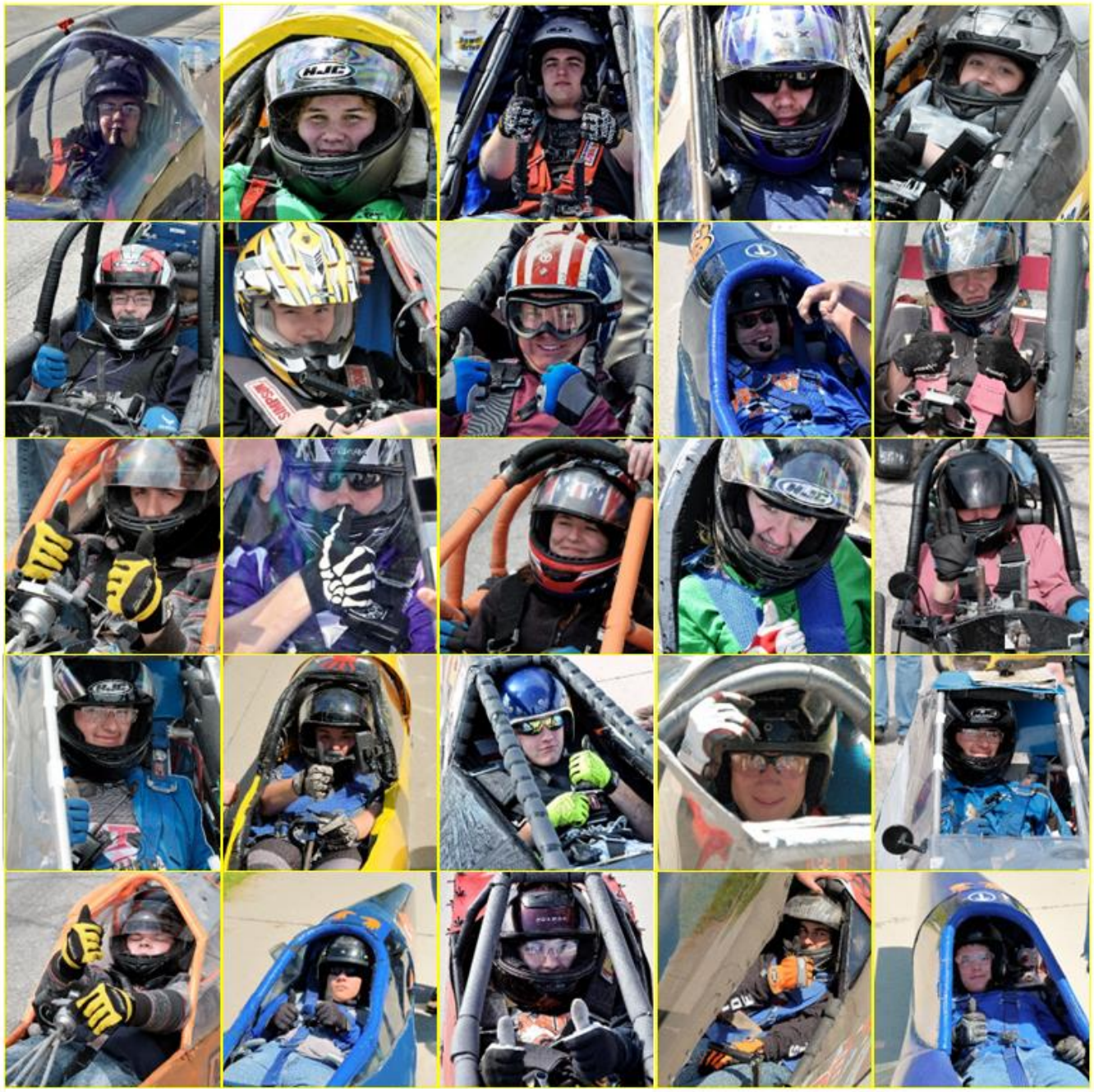
POWER DRIVE Rules for 2025

November 10, 2024



Power Drive Drivers in Their Natural Habitat

EVERON Power Drive

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1 Message from EVERON

In the past two seasons, we've used the rules cover page to highlight the noses and then the tails of Power Drive cars. This year, we celebrate the most important element of a Power Drive car – the drivers! These students are smart and hardworking. They have helped design and build the cars. They are confident and upbeat (note all the smiles and "thumbs up" gestures), safely buckled in with gloves and helmet, wrapped inside a strong roll cage, and brave enough to pilot the machines against each other. We salute each of you and your teammates!

As we did for 2024, there are no rules changes for 2025. Several rule change possibilities came up and were discussed. One example asked if we should allow batteries other than lead acid, such as lithium ion. They are allowed in the ChallengeUSA program in Wisconsin. That program supports several different competition classes, some of which permit lithium ion. However, we decided against it because of our size. We're barely big enough to support our four Classes now, so adding more Classes could result in Classes with only one or two cars in each. That does not seem very competitive. We still encourage you to submit suggestions for rule change!

We have been busy in other ways. Most of my time this year, aside from day-to-day administrative work, has been spent on the creation of an entirely new website for EVERON and Power Drive. The current website is aimed exclusively at disseminating information to the Power Drive teams. The new one will continue providing complete information to teams, but it will dramatically expand into serving the public in general. Most importantly, it will add a "Donate" function so we can more effectively raise money. We'll share more information about the site near the start of 2025.

We at EVERON (**E**lectric **V**ehicle **E**nergy **R**esearch **O**f **N**ebraska) are grateful for the continued support and participation of the many students, instructors, and volunteers who comprise Power Drive teams and conduct rallies. Venue and track owners are much appreciated for giving us a place to run. Please ask your friends, family members, and classmates to consider the program. Help us level up the competitions with more students, more teams, and more vehicles!

EVERON is a 501(c)(3) organization, which means that contributions (even non-cash) are eligible in most cases for tax deductibility for most donors. Fund-raising efforts will increase as we build a stronger base of support, especially once the new website is in production. We ask each of you to keep EVERON in mind as you solicit your own donors, some of whom may want to contribute to the larger EVERON program as well. The new website will also help you in your efforts!

Thank you, and please contact me, or Tony Cantrell (who organizes the rally operations) any time. Our contact information appears on the last page of these rules.

Sincerely,

Jim Morrow

President and Member of the EVERON Board of Directors

(402) 250-6588 (mobile number)

morrowjsr@gmail.com

2 Summary of Rules Changes

The rules of Power Drive change from time to time, usually on an annual basis. This section summarizes the changes. Details are found in the actual rule itself, which is cited in the summary of rules changes below.

This list of rule changes is shown in green text, the same as this document section. The same green text is used to highlight the rules changes elsewhere in the document, making it easier to identify the changes.

Please read all the rules to ensure full understanding. Power Drive leadership appreciates your input into the rules document, not only in its format and structure, but also for the rules themselves. It can only be a strong document with everyone's participation.

Here is the summary of the changes:

Section	Description
Entire document	Misspellings, grammatical corrections, format inconsistencies, punctuation mistakes, and similar typographical, layout, and/or language errors are fixed when found. These are not highlighted in green because they are not intended as rules changes.
None	There are no rule changes for 2025.

