SANDBAR - BURLEIGH

AS1768-2021 – LIGHTNING PROTECTION OPERATING AND MAINTENANCE MANUAL

Tercel International (AUST) Pty Ltd

September 2023

MACO Electrical

Contents

Contacts 3
TERCEL INTERNATIONAL (AUST) PTY LTD 3
Introduction to LPS 4
Installation Maintenance & Operating Instructions 5
Record Keeping 8
Photos 9
Photos 10
Photos 11
As Built Drawing Numbers 12
Lightning Protection System Warranty 13
LPS Test Report 14
Operational Reference 14
Equipment Used 14
System Description 15
Test Procedure 15
Soil Condition 15
Rainfall Data 16
Test Results 17
Conclusion 17
Recommendations 17
Tercel Sign Off 17
Compliance Certification for Test Equipment 18
Certificate of Compliance 19

PO Box 3233, HENDRA, QLD 4011
Ph.: 07 3290 4612
info@tercel.com.au
www.tercel.com.au

Lightning Protection

Contacts

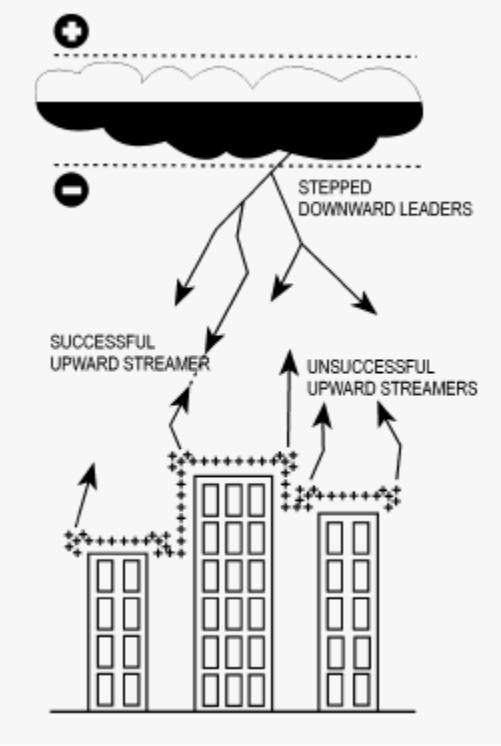
TERCEL INTERNATIONAL (AUST) PTY LTD

*: **Mailing Address***	PO Box 3233, Hendra, Qld. 4011
*: **Office Address***	3/170 North Road, Woodridge, Qld. 4114
*: **Director***	Rowan Falconer Ph. 0416 283 392 Fax 07 3290 4612
*: **Project Manager***	James Walsh Ph. 0417 820 779 Ph. 07 3290 4612
: Install Managers	*Lloyd Elliott* *Ph. 0437 783 053*

Introduction to LPS

Lightning occurs as the result of unstable upper atmospheric conditions.
On a hot day, air rises from the ground and is replaced by cooler air. The convection process cools the rising air to form clouds first as water globules and then at greater heights as ice crystals. The top of storm clouds may reach a height of ten kilometers. Charge separation within a cloud occurs because ice crystals at the top become positively charged while water globules at the bottom are negatively charged.
High structures are most vulnerable. The first stage of a lightning discharge is stepped downward leaders moving from cloud towards ground. These leaders are invisible to the naked eye. Prominent features such as tall buildings develop high positive charges which emit upward moving streamers competing for the downward leaders. When a connection occurs a path to ground is formed for the lightning current. The return stroke is the lightning flash visible to the eye.

LIGHTNING FORMATION PROCESS



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info@tercel.com.au
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Installation Maintenance & Operating Instructions

Generally Lightning Protection Systems (LPS) do not require a lot of maintenance. Nevertheless, some system components will lose their effectiveness over time because of weathering, corrosion, and stroke damage. Both physical and electrical characteristics of the LPS must be maintained to ensure compliance with the design requirements.

The periodic inspection and tests described below will indicate what maintenance, if any, should be undertaken.

Particular attention should be paid to earthing, to any evidence of corrosion and to any alterations or extensions to the structure that may affect the LPS.

Examples of such alterations or extensions are as follows: -

(a) Changes in the use of a building.

(b) Installation of fuel oil storage tanks.

(c) The erection of radio and television antennas.

(d) Installation or alteration to the electrical, telecommunications or computing facilities within, or closely connected to, the building.

