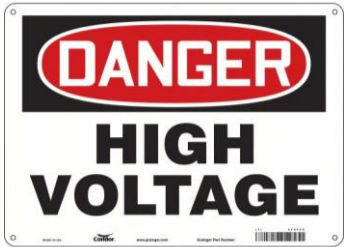


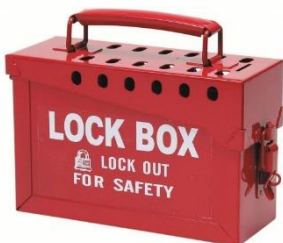


MINNESOTA STATE
Transportation Center of Excellence

EV RECOMMENDED TOOLS AND SAFETY EQUIPMENT

Safety Equipment			
Image	Item	Link *Preferred	Cost
	Class 0, Insulated rubber gloves kit -Rubber gloves, and protective leather gloves in a storage bag -Rubber gloves lifespan 6 months -Different sizes: Size 8-10 covers most people	Grainger Amazon AESWave* How to size gloves	\$150-300 Per Set
	Cotton under gloves (optional)	Grainger* Amazon	\$1-6 Per Pair
	Glove Dust (optional)	Grainger*	\$15

	Rubber Glove Tester -Used to field test gloves before use	Grainger Amazon*	\$350-600
	HV Rescue Hook (Hot stick) -Life span: 2 years	Grainger Amazon AESWave*	\$500-750
	Arc Flash Clothing Kit -Some manufacturers require -Different sizes available -Category 2 (Might need higher depending on the job being performed) *See the manufacturer service manual for the recommended level of PPE	Grainger* Amazon	\$700-1000
	Arc Flash Face Shield -Some manufacturers require	Grainger Amazon*	\$72-\$470
	HV Signage -You'll need multiple signs around the vehicle and/or shop	Grainger Amazon*	\$12-25 each

	HV Barrier -Alternative barriers are possible with tall construction cones with caution tape between them	Grainger* Alternative: Grainger 4x Cone Grainger Caution tape	\$1300-1500 \$35 each \$65
	Large NFPA 701 Certified Fire Blanket (9M X 6M)	Vehicle Response Training (VRT) Use code: Educator250 For a \$250 discount	\$2,800
	Class D Fire Extinguisher – Combustible Metals -Designed to extinguish nickel metal hydride batteries NOT effective on lithium chemistry batteries	Grainger ULINE	\$900-1,100
	Lithium Battery Encapsulator Fire Extinguisher -Designed to combat lithium battery fires. Only use if the fire is small and containable. Place fire blank over component/vehicle ASAP.	All Hands Public Safety	\$300-900
	Lock Box -Lock vehicle key and MSD away when HV system is being serviced	Grainger Amazon*	\$32-70

	Lock Out, Tag Out Kit	Grainger Amazon*	\$33-182
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Basic EV Tools and Equipment			
Image	Item	Link *Preferred	Cost
	CATIII Multi Meter with <u>insulation tester</u> – Fluke 1587	Grainger Amazon* AESWave	\$750-1100
	Proving unit FlukePRV240 -Alternative 9-volt battery	Grainger Amazon*	\$160-170
	Level 1 & 2 NACS(Tesla) Charger	Amazon*	\$300
	Level 2 J1772 Charger -You'll need an electrician to add a 240 Volt plug/hardwire charging unit	Amazon* NorthernTool	\$550-600

	Insulated Tool Kit	Grainger Amazon* NorthernTool	\$530-2010
	OEM Factory Scan Tool -Recommend OEM factory scan tool for the EV you plan on working on the most. Example: Toyota TIS TechStream.	Toyota-TechStream	\$6,330

Advanced EV Tools and Equipment			
Image	Item	Link *Preferred	Cost
	4-Channel Pico EV Kit 4425A -This is a great kit that has most of the things to scope HV components safely	AESWave*	\$5,650

	Additional Differential Probes (optional) -Ideally 3 total	Amazon AESWave*	\$460
	Milliohm Meter -Used to measure electrical resistance in motor windings	Amazon- Hioki ASEWave*- Hioki AESWave-PICO Milliohm Meter Explained	\$1,100-1,400 \$860

Other things to think about...

Image	Item	Link
	HD Hoist (Wider) or Special EV hoist (optional) -Wider hoist to accommodate lowering HV Batteries	FleetMaintenance- Hoist Evolving BendPak- EV hoist Concept Rotary Hoist- EV lift new arms
	EV Battery Lift Table and Fixtures -2,400-4,500LBS rated depending on what vehicles you have -Some tables will need additional fixtures to drop some batteries	BendPak- EV battery lift tables Hyundai-EV battery lift tables Challenger- Lift tables

	Insulated Workbenches and Storage Shelves -Wood or nonconductive material to work on and store HV Batteries	Global Industrial- Wood workbench Global Industrial- ESD Tabletop
	High-Voltage Module Balancer (optional) -If you plan on doing high-voltage battery internal servicing of modules, you'll need the manufactured recommended balancer, Example: Ford's recommended balancer from Medtronic -*Not all manufacturers are servicing HV battery packs	FORD Rotunda Midtronics Site and Video