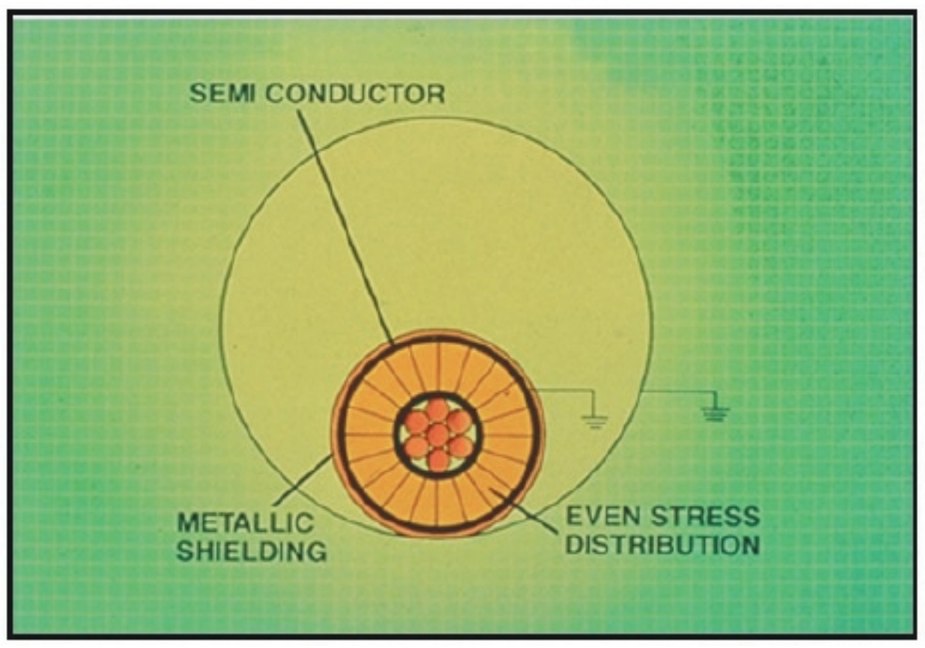
