

**EV CHALLENGE
STEMcycle Roadracer
DESIGN and SAFETY REGULATIONS**

**1st Edition
Effective August 2015**

MECHANICAL SPECIFICATIONS

M1 Vehicle Dimensions

- M1.1 Track width (spacing between tires on axles with 2 tires) shall be a minimum of 50 cm (19.7 inches)
- M1.2 Vehicle width shall be a maximum of 122 cm (48 inches)
- M1.3 Vehicle length shall be a maximum of 365.75 cm (144 inches)
- M1.4 Vehicle height shall be no greater than twice the track width
- M1.5 Vehicle ground clearance shall be greater than the sidewall height of all tires

M2 Wheels

- M2.1 Vehicle shall have 3 or 4 wheels (all load bearing)
- M2.2 There is no restriction on wheel type or size

M3 Frame

- M3.1 Frame of the vehicle shall protect the driver from collisions from any direction
- M3.2 Driver shall be seated less than 100 mm (3.9 inches) from the ground

M4 Steering

- M4.1 Vehicle shall only be steered by the front wheels
- M4.2 Steering shall be through a well-constructed mechanical linkage with minimal play
- M4.3 Vehicle shall have less than a 15.25 meter (50 feet) diameter turning circle

M5 Brakes

- M5.1 All wheels shall have a brake
- M5.2 Vehicle shall be equipped with two independent brake systems with separate means of actuation
- M5.3 Brakes on the same axle shall be operated simultaneously by a single mechanism
- M5.4 Brakes shall not press directly on the tire for stopping force
- M5.5 Brakes shall be of cantilever, disc, drum design
- M5.6 Brakes shall be actuated by a pedal or lever. Mechanical or hydraulic linkage is

permitted

M5.6 Each braking system shall hold the vehicle and driver stationary on a 20% grade.

M6 Body

M6.1 Body shall be constructed of moisture resistant materials

M6.2 Vehicle side and top coverings shall prevent driver arms and legs from leaving the vehicle

M6.3 A solid floor pan shall be placed underneath the driver compartment.

M6.4 Floor pan shall be constructed of a rigid material (1.5 mm aluminum, rigid plastic or carbon fiber; 3mm plywood)

ELECTRICAL SPECIFICATIONS

E1 Motor

E1.1 Motor shall be DC

E1.2 Motor shall be rated at 750 Watts (1 hp) or less

E1.3 All drive components (motor, chain, etc.) shall be guarded or shielded

E2 Traction Battery

E2.1 Battery shall have a maximum capacity of 1000 W-h

E2.2 Battery shall be rated at no more than 48 Volt nominal (60 Volt maximum under charge)

E2.3 Flooded lead acid batteries are prohibited

E2.4 Battery shall be in a proper enclosure and secured to the vehicle

E2.5 Base of the battery enclosure shall be less than 10 cm (3.9 inches) from the ground

E2.6 Documentation of battery specifications and safety shall be provided during technical inspection

E3 Controller

E3.1 Any type of DC motor controller is permitted

E3.2 Accelerator mechanism shall be spring loaded to return to zero-current position when released

E3.3 Cruise control is prohibited

E3.4 Controller shall be operable solely by the driver (no remote control allowed)

E4 Electrical disconnect

E4.1 Vehicle shall be equipped with a clearly labeled mechanical electrical disconnect on

a main battery cable

E4.2 Disconnect shall be accessible to a belted driver without reaching outside of the vehicle, and accessible from outside the vehicle without reaching inside the vehicle

E4.3 Two separate disconnects may be used to fulfill this requirement

E5 Auxiliary Equipment

E5.1 Auxiliary equipment (fans, gauges, etc.) may be powered from the main traction battery or from a separate power source

E5.2 Handheld two-way communication devices are prohibited

SAFETY

S1 Guiding Principles

S1.1 Vehicle shall be designed for safe operation, consistent with reasonable and common-sense design principles. Ultimate determination of vehicle safety shall be made during technical inspection

S1.2 No vehicle deemed unsafe shall be permitted to enter any competitive event.

S2 Roll Bar

S2.1 Vehicle shall be equipped with a roll bar

S2.2 Roll bar shall be mechanically and securely attached to the vehicle frame

S2.3 Roll bar shall protect the belted driver's helmeted head throughout the full range of

head motions

S3 Electrical Safety

S3.1 All wiring shall be properly sized.

S3.2 Vehicle shall be equipped with a main fuse or circuit breaker rated for no more than 120% of maximum controller current.

S4 Safety Belt

S4.1 Vehicle shall be equipped with a minimum 5-point safety belt harness.

S4.2 Harness shall be securely attached to the vehicle.

S4.3 Driver shall wear the safety belt every time the vehicle is operated.

S5 Mirrors

S5.1 Vehicle shall be equipped with a minimum of two mirrors

S5.2 All mirrors shall be a minimum of 25.8 centimeters square (4 square inches)

S5.3 Mirrors shall allow a belted driver to see to the sides and rear of the vehicle

S6 Helmet

S6.1 Helmet shall be DOT approved full faced helmet

S6.2 Helmet shall have a shield or driver shall wear goggles

S6.3 Driver shall wear helmet with all straps fastened every time vehicle is operated

S7 Driver

S7.1 Driver shall wear gloves and eye protection

S7.2 Driver shall wear long sleeved shirt and pants and closed-toe shoes

S7.3 Driver shall restrain hair longer than shoulder length

S7.4 Driver shall refrain from wearing jewelry aside from stud earrings

S7.5 Driver shall demonstrate safe vehicle operation. There is no age restriction.

S7.6 Driver and ballast shall weigh a minimum of 81.6 kg (180 lbs)

S7.7 Ballast shall be removable and secured to vehicle during operation.

S7.8 Driver shall be seated or in a recumbent position, feet forward.

S7.9 Driver shall demonstrate ability to exit the vehicle unaided in under 10 seconds.

S7.10 Driver shall remain in the vehicle while on the track unless there is an immediate danger.

DESIGN PORTFOLIO

D1 A design portfolio shall be submitted documenting the progress of the vehicle.

	Deadline to submit documentation	Objective	Documentation Required
12/11/2016	18 weeks before competition - DO NOT PROCEED UNTIL APPROVED	preliminary vehicle design - wheel layout, brakes, etc	submit document
1/8/2016	14 weeks before competition	battery and motor selection	submit document
1/8/2016	14 weeks before competition	preliminary electrical wiring diagram	submit document
1/22/2016	12 weeks before competition	final frame blueprint	submit document
1/22/2016	12 weeks before competition	battery and motor obtained	submit picture
2/19/2016	8 weeks before competition	electrical components bench tested	submit video
2/26/2016	7 weeks before competition	final electrical wiring diagram	submit document
3/4/2016	6 weeks before competition	frame assembled	submit picture
3/18/2016	4 weeks before competition	steering assembly installed and tested	submit video
3/25/2016	3 weeks before competition	brakes and wheels installed and tested	submit video
4/1/2016	2 weeks before competition	electrical components installed and tested	submit video
4/8/2016	7 days before competition	vehicle assembly complete and operational	submit video
4/15/2016	day of competition	documentation of vehicle testing	bring testing log to competition