A good maintenance program should also contain provision for the following:

(i) Inspection of all system components.

(ii) Tightening of all accessible clamps and splices.

(iii) Measurement of system resistance, including earth resistance of terminals.

(iv) Inspection or testing of SPDs.

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Inspection

All Lightning Protection System's should be inspected after completion, alteration or extension, in order to verify that they are in accordance with this Standard. A routine inspection should be made at least every two years.

More frequent inspections may be warranted in some circumstances.

Such circumstances include, but are not limited to: -

(a) areas subject to severe weather and lightning activity;

(b) structures located in areas where aggressive soil or other conditions may accelerate corrosion or other aspects of system degradation;

(c) changes in technology use within the structure that may necessitate a review of the protection means and their continued effectiveness; and

(d) any other time where it is deemed necessary to update the original risk assessment for lightning damage.

Testing

On the completion of the installation or of any modification to it, and at the time of any maintenance inspection, the resistance to earth of the whole installation and of each earth termination should be measured, and the electrical continuity of all conductors, bonds and joints and their mechanical condition verified. The testing should be carried out in accordance with Appendix 5 of AS1768.

Where regular testing during maintenance reveals that the earthing resistance is substantially unchanged, the frequency of maintenance testing may be reduced to each alternate inspection. If the resistance to earth of an LPS, when so determined, exceeds the specified value for the particular applications the value should be reduced to be in accordance with the recommendations of this AS1768.

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If the resistance is less than the recommended value, but significantly higher, than the previous reading, the cause should be investigated, in accordance with Appendix C of AS1768. The condition of the soil, the procedure adopted, details of salting or other soil treatment, and the results obtained should all be recorded as listed in AS1768 Clause 5.4.

Records

The following records should be kept on site, or by the persons responsible for the upkeep of the installation:

(a) Scale drawings showing the nature, dimensions and position of all component parts of the LPS.

(b) The nature of the soil and any special earthing arrangements.

(c) Date and particulars of salting, if used.

(d) Test conditions, date and results in accordance with Clause 8.3.

(e) Alterations, additions or repairs to the system.

(f) The name and contact details of the persons responsible for the installation or for its upkeep.

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Record Keeping

YEAR	DATE	TEST	SIGNED
2023	23/02/2023	3 PIN FOP & 2 PIN Continuity	*L Elliott*
2025			
2027			
2029			
2031			
2033			
2035			
2037			
2039			
2041			

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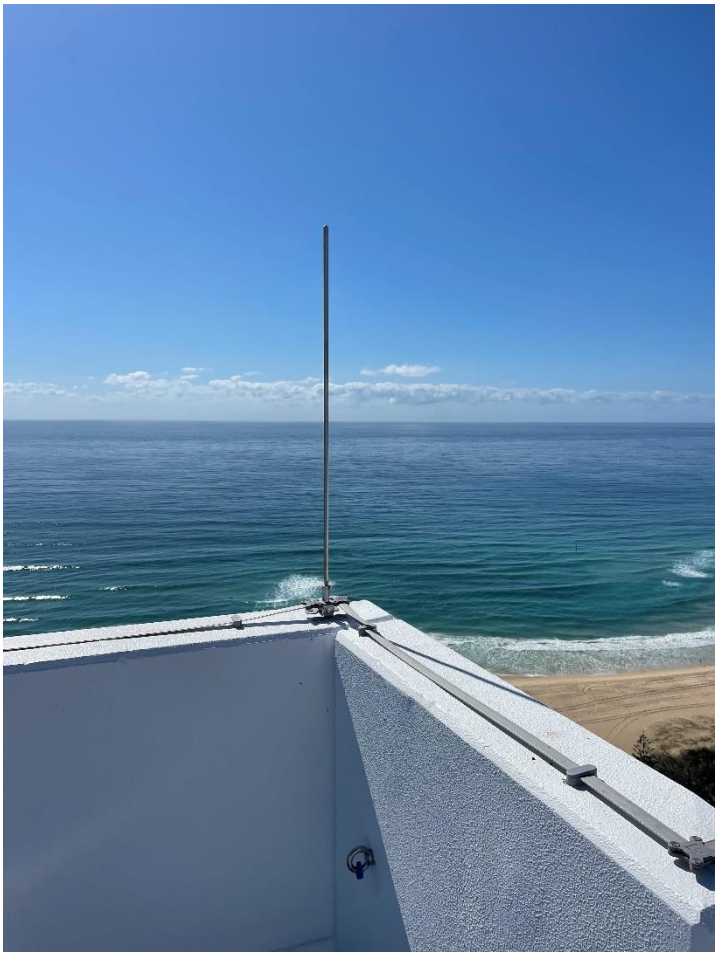
Photos



