



The World's First 100% Efficient Park-and-Walk Charger for Electric Vehicles.

Contact: Satyajit Patwardhan,  
510-364-8280  
[satyajit@green-dot-charging.com](mailto:satyajit@green-dot-charging.com)

# Its Time to re-invent Hands-Free charger for EVs

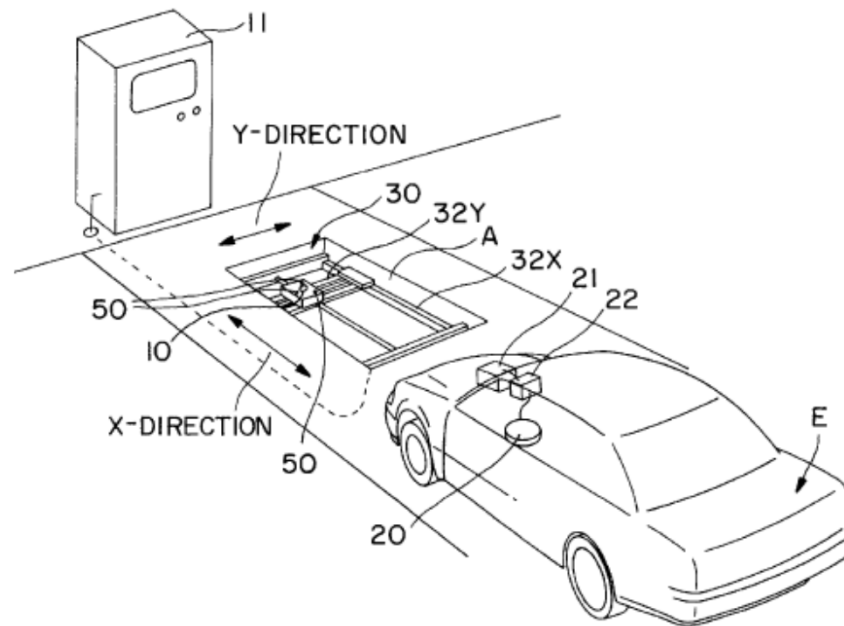


- Modern EVs require high energy → need high power charger.
- Users want to charger as fast as possible → need high power charger.
- Consumers want affordable Solution.
- Automated Self-Parking Cars Need hands-free parking.



# Hands Free Conductive Fits the Requirements

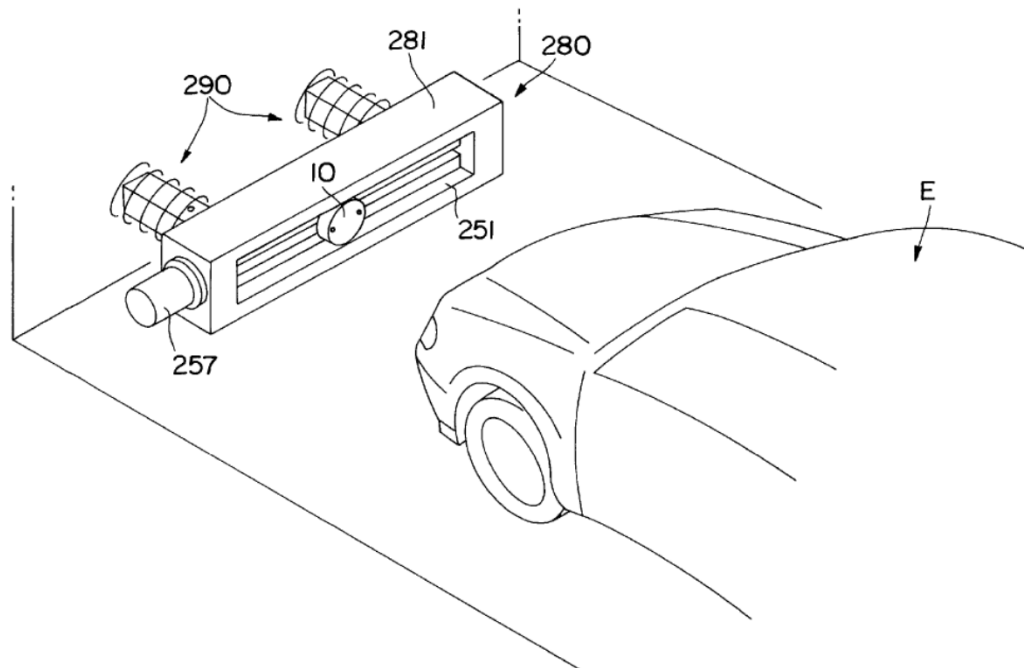
# Prior Art



X-Y slide + Z plunger.

