


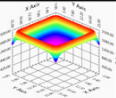
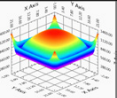
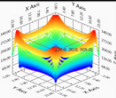
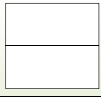
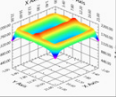
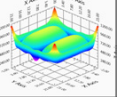
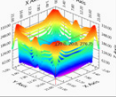
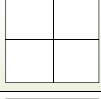
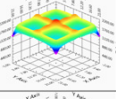
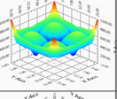
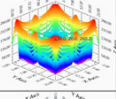
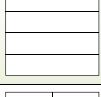
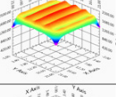
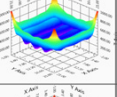
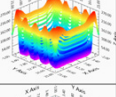
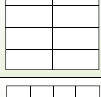
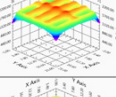
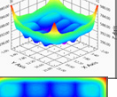
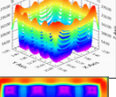
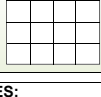
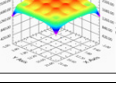
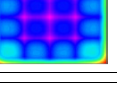
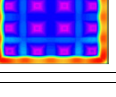
## Earthing Grid Analysis - Number of Meshes Versus Grid Resistance

SafeGrid is earthing design and analysis software. Complies IEEE Std 80 [1] and IEC 60479 [2]. Visit the website for more information: [www.elek.com.au/safegrid.htm](http://www.elek.com.au/safegrid.htm)

### OVERVIEW

A summary of some of the results of an extensive study conducted using SafeGrid a computer program designed for determining grounding performance are presented.

- Effects of total length of conductor and number of meshes on earth grid resistance.
- The calculated earth grid impedances, surface, step and touch potentials are summarised in several 3D and 2D charts below.
- The results from SafeGrid earthing software have been verified and compared with those given by similar CDEGS earthing software package [3].

Case ID	Grid	Inputs				Grid Impedance (Ohms)		Grid Potential Rise, GPR (V)	Surface Potential - Max. (V)		Touch Potential - Max. (V)		Step Potential - Max. (V)	
		Number of meshes	Dimensions (m)	Total length of conductors (m)	Depth of burial (m)	SafeGrid	CDEGS		SafeGrid	CDEGS	SafeGrid	CDEGS	SafeGrid	CDEGS
1		1	20 x 20	80	0.8	2.71	2.76	2708		2054		1310		331
2		2	20 x 20	100	0.8	2.53	2.56	2527		2101		1139		301
3		4	20 x 20	120	0.8	2.44	2.44	2438		2166		1073		283
4		4	20 x 20	140	0.8	2.33	2.35	2333		2034		992		269
5		25	20 x 20	160	0.8	2.31	2.30	2309		2113		972		264
6		16	20 x 20	200	0.8	2.26	2.22	2256		2093		928		256

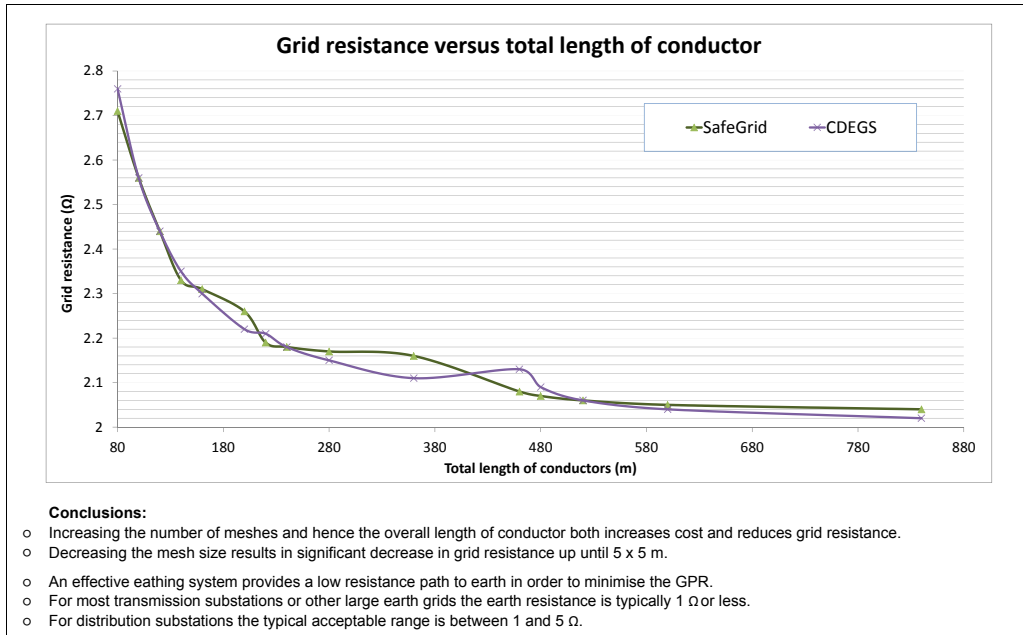
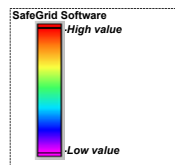
### NOTES:

#### 1. Common inputs:

Soil resistivity =	100 Ω.m, uniform soil
Depth of grid conductor burial =	0.8 m
Earth fault current which flows into the grid =	1000 A
Grid conductor type & material =	Copper, annealed soft-drawn (100% conductivity)
Grid conductor radius =	0.01 m
Frequency for conductor impedance calculation =	50 Hz

#### 2. Colour scales:

Scales indicate the colours used by the earthing software to represent high to low values (relative) in the plots.



### References:

- [1] IEEE Standard 80-2000, IEEE Guide for Safety in AC Substation Grounding
- [2] IEC 60479, Effects of current on human beings and livestock
- [3] Ladanyi, J., Analyses of the earthing resistance of HV/MV transformer stations with different earth electrode arrangements and soil structures, IEEE Transactions (2007)