3 Membership and Participation

3.1 Membership

a. Membership for those wishing to compete in sanctioned Power Drive events is open to students from any high school or post-secondary school. There is no requirement for Nebraska residency. These students form teams with no limit on the number of members of one team. The program's focus is on high school students, however, and Competition Classes favor high school students through increased numbers of events within a rally. For any school, there is no restriction on grade level (such as first-year students, sophomore, junior, and senior). Each team, or each school or organization sponsoring a team, may impose its own requirements on team member eligibility.

b. Membership requires registration of the team at the point of joining the Power Drive program. During registration, the Power Drive program collects the appropriate contact information of the coaches, directors, or instructors who head the team. All team members, and anyone associated with the team who plans to be present in the team's Pit Row, staging areas, or near the track (outside of designated public audience locations), will need to submit a signed liability waiver sent out prior to the competitions. The names of the student team members are required on this liability form, but their contact information is not otherwise collected or retained by Power Drive or EVERON.

c. Collecting team size and contact information allows the program's administrators to plan for the number of participants in each rally or other event, schedule enough "heats," purchase insurance coverage, and communicate with all teams and participants. These participants are linked to the vehicle (or sometimes called "car") that each team builds for competition. There is no limit to the number of vehicles that each team may build and operate. If a team registers more than one vehicle, then some or all team members may be associated with one, some, or all its vehicles.

d. Once registered, the team may be asked from time to time to vote on, or submit a survey response for, a variety of items, such as rules changes, preferences, operational items, etc. These votes will, by default, be conducted on a one vehicle = one vote basis. Power Drive administration will have the final say. Note that the administration of the Power Drive program and membership is managed by EVERON or its designees.

e. All registrations and memberships are valid for the event season during which they compete. The event season is from January 1st to December 31st of each calendar year. All approved rule changes will take effect January 1 of each event year, or on a different date as announced by the Board.

3.2 Participants

a. Participation as a student is open to any student at a high school (grades 9 through 12) or a post-secondary school (community college, university, vocational school, etc.).

b. Non-student participation is encouraged and allowed for such roles as coaches, instructors, advisors, volunteers, rally officials, announcers, etc.

c. Program focus offers more emphasis on high school students, as described in later sections that describe the Competition Classes.

d. All participants must sign a liability waiver prior to any competition. Participants under 18 for any competition in each season must have a parent or legal guardian co-sign the liability release for that season. Participants may also have to sign a liability waiver specific to each facility that hosts a rally. Proof of age and of having a valid driver's license is required for vehicle drivers in competition.

3.3 Rules Change Sources and Submissions

a. Participation in Power Drive follows a set of rules to ensure safe and fair competition. Power Drive administration communicates rules and rules changes to the participants periodically. The primary method is via the EVERON website, but other methods may be employed as appropriate (example: email).

b. Sources of rules changes may be Power Drive or EVERON administrators, input from teams, suggestions from rally officials, and feedback from the public in general.

c. Rule change requests must be presented to Power Drive leadership in writing, via electronic forms, as responses to surveys, or in forums arranged to gather such input. If a proposed rule is consistent with the spirit and direction of the Power Drive program and competition, and will benefit the program, then program officials may work to approve the change, or present the proposal to the current-year membership for input or a vote. Final decision rests with the Power Drive leadership.

d. Approved rule changes will be included in the next edition of these Rules. It is possible that a given rule change is urgent enough to be immediately implemented. Either way, Power Drive administrators will include the effective date in any rules document distributions and notices.

e. Note that these rules all apply to the Power Drive competitions and program. Other entities may operate competitions that resemble Power Drive rallies and use Power Drive rules and structures. This is allowed and encouraged by Power Drive and EVERON in the spirit of promoting electric vehicles, electric vehicle competitions, and the associated knowledge and understanding. These entities do not need permission from Power Drive or EVERON to do so. Such competitions are not sanctioned by Power Drive or EVERON. They are not covered by the Power Drive or EVERON insurance or organization.

f. The rules governing EVERON are covered by EVERON's own bylaws and corporate policies. Leadership is provided by the EVERON Board of Directors, which may include members of the Power Drive leadership.

4 Competition Classes

Power Drive is a multi-class competition due to the number of participants and the variety of experience and skill levels involved. One team may have multiple vehicles entered in one or more Classes. The defining criteria for these classes are summarized in the following table, and then described in detail after that:

Class & Letter	Frame Age	Open to…	Dollar Limit	Events	Comments
Novice - "N"	1st year	High school only	$3,300	All (see Comments)	Competes against only "N" in Endurance Competes against "N" and "S" cars for Overall
Standard - "S"	1st year	High school only	$3,300	All	Competes against "S" cars in Endurance Competes against "N" and "S" cars for Overall
Advanced -"A"	2nd or 3rd	High school only	$3,800	All	Competes only against "A" cars for Overall
Exhibition - "E"	4th or more	High school or post-secondary	No limit	Endurance only	Competes against only "E" cars in Endurance No Overall eligibility

4.1 Standard Class

a. Open to teams composed of high school students only.

b. The basic frame, roll bar, and axle assembly cannot be carried over from a previous car, i.e., this vehicle must be a "first year" car.

c. The frame and roll bar construction must utilize the type and grade material described elsewhere in the Power Drive rules.

d. Vehicles must utilize belt or chain drives (no direct or fluid drive mechanisms).

e. No multi-speed transmissions permitted.

f. No regenerative braking systems permitted.

g. No solar panel recharging permitted.

h. $3,300 spending limit on the car (see the note later that describes this limit)

4.2 Novice Class

a. Open to teams composed of high school students only.

b. The Novice Class is identical to the Standard Class (see above) in all aspects except that to be entered in this class, the team that built the proposed Novice Class car cannot have won a trophy at any Power Drive-sanctioned endurance rally in the previous two seasons.

c. The Novice Class is an Endurance event classification only. These cars will compete alongside Standard Class cars in Braking, Maneuverability, Documentation, and Design & Construction without regard for the Novice Class designation.

d. Once a car receives a trophy in the Novice Class, it will be promoted to the Standard Class at the next Endurance event entered. The team will change the letter designation of the car from "N" to "S".

e. A Novice Class car stays in the Novice Class until either of two things happen:

- The car wins an Endurance event vs. other Novice Class cars. From that point forward in the current season, the car competes as a Standard Class car.
- A team can request promotion to Standard Class at any time. From that point forward during the current season, the car is considered Standard Class.

4.3 Advanced Class

a. Open to teams composed of high school students only.

b. Chassis must have a fully enclosed body except for driver entry and exit. All frame components, driveline systems, and the driver's body must be enclosed within the body shell. Open cockpit designs are acceptable. Wheels and tires need not be enclosed.

c. Alternative frame designs must produce documentation that demonstrates equivalent resisting bending moment to the materials described elsewhere in the rules.

d. The team must submit "multi-media" documentation as defined later in the Documentation section.

e. A “carryover” vehicle is one of the following:
   - A Standard Class vehicle that is moving to the Advanced Class for competition in a new season.
   - A Novice Class vehicle that is moving to the Advanced Class for competition in a new season.
   - An Advanced Class vehicle that is entering its second year of Advanced Class competition in a new season.
   - Note that Class changes as described above do not have to be in successive seasons. For example, a vehicle may have competed in the Advanced Class in the 2021 season. It does not compete in the 2022 season but picks up again in the 2023 season. This is permitted.

f. For carryover vehicles: Two of the major systems (examples are frame, electrical/electronics, steering, brakes, body, suspension, motor/driveline, and wheels) must be changed in at least one substantial way and documented from the previous season of competition from which the change is being made.

g. A vehicle may compete in the Advanced Class for no more than two seasons.

h. No multi-speed transmissions permitted.

i. $3,800 spending limit on the car (see the note later that describes this limit)

4.4 Exhibition Class

a. Open to teams composed of high school and post-secondary students. Teams made up of non-student enthusiasts are not accepted in any Power Drive competition. The drivers and team members, other than instructors and adult volunteers, must be students.

b. High school students entering a vehicle in this class will be considered "participants" for Power Drive Scholarship application purposes in the years during which such scholarships are awarded.

c. No “points” toward an overall championship will be awarded in this classification. This is an Endurance-only Competition Class.

d. Teams are not required to submit documentation or a Part List of the vehicle.

e. No spending limit on the car.

