



Evaluating Step and Touch Potential Risks on Earthing Systems of High Voltage Cable Systems

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Summary

- HV cable earthing and associated auxiliary equipment: Step potential and Touch potential risks need to be assessed through Finite Element Analysis to ensure it is safe in substations and public accessible areas.

CASE STUDY: TOUCH POTENTIAL RISK (3L 3SVL)

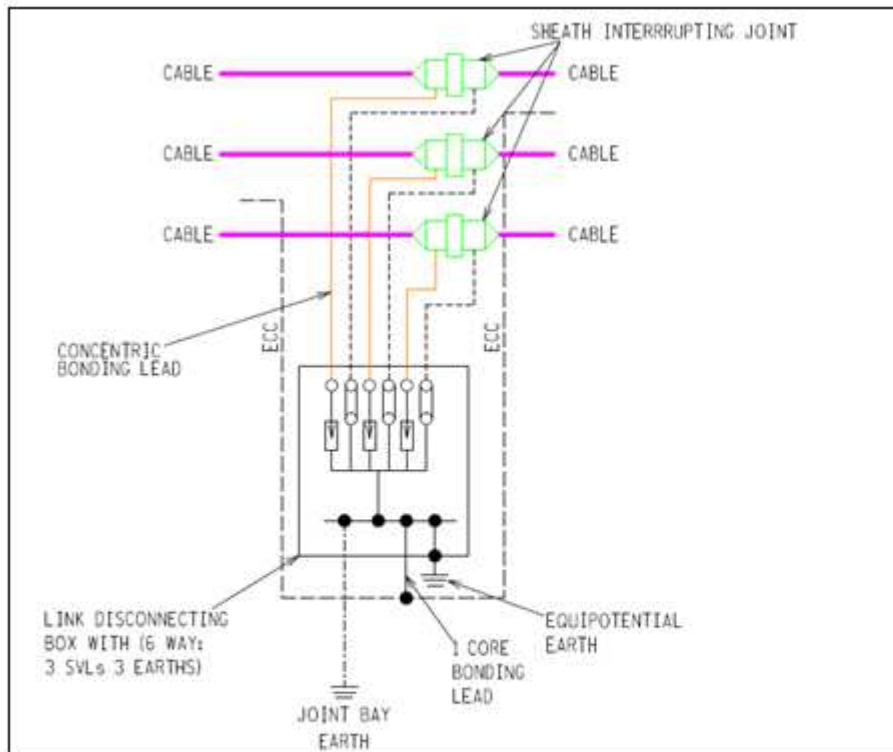


Figure 3.1a: Unsafe connection for a 6 Way link disconnecting kiosk comprising of 3SVLs and 3 earth connections

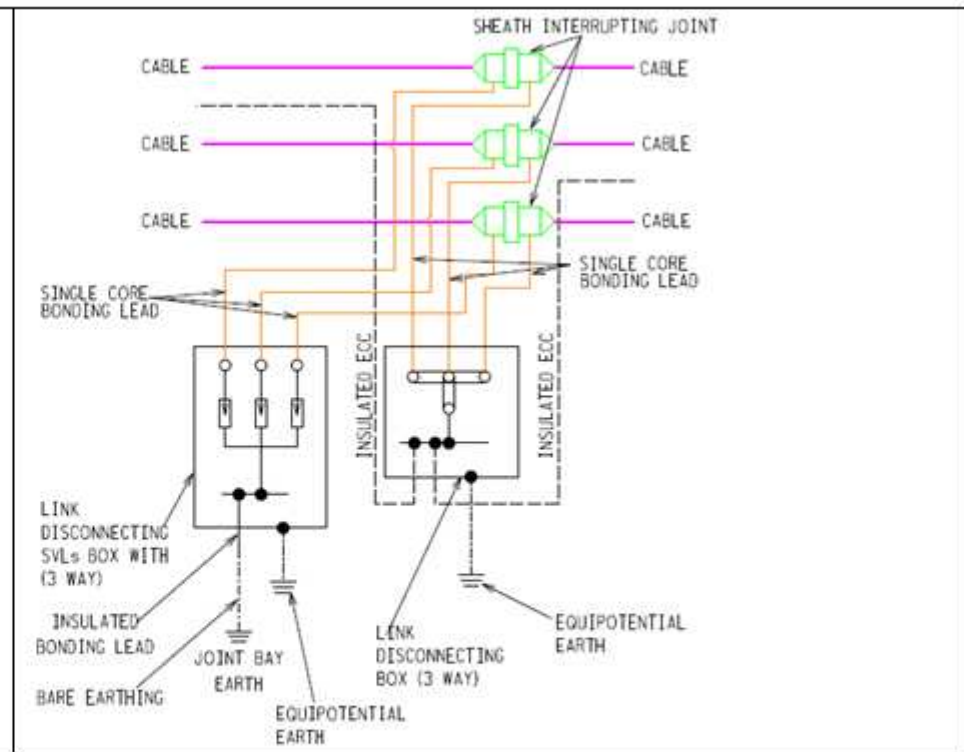


Figure 3.1b: Safe connection for a 6 Way link disconnecting kiosk comprising of 3SVLs and 3 earth Connections

CASE STUDY: TOUCH POTENTIAL RISK (3L 3SVL)