**Large Intrusive Footprint, Sensor Based Search, Too many Failure Points.**

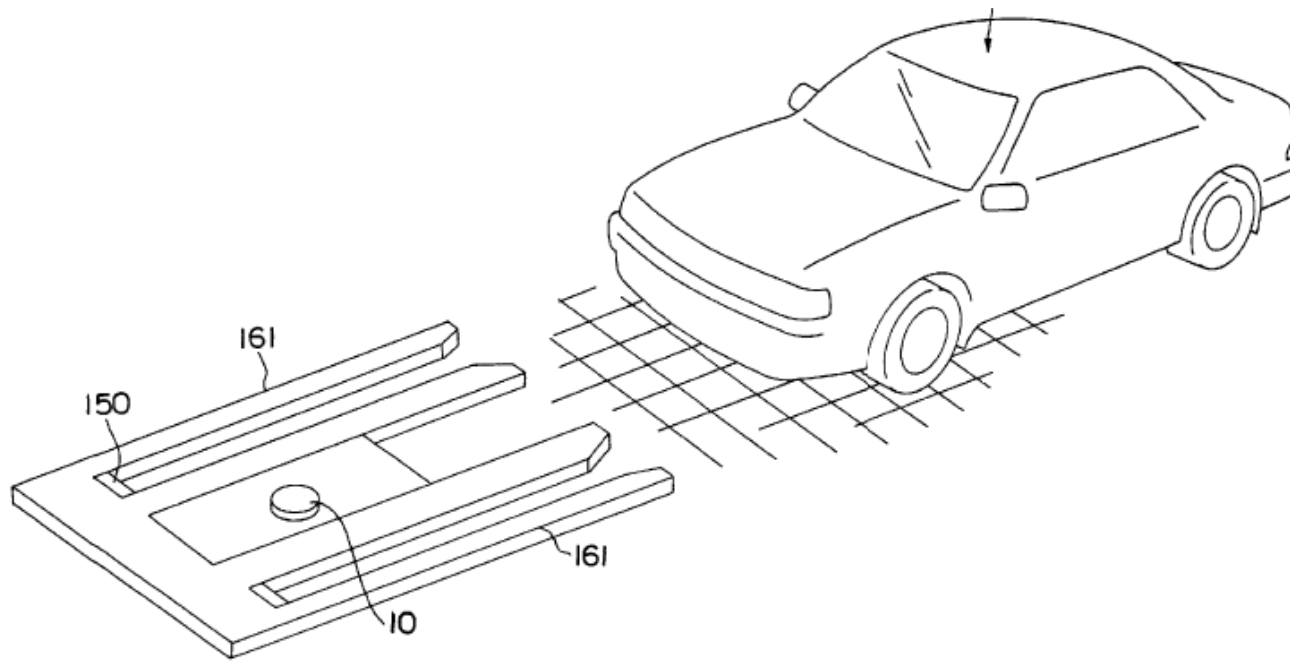
# Prior Art



Plunger / Slider at front bumper

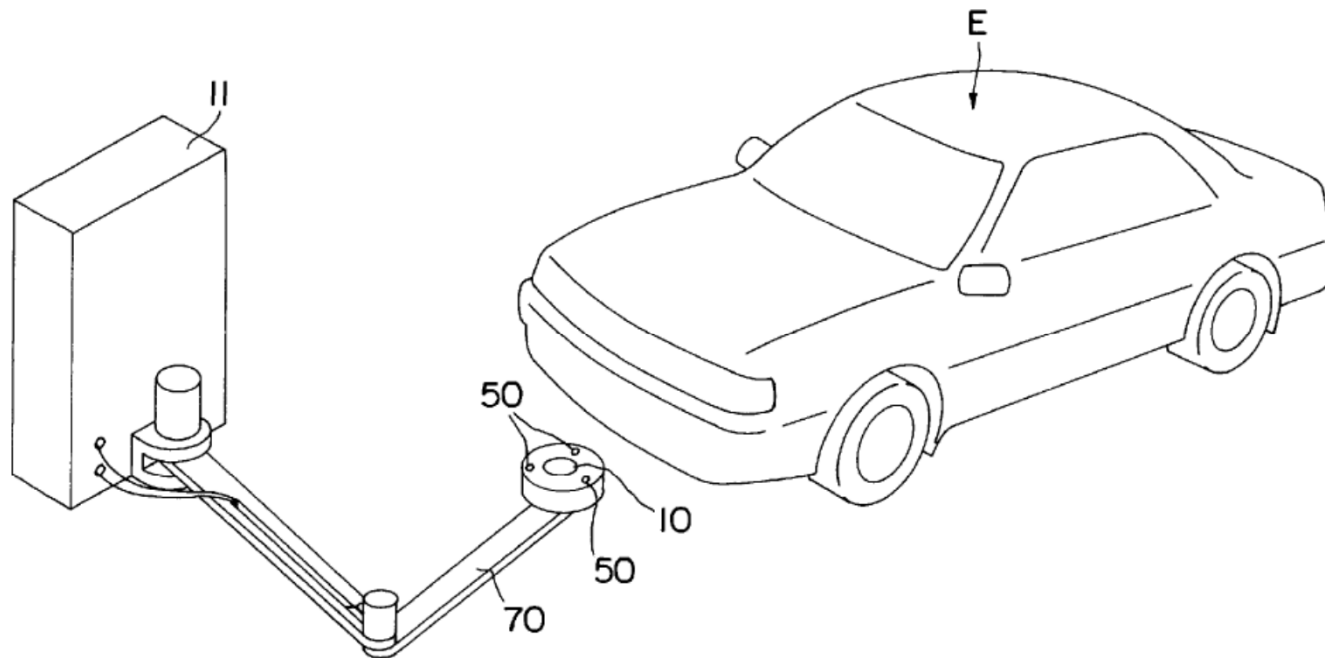
**Large Intrusive Footprint, Sensor Based Search, Too many Failure Points.**

# Prior Art



Car-Wash style guides.  
**Large Footprint.**

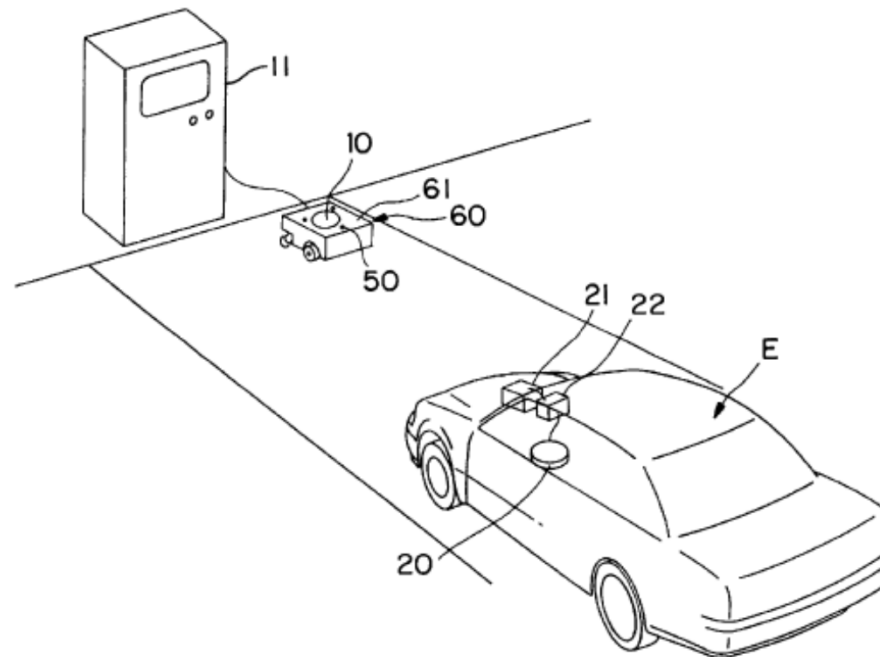
# Prior Art



Search Robot + Z plunger.