4.5 General Notes on the Classes

4.5.1 Deciding the Competition Class

a. Each team will make the initial decision about which Competition Class will apply to that team's vehicles by following the guidance offered by these rules.

b. Teams may seek an opinion of the Power Drive administration if desired. The Power Drive administration may inquire into the qualifications of a given vehicle to confirm proper classification.

c. The final decision rests with the Power Drive administration.

4.5.2 Dollar Limits

a. The dollar limitations are for the parts and materials used in the construction of the car as it is presented for the competition.
b. Dollar limits specifically exclude driver's clothing, driver-worn safety equipment, pit tools, spare parts, batteries used for non-Endurance activity (inspections, Maneuverability, and Braking).
c. Dollar limits specifically include the batteries used for the Endurance competition and all components (sending and receiving) of real-time telemetry devices. Batteries used for non-Endurance events are specifically excluded, provided they are not also used for Endurance.
d. If performance data, audio, and/or video (example: Car-Cams) is collected and later downloaded, the value of any collection hardware and software need not be included in the car value.

4.5.3 Parts List

a. The Documentation is to include a detailed listing of purchases, donations, and loans of all material used in the construction of the car. Itemization is to include the actual/estimated value and source of the material, and the year in which the item was acquired. This is necessary to enforce the spending limits of the various competition Classes in Power Drive. Even if other types of documentation are not submitted, this item must accompany the vehicle to compete in the Endurance competition. The Parts List is not required for Exhibition-Class vehicles.
b. It is preferable that each team includes the Parts List in a Documentation entry. However, if a team chooses to submit only a Parts List with no additional Documentation elements (such as the Journal, a marketing video, or monthly reports), the deadline for the Parts List to be submitted is described in part (c) of this rule. Failure to do so will cause the affected vehicle to compete only as an Exhibition Class vehicle. Beginning with the part (c) due date, and continuing for the remainder of the season, the affected vehicle will be judged solely as an Exhibition Class car even if it had entered the current Power Drive season in a different competition Class. If the affected vehicle team later submits a Parts List (as noted in part (c), then from that point forward, the vehicle may return to competing in its intended competition Class. This post-deadline submission applies only to the Parts List, not to other portions of the Documentation.
c. The deadline for submitting a Parts List alone is different from submitting the Documentation entry. The deadline is two calendar days before the Documentation submission deadline. Example: The 2021 Documentation submission deadline was Saturday, April 16. The deadline for the Parts List would have been Thursday, April 14, to meet this rule. For submissions later in the season, the deadline is two calendar days before the rally at which the restored competition

classification would take effect. This change in classification is not retroactive. The reason for the earlier deadline is to allow rally officials time to adjust heats and set up the race monitor and transponders to match the new classification.

d. Here is an excerpt of an acceptable parts list:

Part Name and Amount	Part Price ($)	Source of Part	Date
Motor: Etek	$350.00	Briggs & Stratton	2010
Controller: Alltrax 400 Amp AXE 4844	$380.00	EVParts.com	2010
Throttle: 5K Ohm Potentiometer	$99.00	Cloud Electric	2015
Wiring: 14 gauge for cockpit (80' @ $0.12)	$9.00	Menards	2014
Wiring: 4 gauge for battery	$25.00	Go Kart, Inc.	2014
Wheel Rim and Hub: 20" for front wheel	$200.00	Cloud Electric	2015
Brake Cables (2)	$21.98	Goosegear	2017
Steering "Push/Pull" handles: Custom Made	$5.00	Team	2017
Tie rods and ends	$12.00	Nebraska Fasteners	2013
Sprocket: Drive Wheel	$31.45	Jack's Small Engines	2015

4.5.4 Endurance Scoring for Standard and Novice Class Vehicles

a. Only in the Endurance Event are Standard and Novice Class vehicles scored separately. A Novice Class car could finish better than one or more Standard Class cars in an Endurance event. The Novice Class car (or “N car”) will still be scored only against the other Novice Class cars for the purpose of determining the finishing order of the cars.

b. Example: In a given Endurance competition, the cars finish with the lap totals shown below.

S-Cars	Laps	N-Cars	Laps
S-10	75 laps	N-15	77 laps
S-20	73 laps	N-25	72 laps
S-30	71 laps	N-35	70 laps
S-40	65 laps	N-45	66 laps

The awards given for the Endurance event are as follows:

Standard Class:	1st place	S-10
	2nd place	S-20
	3rd place	S-30

Novice Class	1st place	N-15

The N-15 car is promoted to Standard Class for the remainder of the season.

Even though some N cars had more laps than some of the S cars that placed, the N cars and S cars are judged only within their class.

c. This is different for how the “overall” points are awarded. When determining the Overall placings, there is no difference between the Standard and Novice Class cars. Overall scoring is described later in the rules. When determining overall scoring, here is the order of finish that should be used to award Overall points for the Endurance event:

Endurance Finish Order for Overall:			
	1st place	N-15	77 laps
	2nd place	S-10	75 laps
	3rd place	S-20	73 laps
	4th place	N-25	72 laps
	5th place	S-30	71 laps
	6th place	N-35	70 laps
	7th place	N-45	66 laps
	8th place	S-40	65 laps

5 Vehicle, Driver, and Safety

All vehicles and participants must meet all vehicle design and safety rules to compete at any Power Drive sanctioned event. This is true for competition, practice, and testing, and includes driver's clothing, safety equipment, batteries, battery-securing systems, seat belts, etc.

5.1 Vehicle

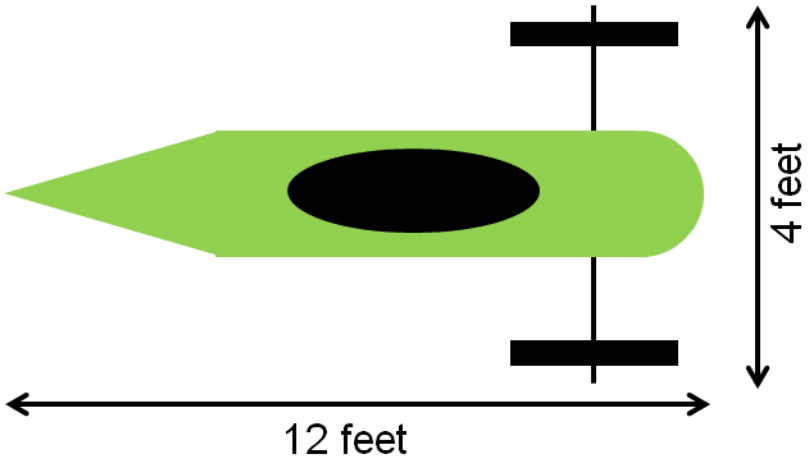
The following rules govern the design, construction, and operation of all Power Drive vehicles, regardless of Class, unless specified otherwise. The rules were developed for the safety of the participants and must always be followed.

5.1.1 Vehicle Dimensions

a. Maximum vehicle length is twelve feet.

b. Maximum vehicle width is four feet at its widest point when the steering system is positioned as if driving in a straight line.

c. NOTE: If the vehicle's steering wheels are turned right or left, it is possible that the vehicle will be wider than four feet due to the angle of the wheels used for steering. This is allowed. Measurements are made with the steering in a "straight ahead" position.



5.1.2 Vehicle Configuration

a. Vehicle must be designed so driver is positioned with his/her head behind torso, knees, and legs.

b. Vehicles must have at least three load bearing wheels. Such wheels are always in contact with the ground.

c. NOTE: A vehicle that frequently has one or more wheels visibly lose contact with the ground is subject to a black flag for either a defective design and/or unsafe driving.