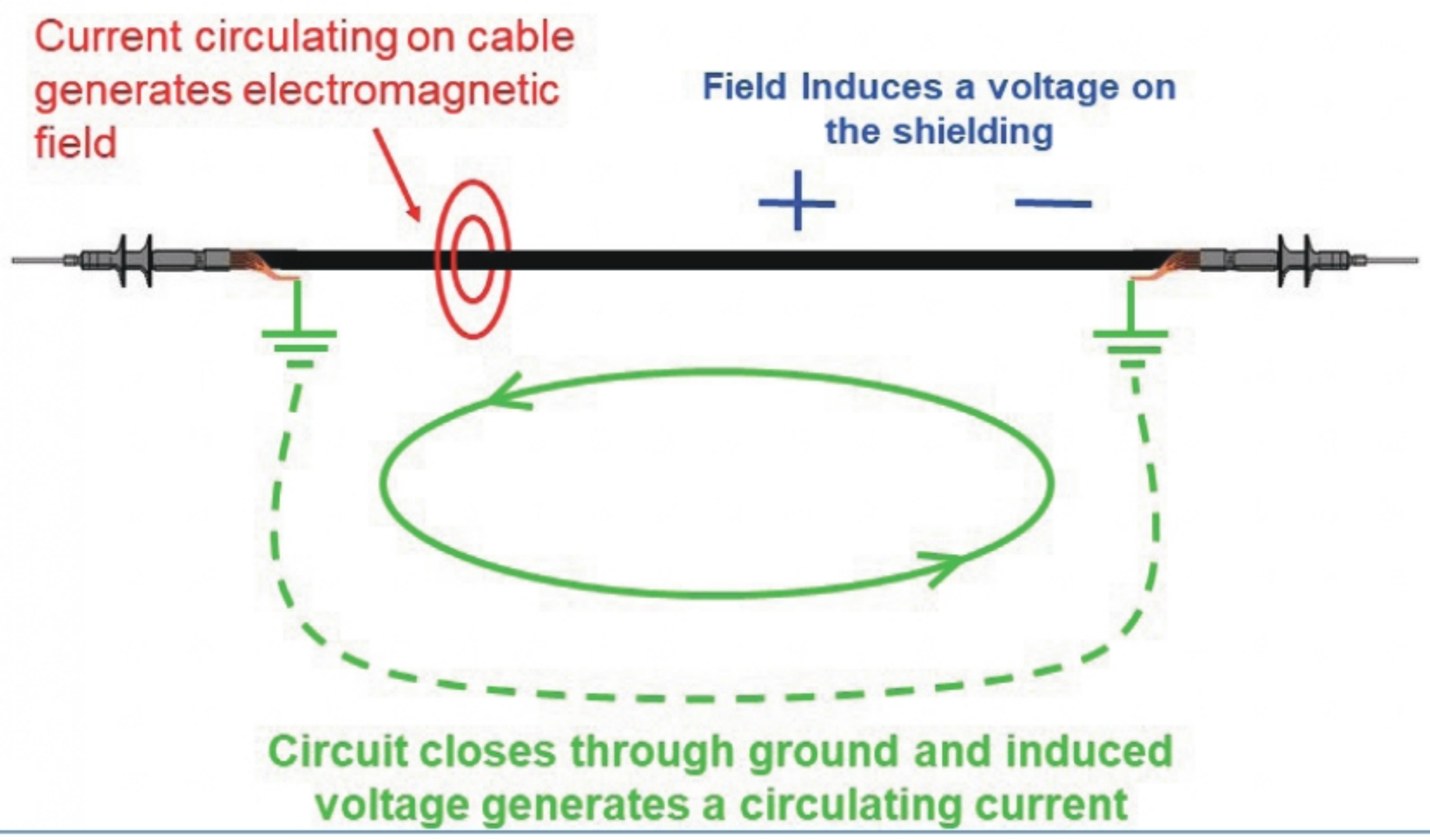
GROUNDING SYSTEMS