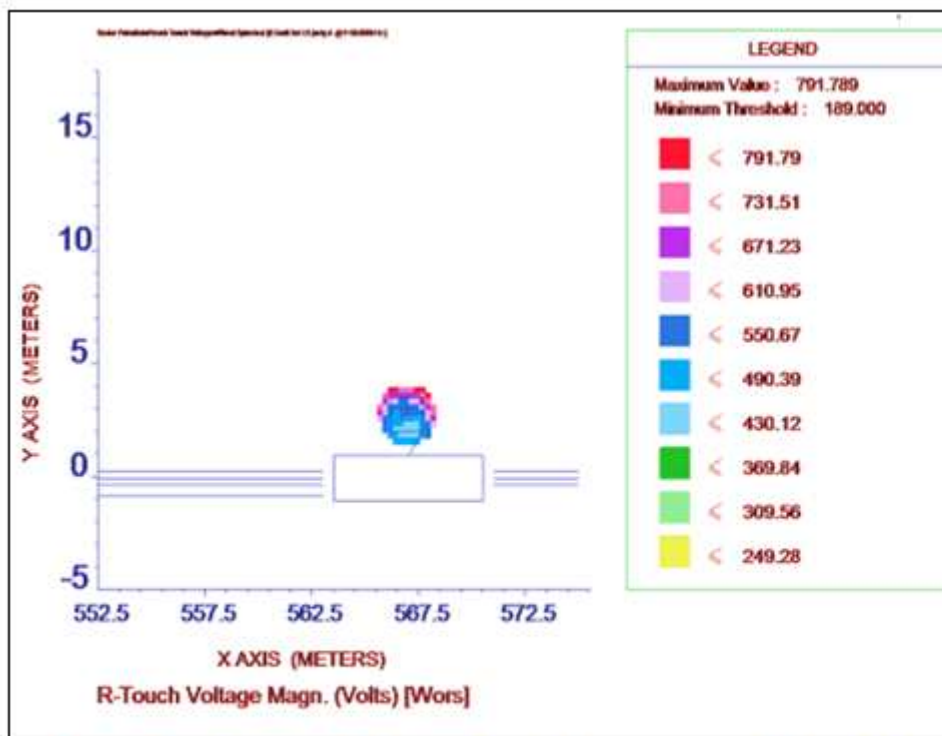


Figure 3.1c: Unsafe Touch potential using configuration as per Figure 3.1a

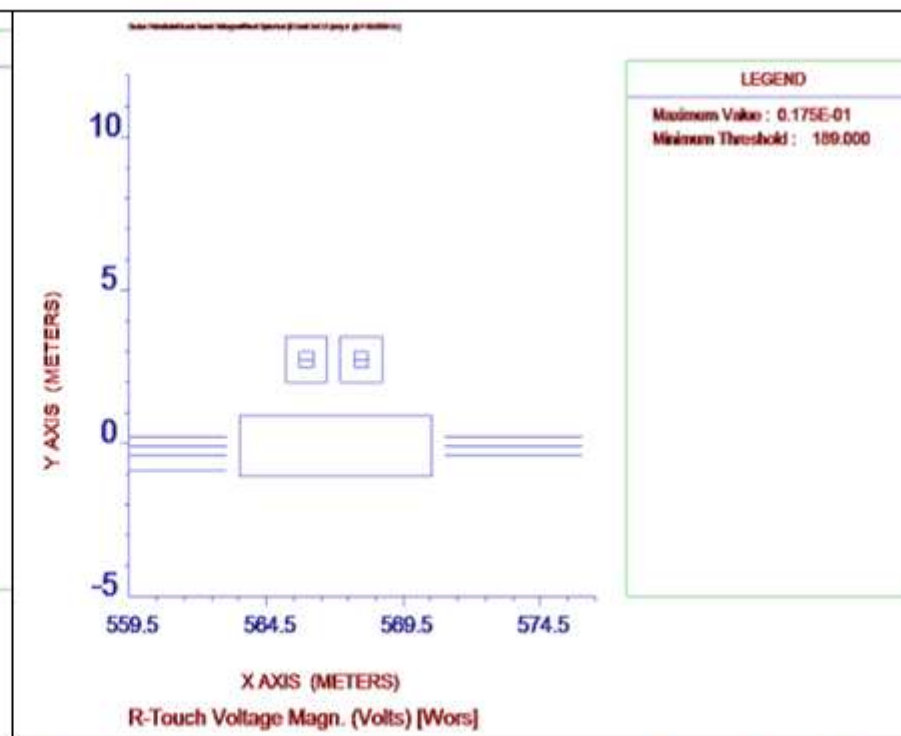


Figure 3.1d: Safe Touch potential using configuration as per Figure 3.1b

CASE STUDY: STEP POTENTIAL RISK

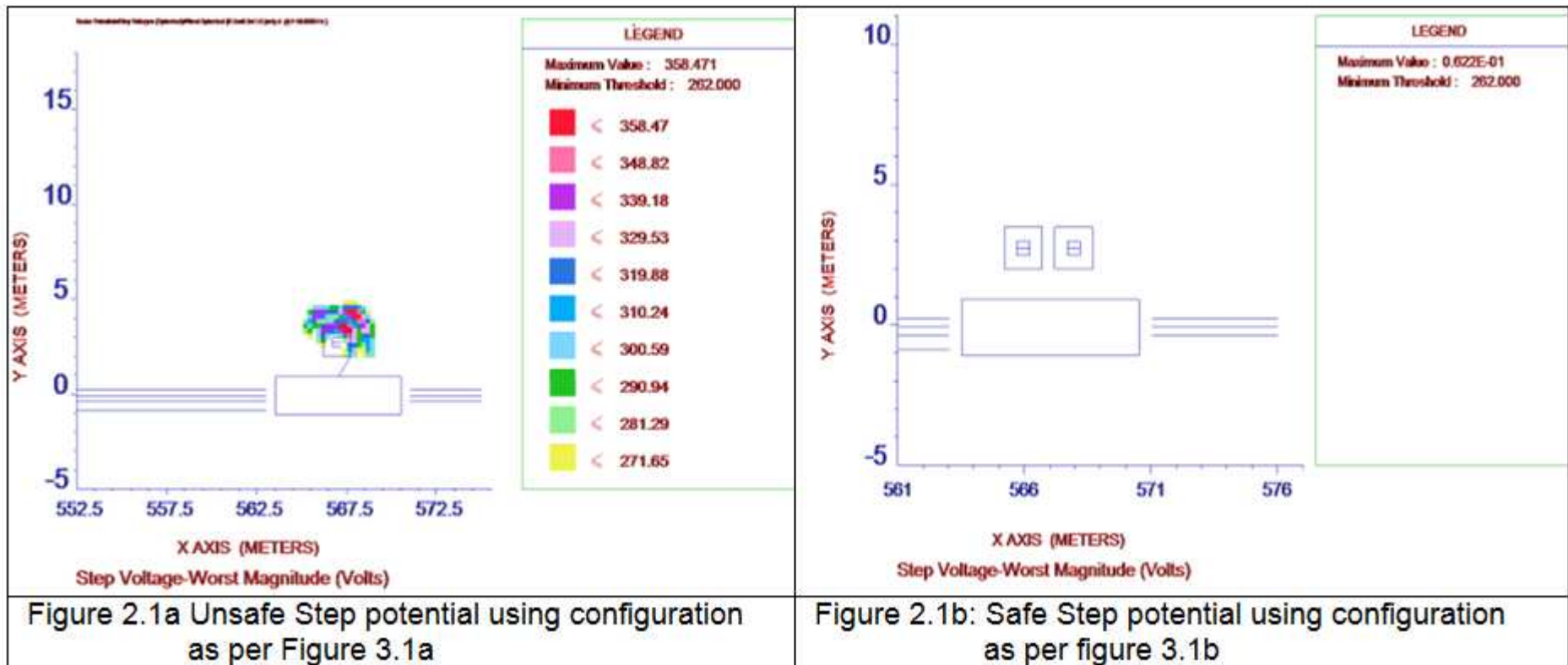


Figure 2.1a Unsafe Step potential using configuration as per Figure 3.1a

Figure 2.1b: Safe Step potential using configuration as per figure 3.1b

CASE STUDY: TOUCH POTENTIAL RISK (6L SVL)