Large Footprint, Sensor Based Search, Too many Failure Points.

# Prior Art



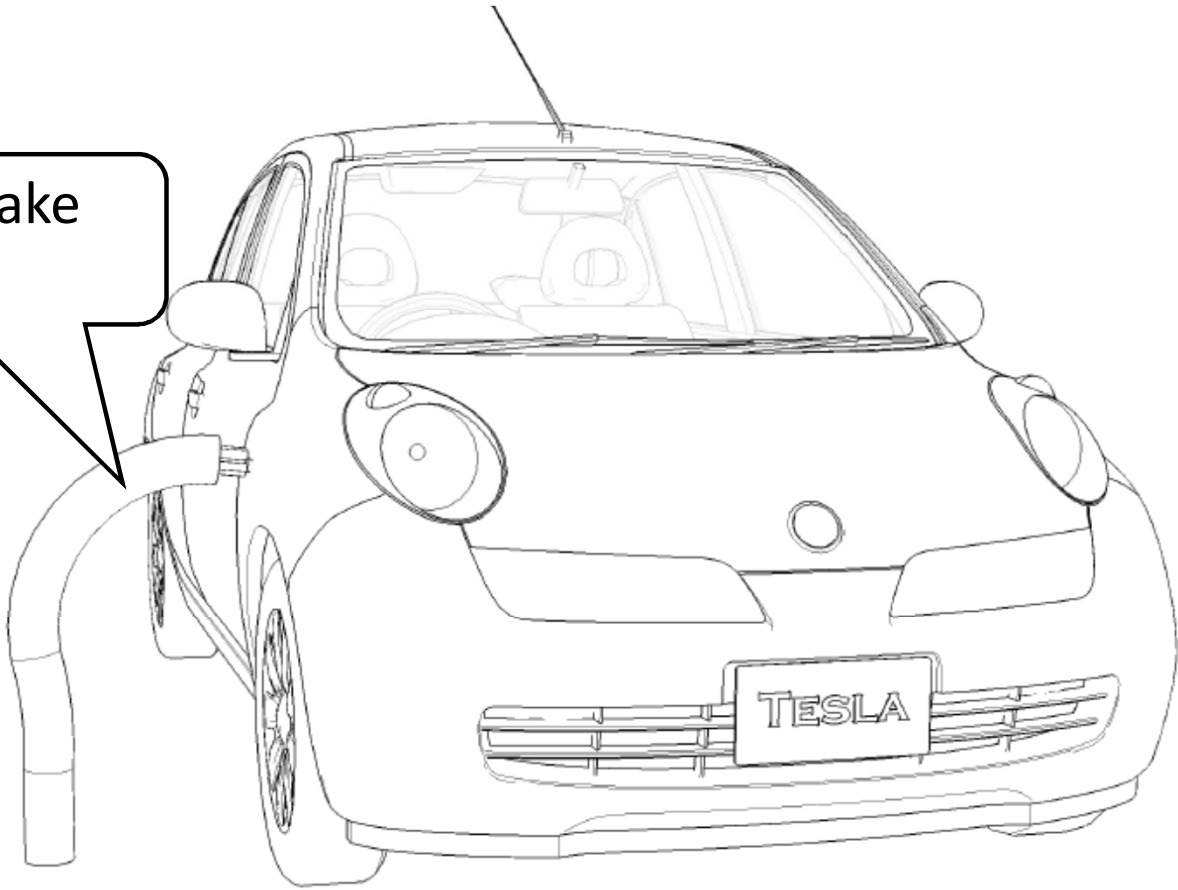
**Search Trolley + Z plunger.**  
**Sensor Based Search, Too many Failure Points.**



