

Industry Advisory

FAC-003-3 Minimum Vegetation Clearance Distances (MVCD)

Initial Distribution: May 14, 2015

The purpose of this Advisory is to provide Transmission Owners and Generator Owners information about preliminary testing results and anticipated adjustments to the Minimum Vegetation Clearance Distances (MVCDs) specified in the NERC Reliability Standard FAC-003-3. As a result of the preliminary testing, the MVCD listed in the Standard required to prevent a flashover and improve the reliability of the Bulk Power System (BPS) will need to be increased. Transmission and Generator Owners should consider this information in their maintenance strategies or any related vegetation management programs, processes, and procedures.

NERC conducted testing as directed in the Federal Energy Regulatory Commission's (FERC's) Order No. 777 ([Revisions to Reliability Standard for Transmission Vegetation Management](#), 142 FERC ¶ 61,208 (2013)). The testing is intended to support the MVCD calculated based on application of the Gallet equation, with the gap factors for all alternating current system voltages covered in Table 2 of the Standard. The preliminary test results, identified in a collaborative research project under contract with the Electric Power Research Institute (EPRI), determined that the current gap factor requires adjustment.

NERC will initiate efforts to correct the MVCD values in FAC-003-3 following the conclusion of validation testing expected in early to mid-summer. The final adjustments will be based solely on the validated findings of the research.

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Advisory: The preliminary findings of NERC’s testing determined that the current gap factor in the Gallet equation of 1.3 will likely be adjusted to a value around 1.0. This will result in increased MVCD values for all alternating current system voltages identified in Table 2 of the Reliability Standard. The adjusted MVCD values, reflecting the anticipated 1.0 gap factor, would be as follows:

Nominal AC System Voltage (kV)	MVCD at 1.0 Gap Factor (feet)														
	Sea Level up to 500 ft	Over 500 ft up to 1,000 ft	Over 1,000 ft up to 2,000 ft	Over 2,000 ft up to 3,000 ft	Over 3,000 ft up to 4,000 ft	Over 4,000 ft up to 5,000 ft	Over 5,000 ft up to 6,000 ft	Over 6,000 ft up to 7,000 ft	Over 7,000 ft up to 8,000 ft	Over 8,000 ft up to 9,000 ft	Over 9,000 ft up to 10,000 ft	Over 10,000 ft up to 11,000 ft	Over 11,000 ft up to 12,000 ft	Over 12,000 ft up to 13,000 ft	Over 13,000 ft up to 14,000 ft
765	11.6	11.7	11.9	12.1	12.2	12.4	12.6	12.8	13.0	13.1	13.3	13.5	13.7	13.9	14.0
500	7.0	7.1	7.2	7.4	7.5	7.6	7.8	7.9	8.1	8.2	8.3	8.5	8.6	8.8	8.9
345	4.3	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6
287	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.1	6.2	6.3	6.4	6.5	6.6	6.7
230	4.0	4.1	4.2	4.3	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3
161	2.7	2.7	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.3	3.3	3.4	3.5	3.6	3.6
138	2.3	2.3	2.4	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.0	3.1
115	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.6
88	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1
69	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5

Table 1 – Table of MVCD values at a 1.0 gap factor (in U.S. customary units)

Nominal AC System Voltage (kV)	MVCD at 1.0 Gap Factor (meters)														
	Sea Level up to 152 m	Over 152 m up to 305 m	Over 305 m up to 610 m	Over 610 m up to 914 m	Over 914 m up to 1,219 m	Over 1,219 m up to 1,524 m	Over 1,524 m up to 1,829 m	Over 1,829 m up to 2,134 m	Over 2,134 m up to 2,438 m	Over 2,438 m up to 2,743 m	Over 2,743 m up to 3,048 m	Over 3,048 m up to 3,353 m	Over 3,353 m up to 3,657 m	Over 3,657 m up to 3,962 m	Over 3,962 m up to 4,267 m
765	3.5	3.6	3.6	3.7	3.7	3.8	3.8	3.9	4.0	4.0	4.1	4.1	4.2	4.2	4.3
500	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.7
345	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.7	1.7
287	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.1
230	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6
161	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1
138	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9
115	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
88	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
69	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5

Table 2 – Table of MVCD values at a 1.0 gap factor (in metric units)

For example, the original MVCD listed in Table 2 of FAC-003-3 for 500kV at sea level was 5.15 feet. The new MVCD, listed in Table 1 above, with the adjusted gap factor is 7.0 feet.

Under FAC-003-3, Transmission Owners and Generator Owners are responsible for ensuring that vegetation encroachments do not occur within the MVCDs of applicable transmission lines. NERC is providing the preliminary findings of the research project to enable Transmission Owners and Generator Owners to make adjustments that may be appropriate in the maintenance strategies, procedures, processes, or specifications used in vegetation management programs.

Background: In Order No. 777, FERC directed NERC to undertake testing to gather empirical data validating the appropriate gap factor used in the Gallet equation to calculate MVCDs, specifically the gap factor for the flashover distances between conductors and vegetation. FERC directed NERC to submit: (1) a schedule for testing; (2) the scope of work; (3) funding solutions; and (4) a deadline for submitting a final report on the test results to FERC, along with interim reports if a multi-year study is conducted. NERC engaged industry through a collaborative research project and contracted EPRI to complete the scope of work. NERC submitted a compliance filing in accordance with Order No. 777 on July 12, 2013 ([Compliance Filing of the N. Am. Reliability Corp.](#), Docket No. RM12-4-000) which FERC accepted on September 4, 2013 ([N. Am. Elec. Reliability Corp.](#), Docket No. RM12-4-001).

In January 2014, NERC formed an advisory group to assist with developing the scope of work for the project. This team provided subject matter expertise for developing

the test plan, monitoring testing, and vetting the analysis and conclusions to be submitted in a final report. The advisory team comprises NERC staff, arborists, and industry members with wide-ranging expertise in transmission engineering, insulation coordination, and vegetation management. In March 2014, the project's scope of work and a detailed test plan was finalized with EPRI staff, members of industry, and FERC staff.

The testing project commenced in April 2014 and continued through October 2014. EPRI completed the prescribed tests aimed at determining the gap factor applied in the Gallet equation. On July 31, 2014, NERC filed an informational filing with FERC ([Informational Filing of NERC](#), Docket Nos. RM12-4-000 and RM12-4-001) containing the details of the testing work that had been completed through the end of July. The initial analysis, as well as preliminary conclusions and recommendations, was reached in early 2015. Based on these preliminary results, it has become apparent that the gap factor used in the Gallet equation requires adjustment from 1.3 to 1.0. For additional details on the testing project, please follow this [link to Project 2010-07.1 Vegetation Management](#).

NERC will undertake additional tests as needed to finalize the preliminary gap factor determinations, file a final report with FERC by late summer of 2015, and initiate a narrowly prescribed Standard Authorization Request for a NERC Reliability Standards development effort to adjust the MVCD values in FAC-003-3.

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