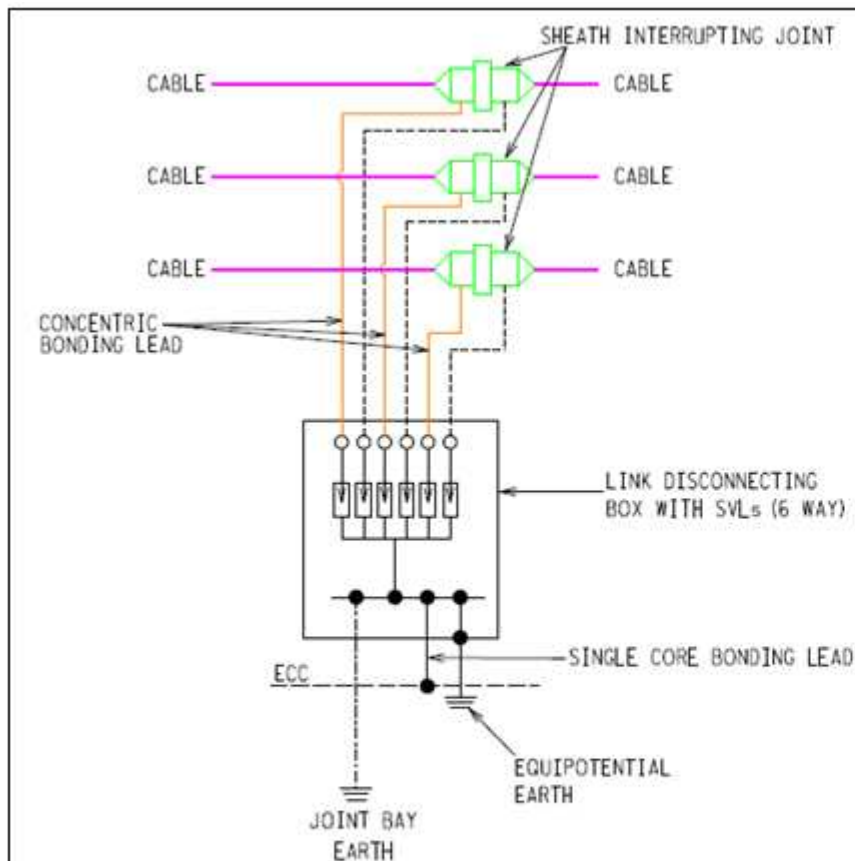


Figure 3.2a: Potentially unsafe connection for a 6 Way link disconnecting kiosk comprising of 6 SVL earth connections

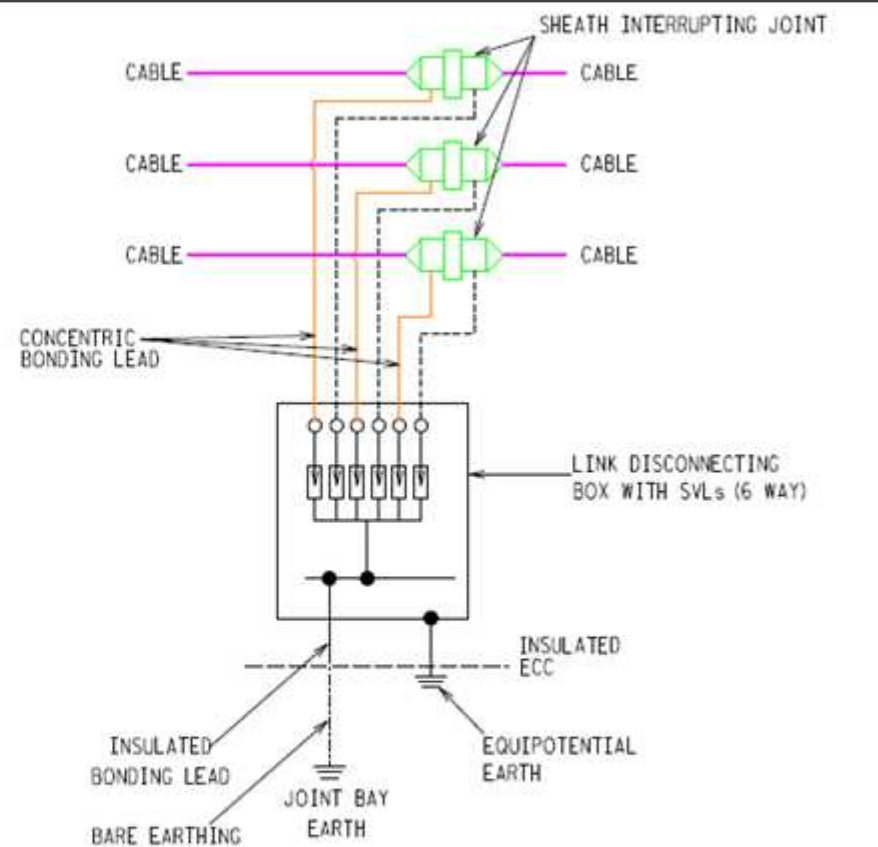
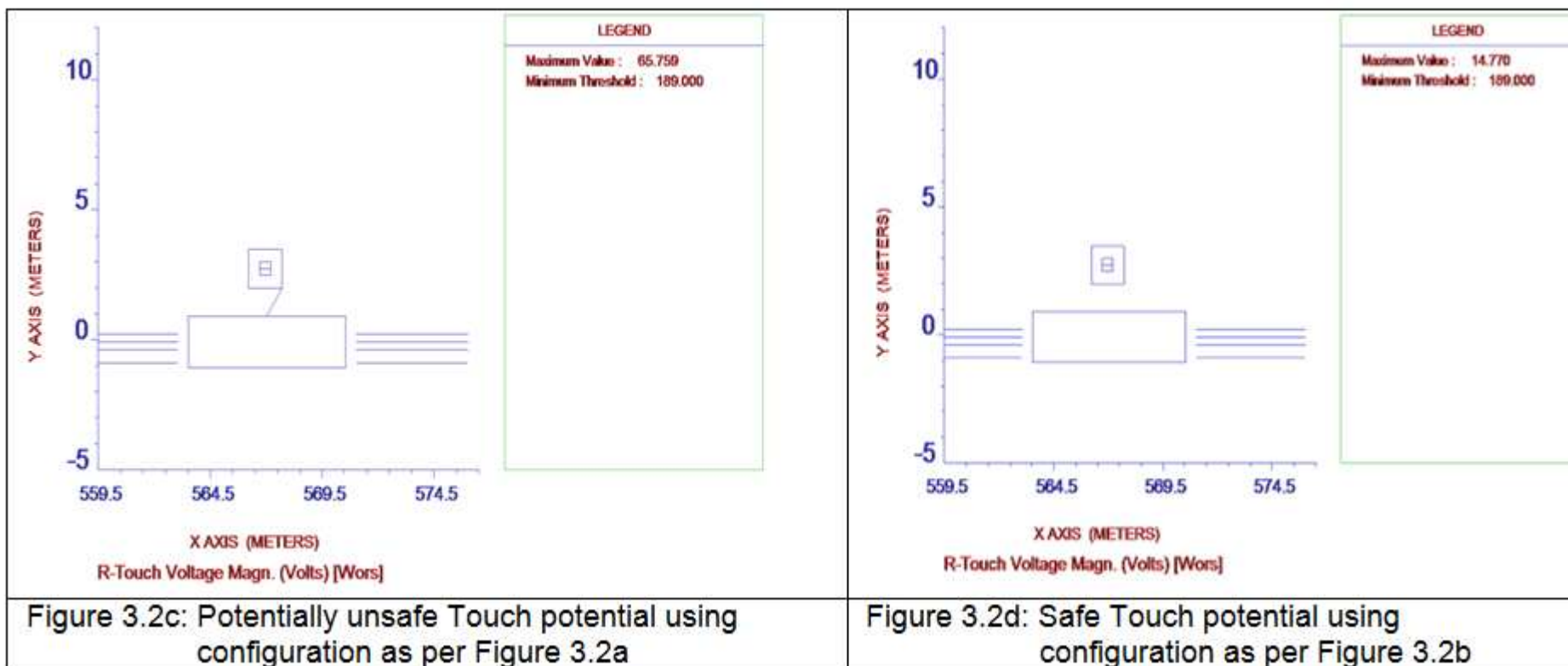