# Prior Art



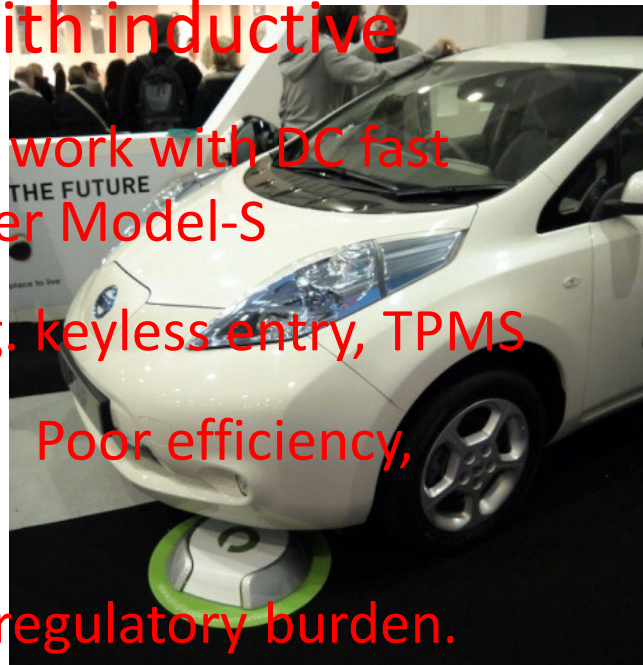
Tesla's Snake Robot



# Industry's answer to Hands - Free

## What's wrong with inductive

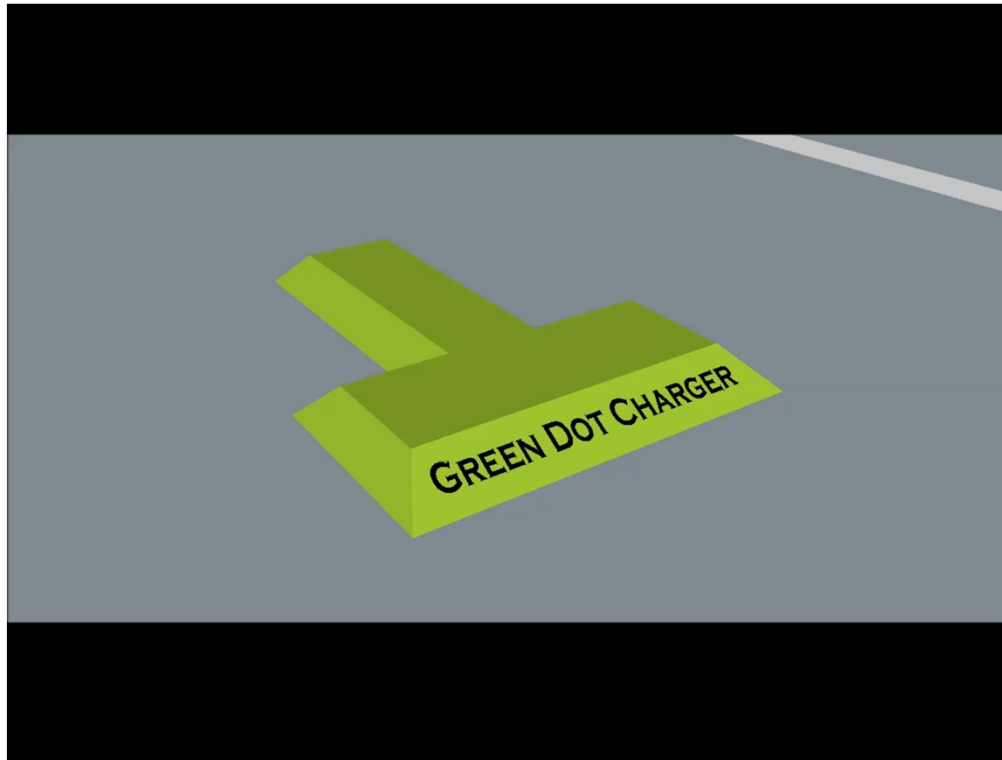
- Low Power -> can't work with DC fast charging, high power Model-S
- Can't work with e.g. keyless entry, TPMS
- Magnetic hazard, Poor efficiency, High cost.
- Large and still TBD regulatory burden. (FCC, FDA, ICNIRP, IEEE)



Inductive Charging.