Why must we connect the cable shield to ground?

- A medium voltage cable will work properly only if the shielding is connected to ground, and therefore the voltage is 0 (zero)



Both sides connected to ground: What happens??

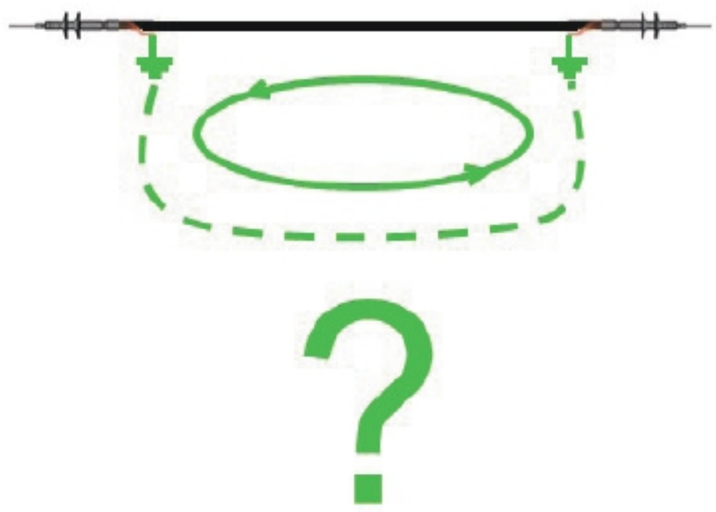


Which is the problem with this "Circulating current"??

- Circulating current generates HEAT!!!
- Cable becames hotter due to this heat
- If cable increases its temperature due to the current circulating through the shielding, this is helping to the TOTAL heating of the cable
- Cable will need to REDUCE ITS CURRENT RATING, if you wish to keep it BELOW THE MAXIMUM OPERATING CURRENT!!!
- You are paying for a big cable, and you don't get the current you need!!!