5.1.3 Frame Material and Construction

a. All vehicles must have frame members and padding that protect the driver in the event of collisions from any direction.

b. The minimum size of such frame members is:

- 1-inch O.D. round, or 1-inch square tubing with:
  - 0.0625-inch (16-gauge) wall thickness for mild-steel
  - 0.058-inch wall thickness for 4130 chrome moly
  - 0.083-inch wall thickness for aluminum
- ¾ inch (nominal) rigid conduit with:
  - .0625 wall thickness for steel

c. The minimum size for extra support, used in triangulation will be:

- ¾ inch O.D. round, or ¾ inch square tubing with:
  - 0.0625-inch (16-gauge) wall thickness for mild-steel
  - 0.058-inch wall thickness for 4130 chrome moly, and
  - 0.083-inch wall thickness for aluminum
- ¾ inch (nominal) rigid conduit with:
  - .0625 wall thickness for steel

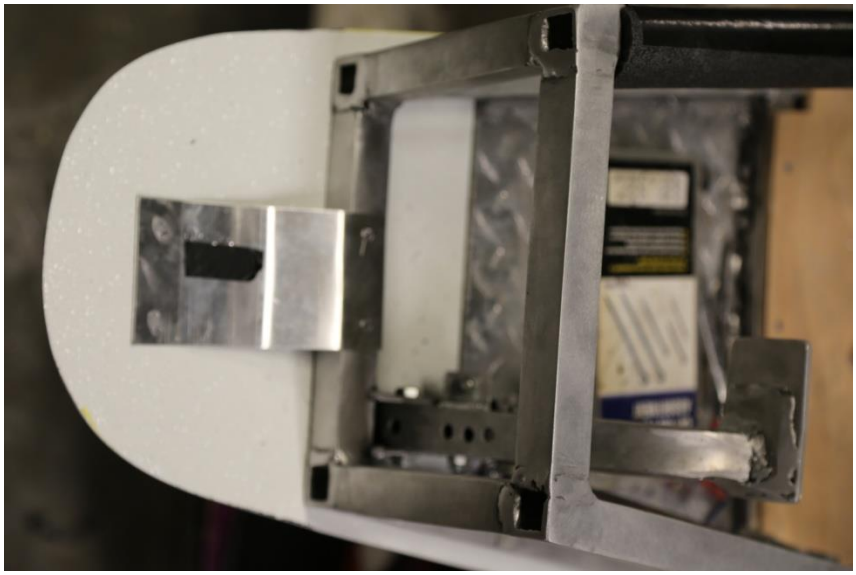
d. Frames constructed of other materials are allowed on Advanced and Exhibition class vehicles providing it is demonstrated and documented that the alternative materials or methods provide equal or greater structural strength and protection/safety. Documentation of the calculations and/or testing of alternative frames is mandatory.

e. Padding must be installed to prevent injury from contacting the frame members in the event of an accident. Padding must be at least 1/2-inch thick and made of closed-cell foam. The padding must be installed in any location within the cockpit where the driver has a reasonable chance of making hard contact in the event of collision or rollover. See the photo example below:

Padding installed around the roll cage tubing

5.1.4 Impact Protection

a. Each vehicle shall have structural members at the front of the vehicle to be a barrier, or bumper, to protect the feet of the driver and to help prevent intrusion into another vehicle in the event of contact. The minimum dimension of these structural members shall be eight inches in the horizontal and eight inches in the vertical dimensions. The barrier must be made of materials that meet the minimum standards for frame components. See the photo example below (front of car is to the left):



Front-end protection - 8" x 8" Frame Members (top view)

b. Blunt aerodynamic fairings, or similar structures, may be used in front of the protective members to enhance airflow or for other purposes.

c. Impact protection is required for both single- and double-wheel front ends, rear- and front-wheel drive, etc. In the case of a front-wheel drive vehicle, for example, the protective member would be between the front-wheel drive assembly and the driver's feet.

5.1.5 Roll Cage

a. Frame members on the side of the vehicles shall be designed to help ensure that another vehicle cannot intrude into the driver's compartment in the event of contact. Therefore, the maximum open space between adjacent frame/reinforcing members must be less than six inches. That is, a six-inch diameter sphere should not pass through any of the frame openings. Side impact protection must extend up to the highest level of the driver's shoulder.

b. All driver extremities must be contained within the vehicle's frame during operation. Cars where the driver's arms or legs are not completely protected will not be allowed to compete.

c. Monocoque frame cars must be constructed of materials sufficient to protect the driver in the event of a side impact. Teams should seek a ruling from the Power Drive administration to verify approval prior to inspection and competition. Inspection is still required prior to each rally.

d. The frame protection must extend high enough to provide a 2-inch space cushion above any body part of the largest driver. This is determined by drawing a straight line from the top of the roll cage to the next lowest support point on the vehicle frame that can support the vehicle in the event of a rollover. The front wheels of the vehicle are not considered to be strong enough to be the next-lowest support point.

e. The center of the driver's helmet must be positioned directly below the roll bar when in normal driving position.

f. A head restraint, capable of withstanding a force of 100 pounds or greater in the rearward direction, is required to prevent whiplash.

g. The roll cage must be cross braced to the chassis, forward and rearward from a point that is no more than three inches vertically from the top of the roll cage.

h. Forward roll bar bracing shall form a protective cage around the driver and be designed to protect the driver from side/front impact injury. Placing a straightedge across the front roll cage braces and running it down and forward, the edge must not touch the helmet, face shield or other body part of the driver. The cage must be made of tubing that meets the minimum standards for frame/bracing components.

i. An inspection hole, at least 1/8-inch diameter, may be drilled in a non-critical area of the roll cage to permit inspector confirmation of the wall thickness. Such a hole will be drilled if it is deemed necessary by the inspection officials.

j. Padding must be installed to prevent the driver's body from being injured when contacting the roll cage or head restraint in the event of an accident. Padding must be at least 1/2-inch thick and made from closed-cell foam.

k. All parts of the driver shall always be within the frame cage when in the normal driving position.

l. For the Advanced and Exhibition Classes only: Roll cages constructed of other materials may be allowed if it can be demonstrated that the alternative materials provide equal or greater structural strength and protection/safety. It is the team's responsibility to provide this evidence.

m. Any questions regarding frame/roll cage compliance should be addressed by contacting the Power Drive administration well before the first competitive use of the vehicle using the frame or roll cage. An acceptable roll cage example is shown below:

Roll cage with bracing front and rear

5.1.6 Wheels and Axles

a. Wheels must be strong enough to support not only the weight of the vehicle, but the sideway stress experienced during turns at speed. Plastic BMX type wheels are not recommended, since they often cannot withstand the side loads applied.

b. The wheels and axles must be strong enough to withstand the stresses of the Braking, Maneuverability, and Endurance competitions.

c. Wheels must be separated from making any contact with the driver during operation.

d. Axles require a minimum diameter of 12 mm or 1/2-inch unless supported at both ends.

e. Safety wire or cotter pins must be used to secure cantilevered wheel axle nuts. Nylon lock nuts alone are not acceptable. A cotter pin example is shown below:

Cotter pin inserted into the wheel nut for safety

f. A one-time variance may be allowed at the discretion of the inspector for using double nuts for teams that forget this requirement. The nuts must be installed in the presence of an instructor or an inspector to ensure effective installation.

5.1.7 Tires

a. Tires must be pneumatic.

b. Vehicle ground clearance must exceed the sidewall height of the tire to keep the vehicle off the ground in the event of a flat tire. This is true even if all tires have gone flat.

5.1.8 Steering

a. Steering arms, rod ends, wire rope, ball joints, and all associated hardware serving to mount any steering elements must be equivalent or greater in strength than 3/8-inch diameter steel rod.

b. If using an “equivalent” material, the vehicle’s Documentation entry must show the strength verification/calculation for steering components. Team members should be able to describe the process used for that verification/calculation at vehicle inspections if asked.

c. Kingpins must be made of material that is as strong as or stronger than a 3/8-inch grade 8 bolt.

d. Vehicles must be able to turn a full 360° within a 25-foot turning radius as measured to the inside wheel of the turning vehicle.

e. Fasteners used to connect all steering related components must be pinned or safety wired. A one-time variance for double nuts may be allowed here at the discretion of the inspector.

f. No tiller or handlebar steering designs are allowed.