Ho

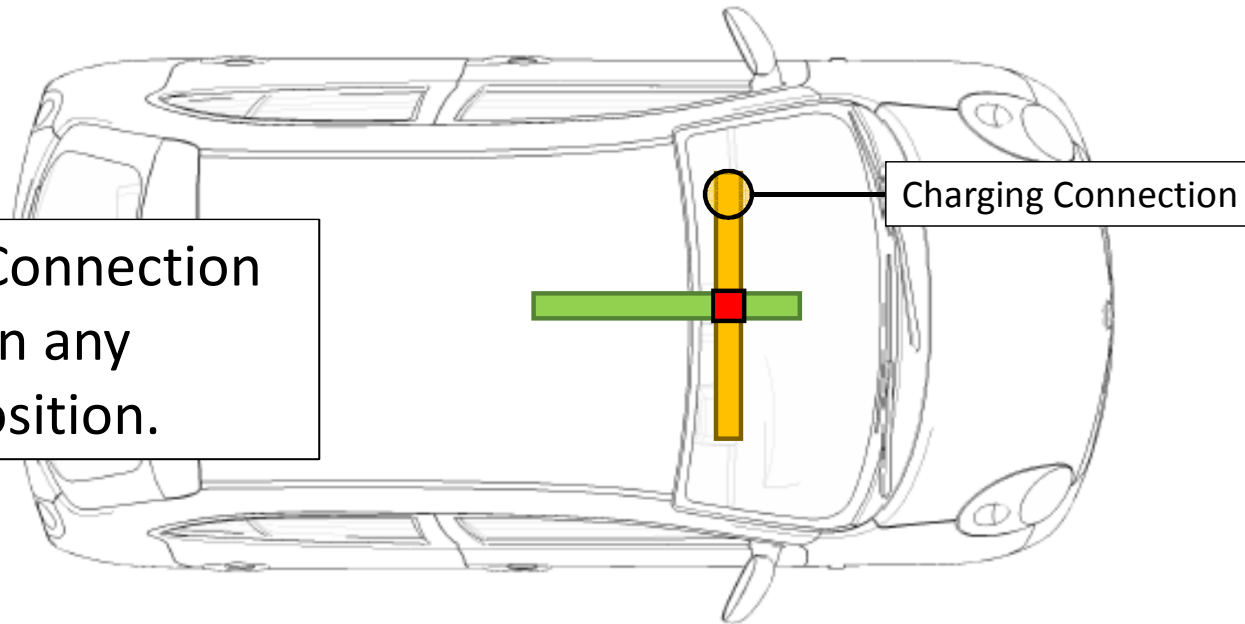




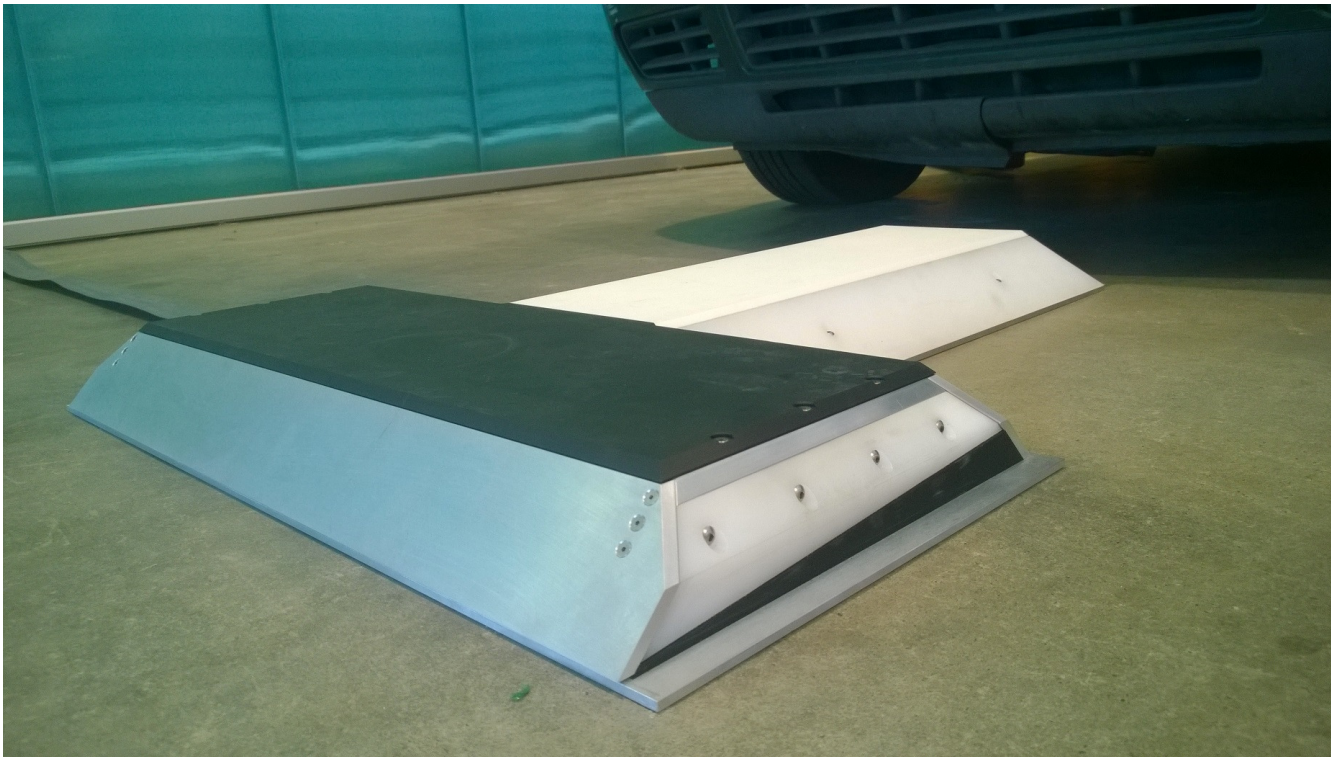
# How it works: Cross Bar Technology



Charging Connection  
Available in any  
parking position.