What can affect the "Circulating Current" value?

- System Voltage
- Cable current
- Resistance of the shielding
  - *Tape shield vs. JCN*
- Ground resistance
  - *Rock vs. Humid Soil*
- Cable length
- SOMETIMES IS SMALL AND CAN BE NEGLECTED!!!!



WAYS TO CONTROL CIRCULATING CURRENT

Ground only one side of the cable

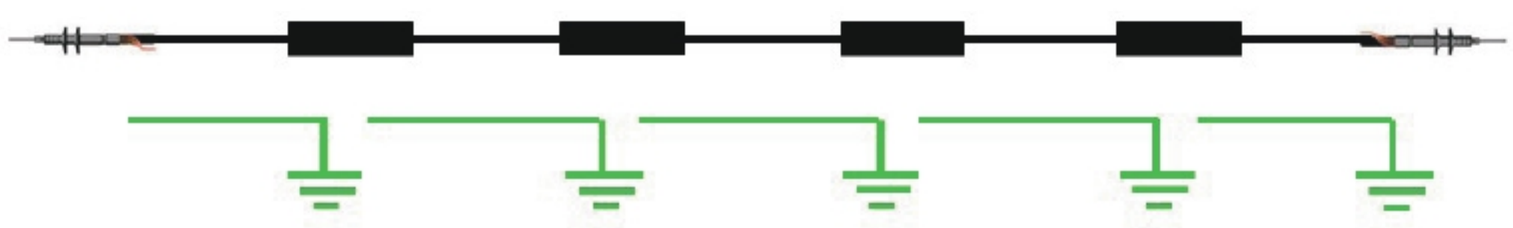
- Depending the system, a VOLTAGE between shielding and ground may appear
  - *If value raises, the cable will not work properly!!!*
- Can be a good solution for SHORT lines

Ground voltage limiters

- Voltage limiter (surge arrestor) located in the “non-grounded” side
- If voltage on that side raises above a certain safety value, arrestor activates and makes direct connection to ground

Isolated (broken) ground

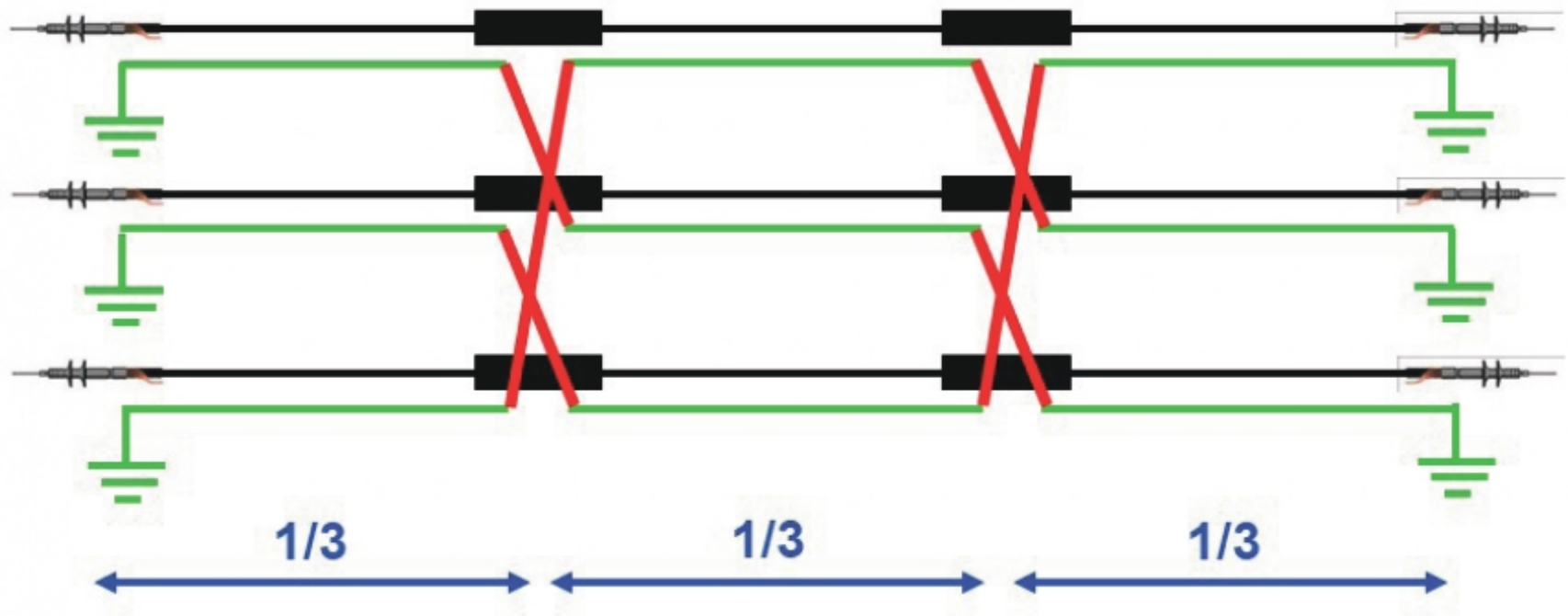
- Solution for long lines requiring several splices