Figure 3.2b: Safe connection for a 6 Way link disconnecting kiosk comprising of 6 SVL connections

CASE STUDY: TOUCH POTENTIAL RISK (6L SVL)



CASE STUDY: TOUCH POTENTIAL RISK (6L)

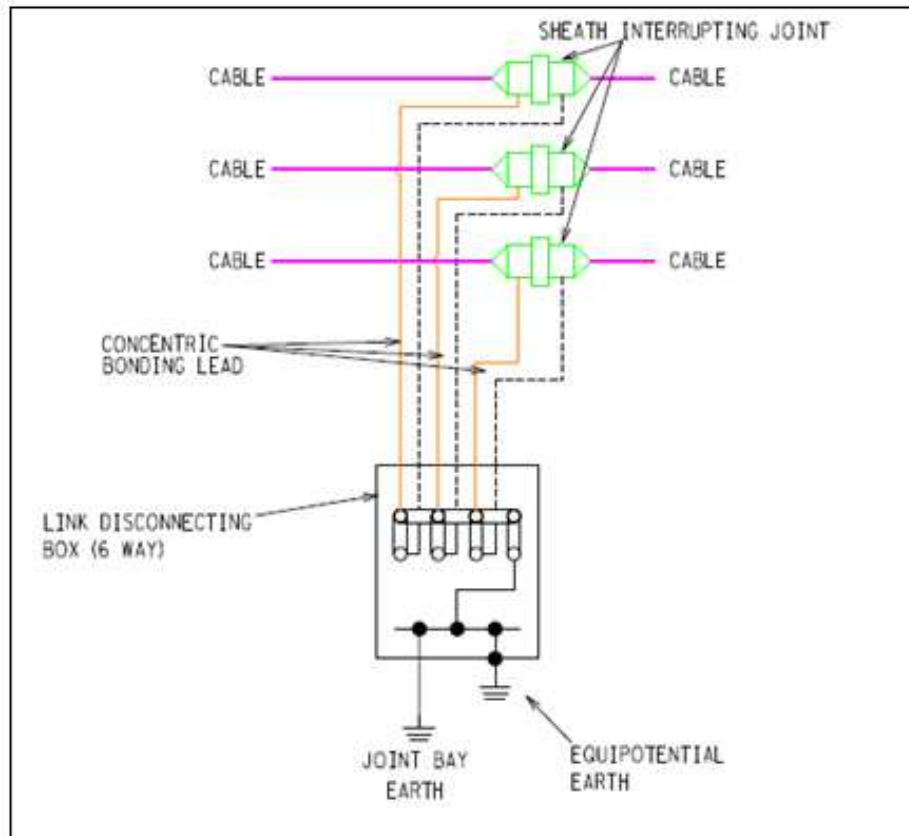


Figure 3.3a: Unsafe connection for a 6 Way link disconnecting kiosk comprising of 6 earth connections

