

Source: [\[KBhPHYS201ElectricFields\]](#)

## 1 | Conductors at Equilibrium

If the charges on a conductor are **stationary**, no electron flow within the conductor (so, it's **at equilibrium**)... This means that:

- 1) Net E-field *in* the conducting material must be zero
  - Because, uhh...., the conductor is stationary, meaning no electron flow
  - So, without electric flow, you know that there is no electrons flowing, which means no electric field
- 2) Any electrons that would exist would cluster at the surface of the conductor
  - At equilibrium, the electrons would want to be as far away from each other as possible, meaning that they would stick to the surface — to take advantage of the biggest perimeter/circumference
- 3) At the surface of the conductor, if any E-field is present, it must be perpendicular to the surface
  - If you have a horizontal component, the conductor would be, well, *conducting* electricity, making it rather not static. This horizontal component will push electrons in the conductor around until it doesn't exist
  - If the E-Field is perpendicular, because we are in the Physics Vacuum, no charges will flow because it can't flow out of the conductor into something else

The net electric field inside a neutral conductor must be 0 equilibrium (at which point it is stationary)

- A conductor at equilibrium would see electrons cluster at curves to maintain perpendicularity of e-Fields
  - Because there are more electrons towards the center and across the conductor to push all electrons towards the extremities before achieving equilibrium
  - If charges are evenly distributed instead of being concentrated on sharper corners, the now-unbalanced electrons will create horizontal components

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- PhET Exploration:
  - r0N: [\[KBe20phys201retFieldsVoltagePhET\]](#)
  - 'Moka: [\[KBhPHYS201PHETElectricFields\]](#)