Standard – Horizon Power Environmental Conditions

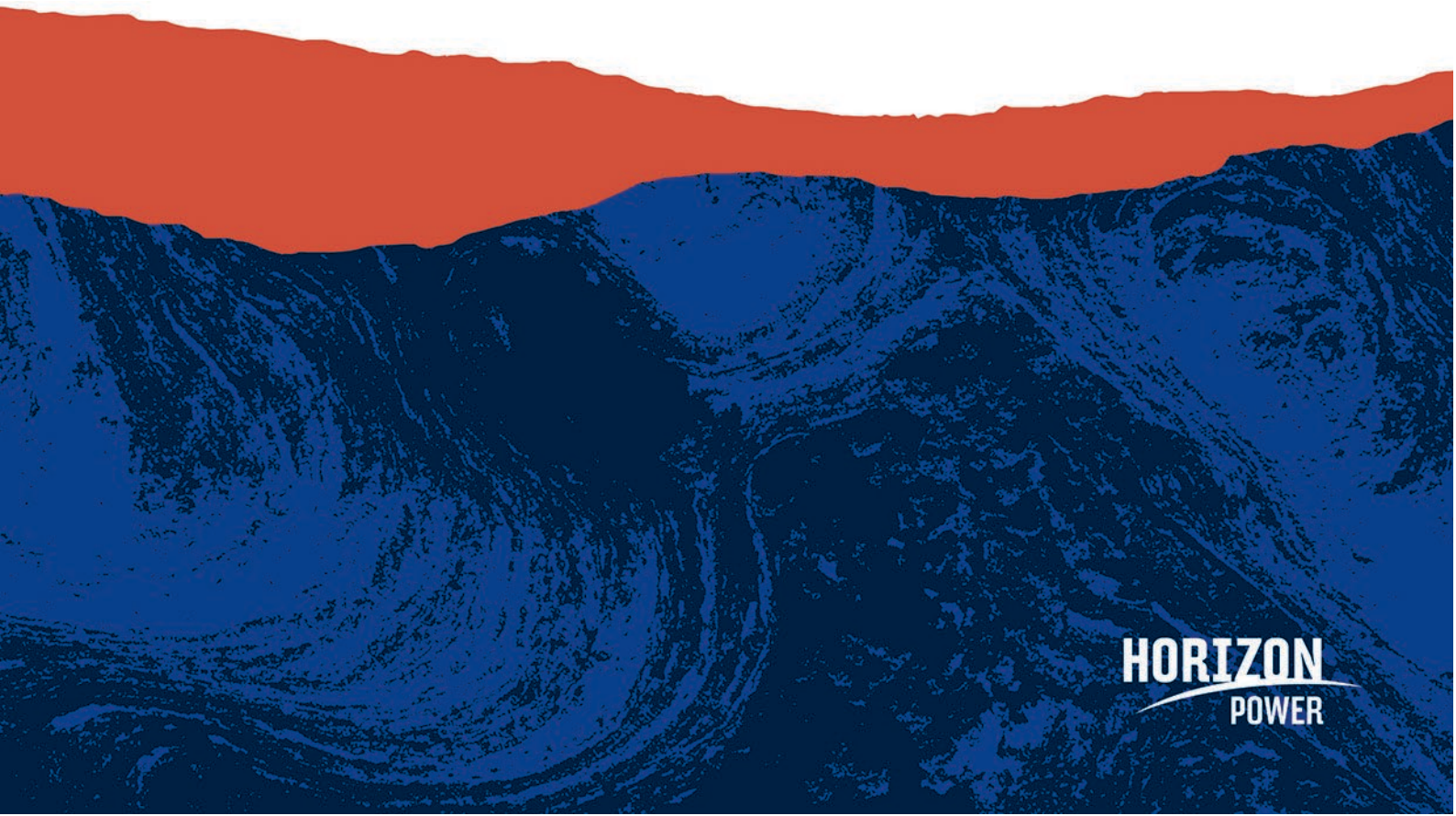
Standard Number: HPC-9EJ-01-0001-2013

Original Issue Date: 26th May 2014
Document Number: 2302921

Print Date: 4/03/2026

Uncontrolled document when downloaded. Refer to Horizon Power's website for most current version.

