3 – Install the cable system on rack and ancillary structures starting in FY 2017/18

The installation program involves:

- Proactive installation of the cable fall arrest system on structures inside terminal stations and power stations (38% of the total number of stations).
- Meeting Occupational Health and Safety Regulations 2007, No. 54 – Part3.3.
- Providing the safest method of climbing towers.
- Reducing the current risks associated with inspection and maintenance works on rack structures and ancillary structures.

6 Options Analysis

6.1 Option 1 – Do nothing and continue to use double lanyards to access the structures

The do nothing option would result in delays during climbing inspections and the continued exposure of line workers from the hazards associated with falling from a considerable height whilst climbing/descending, and walking across the rack structures, i.e. double lanyards are designed to extend to more than 1.5 metres as a means of dampening the fall of a line worker. This means that although a line worker is restrained from falling to the ground, there is a high probability that he will get into contact with the steelwork (step bolts, bracing members, etc) beneath him.

This option will also leave AusNet Services open to the risk of receiving substantial fines from WorkSafe, even to the point of suffering a ban on the use of dual lanyards whilst accessing the structures. If this ensues, the company will be forced to use Elevated Work Platforms and/or Brontos (electrically insulated work platforms) on all manner of maintenance work, inspections, and project works. Besides the high cost for these plant items, the cost for access installation and repair will be considerable – amounting to more than the actual job itself.

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The negative impact to AusNet Services' Corporate Reputation of this penalty from WorkSafe, and the implications of a power utility not capable of accessing its assets will be very serious. This option is not economically feasible. It is inconsistent with good industry practice. This option is also inconsistent with AusNet Services' obligation under the Electricity Safety Act to:

"...design, construct, operate, maintain and decommission its supply network to minimise as far as is practicable the hazards and risks to the safety of any person arising from the supply network; having regard to the:

- a) severity of the hazard or risk in question; and*
- b) state of knowledge about the hazard or risk and any ways of removing or mitigating the hazard or risk; and*
- c) availability and suitability of ways to remove or mitigate the hazard or risk; and*
- d) cost of removing or mitigating the hazard or risk".*

It is also inconsistent with AusNet Services' accepted Electricity Safety Management Scheme and thus, is not recommended.

6.2 Option 2 – Defer the program to begin in 2020/21

This option carries the same disadvantages as Option 1 for a defined period of time, in addition to the risk of increasing labour and material costs compared to Option 3. The economic analysis shows that the benefits of deferring the expenditure are outweighed by the costs associated with carrying the risks until FY 2020/21. This option is therefore not recommended.

6.3 Option 3 – Install the cable system on rack and ancillary structures starting in FY 2017/18 – preferred option

This option will address the safety hazards associated with falling from the rack structure whilst ascending/descending, and walking across the rack structures, as well as improve the productivity of line workers during inspections and maintenance works by increasing the rate of access on these assets.

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7 Financial Analysis

Each option has been financially analysed using an NPV model¹. Option 3 which is the continuation of the fall arrest installation program has a similar NPV to Option 2 however Option 2 does not meet regulatory obligations and is therefore not preferred. The benefits are based on the expected increase in safety for the lineworkers while climbing up and down the rack structure.

Economic Analysis of Options (\$'000s)	PV Capital Cost	PV Opex Costs	PV Community Benefits	PV Proceeds from Sales	Total PV Cost	NPV including Reg Return
Do Nothing	-	(131)	(1,371)	-	(1,502)	-
Defer the program to begin in 2020/21	(667)	(84)	(554)	-	(1,306)	29
Install the cable system on remaining rack and ancillary structures starting in FY 2017/18.	(835)	(70)	(73)	-	(978)	30

Table 2 – NPV analysis

Note: All figures are in \$000's unless otherwise stated (nominal and discounted)

8 Recommended Action

Option 3, the installation of the fall arrest system on 38% of the rack and ancillary structures that do not already have an FAS installed is recommended.

9 Reference Documents

- Electricity Safety Act.
- Electricity Safety (Management) Regulations.
- Occupational Health & Safety Act – provision of safe work environment.
- AMS 10-77 Transmission Line Structures.
- Racks FAS installation ver. 1.xls.

¹ \\Rchfil100\asset\Asset Engineering\Lines\General Team Information\Regulatory Resets\TRR\TRR 2018-2022\4. Program of Works 2017-2022