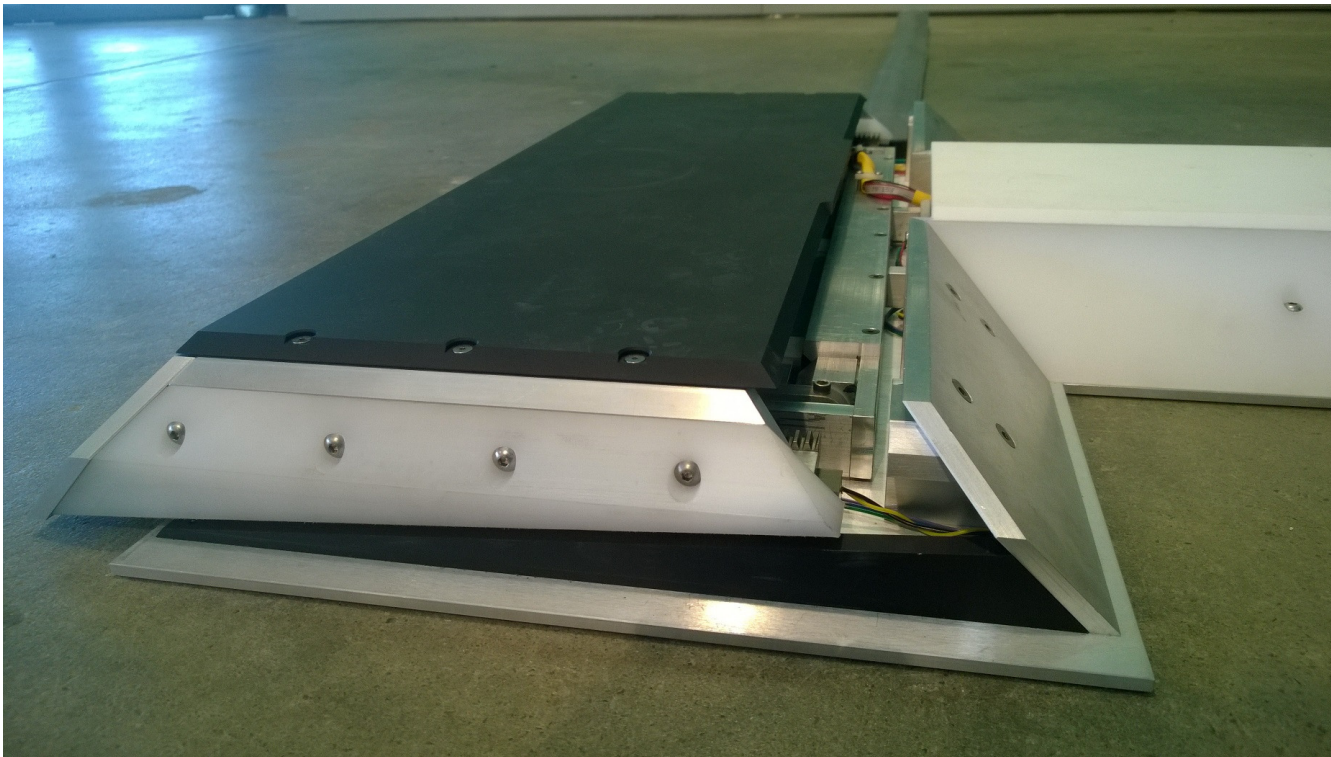
# How it Looks



# How it Looks



# How it Looks – Ground-Side

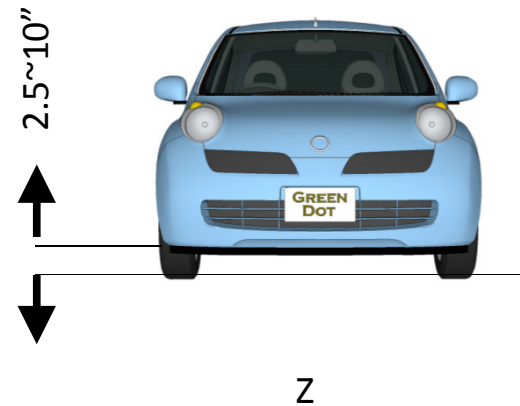
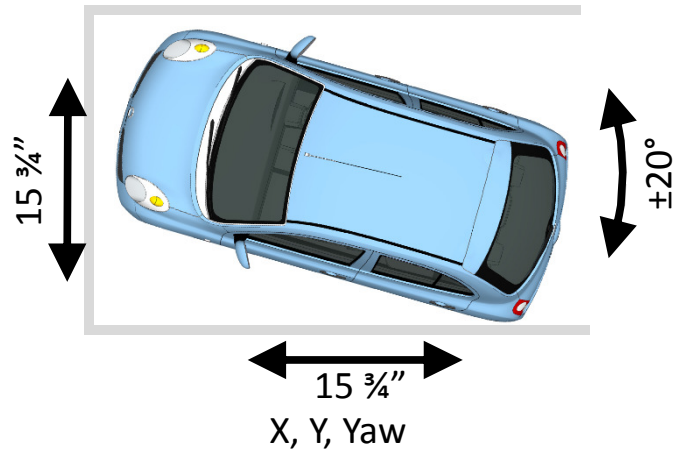
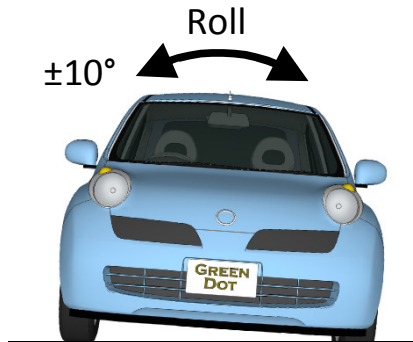
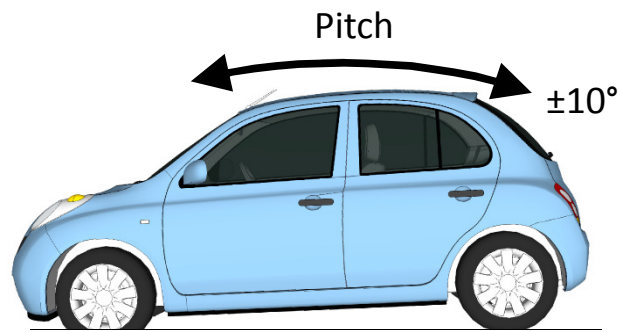