© Horizon Power Corporation 2026



Document Control			
Author	**Name:** Oliver Blakeley **Position:** Intern Standards & Plant Engineer		Digitally signed by Paul Savig Date: 2026.03.04 12:46:51 +08'00'
Reviewed By	**Name:** Paul Savig **Position:** Senior Standards & Plant Engineer		Digitally signed by Paul Savig Date: 2026.03.04 12:46:59 +08'00'
Endorsed By	**Name:** Johnathan Choi **Position:** Standards and Plant Manager		Digitally signed by Johnathan Choi Date: 2026.03.04 12:54:32 +08'00'
Approved By *	**Name:** Victor Cheng **Position:** Senior Manager Engineering and Project Services		Digitally signed by Victor Cheng Date: 2026.03.06 16:30:41 +08'00'
Date Created/Last Updated	4 March 2026		
Review Frequency **	5 yearly		
Next Review Date **	4 March 2031		

** Shall be the Process Owner and is the person assigned authority and responsibility for managing the whole process, end-to-end, which may extend across more than one division and/or functions, in order to deliver agreed business results.*

*** Frequency period is dependent upon circumstances– maximum is 5 years from last issue, review, or revision whichever is the latest. If left blank, the default shall be 1 year unless otherwise specified.*

Revision Control		
Revision	**Date**	**Description**
2	4/03/2026	Review and update to reflect current standards

STAKEHOLDERS *The following positions shall be consulted if an update or review is required:*	
Senior Manager – Engineering & Project Services	Senior Manager – Asset Services
Senior Manager – Energy Planning	Senior Manager – System Operations
Head of People and Safety	Senior Manager – Project Delivery

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

Table of Contents

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

1. Purpose

This Standard sets forth Horizon Power's required Environmental Conditions for all Generation, Transmission and Distribution Assets, thus eliminating the need to continually repeat the Environmental Conditions in every Document, Standard, Specification or Tender.

2. Scope and Application

This Standard shall be used to define the allowable, maximum or minimum Environmental Conditions required by Horizon Power's for its Assets, (whether part of an electrical network or not).

This Standard shall be applied in the following circumstances:

- Design of New Assets;
- Leasing of Equipment;
- Installation of New Assets;
- Purchasing of all Assets/Equipment;
- Operation of leased or purchased Assets; and
- Tendering of Projects.

3. Normative References

3.1 Standards

3.1.1 Australian Standards

The following standards are available at http://www.intertekinform.com/.

[1]. *AS/NZS 1170.2: 2021 (Amd 2: 2024), Structure design actions - Wind Actions*

[2]. *AS/NZS 1170.4: 2024, Minimum design loads on structures - Earthquake Loads*

[3]. *AS 4312: 2019, Atmospheric Corrosivity zones in Australia*

[4]. *AS/NZS 7000: 2016, Overheard line design*

[5]. *SA/SNZ HB 331: 2020, Overhead line design handbook*

3.1.2 Compliance With Standards

Various Standards are referenced in this Standard. The Standards have reference to the year they were published. If over the life of the Tender the Standards change, the Vendor is required to conform to the new edition of the Standard.

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

Unless otherwise specified herein, the Equipment shall be designed, manufactured and type and routine tested in accordance with the referenced Australian Standards, including all amendments. Where there is no Australian Standard equivalent, International Standards or Codes as defined in this specification shall be used. The specified documents contain provisions that, through reference in the text, constitute requirements of this Specification. At the time of publication of this Specification, the editions indicated were valid. Information on currently valid national and international standards may be obtained from the Australian Standards website – https://www.intertekinform.com/.

3.2 Definitions and Abbreviations

For the purposes of this standard the following definitions and abbreviations apply:

3.2.1 Definitions

Table 1 – List of Definitions

Definition	Description
Distribution High Importance	Any distribution overhead network assets that require higher reliability due to reasons including but not limited to: a. Criticality of the line b. Close proximity to navigable waterway crossings c. Close proximity to railway track d. Difficulty to access area/terrain

3.2.2 Abbreviations

Table 2 – List of Abbreviations

Abbreviation	Description
dB	decibels
EDC	Earthquake Design Category

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

4. Requirements

4.1 General

All assets bought or built, all equipment leased or purchased, all designs, installations and operations undertaken shall meet or take into consideration the following environmental conditions.

