



ELECTRIC VEHICLE FUNDAMENTALS (EVF)

BODY OF KNOWLEDGE



sme.org/EVF

ELECTRIC VEHICLE FUNDAMENTALS

BODY OF KNOWLEDGE 2024/2025

Topics	
1.0	Manufacturing Foundations/Awareness
1.1.	General OSHA Standards/Regulations
1.1.1.	Bloodborne Pathogens
1.1.2.	Fire and Safety
1.1.3.	Personal Protective Equipment (PPE)
1.1.4.	Lockout/Tagout
1.1.5.	Hazardous Materials
1.1.6.	Hazardous Material Handling
1.1.7.	Electrical Safety
1.1.8.	High Voltage Safety
1.1.9.	High Voltage Cables
1.1.10.	Safety Switch
1.2.	Measurement
1.3.	Print Reading
1.4.	Mechanical Technologies / Physics Fundamentals (Torque, speed)
1.5.	Direct Current Electricity
1.5.1.	Direct Current Properties
1.6.	Ohm Law
1.6.1.	Voltage
1.6.2.	Current
1.6.3.	Resistance
1.8.	Analytical Simulation, Methods and Techniques - Digital Twin
2.0	Electric Vehicle Overview
2.1.	What are Electric Vehicles?
2.1.1.	Electric Vehicle (EV) vs. Internal Combustion Engine (ICE)

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Topics	
2.2.	Types of Electric Vehicles
2.2.1.	Battery Electric Vehicle (BEV)
2.2.2.	Plug-in Hybrid Electric Vehicle (PHEV)
2.2.3.	Hybrid Electric Vehicle (HEV)
2.2.4.	Fuel Cell Electric Vehicle (FCEV)
3.	Components of Electric Vehicles
3.1.	Electrical Storage Systems
3.1.1	Battery Cells
3.1.1.1	Cylindrical Cells
3.1.1.2	Prismatic Cells
3.1.1.3	Pouch Cells
3.2.	Battery Selection
3.2.1.	Lithium-ion
3.2.2.	Lithium Polymer
3.2.3	Nickel metal hydride
3.2.4	Lead acid
3.3.	Battery Cells
3.3.1.	Cylindrical Cells
3.3.2.	Prismatic Cells
3.3.3.	Pouch Cells
3.4.	Battery Management System (BMS)
3.4.1.	Battery State Determination
3.4.1.1.	User Interface
3.4.1.2.	Electrical Control
3.4.1.3.	Safety Protection

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Topics	
3.5.	Battery Monitoring
3.5.1.	Current
3.5.2.	Voltage
3.5.3.	Temperature
3.5.4.	Data Acquisition
3.5.5.	Safety Protection
3.5.6.	Thermal Management
3.5.7.	High voltage interlock
3.6.	EV Traction/Propulsion System
3.6.1.	EV Motor
3.6.2.	Direct Current Motor
3.6.3.	Alternating Current Motor
3.6.4.	Inverters
3.7.	EV Speed and Power Controller
3.7.1.	Electronics Controller
3.7.2.	Silicon-Controlled Rectifiers (SCR)
3.8.	EV Braking Systems
3.8.1.	Regenerative Braking System
3.8.2.	Traditional Braking System
3.9.	EV Charging Station Components
3.9.1.	Miniature Circuit Breakers (MCB)
3.9.2.	Residual Current Circuit Breakers
3.9.3.	Disconnect Switches
3.9.4.	Surge Protection Devices
3.9.5.	Contactors
3.9.6.	Energy Meters
3.9.7.	Terminal Blocks

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Topics

3.9.8. Wire Duct
3.9.9. DIN Rail
3.10. EV Charging Systems and Technology
3.10.1. Charge Port
3.10.2. DC/DC Convertor
3.10.3. Electric Traction Motor
3.10.4. Onboard Charger
3.10.5. Thermal System (Cooling)
3.10.6. Transmission (Electric)
3.10.7. Full-Size Charger
3.10.8. Portable Charger
3.10.9. Level 1 Charging Station
3.10.10. Level 2 Charging Station
3.10.11. Level 3 Charging Station
3.10.12. Wireless Charging Station
3.10.13. Power electronics