

For Your Safety

SUBSTATION GROUNDING SYSTEM

Substation metallic fence is at least 1.0m inside substation's ground grid area. This includes the swing on a gate.

OESC 36-312 (1) and IEEE Std 80 17.3

Fence corner-posts and gate-posts are grounded with min. 2/0 Cu conductor

OESC 36-312 (2)

Fence posts are grounded at maximum 12m intervals with min. 2/0 Cu conductor

OESC 36-312 (2)

Gate frames are bonded to gate post hinges via Cu braid

OESC 36-312 (3)

Substation ground grid keeps touch/step voltages below tolerable level

OESC Table 52 and IEEE Std 80

Substation fence area has tolerable touch/step voltages within 1m from fence

Bare Cu grounding min. conductor size is based on max. short circuit current available

Substation ground grid is limiting potential rise of ground grid to 5000V (ground fault)

Actual resistance of Substation's ground grid measured after construction completion

Substation ground rods have proper dimensions and spacing as per Plan

All ground grid cross-connections are securely bonded together

IEEE Std 80 9.4 (c)

Ground grid conductor is not less than 2/0 AWG bare Cu

Ground grid conductor has minimum depth of 150mm below finished station grade

Ground grid conductor has maximum depth of 600mm below final station grade

Ground grid conductors are connected to all non-current carrying parts of H.V. equipment

Ground grid is forming a loop around each H.V. equipment to be grounded (outdoor)

All connections to ground grid with min. 2/0 Cu conductor for indoor station

Concrete foundation rebars connected to ground grid with 2 or more conductors

Gang-operated H.V. switch handle is properly grounded

OESC 36-310 (1)

Gang-operated H.V. switch handle is c/w gradient control mat connected to switch handle

All non-current carrying metal equipment and structures are connected to main ground grid

Tanks of transformers, breakers, reclosers, switchgears are grounded with min. 2/0 Cu wire

Metal frames of instrument transformers and motors are grounded with min. 2/0 Cu wire

Each leg of metal structure is grounded with min. 2/0 Cu wire

All H.V. cable metal potheads, sheaths and armours are properly grounded
OESC 36-308 (2)(e)

Substation's metal water main is grounded to main ground grid at intervals less than 12m
OESC 36-308 (2)(d)

All Substation metal frames, pipes, raceways and screen guards are properly grounded

A Substation ground loop is installed around building to limit touch/step potentials, when required.
OESC 36-308 (3)

Ground metal siding or flashing of buildings inside station perimeter

A line neutral conductor (grounded system) is connected to Substation main ground grid

All transformer neutrals (grounded system) are connected to Substation main ground grid

Connections come with removable connectors when needed.

LIGHTNING ARRESTERS

Lightning arresters meet Standard Design or Plan Class (check for Station Class)

Lightning arresters are located directly at terminals of equipment being protected

All Substation lightning arresters are grounded with min. 2/0 Cu wire

Connection from lightning arrester to ground is as short as possible and without sharp bends

SUBSTATION FENCING

There is a clearance of 1m from lot line to fence for proper grounding

For Your Safety

Metal boundary fence has a min. 2.4m isolated section from Substation fence

Height of fence is not less than 1.8m (excluding barbed wire)

Top rails of fence and barbed wire to be grounded

Top rail sections bonded (jumped) together

Fence is topped with minimum three(3) strands of barbed wire

Barb wire bends/faces into the station where children may toboggan, ski, snowboard nearby creating ramps

Spacing between fence posts is maximum 3m

Metal fence posts are 3" for corner, end, gate-post, and 2" for intermediate post

Ground grid extends beyond perimeter of open gate
IEEE 80 17.3

Chain link fabric mesh is maximum 50mm c/w wire minimum 3.6mm in diameter

Ground conductors woven through chain link fabric mesh

Bottom tensor wire of fence grounded

Chain link fabric mesh extends to within 50mm (2") maximum of ground

Chain link fabric mesh extends to within 50mm (2") maximum of ground at all gates including truck entrance

SUBSTATION SIGNS

A permanent warning sign: 'DANGER-HIGH VOLTAGE' placed on all H.V. equipment, enclosures, exposed cables and cable trays

A sign is installed adjacent to H.V. fuses warning not to replace fuse while circuit is live

A single-line diagram of switchgear is installed on every H.V. metal enclosed switchgear (including isolation means and interlocks)

A permanent warning sign is installed on all panels or doors protecting H.V. live parts

A warning sign that 'either side of switch may be energized' is installed (possible feedback)

A warning sign: ie. 'Danger-High Voltage, do not climb fence' is installed on all fence sides

A warning sign: 'Smoking not permitted' is installed in battery-charging room

For Your Safety

H.V. CLEARANCES

H.V. bus or conductors have proper air-gap clearance to adjacent surfaces
OESC 36-108 (1)(b) and Table 30

H.V. bus or conductors have proper air-gap clearances between live parts
OESC 36-108 (1)(b) and Table 30

H.V. unguarded live parts have minimum vertical separation from ground (heavy snow, vehicles)
OPSD 217.030

H.V. unguarded live parts have minimum horizontal clearance from Substation fence
OESC 26-302 (1), Table 33 and IEEE Std 1119

H.V. enclosures with live parts have minimum clearance from Substation fence
OESC 26-302 (2)

H.V. switches and fuses assembled on site have minimum phase spacing
OESC 36-212

H.V. bare conductors have minimum horizontal clearances from trees (4m)

H.V. PRIMARY CABLES

Primary cables have bending radius greater than minimum required
OESC 36-102 and Table 15

Primary cables on Transformer primary side are rated minimum 125% of FLA or to Plan

Primary cables metal shielding is bonded together and grounded (concentric neutral)

A set of lightning arresters is installed at both ends of primary cables when run to dipole

All primary cables aluminum joints are treated with joint compound (oxide inhibitor)

Primary cables are not causing any mechanical stress to adjacent device (switch, fuse)

SUBSTATION TRANSFORMER

Substation Transformer is properly labeled (nameplate)
CSA C88 (17)

In heavy snow areas Transformer's tank-top has minimum required height above grade
OESC Bulletin 36-5-*

Substation Transformer has safe working and safe access space for operators

Substation Transformer has safe clearance from combustible surfaces such as windows

For Your Safety

Substation Transformer infrastructure exists for handling oil spills (curb, catch basin)

DISCONNECTING MEANS

H.V. circuit/load breakers provide visible isolation for inspection

H.V. circuit/load breaker is installed with isolating switch (supply side)

Where feedback is possible, visible isolation points for all circuits are provided