5.1.9 Stability

a. All vehicles must demonstrate inherent stability at rest, and while cornering, braking, and cruising at top speed.

b. Vehicles that do not exhibit such stability, either due to the design and construction of the vehicle, or due to the way it is driven, are subject to a black flag stoppage or may be prohibited from running at all.

5.1.10 Brakes

a. All vehicles must have mechanical or hydraulic brakes.

b. Vehicles must have brakes on at least two wheels that are "on the same axle" (either both front or both rear wheels). It is optionally allowed to have additional brakes on more than one axle.

c. Hand-operated brakes must allow full application without taking the driver’s hands off the steering controls.

d. Brakes that use a ground-contacting mechanism (other than the wheels themselves) are not allowed.

e. Effective braking will be checked before the Endurance event. A “push-test” will be conducted on all vehicles during inspection and/or immediately before the start of each Endurance heat. The brakes must be capable of holding the vehicle stationary while being pushed by one person.

f. Brakes must be able to stop the vehicle in a straight line without locking the wheels.

g. For Advanced and Exhibition Class only: Regenerative braking is permitted in addition to conventional brakes.

5.1.11 Body

a. The body should not have sharp edges, pointed nose cones, corners, or other protrusions that could injure spectators or other drivers.

b. The vehicle must have a fixed floor pan that prevents the driver's body from contacting the ground. Floor pan must be a solid material, no expanded metal.

c. Driver must be capable of removing the canopy unassisted. Enclosed canopies will not be taped-on or fastened in a manner that could hamper emergency egress.

d. The body cannot be made of cardboard, paper, or any material that becomes weak when wet. Materials that are brittle or produce sharp edges when broken (examples are Plexiglas or brittle acrylic panels) are also not allowed.

e. Vehicles must display the following items on the body:

- Competition Class letter (must be an upper-case letter):
  - N – Novice Class
  - S – Standard Class
  - A – Advanced Class
  - E – Exhibition Class
- Identification numbers:
  - All vehicle numbers will be one-, two-, or three-digit numbers, preceded by the classification letter. Once a number is issued, it will normally be retained in subsequent competitions and seasons.
  - There are no minimum or maximum dimensions for the alphabetic or numeric characters, but they must be easily readable by the lap counters and rally officials, including when the vehicle is competing at speed.
  - Vehicle numbers must be displayed on both sides of the vehicle. They are optional on the top, front, and rear of the vehicle.
  - Vehicle numbers must be a contrasting color compared to the vehicle to be easily readable.
  - It is possible that one or more of the car's numbers will fall off, or be damaged by a collision, such that it is unreadable. The numbers do not have to be replaced or repaired once the heat is underway because these numbers are not needed for scoring due to the use of transponders. However, if the rally officials decide the numbers must be replaced, then that vehicle team may be required to make a pit stop to place replacement numbers on the car. An example of a temporary fix is the use of tape strips shaped in the car's number, or some other acceptable method. If such replacement is not deemed reasonable by rally officials, this requirement can be dropped. Example: Numbers were on a large canopy that can't itself be replaced, and there is no room for adding replacement numbers elsewhere on the car.
- Decals issued by Power Drive / EVERON:
  - A Power Drive Logo Decal, which will be provided by the Power Drive program, must be affixed to each car in a position that is clearly visible as a car is driving in a rally.
- Decal recommendations (these are not required but are recommended):

- Display the school's name on each side of the vehicle. Cars with visible names and numbers are easier for judges and spectators to notice and recognize during a heat, better facilitating accurate lap counting, and enhancing the audience experience.
- Add a "Push Here" or similar sign at the proper "push points" on the vehicle. Rally officials may have to push a car clear of the track in the event the car is disabled. Damage to the body structure may occur during such pushing if these markings are not present.
- An example of good decals and numbering is shown below:

"Push Here" decal

Readable Number

Team Name

5.1.12 Drive Train

a. All chains, gears, etc., must be guarded or covered to minimize exposure of personnel to "pinch-points" at the pulley/sprocket.

b. The guard must be designed such that no driver can reach out and get a body part into the chain or belt at any point. The guard/cover shall also serve as damage and injury protection for slipped or broken belts/chains.

c. The vehicle must be rendered inoperable (example: main power turned off or disconnected) whenever the guard/cover is removed for access to the chain/belt.

d. Fully enclosed body sections fulfill this requirement if there is a barrier between the driver and the chain.

e. Gear ratios may be changed between the events at a rally. It is not required to use the same gear ratio for all events. Within a given Event, once a car begins competing in that Event, the gear ratio may not be changed. Example: Car A-01 begins an Endurance heat using "N" as its gear ratio. The value of "N" cannot change until the heat is completed, even if car A-01 makes changes or repairs to other parts of the car. Similarly, once A-01 begins the Maneuverability or Braking Events, it cannot have its gear ratio changed from one run vs. another until it has completed that Event.

5.1.13 Electrical System

a. All vehicles must have a fuse or a circuit breaker between the battery and any electrical load.

b. A "master" battery disconnect switch or circuit breaker must be accessible by both the driver and by officials during the competition. The disconnect switch, or pull cord for the disconnect switch, must be mounted on the outer part of the roll bar assembly near the driver's shoulder level (or

higher) and clearly marked with a red (or red outlined in white), equilateral (approximately) triangle with four-inch minimum sides. The driver's disconnect switch shall be mounted where he/she can operate it from the driving position. The driver's switch can either be a separate device or the same as the device for the race officials. The driver will be asked to demonstrate its use during the vehicle inspection.

c. Power to the motor must be controlled by the driver. It must turn off automatically when the driver releases the accelerator. (Example: spring-loaded retraction to the "off" position of the throttle mechanism.)

d. Wiring must be of suitable size so that the fuse will blow, or the breaker will trip, before the cable or its insulation can melt.

e. Wiring should be neat, well insulated, and securely tied to the frame.

f. All wiring must be kept clear of moving parts and protected from chafing and being snagged.

g. The vehicle frame may not be used as a conductor for any part of the electrical system.

h. For Advanced and Exhibition Class only: A maximum of one square meter of solar cells is allowed. The one square meter maximum refers to actual cell area and does not include areas between the cells. The cells must be safely attached to the body of the vehicle in such a manner that they do not protrude from the front, sides, or rear in a dangerous manner.

5.1.14 Lighting

a. All Power Drive vehicles must be equipped with a clearly visible brake light that is activated automatically whenever the brakes are applied.

b. The brake light should be easily seen by a following vehicle and have a minimum visible area of 4 square inches. Minimum height of brake light is the center of rear wheel.

