

ISO Rules

Part 500 Facilities

Division 502 Technical Requirements

Section 502.7 Load Facility Technical Requirements



Applicability

- 1 Section 502.7 applies to:
 - (a) the **legal owner** of an **electric distribution system**;
 - (b) a **person** who has entered into an arrangement directly with the **ISO** for the provision of **system access service** under subsection 101(2) of the **Act**;
 - (c) the **legal owner** of an industrial system which has been designated as such by the **Commission**;
 - (d) the **legal owner** of a **transmission facility**; and
 - (e) the **ISO**.
- 2 For the purposes of this Section 502.7, a reference to:
 - (a) a load facility means a facility connecting industrial load or distribution load to the **transmission system**; and
 - (b) a **legal owner** of a load facility means the entities described in subsections 1(a) through (c) above.

Functional Specifications

3 The **ISO** must, in accordance and generally consistent with this Section 502.7 and any other applicable **ISO** rules, approve of a functional specification containing further details, work requirements and specifications for the design, construction and operation of any load facility connection project and any **transmission facility** to which the load facility will be connected.

Successor to Prior Requirements

- 4(1) Subject to subsection 3, the provisions of this Section 502.7 do not apply to the **legal owner** of a load facility or a **legal owner** of a **transmission facility**:
- (a) that was built in accordance with a previous technical requirement, technical standard, or **ISO rule**; or
 - (b) with a functional specification that refers to a previous technical requirement, technical standard, or **ISO rule**,

however, the load facility or **transmission facility**, as applicable, must continue to remain in compliance with that previous technical requirement, technical standard, **ISO rule**, or functional specification.

(2) The **ISO** may, notwithstanding subsection 4(1), require the **legal owner** of a load facility or a **transmission facility** in existence prior to October 25, 2019 to comply with any specific provision or all of the provisions of this Section 502.7, if the **ISO** determines that such compliance is critical for the safe and reliable operation of the **interconnected electric system**.

Power Quality

5(1) The **legal owner** of a load facility must design and operate the load facility to meet the following power quality requirements at the **point of common coupling**:

- (a) the voltage flicker must:
 - (i) comply with the specifications set out in the version of the *International Electrotechnical Commission 61000-3-7, Electromagnetic compatibility (EMC) – Part 3-7: Limits -*

ISO Rules

Part 500 Facilities

Division 502 Technical Requirements

Section 502.7 Load Facility Technical Requirements



Assessment of emission limits for the connection of fluctuating installations to MV, HV and EHV power systems that is in effect as of the date the ISO first approves the functional specification for the load facility connection project; and

- (ii) without limiting the generality of subsection 5(a)(i), comply with the short and long term flicker limits as set out in the following Table 1:

Table 1
Short and Long Term Flicker Limits

Planning Levels		
	≤ 25 kV	>25 kV
P _{st}	0.9	0.8
P _{lt}	0.7	0.6

where:

P_{st} is an index representing the magnitude of the resulting short term flicker level for the considered aggregation of flicker sources (probabilistic value);

P_{lt} is an index representing the magnitude of the resulting long term flicker level for the considered aggregation of flicker sources (probabilistic value);

and

- (iii) meet the:

- (A) 99% probability weekly value for P_{st}; and
- (B) 95% probability weekly value for P_{lt}

based on measurement period of one (1) week of normal operation of the load facility;

- (b) the harmonics must comply with the specifications set out in the *IEEE Standard 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems* which is in effect as of the date the ISO first approves of the functional specification for the load facility connection project;
- (c) undamped resonance must not be introduced into the **transmission system**, including but not limited to self-excitation of induction machines, transformer ferroresonance, resonant effects of capacitor additions and the capacitance of the lines and cables of the load facility and the **transmission facility** to which the load facility is connected;
- (d) the increase of the phase-to-phase voltage unbalance caused by the load facility project must not exceed 1%, where the phase-to-phase voltage unbalance is measured based on normal operating conditions for 95% of the time over any continuous 7 **day** measurement period, calculated in accordance with the following formula:

$$\text{Voltage unbalance} = \frac{\text{Negative sequence voltage component}}{\text{Positive sequence voltage component}} \times 100\%$$

and

- (e) rapid voltage changes caused by any change of load, including the start of large motors, must be below the allowable limits set out in Table 2:

ISO Rules

Part 500 Facilities

Division 502 Technical Requirements

Section 502.7 Load Facility Technical Requirements



Table 2
Maximum Rapid Voltage Change Limits

Number of changes (n)	≤ 25 kV	> 25 kV
n ≤ 4 per day	5%	4%
n ≤ 2 per hour and > 4 per day	4%	3%
2 < n ≤ 10 per hour	3%	2.5%

(2) The **legal owner** of the **transmission facility** to which a load facility is connected must meet the following power quality requirements at the **point of common coupling**:

- (a) the **transmission facility** must be designed and operated such that the phase-to-phase voltage unbalance is below the allowable limits set out in Table 3:

Table 3
Maximum Phase-to-Phase Voltage Unbalance Limits

≤ 25 kV	1.8%
138/144 kV	1.4%
240/260 kV	1.4%
500 kV	0.8%

and

- (b) the phase-to-phase voltage unbalance percentages must be based on normal operating conditions for 95% of the time over any continuous **7 day** measurement period, calculated in accordance with the following formula:

$$\text{Voltage unbalance} = \frac{\text{Negative sequence voltage component}}{\text{Positive sequence voltage component}} \times 100\%$$

(3) The **legal owner** of the **transmission facility** must, if an existing **transmission facility** to which the load facility will be connected exceeds the maximum phase-to-phase voltage unbalance limits in this Table 3, submit to the **ISO** a proposal with an estimate to remedy such non-compliance.

Grounding

6 The **legal owner** of a load facility or the **legal owner** of a **transmission facility** must design the load facility and the **transmission facility** to which the load facility is connected to operate within a **transmission system** that operates as an effectively grounded system.

Lighting and Other Surge Protection

7 The **legal owner** of a load facility must coordinate insulation levels with the **legal owner** of the **transmission facility** to which the load facility is connected, taking into account the average lightning ground-flash density level for the site location of the load facility and compatibility with the connecting **transmission facility**.

Load Facility Fault Interrupting Devices

8(1) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must ensure that there is at least one fault interrupting device which will

ISO Rules

Part 500 Facilities

Division 502 Technical Requirements

Section 502.7 Load Facility Technical Requirements



electrically disconnect the load facility from the **transmission system** at the **point of connection**.

(2) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must ensure the fault interrupting device required by subsection 8(1) is designed and operated to account for the present and ultimate fault current contributions from both the **transmission system** and the load facility.

(3) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must not use fuses at 60 kV or higher nominal voltage to meet the requirements of this subsection 8.

Isolating Devices

9 The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must ensure that:

- (a) the load facility has a minimum of one isolation device with manual operation capability at a point of isolation; and
- (b) any isolation devices referred to in subsection 9(a):
 - (i) permit visual verification of electrical isolation and are capable of being locked open with 2 or more locks;
 - (ii) are under the control of a single control authority as confirmed by a joint operating agreement between the **legal owner** of the load facility and the **legal owner** of the **transmission facility**; and
 - (iii) permit the installation of temporary safety grounding so that either side of the isolation device can be safely maintained when the other side is energized.

Power Factor Requirement

10(1) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must design the load facility with **reactive power** resources to result in a **power factor** of above 0.9 lagging.

(2) The **legal owner** of a load facility and the **legal owner** of the **transmission facility** to which the load facility is connected must ensure the **power factor** requirement in subsection 10(1) is based on expected normal operating conditions up to the **contract capacity**, and measured at the **point of common coupling**.

Revision History

Effective	Description
2019-12-11	Removed duplication with new Section 103.14 Waivers and Variances; standardized functional specifications language; inserted the actual effective date in subsection 4(2); minor administrative edits.
2019-10-25	Initial release.