Table 3 – Environmental Conditions

Condition	Requirement
Altitude	Not exceeding 1000 m above mean sea level
Corrosion[1]	Distribution Assets – C3 Medium Transmission Assets – C5 Very High
Humidity (Relative)	0% to 100%, wet/condensing
Lightning (Isokeraunic Levels)	6-12 strikes/km^2 per year
Pollution (Deposits)	Insulation Levels for areas of: • Heavy pollution shall be 31 mm/kV; and • All other areas 20 mm/kV.
Pollution (Noise)	Less than 60 dB
Seismic	EDC II as per AS/NZS 1170.4 [2]
Soil Ambient Temperature	Soil ambient temperature shall be taken as: * 30°C or; * Maximum air temperature at the location minus 15°C Whichever one is greater
Soil Thermal Resistivity	Between 1.0°C.m/W and 3.8°C.m/W
Soil Water logged (in specific areas)	Wet salty soil due to accumulation of salt water for long periods. Salt concentration can be as high 5000 mg/litre in certain areas.
Solar Radiation (Peak Maximum Intensity)	1.1 kWh/m² or 3.96 MJ/m^2
Temperature Air	-5°C minimum to 50°C maximum
Temperature Black Body in sunlight	80°C maximum
Wind Maximum Velocities	

Assets	Wind velocity (m/s)		
	Region A	Region C	Region D
Overhead Network Assets			
Distribution	39	52	60

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

Condition		Requirement		
	Distribution High Importance	41	56	66
	Transmission (> 33 kV)	43	61	72
	Ground-mounted/Substation Assets[2]			
	Distribution	41	58.8	69.3
	Transmission	46	73.5	89.25
Other – Live Line		Washing with water having a resistivity above 600 Ω.cm		

Note:

1. As per AS/NZS 4312: 2019, Atmospheric Corrosivity categories Section 3.2
2. As per AS/NZS 1170.2: 2021, climate change multiplier M_C, with a value of 1.05 for cyclonic regions

4.2 Regions

Horizon Power shares the task, with Western Power, of supplying electrical power to Western Australia (WA) as shown in Appendix B.

Due to the large area required to be covered by Horizon Power, it has subdivided its area of responsibility into District Offices, namely:

- **East Kimberley** looking after Halls Creek, Kalumburu, Kununurra, Lake Argyle, Warmun and Wyndham;
- **West Kimberley** looking after Ardyaloon, Beagle Bay, Bidyadanga, Broome, Camballin, Derby, Fitzroy Crossing, Lombadina/Djarindjin and Yungngora;
- **East Pilbara** looking after Marble Bar, Nullagine, Port Hedland and South Hedland;
- **West Pilbara** looking after Cossack, Karratha, Onslow, Point Samson and Roebourne;
- **Gascoyne/Mid West** looking after Carnarvon, Coral Bay, Denham, Exmouth and Gascoyne Junction; Cue, Meekatharra, Mount Magnet, Sandstone, Wiluna and Yalgoo; and
- **Esperance** looking after Esperance, Hopetoun, Laverton, Leonora, Menzies and Norseman.

These District Office's contact details are available on Horizon Power's web page, and the Offices should be contacted for any particular environmental conditions relating to their area.

4.3 Environmental Conditions

Horizon Power recommends that the correct data be obtained from the respective agencies.

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

4.3.1 Altitude

Topography of Western Australia ranging from areas 0 to 300 metres above mean sea level to areas over 600 metres.

Information can be sourced from:

https://en-au.topographic-map.com/map-hhgp/Western-Australia/

4.3.2 Humidity

The relative humidity for Western Australia varying between 30% and 70%.

Information can be sourced from:

https://www.bom.gov.au/jsp/ncc/climate_averages/relative-humidity/

4.3.3 Lightning

The isokeraunic activity -average annual ground lightning flash density of Western Australia varying from 3-12 flashes/km^2 per year in the Kimberley, to 0.5-4 flashes/km^2 per year in the Pilbara, and 0.1-2 flashes/km^2 per year along the South Coast.