5.1.15 Batteries

a. Batteries must be lead-acid only. Only batteries that will not leak if punctured, such as gel cell or AGM (Absorptive Glass Mat) will be allowed to participate.
b. The number of batteries and the voltages are not limited but must meet specified weight limits (see below). Alternatively, they must be one of the accepted battery types listed (see below).
c. Batteries must display all original manufacturer labels. Batteries must be commercially retailed and available to any competitor. Custom-built or specialized batteries are not allowed.
d. Batteries must be "stock" and unmodified in any way and meet all conditions of the manufacturer's written warranty.
e. Total battery weight cannot exceed 67 pounds including any batteries used for motor controllers, contacts, relays, solenoids, instrumentation, computers, etc. Batteries used for two-way communications devices are not included in the total battery weight. Note: Many batteries advertised by the manufacturer at 31 to 33 pounds are in fact above 34 pounds when prepared for use. It is suggested that arrangements be made in advance with your suppliers to return

batteries that don't meet this requirement. Non-compliant batteries will not be allowed to compete.

f. Due to their construction and power ratings, the following batteries will be allowed, regardless of weight:
   - Optima Red Top SC25A, SC35A, SC75/35 (side and top post), 75u, 75/25
   - Optima Yellow Top D35, D75/25
   - Odyssey Genesis G42 (VP, VPX, EP, EPX)
   - MK 40
   - Exide Orbital Model 75/35
   - Champion Vortex 75/35
   - In addition, any commercial gel-cell or AGM battery with a manufacturer's rating of 45 amp-hour or less and a cold cranking (0 degrees F.) capacity of 720 CCA or less may be considered as legal (in terms of battery capacity) by Power Drive officials. Any team wanting to use a battery pack of more than 67 pounds that is not on the list above must get it pre-approved by the Power Drive administration.

g. Batteries of vehicles are weighed prior to the first competition by a given vehicle and whenever new batteries are introduced to that vehicle. In addition, batteries are subject to being weighed randomly at the discretion of Power Drive officials at any time at each rally.

h. Batteries mounted within the confines of the frame rails do not have to be mounted in a protective "box." The batteries (or battery box if used – see below) must be securely fastened to the frame using bolts and/or clamps. “Bungee” or other elastic cords are not sufficient.

i. Batteries mounted outside of the frame rails must be enclosed in a rigid box or other structure that will protect them from puncture. The design of the battery box shall be non-conductive, or if made with conductive materials, the battery terminals cannot contact the conductive material.

j. All batteries must be securely attached to the vehicle in such a manner as to withstand an impact or rollover.

k. All battery terminals must be covered with non-conductive material to protect from accidental contact.

l. Batteries may not be remotely recharged or replaced once the endurance competition has begun.

m. Batteries used for the Braking and Maneuverability events do not need to comply with the weight restrictions of this section. Other battery requirements are still in effect.

n. A Power Drive rally official will be allowed to pre-certify “competition” batteries prior to the competitions. If a team chooses to have this done, they should contact a Power Drive official to arrange for such pre-certification. If a battery which has been pre-certified is replaced during the season, the replacement will have to be newly certified.

o. Except for communications devices, camcorders, Global Positioning System (GPS) devices, and small, bicycle-type speedometers, no accessory batteries are permitted.

5.1.16 Mirrors and Vision

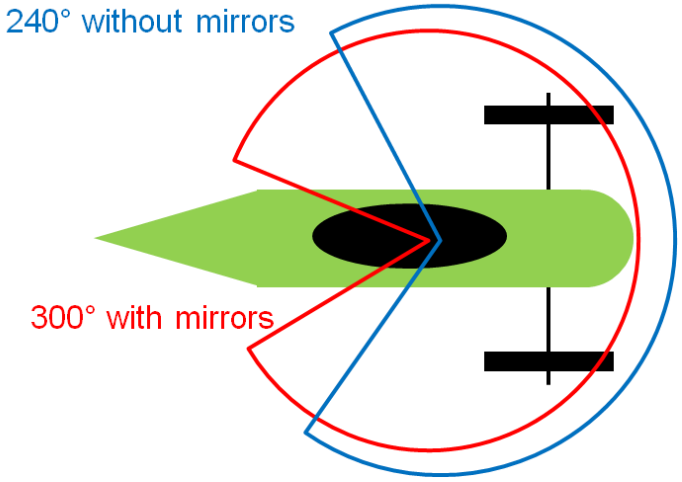
a. All vehicles must have at least one functional rearview mirror (two or more recommended) with a total mirror area of no less than eight square inches.

b. These mirror requirements are for the inspection and start of a heat in which the car participates. It is possible that one or all mirrors come off the car or become nonfunctional during the heat. If the mirror can be readily replaced or adjusted in a short time, teams should try to do so on a subsequent pit stop, but rally officials will not require it. The driver must work to compensate through more careful driving, direct visual sighting of nearby traffic, and the avoidance of unsafe movement. However, if rally officials deem the driver is not driving with adequate safety, the car

may be black-flagged for either a mirror replacement/adjustment or stopped from further competition in that heat.

c. Without mirrors, the driver must have at least 120-degrees field of vision on each side of the vehicle as measured from the front of the vehicle's centerline (240 degrees total).

d. Adding in the mirrors, the driver must have at least 150 degrees of unobstructed vision to each side as measured from the front of the vehicle's centerline (300 degrees total). Vision obstructed by frame members is an allowed exception to this rule. Vision must be provided without the need for manual adjustment of the mirrors. Examples of the visibility angles are shown below:



5.2 Driver and Pit Crew

5.2.1 Driver and Driver Clothing

a. All drivers must wear DOT-approved motor vehicle/motorcycle helmets (full-face helmets are recommended) with a Snell rating of 95 or greater. The helmets must be clearly labeled as meeting the Snell rating. Bicycle helmets are not acceptable.

b. Helmets must be worn with the chin straps correctly fastened.

c. Drivers for all driving events must wear the following items:

- Helmet (see above)
- Long-sleeve shirt
- Long pants
- Enclosed shoes
- Gloves (made of leather or other protective material)
- Z87 approved eyewear (safety glasses or helmet face shield)

d. NOTE: Teams should verify that protective eyewear meets the Z87 standard, typically through the packaging material, the manufacturer's website, or similar sources.

e. Here is a brief introduction of the standard taken from the standards body's website in 2017: *"ANSI/ISEA Z87.1-2015 prescribes the design, performance specifications, and marking of safety eye and face products, including millions of safety goggles, spectacles, face shields, and welding helmets, worn by workers in thousands of manufacturing and processing facilities, university and research laboratories, and other occupational settings. It was developed by the Z87 Committee on Safety Eye and Face Protection, which is administered by the International Safety Equipment Association (ISEA) and approved by the American National Standards Institute (ANSI). Safety eyewear conforming to the standard is widely used in the U.S., and the standard is incorporated into OSHA regulations for personal protective equipment."*

f. All drivers must be at least 16 years old.

g. All drivers must hold a valid driver's license. Learner's permits and school permits are not acceptable.

h. For all phases of the competition, the vehicle operator is to weigh at least 160 pounds. All personal protective equipment, including helmet, clothing, and glasses are considered part of the driver and count toward the 160-pound minimum.

i. Drivers weighing less than 160 pounds must carry enough ballast to fill that difference.

j. A pit stop must be made during one or more pre-determined "windows" of time as announced by the rally officials. The purpose of this pit stop is to conduct a driver change (see below).

- Each vehicle team must furnish at least two qualified drivers for the Endurance event. When changing drivers during the driver change pit stop, the vehicle may return to competition as soon as the driver change is completed.

- If a second driver is not available for the Endurance competition, one driver may participate. If a vehicle is using a single driver, a team representative should inform the Power Drive rally official in charge of the Pit Row area of this fact. A rally official will then be prepared to observe and time the Pit Stop accordingly. Single-driver participation is subject to the restrictions imposed by the following two options:
    - Option #1: The driver must exit the vehicle completely (standing erect outside the vehicle with both feet on the ground on the same side of the vehicle), and may then immediately get back in, as if this was a "new" driver.
    - Option #2: The driver may stay in the vehicle without exiting, but the vehicle must remain stationary for three minutes before returning to competition.

k. Drivers must be able to exit the vehicle, unassisted, in 20 seconds or less. This ability will be demonstrated by at least one driver during vehicle inspections.