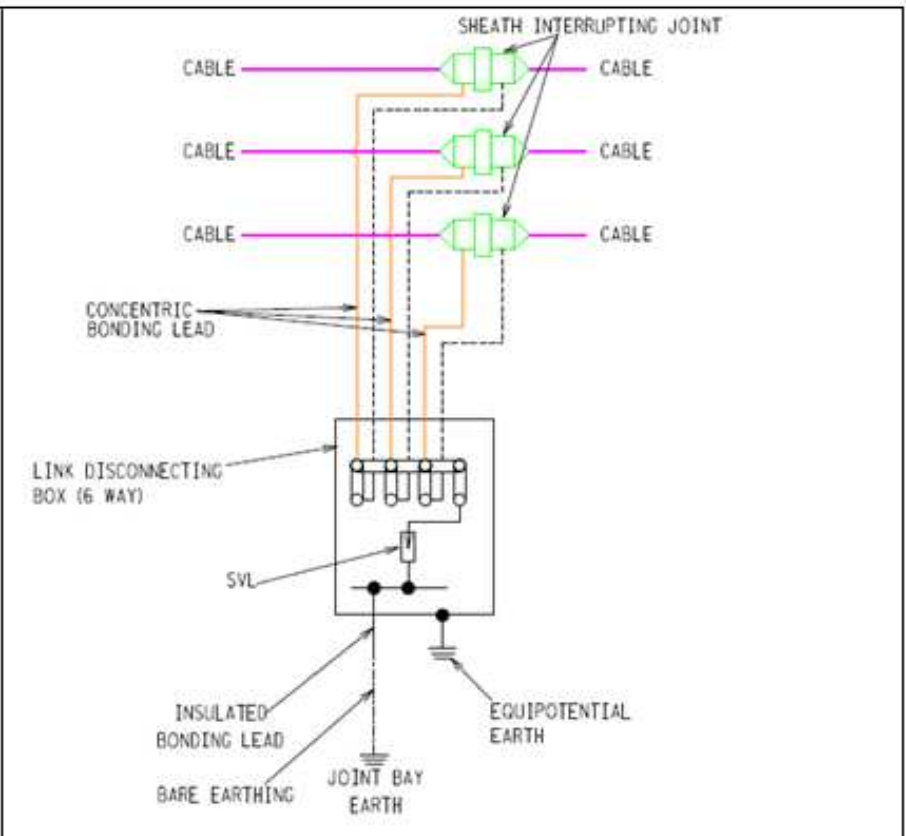
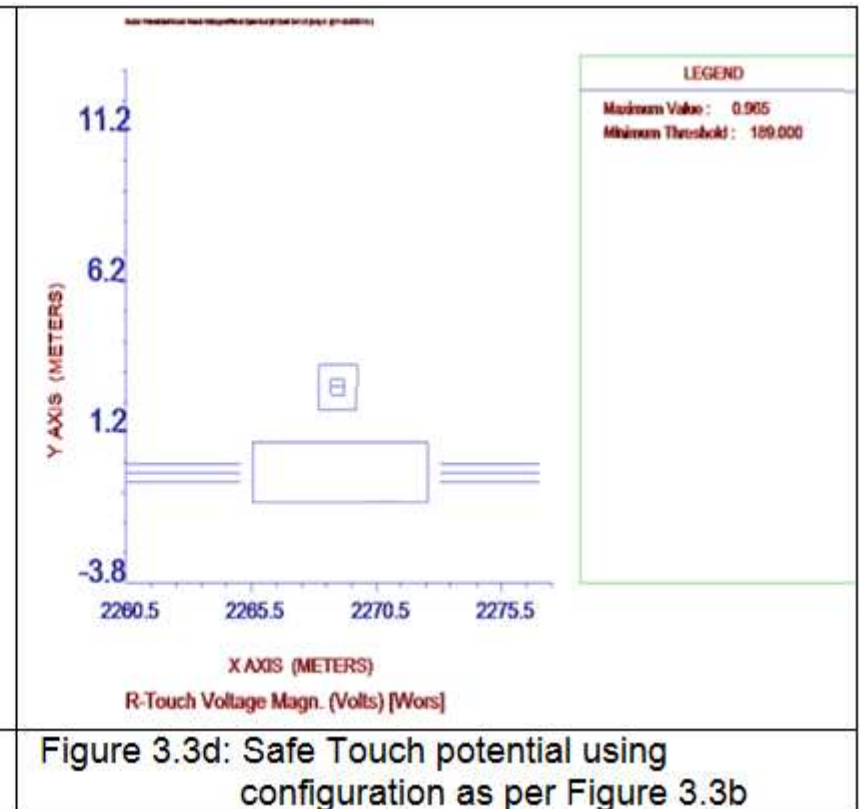
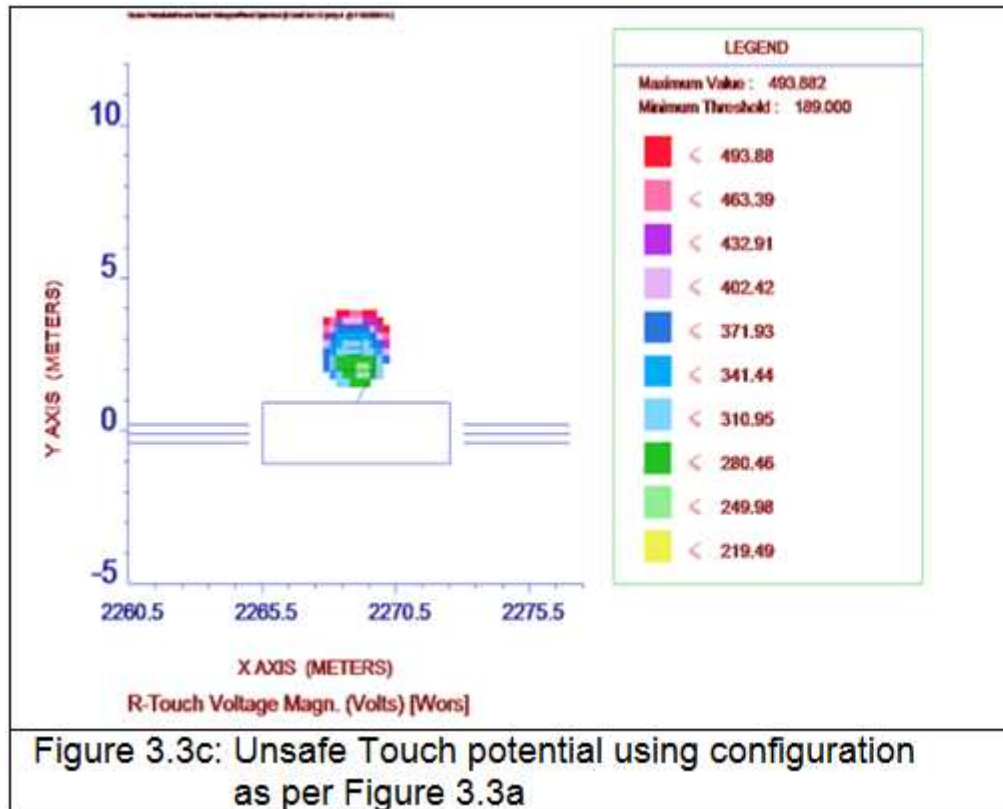


