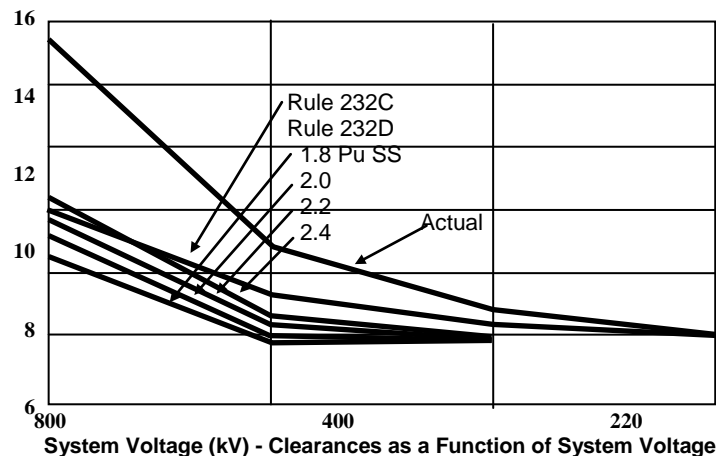


ELECTRO-MAGNETIC FIELD

Power Technologies, Inc. has been requested to review POWERGRID's 132 KV, 220 KV, 400 KV and 800 KV lines with respect to conductor to ground, phase to phase and circuit to circuit clearances and their appropriateness in light of present practice.

Based on a review of POWERGRID's designs, we find that the phase to phase and circuit to circuit clearances are consistent with practices used for line clearances throughout the world. The values used by POWERGRID are generally in the middle range of that used throughout the world and are expected to provide satisfactory performance.

The conductor to ground clearances are within typical limits and meet or exceed the requirements of the National Electrical Safety Code, American National Standard Institute, C2, as shown on Figure.



Analysis of POWERGRID Transmission Line Clearances

The analysis was based on the following data as supplied by POWERGRID.

800 KV S/C LINE

Configuration - Horizontal

Conductor Bundle - Quad CSR Bursitis (35.1 mm id)

Max. conductor sag - 14.56 m

Phase to phase spacing - approx. 15 m.

Ground clearance - 12.4 m (as per IE rules); 15 m (maintained to limit max. electric field to 10 KV/m)

Right of way - 85 m

400 KV S/C LINE

Configuration - Horizontal
Conductor Bundle - Twin ACSR Moose (31.77 mm dia)
Maximum conductor sag - 12.87 m
Phase to phase spacing - 10 to 12 m
Ground clearance - 8.84 m (as per IE rules)
Right of way - 52 m

400 KV D/C LINE

Configuration - Vertical
Conductor Bundle - Twin ACSR Moose (31.77 mm dia)
Maximum conductor sag - 12.87 m
Phase to phase spacing - 8 to 9 m
Ckt. to ckt. spacing - 12 to 14 m
Ground clearance - 8.84 m (as per IE rules)
Right of way - 52 m

220 KV D/C LINE

Configuration - Vertical
Maximum conductor sag - approximately 9.8 m
Phase to phase spacing - 5 to 5.5 m
Ckt. to ckt. spacing - approximately 10
Ground clearance - 7.015 m (as per IE rules)
Right of way - 35 m

132 KV D/C LINE

Configuration - Vertical
Conductor - ACSR Panther (21 mm dia)
Maximum conductor sag - approximately 6.6 m
Phase to phase spacing - approximately 4 m
Ckt. to ckt. spacing - approximately 7 m
Ground clearance - 6.1 m (as per IE rules)
Right of way - 27 m