Information can be sourced from:

https://www.bom.gov.au/jsp/ncc/climate_averages/thunder-lightning/

4.3.4 Pollution

Pollution deposits can be in the form of:

Dust from agriculture or very sandy areas. Wind borne dust deposits may accumulate over a number of months followed by high humidity with heavy dew or light rain.

Salt from the sea (up to 50 km).

The Atmospheric Corrosivity Zone is determined by the duration of wetness and airborne salt. The greater the duration of wetness the greater the amount of corrosion which would correspond to salt pollution.

Noise discharge is also considered pollution, but its effect is more related to the effect on human beings. Assets and electrical equipment shall not have high noise emissions. Horizon Power shall give preference to assets and equipment with the lowest noise emissions.

Information can be sourced from AS 4312: Atmospheric Corrosivity Zones in Australia and Environmental Protection (Noise) Regulations.

4.3.5 Seismic Interaction

There has been little impact, from seismic disturbances, on Horizon Power's assets and equipment.

Information can be sourced from:

https://earthquakes.ga.gov.au

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

4.3.6 Soil

There are different resistivity values for different soil types, which would impact on the installation requirements of assets and equipment. The Table 4 below provides general resistance data for soil types. This information needs to be verified by on site tests.

Table 4 – Soil Types

Soil Type	Resistance (Ωm)
Wet organic soil	5-50
Clays	10-50
'Typical soil'	50-100
Moist sand and gravel	60-200
Loam and broken stone	200-350
Slate, shale, sandstone	100-1,000
Very dry soil	1,000-2,500
Damp sand	200-500
Dry sand	1,000-2,500
Stony/rocky ground	1,000-10,000
Dry gravel	1,000-5,000
Bed rock	5,000-10,000

Concerns:

Karratha – high concentration of hard rock (trenching is difficult)

Onslow – high concentration of salt (corrosion is prevalent)

Information can be sourced from:

https://library.dpird.wa.gov.au/gis_maps/15/

4.3.7 Solar Radiation

The average daily solar radiation exposure for Western Australia which varies from 15 MJ/m^2, in the Esperance area, to 24 MJ/m^2, in the Kimberley/Pilbara area.

Information can be sourced from:

https://www.bom.gov.au/climate/maps/averages/solar-exposure/

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

4.3.8 Temperature

The recorded maximum air temperature annually for Western Australia varies from 21°C in the Esperance area to 42°C in the Kimberley area.

Information can be sourced from:

https://www.bom.gov.au/jsp/ncc/climate_averages/decadal-temperature/

4.3.9 Wind

Base regional wind speed and the associated wind return period shall be selected for a particular set of asset/structure based on:

1. The criticality of the asset/structure. Also referred to as importance level / security level, this is typically determined based on the magnitude of safety, economical, social, environmental consequence in the event of a failure. A higher importance level can also be applied to assets installed in areas not easily accessible for maintenance purposes.
2. The expected design working life of the asset

For above-ground assets, Horizon Power typically adopts an asset working life of 50 years. Taking into consideration the criticality of the assets, the following are the recommended wind return period (WRP):

1. Overhead network assets (Based on AS/NZS 7000: 2016 section 6.2.2 and Table 6.2 [4])
    a. Distribution – WRP = 50 years (line security level 1)
    b. Distribution High Importance – WRP = 100 years (line security level 2)
    c. Transmission (>33 kV) – WRP = 200 years (line security level 3)
2. Ground-mounted/Substation assets (Based on AS/NZS 1170.2: 2021 – Table 3.1 [1])
    a. Distribution – WRP = 100 years (importance level 1)
    b. Transmission – WRP = 1000 years (importance level 3)

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

APPENDIX A. REVISION INFORMATION

(Informative) Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification of errors or queries.