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Lightning Protection

As Built Drawing Numbers

SBH-TER-EL-LP-0000-0001_0

SBH-TER-EL-LP-0989-0002_0

SBH-TER-EL-LP-0993-0003_0

SBH-TER-EL-LP-0996-0004_0

SBH-TER-EL-LP-1000-0005_0

SBH-TER-EL-LP-1004-0006_0

SBH-TER-EL-LP-1008-0007_0

SBH-TER-EL-LP-1045-0008_0

SBH-TER-EL-LP-1049-0009_0

SBH-TER-EL-LP-1094-0010_0

SBH-TER-EL-LP-1098-0011_0

SBH-TER-EL-LP-8100-0015_0

SBH-TER-EL-LP-9004-0020_0

SBH-TER-EL-LP-9187-0021_0

SBH-TER-EL-LP-9193-0022_0

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Lightning Protection System Warranty

TERCEL INTERNATIONAL (AUSTRALIA) PTY LTD HEREBY WARRANTY THE LIGHTNING PROTECTION SYSTEM PARTS and LABOUR, FOR THE SITE BELOW FOR A PERIOD OF 12 MONTHS

Sandbar - Burleigh

1969-1971 Gold Coast highway,

Burleigh Heads

QLD 4220

Valid from 29th September 2023 to the 28th September 2024

To ensure your Lightning Protection/Earthing System remains compliant with Australian Standards, contact your nearest Tercel International office to arrange a Testing Officer to visit.

Lightning Protection

LPS Test Report

Test Date:	29/09/2023
Test Site:	Sandbar – Burleigh 1969-1971 Gold Coast Highway Burleigh Heads QLD, 4220
Nature of Test:	Earth Resistance and Continuity Test
Addressee:	Tim McKay – MACO Electrical
Testing Officer:	Lloyd Elliott - Tercel

Operational Reference

Australian Standard for Lightning Protection AS1768-2021 Appendix 5, Section 5-2.

Equipment Used

AEMC 6470B Digital Earth Resistance Tester

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System Description

System – Conventional:

The Sandbar Project Lightning Protection System utilizes the building Dewatering system as the Earthing System. Welded connections between the reinforcement of the footing & the starter bars for the columns ensure continuity from the earthing medium.
The reinforcing steel within the available structural concrete columns is used as the Down Conductor paths. Transfers & connections from the Lvl 2 reinforcement to tower column down conductors has been achieved utilizing 35mm GY PVC cables clamped or welded to reinforcement bars at selected APTUS COUPLER column locations to create a path of least resistance. The Aptus Coupler Pre-Cast System provides continuous connection for down conductor pathways in the tower columns.
At the roof level, further 35mm GY PVC cables with exothermic welded mild steel bar, have been fusion welded to the top of the reinforcement within the structural concrete Aptus Coupler columns, these have then been transferred to stair over runs, plant room structure and the perimeter hob, these tails have then been terminated onto the air termination system.
The Air Termination installation of25x3 stainless steel tape, coupled with 1000mm-2000mm air Rods at the high points and on equipment to adhere to the *(PLIII)* requirement for this project.
Test points are provided on basement lvl 1 car park on several columns, these allow for future testing of the structure. An ***Electrical Services Bond*** connection has also been provided for connection to the M.S.B & incoming services, this provides a complete protection & common potential across the site.

Test Procedure

Earth resistance testing on the structure & earth grid using 'fall of potential' method with test probes (voltage and current) driven to a depth of 300mm at fixed intervals of 20m and 40m from the Earth Grid/ Installation under test.
Continuity Testing was also conducted from Test Points to the Air Terminations at Roof Level.

Soil Condition

Beach front/sandy location – utilized Dewatering wells as earth medium.