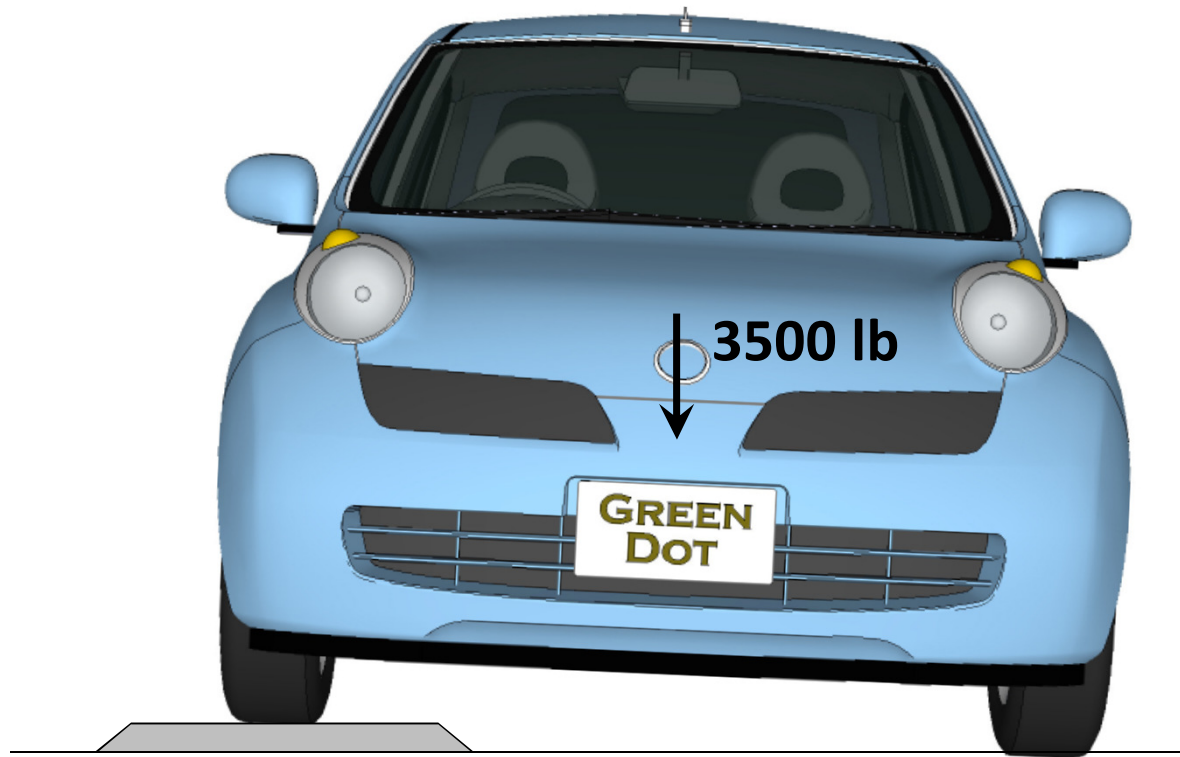
# How it Looks – Vehicle underside



# Misalignment Tolerance



# Run Over Protection

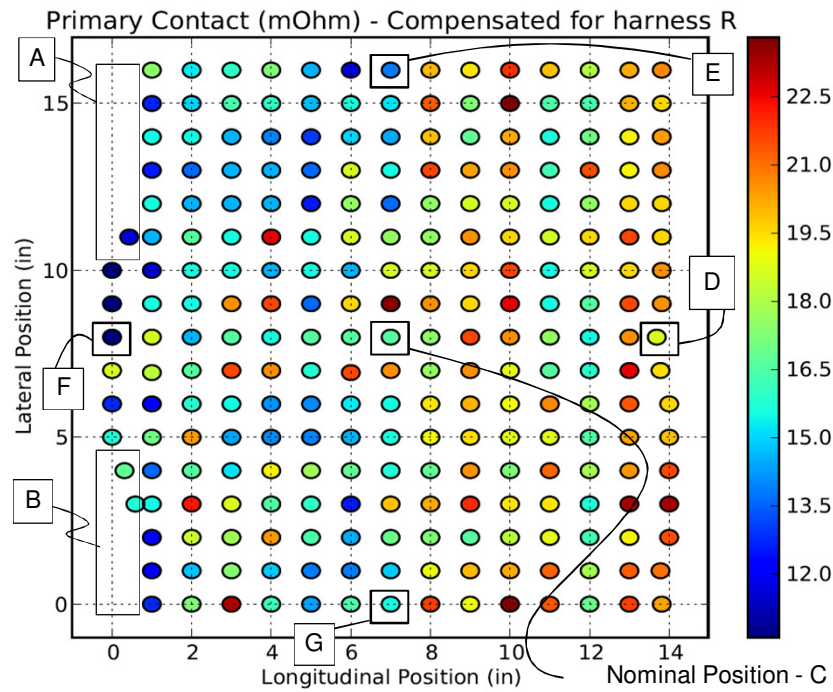


# Time to Engage / Disengage



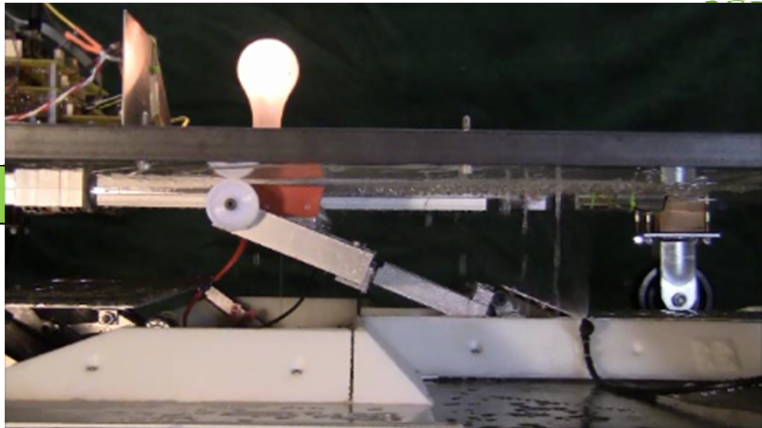
	Normal (S2 open)	Power Failure
Mechanical engagement	15s	-N.A.-
Scan and circuit setup	30s	-N.A.-
Electrical Disconnection	20ms	10ms
Full retraction	11s	< 5s

# Contact Resistance

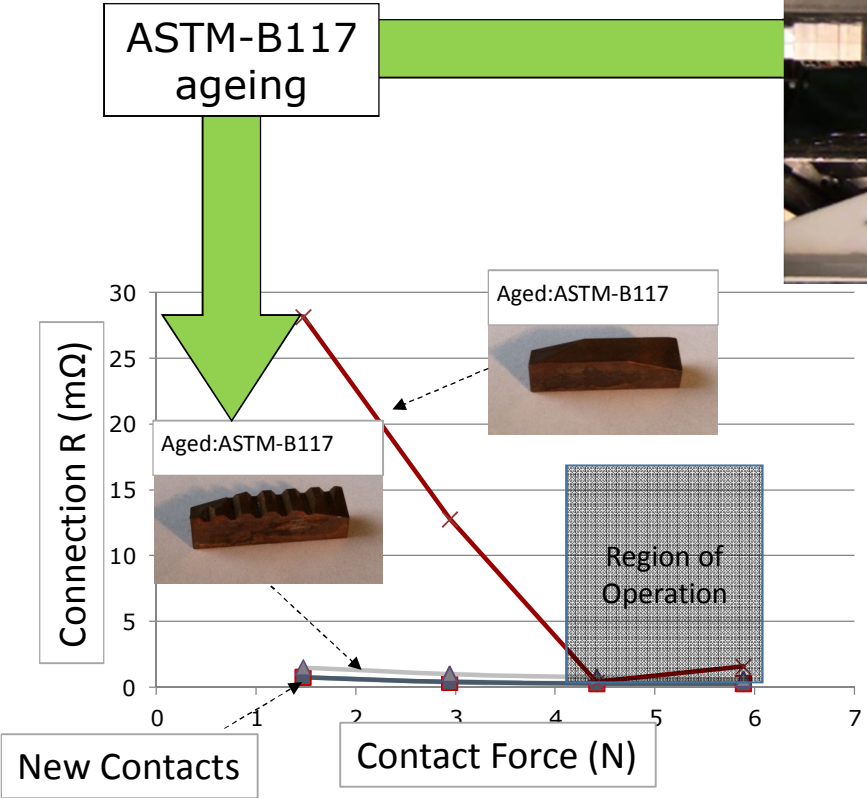


**Contact Resistance Vs. Location: Primary Contact.**

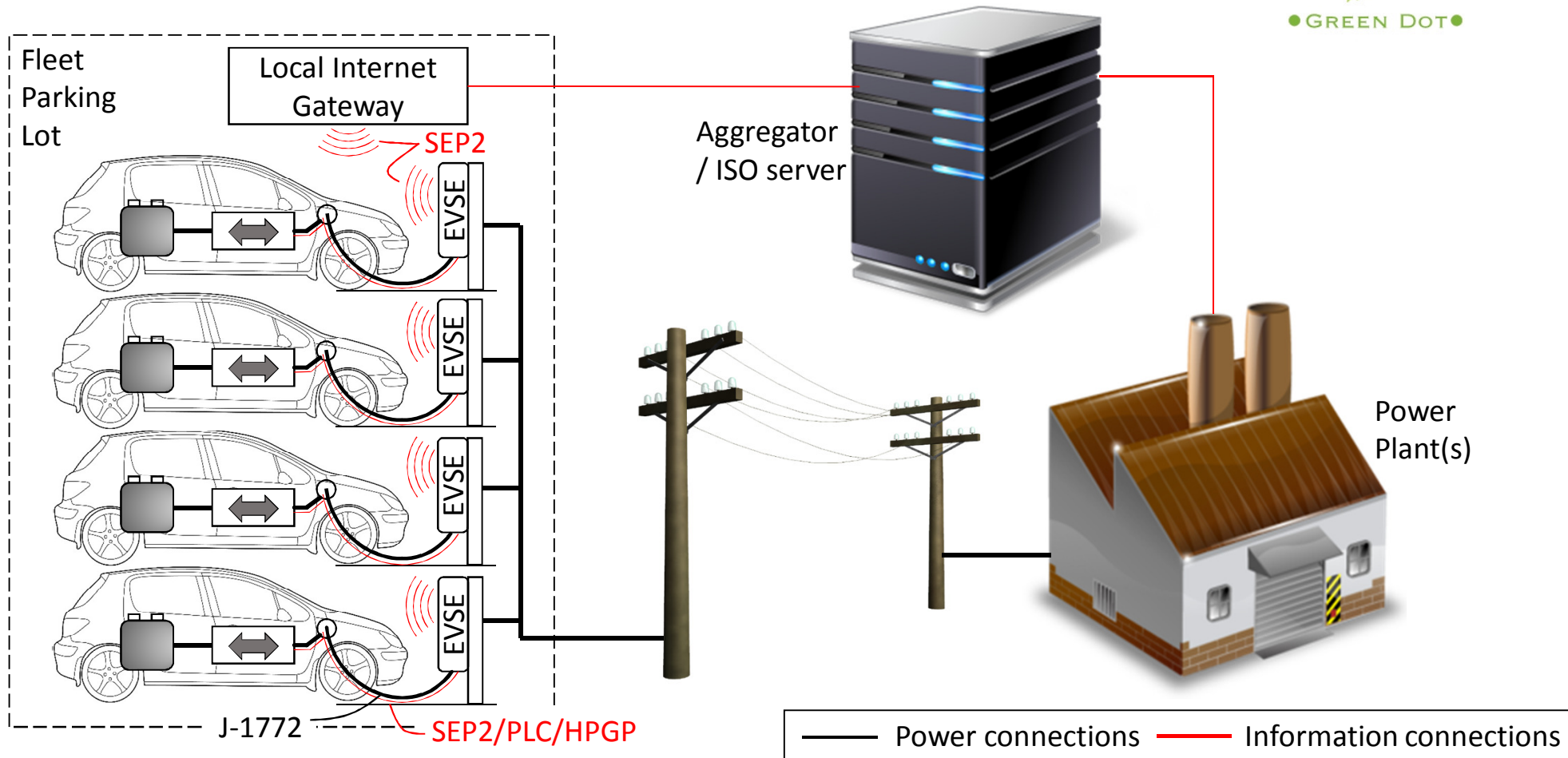
# Corrosion Resistance: Salt – Fog (ASTM-B117) testing