- Shielding at one side of each splice is ISOLATED from the other
- Only one side of the shielding is grounded on each splices
- This method “shortens” the total length of the line
- Reduced length prevents voltage growth on non-grounded side

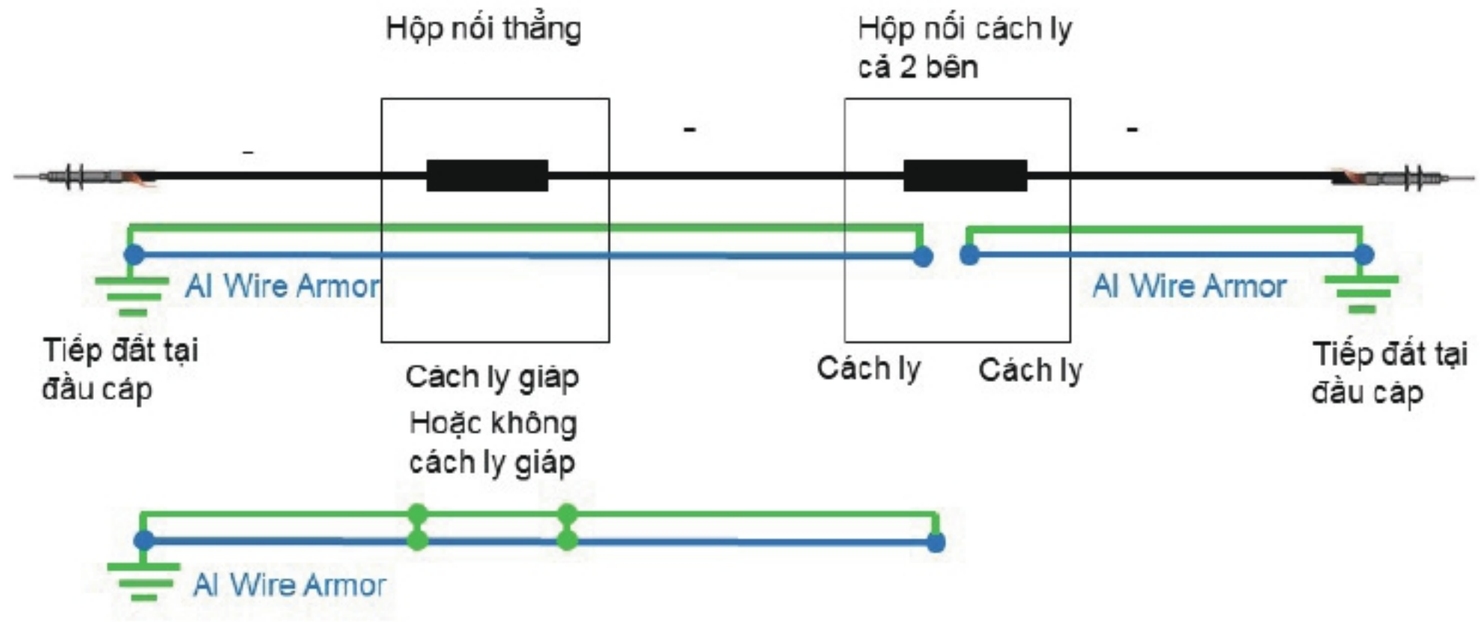
Cross-Bonding

- Very popular in high voltage

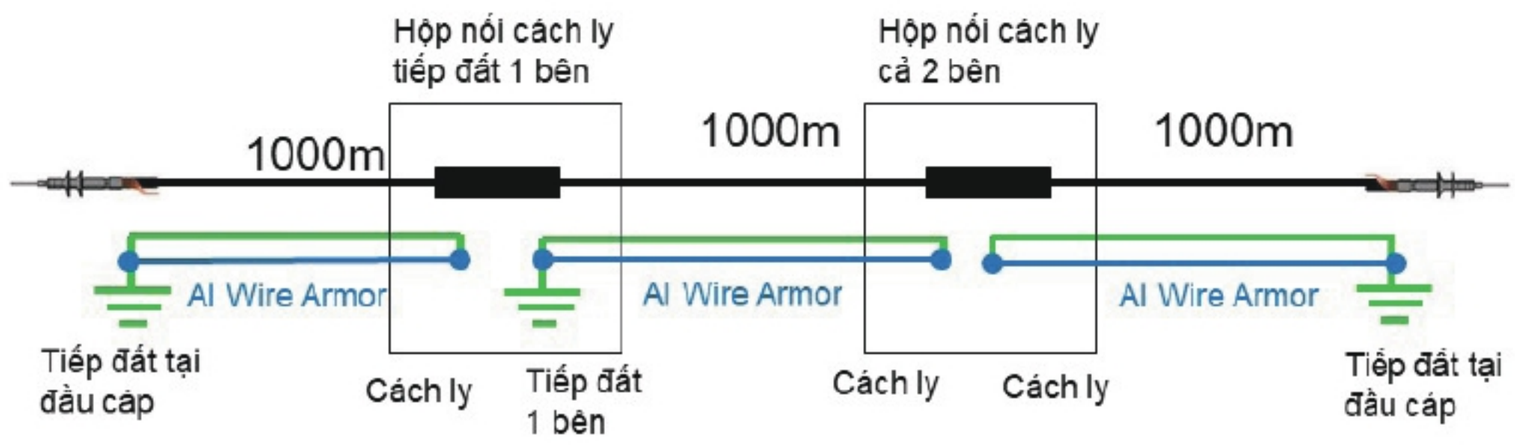


Cross Bonding

- Splices located (during construction) at 1/3 and 2/3 of total length
- Shielding isolated from one side to the other on each splice
- Both terminations grounded
- Shielding connected to form a “transposition” (special accessory required – cross bonding box)
- Voltages induced in the shielding on each section cancel themselves when added
- Circulating current is theoretically “0” (zero)
- EXCELLENT SOLUTION!!!!