Figure 3.3b: Safe connection for a 6 Way link disconnecting kiosk comprising of 6 earth connections, that is connected through an SVL to earth

CASE STUDY: TOUCH POTENTIAL RISK (6L)



CASE STUDY: TOUCH POTENTIAL RISK (X-Bond)

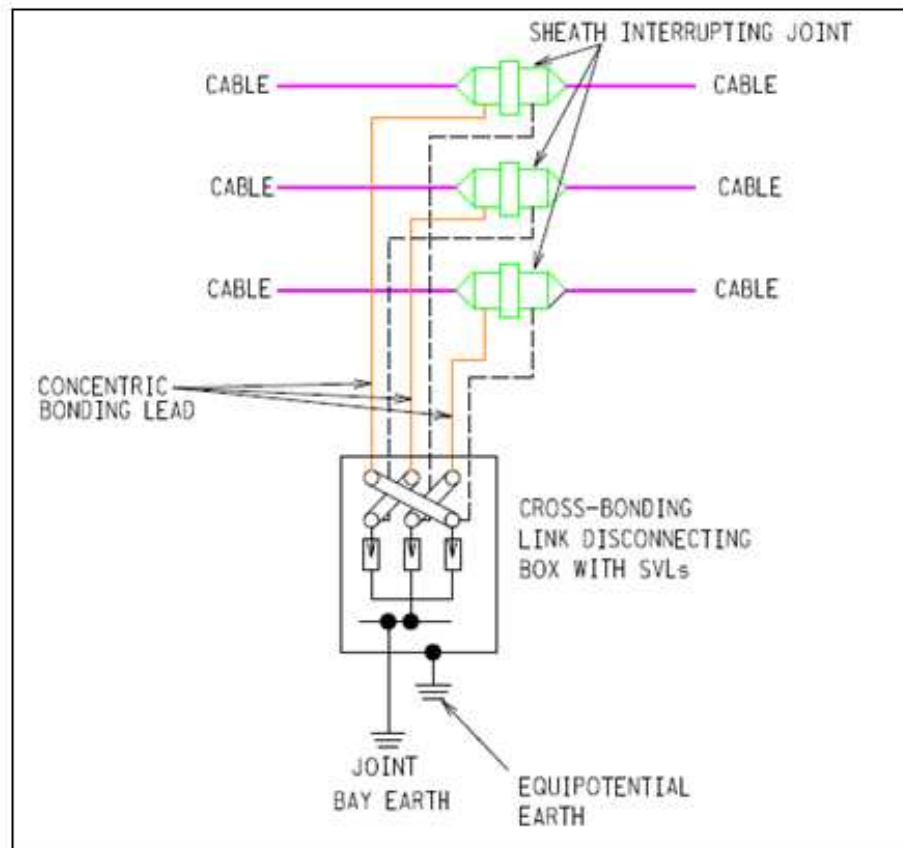


Figure 3.4a: Safe connection for a cross-bonding link disconnection kiosk with SVLs

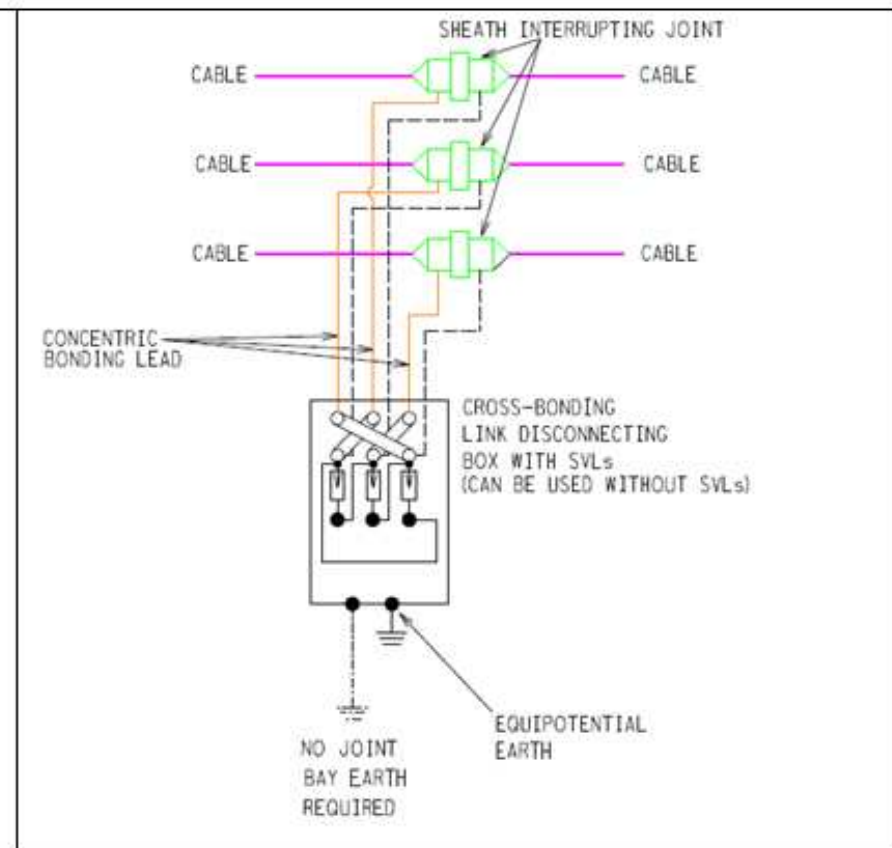


Figure 3.4b: Safe connection for a cross-bonding link disconnection kiosk with SVLs connected in a delta formation

CASE STUDY: TOUCH POTENTIAL RISK (X-Bond)