PO Box 3233, HENDRA, QLD 4011
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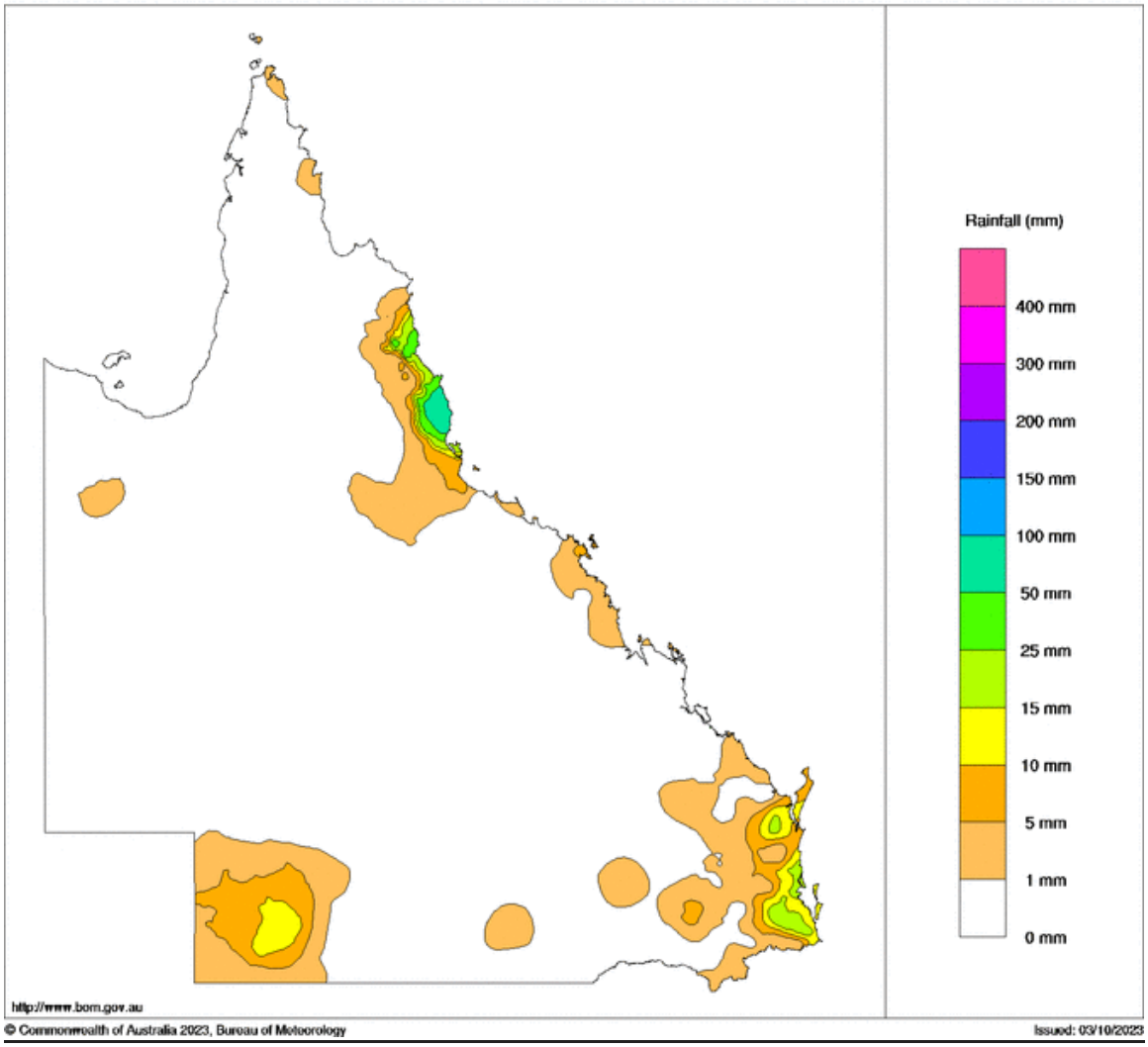
Rainfall Data

Queensland Rainfall Totals (mm) Week Ending 29th September 2023

Australian Bureau of Meteorology



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Test Results

TEST NO.	LOCATION	TEST TYPE	RESULT
Test 1	Down Conductor Test Point E01	3 PIN FOP	8.23 Ω
Test 2	Down Conductor Test Point E02	3 PIN FOP	6.24 Ω
Test 3	Down Conductor Test Point E03	3 PIN FOP	7.54 Ω
Test 4	Down Conductor Test Point E04	3 PIN FOP	6.96 Ω
Test 5	Down Conductor Test Point E05	3 PIN FOP	6.45 Ω
Test 6	Roof network – Test point E2	2 PIN continuity	4.38 Ω

Conclusion

The earth resistance measurements from the tests are below the 10-ohm maximum reading requirement for a lightning protection earthing system, as specified by AS1768-2021.
Consistent readings across the site of several of the measurements confirms that all of the earth grids & equipotentially bonded equipment is interconnected.