Car Underbelly soaking with salt / water



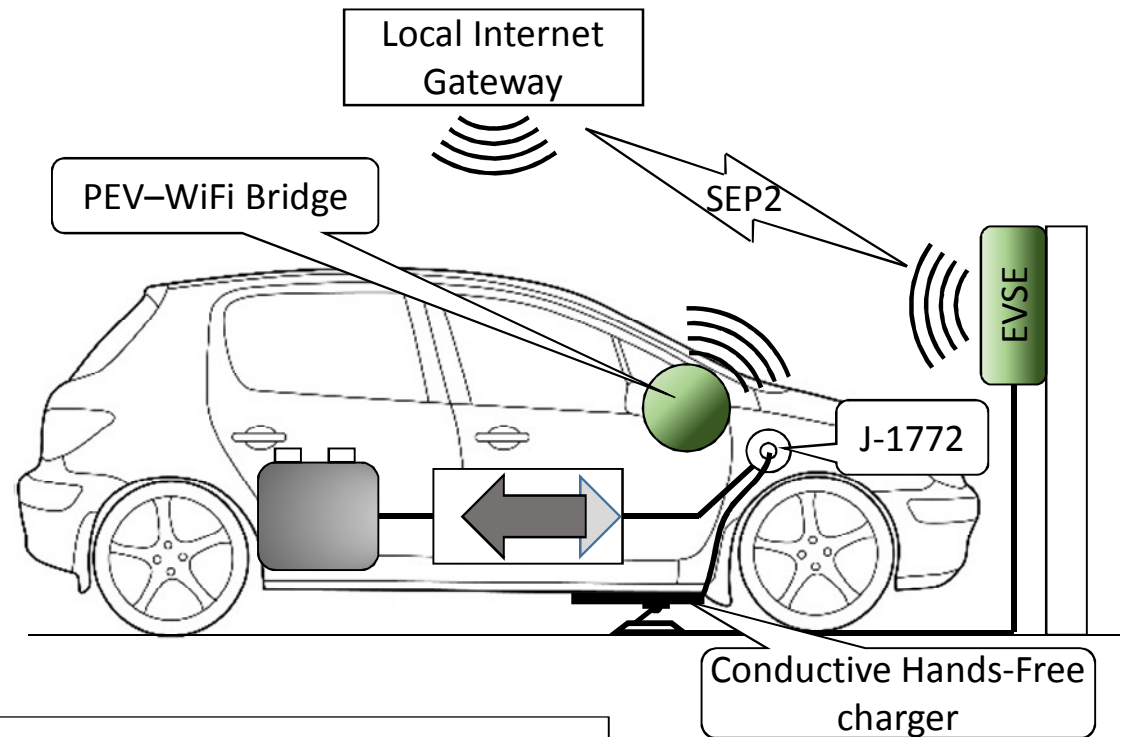
# VGI Components (SAE J-2847 / SEP-2)



# Conductive Hands Free For VGI



- California is leading the effort on “Grid Integrated Vehicles”
- High Efficiency means No Turn-Around Losses.
- Complete hands-free also means :
  - Mechanization of Charging Connection.
  - Automatic Discovery & Pairing of Communication Devices.



Hands-Free Conductive has correct tech. for VGI



# Key Points



- Zero EM field. → Pacemaker Safe → ICNIRP certified.
- Easy Retrofit: No drilling holes on cars. < 1Hr Installation.
- All Z Height compatible: 2" to 10" (or by design)
- No Object Detection → No False Alarms → User can sleep all night



# Summary: Why Conductive

- Already complies with UL requirements.
  - Can be certified safe as it leaves factory.
  - OEM or Tier1's liability does not depend on what happens in field.
- Vehicle side weighs < 5lb,
- Can live with Key-less entry, TPM, etc.
- Seamless grid integration (SEP2, J-2847/3 etc.).
- Affordable: \$1500/- price point.
- Conductive Hands-Free is right around the corner.

# Conclusion



- Conductive Hands-Free parking is right around the corner.
- OEM or Aftermarket deployable technology
- Fully compliant with Integrating into smart Grid.
- No magnetic field hazard.

Fast.



Hands-Free.



Complies With:



UL



NEC



FMVSS

Safe. (Won't kill your cat.)





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# Contact Reliability Design Features



- Corrosion resistant materials and very close on Galvanic Series.
- Mating pair optimized for electrical contact.
- Patented self cleaning treads on sliding contacts.
- Guaranteed large contact force.
- No moving parts, rugged construction on Ground side.