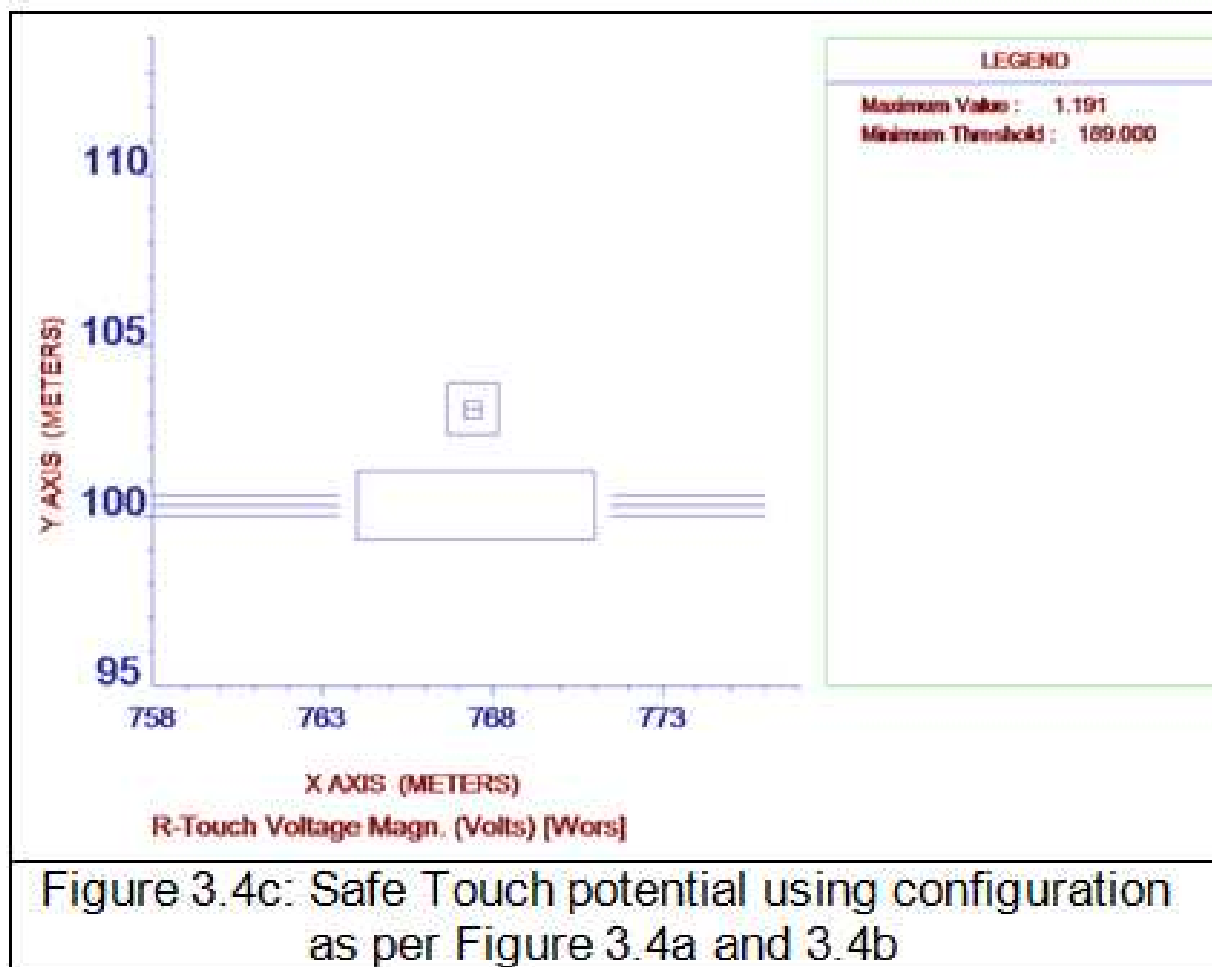


Figure 3.4c: Safe Touch potential using configuration as per Figure 3.4a and 3.4b

CASE STUDY: TOUCH POTENTIAL RISK (3L)

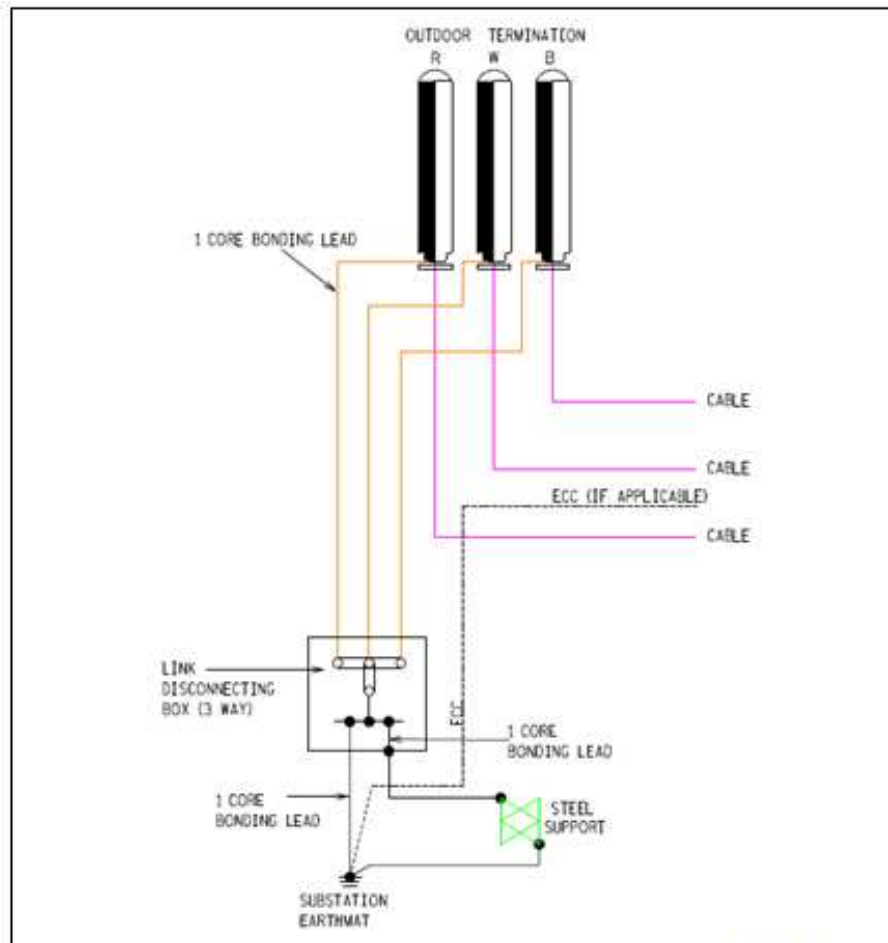


Figure 3.5a: Possible Unsafe connection for a 3 Way link disconnecting kiosk comprising of 3 earth connections