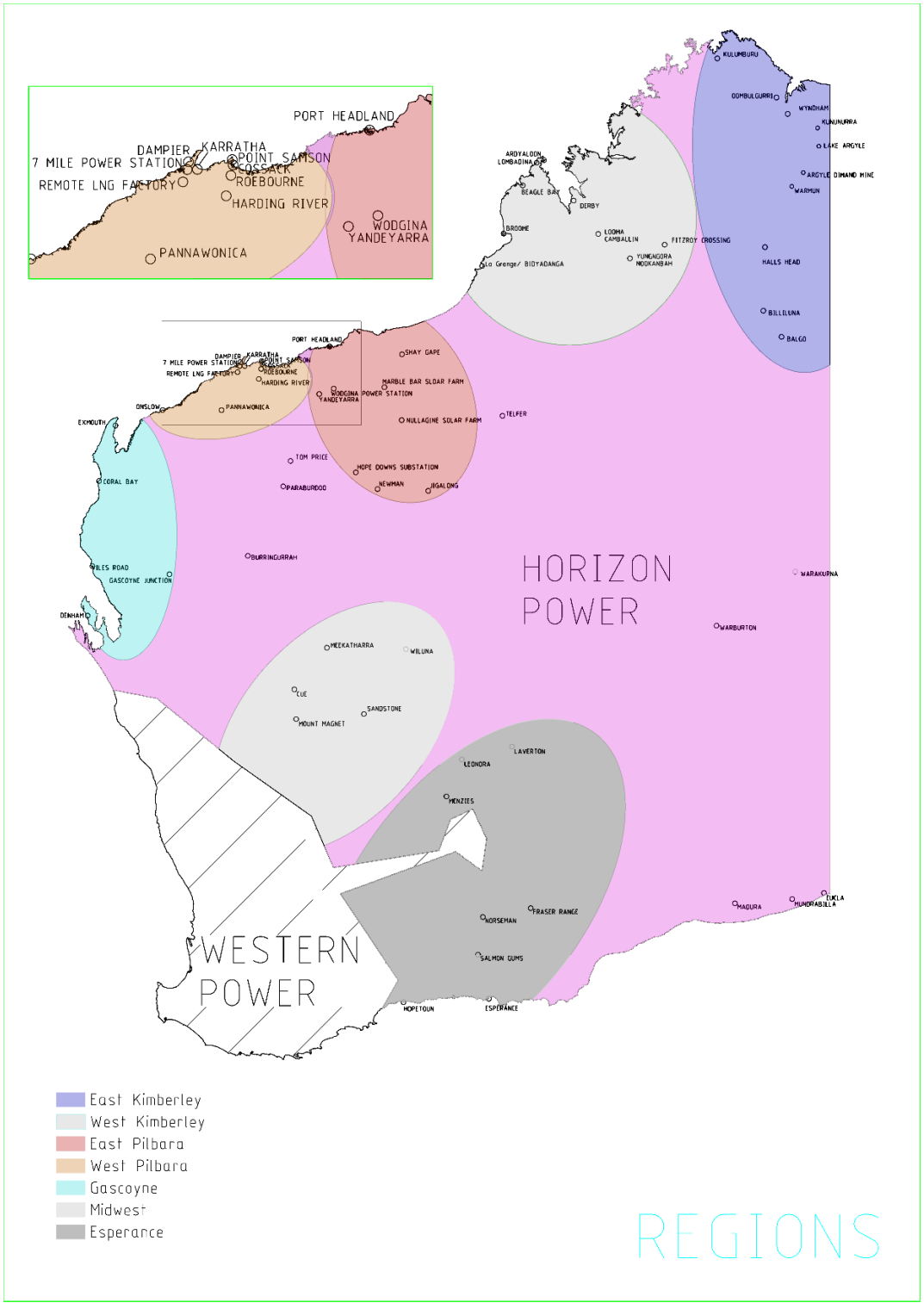
Each Standard makes use of its own comment sheet which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet found in **DM# 1820424**, can be used to record any errors or queries found in or pertaining to this standard. This comment sheet will be referred to each time the standard is updated.

Date	Rev No.	Notes
26/05/2014	0	First Issue
20/10/2020	1	Revise environmental conditions table, wind requirements and map details
4/03/2026	2	Review and update to reflect current standards, due to constant changing maps provided by the various governmental departments, all environmental maps have been removed.

© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.

APPENDIX B. REGIONAL OFFICES



© Horizon Power Corporation
Uncontrolled document when downloaded. Refer to DM for current version.