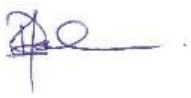
Recommendations

Implement a 2 yearly inspection and test regime as per Section 8.2 “Maintenance and Inspection of AS1768-2021.”

Tercel Sign Off

On Behalf of Tercel International Aust Pty Ltd:

Rowan Falconer

Signed: 

Date: 04/10/2023

PO Box 3233, HENDRA, QLD 4011
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info@tercel.com.au
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Compliance Certification for Test Equipment

HK Calibration Technologies Pty Ltd
ACN: 152 274 014 ABN: 84 152 274 014
Postal Address: PO Box 4489, North Rocks, 2151 NSW Australia
T: 1300 309 881 F: 1300 885 178
Email: info@hkcalibrations.com.au
Web: www.hkcalibrations.com.au

CALIBRATION CERTIFICATE

REPORT NO: 159889-1

CLIENT:	CLIENT ADDRESS:
TERCEL INTERNATIONAL PTY LTD - QLD	3/170 NORTH RD, WOODRIDGE QLD 4114

INSTRUMENT DATA

A	EQUIPMENT TYPE	EARTH GROUND TESTER-6470-B
B	MAKE	AEMC INSTRUMENTS
C	MODEL	6470-B
D	SERIAL NUMBER	102923RFDV
E	ASSET NUMBER	NOT FOUND
F	DESCRIPTION OF TYPE	DIGITAL
G	RANGE	VARIOUS
H	RATED ACCURACY / TOLERANCE OF U.U.T. (±)	AS FOUND

CALIBRATION DATE

I	DATE OF CALIBRATION	11/08/2023
J	RECOMMENDED DUE DATE	11/08/2024

CALIBRATION RESULT

The results of the tests, calibrations, and /or measurements included in this document are traceable to Australian/national standards.

K	READING OF U.U.T.	SEE PAGE 2
L	READING OF MASTER INSTRUMENT	SEE PAGE 2
M	ADJUSTMENT	NIL
N	REPAIR	NIL
O	SERVICEABILITY/FUNCTIONALITY	ACCEPTABLE
P	TECHNICIAN COMMENT	THIS INSTRUMENT WAS FOUND TO BE FUNCTIONING AS INDICATED BY OUR FINDINGS WITHIN THIS REPORT.

The applicable measurement uncertainties are calculated in accordance with the method described in the ISO Guide to the Expression of Uncertainty in Measurement, with confidence level of 95% using a coverage factor k=2.

CALIBRATION PROCEDURE AND TRACEABILITY

Q	LOCATION OF EQUIPMENT	TEST AND MEASUREMENT LAB
R	CALIBRATED BY	BRI TEC
S	CALIBRATION ENVIRONMENT	TEMPERATURE: 23.0 ± 2°C AVERAGE HUMIDITY: 45% ± 10% RH
T	CALIBRATION PROCEDURE	HKC SOP 11-28-V7
U	REFERENCE CALIBRATION STANDARD USED:- HKCT'S PRECISION INSTRUMENT TRACEABLE TO AUSTRALIAN NATIONAL STANDARDS VIA A NATA CERTIFIED CALIBRATION CERTIFICATE:-	*MODEL: 5502E,8846A* *ASSET: HKC001A,HKC001B* *SERIAL NO: 2371801,2362013* *NATA REPORT NO: 2023001112, HK02-2023-0018* *CAL DATE : 02/03/2023, 24/02/2023* *CAL DUE : 02/03/2024, 24/02/2024*

TECHNICIAN'S SIGNATURE	AUTHORISED BY	DATE OF ISSUE
		11/08/2023

Page 1

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info@tercel.com.au
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Lightning Protection

Certificate of Compliance

(PLIV Lightning Protection System) - Certificate of Compliance

in conformity with Australian Standard 1768-2021

This certificate entitles the following structure to two years of compliance of the Lightning Protection and Earthing System installed.

Sandbar - Burleigh

1969-1971 Gold Coast highway,

Burleigh Heads

QLD 4220

Valid from 29/09/2023 to 28/09/2025

To ensure your Lightning Protection/Earthing System remains compliant with Australian Standards, contact your nearest Tercel International team to arrange a Testing Officer to visit.

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