- Lưu ý thiết kế hệ thống tiếp địa phải được thực hiện bởi tư vấn thiết kế có chuyên ngành về việc này.
- Bản vẽ trên chỉ mang tính tham khảo



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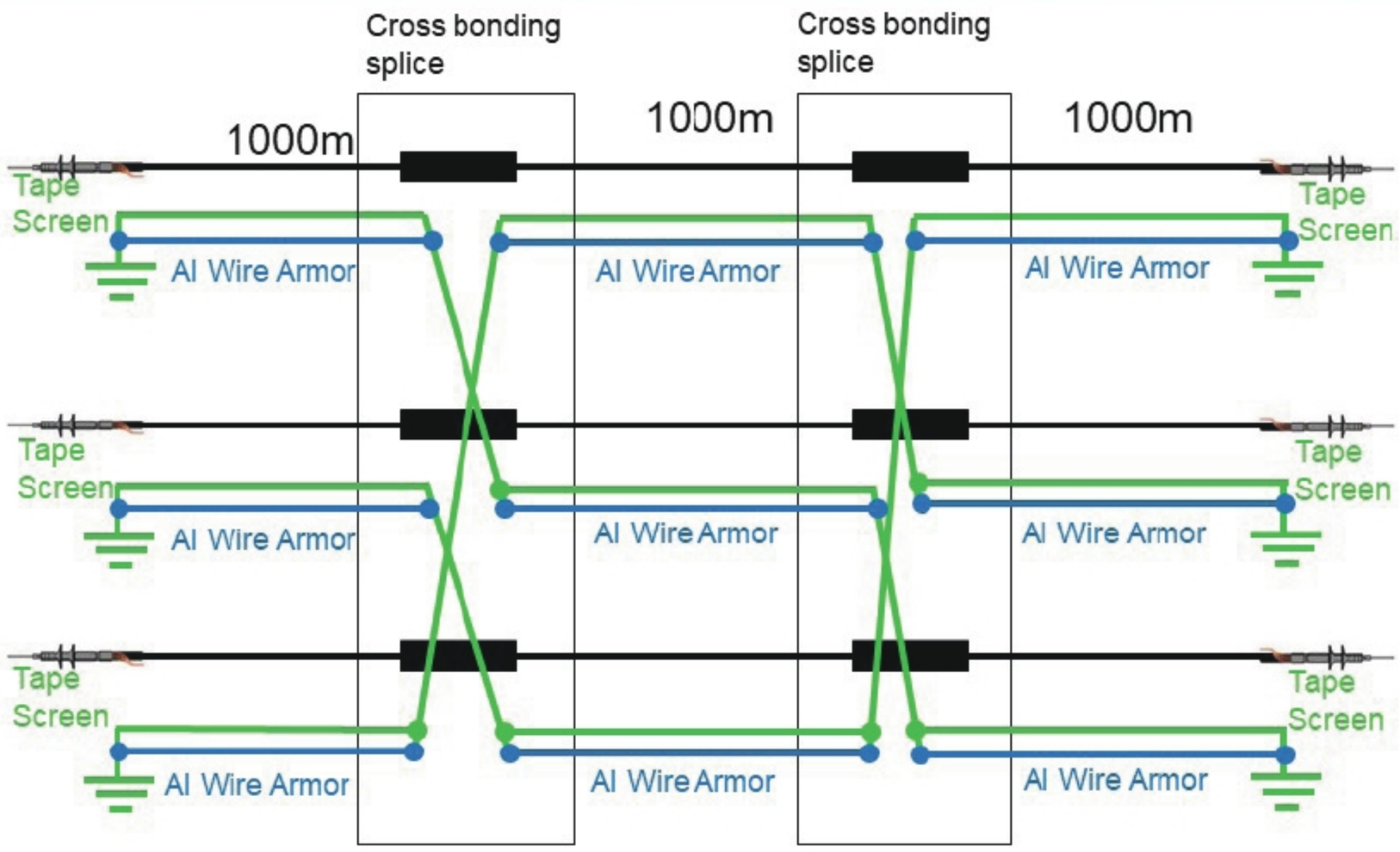

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Some final words

- Customer will probably ask US which is the best way to make a grounding
- BE CAREFUL!!!!: Grounding is not an easy matter!!!
- The Project Engineer is the one who should decide which is the recommended grounding for each situation
- Our role is to be sure we are providing the proper kit (splice or termination), that will allow the proper ground connection

VERY IMPORTANT!!!!