5.2.2 Pit Crew Students and Non-Students

a. Pit Crew member definition: The members of a "Pit Crew" must be student members of the car team. The students must perform all work, adjustments, repairs, etc., of the car during a rally except as allowed under the remaining parts of this rule.

b. Instructors, adults, and other non-student personnel may always be coaches, advisors, cheerleaders, equipment carriers, managers, etc. However, they are prohibited from touching the car because that is only allowed for the members of the Pit Crew, with limited exceptions described in the following parts of this rule.

c. If a team has a very limited number of student members, a non-student may touch the car as described below in parts (d) through (g). Note that if a team has adequate numbers of student team members, these rules parts are not interpreted to allow non-student participation that involves touching a car. The definition of "adequate numbers" is up to the judgment of the rally officials. It is based on a combination of number of students, number of cars, the mix of events at a rally, and the number of cars from that one team involved in these events.

- Example #1: A team with one car, one non-student, and three students qualifies to allow the non-student to assist as described in parts (d) through (g) during Endurance because it would be two students working directly with the driver change while the non-student holds the canopy, but not for non-Endurance events because there are enough students to assist with navigation, line-up, carrying equipment, etc.
- Example #2: A team with one car, one non-student, and four students does not qualify to allow the non-student to assist as described in parts (d) through (g) because there would always be at least three students available to assist in driver changes and in competing on non-Endurance events.
- Example #3: A team with two cars, one non-student, and four students qualifies to allow the non-student to assist as described in parts (d) through (g) during non-Endurance events because there would be a significant need to have more than one student assisting the driver for navigation, line up, carrying equipment, etc., and also during Endurance but only if both cars are in the same heat.
- Example #4: A team with two cars, one non-student, and four students does not qualify to allow the non-student to assist as described in parts (d) through (g) in Endurance events if the cars are in different heats.

d. The non-student may hold the car's canopy, tools, flashlight, and similar items during a pit stop.

e. A non-student team member may push the car, carry batteries, manage Pit Row equipment, and carry car parts (such as the vehicle's canopy) between various points during the rally, such as from the team's staging area to Pit Row.

f. The non-student may assist a driver into and out of the car for the beginning or end of inspections, and at the beginning or end of the heat for that car. This may not be done during a driver change pit stop unless the driver is the sole member of the team at this rally. Such a situation should be pointed out to rally officials in advance of inspections and before the start of the heat so it can be properly enforced during the rally.

g. The definition of "during the rally" for this rule is from the point of the car's successful inspection until the completion of the last event for the affected car. This specifically allows loading, unloading, preparation for inspection, clean-up, repairs (or partial repairs) of a car following a vehicle becoming too disabled to continue competing (even if other events are still running at a rally for other cars).

h. If a non-student is found by rally officials to be in violation of one or more of parts (d) through (g) above, then that car shall be penalized in Endurance by either holding the car in a Pit Stop by an additional two minutes or by black flagging the car into Pit Row and holding it there for two minutes. If it is not possible to apply the above, then the car's final lap total will be decreased by several laps at the discretion of the rally officials.

5.2.3 Pit Crew Clothing

a. Pit Crew members must wear the following items (example photo shown below):

- Long-sleeve shirt
- Long pants
- Enclosed shoes
- Gloves (made of leather or other protective material)
- Z87 approved eyewear (see references to the Z87 standard elsewhere in the rules)

Pit Crew wearing proper safety clothing

b. Special rule for Gloves: It is possible that crew members will need to work on small parts or use small tools while performing their duties. In these cases, the gloves may be left off. The rally officials who enforce Pit Row Clothing rules have discretion to apply this special rule with preference given toward allowing gloves to be off.

5.2.4 Weight and Ballast

a. Driver and ballast will be weighed during the inspection phase of each rally.

b. Ballast carried to supplement the driver's weight must be securely fastened to the car and not upon the driver's person. Examples of prohibited attachments include bungee cords or being taped to the car.

c. Ballast must be removable for weigh-in.

d. Only three types of ballast are acceptable:

- Barbell-style weight discs (either padded or bare) fastened to the frame by bolts, straps, or held in a container fastened to the frame.
- Moldable bags of sand or shot. These must be sealed bags that can be fastened to the frame by straps or held in a container fastened to the frame. The bags must be labeled with the exact weight.
- Metal bars or blocks with smooth edges. No more than four bars can be used at a time for the total ballast of one driver. Bars must be clearly marked with their individual weights and fastened to the frame by bolts, straps, or held in a container fastened to the frame.

e. Each driver is responsible for providing the correct amount of ballast.

f. Ballast cannot be performance-enhancing or structure-related equipment. Example: For a track on which the vehicles always turn left, it would be a performance enhancement to place the ballast on the left side of the vehicle, improving its resistance to rollover. This is not allowed. As a rule, the ballast should be placed in a neutral position relative to the center of gravity, somewhere along the centerline of the vehicle.

g. Ballast cannot be equipment that would otherwise be carried by the driver or used in the cockpit. Examples: Communication equipment, gauges, computers, cameras, wheel-balance weights, etc. Helmets and clothing are allowed to be part of the weight of the driver.

5.3 Safety

Teams are subject to penalties for each non-compliance issue. The size and nature of the penalties are at the discretion of the Power Drive rally officials. Lap / time penalties and disqualification are examples that could be assessed in addition to the required correction of any con-compliance.

5.3.1 Seat Belts / Harness

a. All vehicles must be equipped, at a minimum, with a five-point safety harness. Its connection points will cover the driver's waist (right and left) shoulders (right and left) and crotch area.

b. The harness belt strapping is to be at least two inches in width.

c. The harness set must be commercially available and installed in the vehicle in accordance with manufacturer's instructions. Evidence of installation compliance must be included in the vehicle's Documentation entry.

d. The harness shall be equipped with a quick release to allow easy exit from the vehicle.

5.3.2 Safety Equipment

a. All moving parts that could endanger the driver must be shielded.

b. Each vehicle team must have a ten-pound dry chemical class C fire extinguisher present and easily accessible in the pit area for that vehicle.

c. All safety equipment must be in place and fastened before the driver leaves the pit during each event.

5.3.3 Communications Devices

a. "Push-to-talk" and "walkie-talkie" radios are permitted as long as the driver is not significantly distracted by the action of operating the radios.

b. Cell phones are permitted only when vehicle is at a stop (such as a breakdown, pit stop, or red flag stoppage) or when in hands-free mode on an open line that requires no dialing once connected.

c. Texting is banned by the driver whenever the car is in motion.

6 Competitions

Many of the following descriptions and rules describe things in the English system of measure, such as feet or pounds. It is acceptable to use a different form, such as metric, as desired while using equivalent sizes.

6.1 Eligibility

For cars to be eligible for competition in a season, all the following must apply:

- Vehicle teams must register with Power Drive in advance of the team's first competition.
- Each car must pass inspection at the start of each rally.
- Each vehicle must be registered as members of Electrathon America for the current year. Teams must show their membership card from Electrathon America (or a copy). Alternatively, the team must show its application (or a copy) for such membership if the membership issuance process is not yet complete.

6.2 Braking (Driving Event)

The Braking event demonstrates how well a vehicle can stop. It relies on a formula that considers the speed of the vehicle at the time braking begins and the stopping distance. The result is a "Braking Efficiency" score, with the best score winning the event. In 2018, the unit of measurement for distance is changing from feet to meters. In some cases, the meters value will be rounded off to a whole number. For example, ten feet will now be treated as three meters. Similarly, the unit of speed will change from miles per hour (MPH) to meters per second (MPS). Rules entries that formerly described feet and MPH will be changed to meters and MPS and marked in green.

This change to meters affects only the Braking event. It is tied to the special equipment we use to help automate the Braking event.