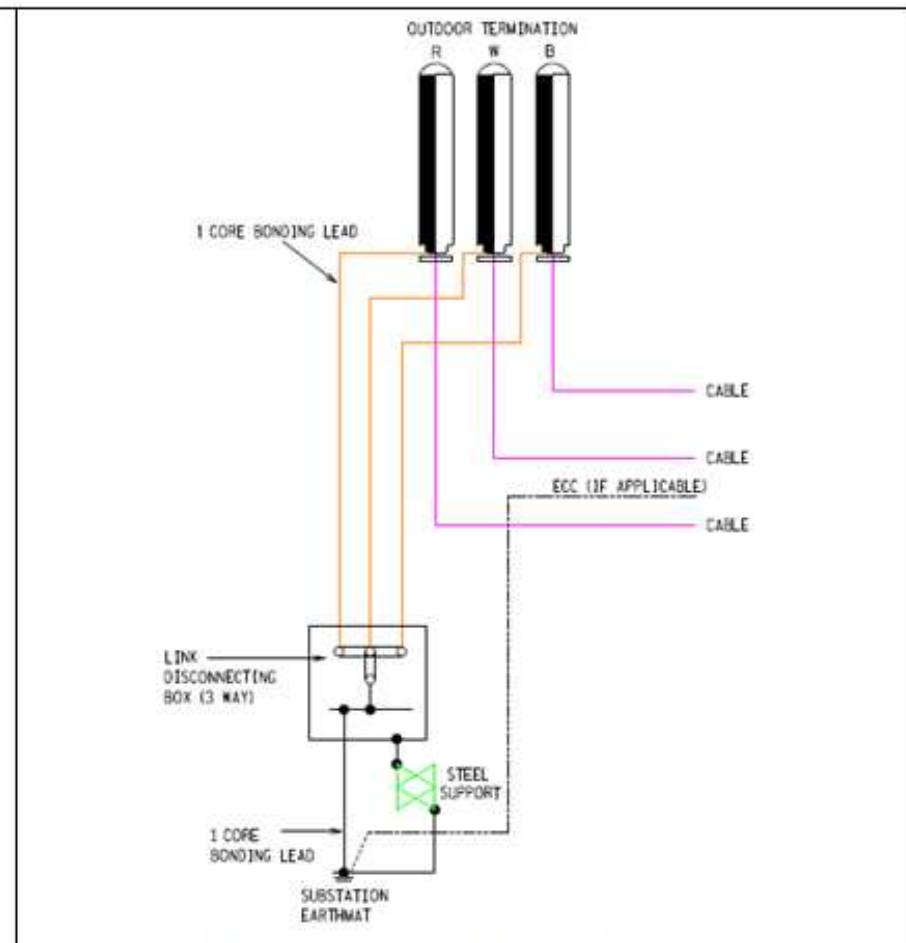


Figure 3.5b: Safe connection for a 3 Way link disconnecting kiosk comprising of 3 earth connections

CASE STUDY: TOUCH POTENTIAL RISK (3SVL)

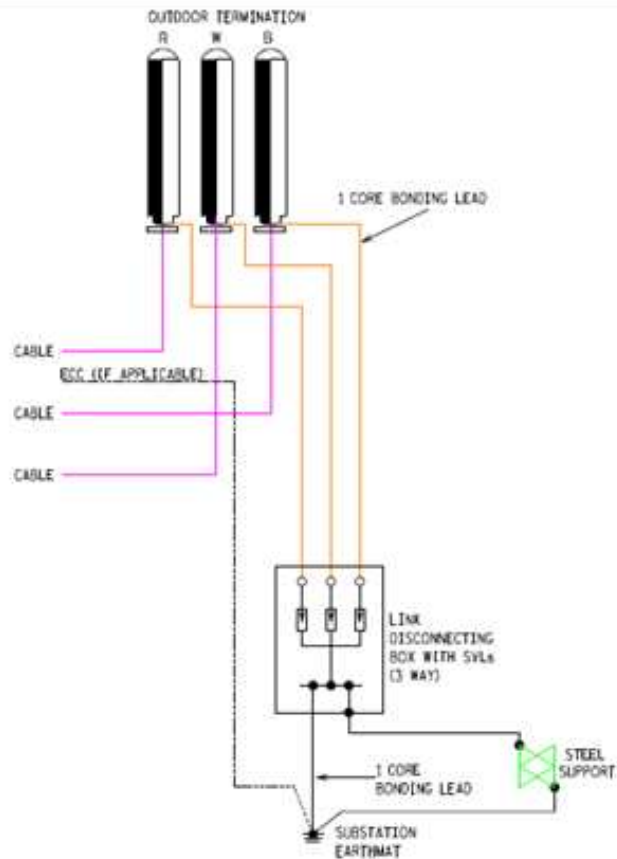


Figure 3.5c: Possible Unsafe connection for a 3 Way link disconnecting kiosk comprising of 3 earth connections

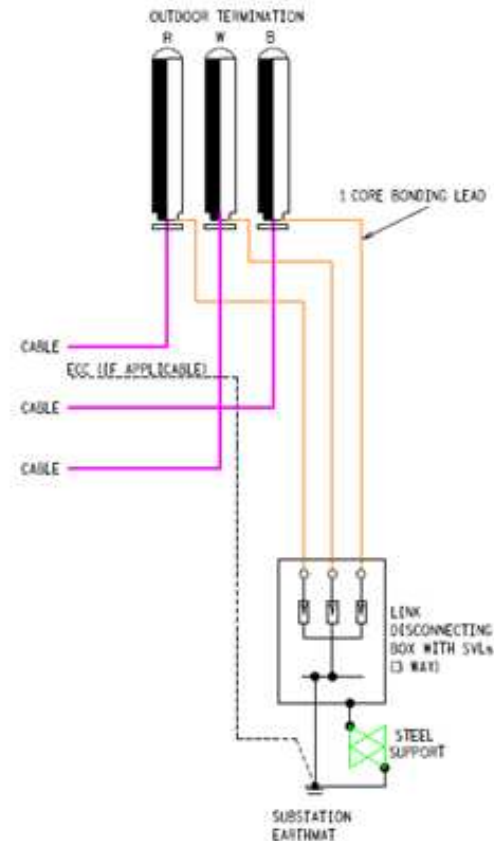


Figure 3.5d: Safe connection for a 3 Way link disconnecting kiosk comprising of 3 SVL connections

Conclusion

- When planning and designing a new HV cable system or performing a retrospective review on an existing system:
 - Step potential and
 - Touch potentialrisks must always be assessed through FE simulations.
- To mitigate against Step and Touch potential risks at HV cable joint bays, consideration can be given to ensuring:
 - joint bay earth electrodes,
 - conductive link disconnecting kiosk housings and,
 - enclosure equipotential earths,are insulated from the fault current conduction earth path of the HV cable system as a possible safe design measure.