6.2.1 Participation in Each Competition Class

Standard:	Required
Novice:	Required and judged within the Standard Class
Advanced:	Required
Exhibition:	Not required, and not allowed to participate

6.2.2 Braking Efficiency

a. All competing vehicles will demonstrate their braking efficiency in the Braking Event. From a running start, at approximately 7 MPS (meters per second), the drivers will be signaled to stop the vehicle in as short a distance as possible within a bounded area known as the Stopping Area. The vehicle must be kept under control and within the Stopping Area during the stop. (NOTE: 7 MPS is approximately 15.66 MPH.)

b. Failure to stop within the Stopping Area will count as one of the two runs. It will be scored using the "Calculated Result" described later.

c. Stopping distance and speed at the time the driver is signaled to apply the brakes will be factored into determining the braking efficiency.

d. NOTE: Some of the formulas used with Braking show a calculation such as: "Speed^{2}" which is read as "Speed squared" when speaking it. This means taking the value of the Speed and multiplying it times itself once. Therefore, if Speed = 7 MPS, then when squared it would be 7 x 7 = 49.

e. Braking efficiency will be computed using the following formula:

$$\text{Braking Efficiency} = (\text{Vehicle Speed})^2 \ / \ (2 * \text{Stopping Distance})$$

f. The higher the braking efficiency value, the better the score.

6.2.3 Braking Event Operation

a. Refer to the diagram shown in the next section.

b. Each vehicle is required to make two runs, with the average of the two being used to determine the score.

c. If a vehicle has only one run (such as after suffering a breakdown that prevents a second run), then the value of the one successful run (called the “first run” below) will be included, and the value of a second run will be calculated.

- The calculation of the second run’s value will start with the value of the first run’s speed and stopping distance.
- Three meters will be added to the first run’s stopping distance
- One half meter per second (0.5 MPS) will be subtracted from the first run’s speed.
- Then the second run’s value will be calculated as if the vehicle had made a run with these calculated values.
- The first run and second run will be fed into the event’s raw score as normal.

d. If a vehicle makes no runs that result in a score, then that vehicle receives a zero for the event, but is not otherwise disqualified from any other event or from the overall points scoring and rank.

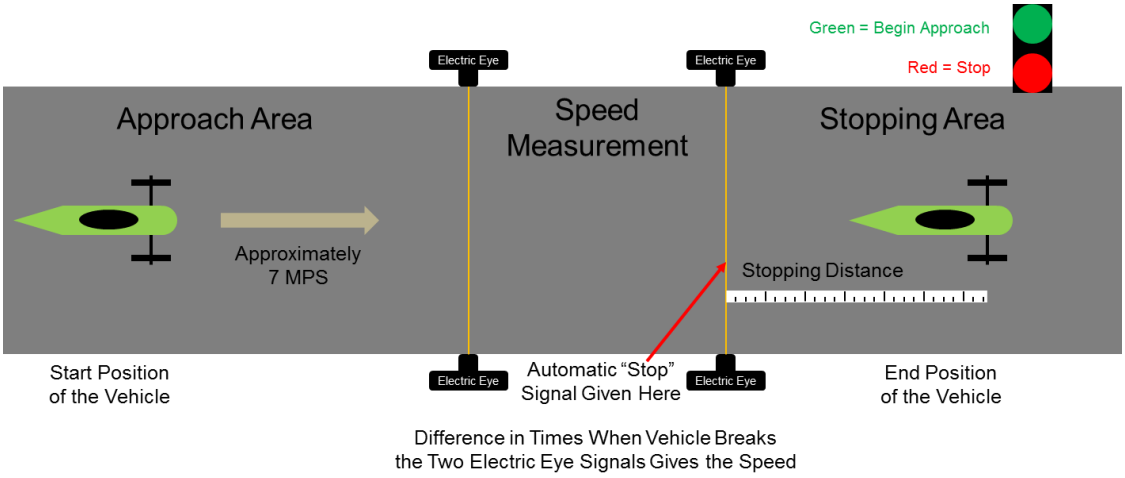
e. Vehicles will be ranked and awarded points based on their placement in the Braking event relative to other cars in their Competition Class. See the scoring description later in the Overall Scoring section.

f. The Braking Event is worth as much as 100 points toward the Overall Championship.

g. Separate battery packs may be used for the Braking Event.

h. The vehicle must be in the same body configuration for the Braking Event as it is when starting the Endurance Event. This includes all vehicle body parts and canopies in place, driver fully buckled into the car with safety equipment being worn, etc. However, a team may use different drivers for each event if desired, as well as different gear settings.

6.2.4 Braking Event Layout



This is the sequence of events for a single Braking run:

1. Vehicle is positioned and stopped at the far end of a long approach area.
2. Officials signal the driver to begin the run by changing the signal to "green."
3. Driver begins moving toward the Stopping Area.
4. Driver will attempt to move at 7 MPS or a little faster. If one is available, officials will utilize some form of RADAR-controlled display that shows speed. If not, driver will make the best attempt at going at least 7 MPS.
5. Vehicle crosses the first Electric Eye. The event equipment then begins counting the time.
6. Vehicle crosses the second Electric Eye. The event equipment automatically flashes the "Stop" signal, ends its timer count, and displays the time to the rally official. This time is recorded on the score sheet.
7. Upon seeing the "Stop" signal, driver stops the vehicle as quickly as possible within the Stopping Area and holds that position.
8. Event officials measure the distance from the second Electric Eye line to the front axle of the vehicle. This distance is reported to the rally official keeping the score sheet.
9. Upon completing the measurement, Event officials instruct the driver to depart the Stopping Area. If this was the first run, the driver returns to the Starting area for the second run. If not, the driver moves on to the next event or back to the staging area.
10. Later, when the event is complete, the data is entered into a spreadsheet for an automated calculation of the Braking Efficiency.

6.2.5 Scoring Example Using Two Runs

Example of a braking efficiency calculation with two actual runs that result in a score:

1st Run

Vehicle speed when starting to brake: 7.10 MPS

Vehicle stopping distance (measured from the stop line to car's nose): 6.17 meters

Efficiency = Speed^2 / (2 * Distance)

= 7.10^2 / (2 * 6.17)

= 50.41 / 12.34

= 4.0851

2nd Run

Vehicle speed when starting to brake: 6.90 MPS

Vehicle stopping distance (measured from the stop line to car's nose): 5.84 meters

Efficiency = Speed^2 / (2 * Distance)

= 6.90^2 / (2 * 5.84)

= 47.61 / 11.68

= 4.0762

Overall Raw Score = (score #1 + Score #2) / 2

= (4.0851 + 4.0762) / 2

= 4.0865

6.2.6 Scoring Example Using One Run

Example of a braking efficiency calculation with only one actual run:

1st Run – Actual Result

Vehicle speed when starting to brake: 7.00 MPS

Vehicle stopping distance (measured from the stop line to car's nose): 5.64 meters

Efficiency = Speed^2 / (2 * Distance)

= 7.00^2 / (2 * 5.64)

= 49 / 11.28

= 4.3440

2nd Run – Calculated Result

Vehicle speed – First run speed minus 0.5 MPS:	6.50 MPS
Vehicle stopping distance (first run plus 3 meters):	8.64 meters

Efficiency = $Speed^2$ / (2 * Distance)

= 6.50^2 / (2 * 8.64)

= 42.25 / 17.28

= 2.4450

Overall Raw Score = (score #1 + Score #2) / 2

= (4.3440 + 2.4450) / 2

= 3.3945

6.3 Maneuverability (Driving Event)

This event measures the car's ability to navigate a slalom course quickly and under control. The driver steers the car through the course and back in the shortest elapsed time possible. Penalties are added to that time for mistakes, such as hitting a cone or incorrectly steering through the cones. Bonuses are subtracted from the time, such as starting from both the left and rights sides on the two runs. The goal is the smallest adjusted time.

6.3.1 Participation in Each Competition Class

Standard:	Required
Novice:	Required and judged within the Standard Class
Advanced:	Required
Exhibition:	Not required, and not allowed to participate

6.3.2 Maneuverability Event Operation

a. Refer to the diagram shown in the next section.

b. The driver steers through a slalom course made up of cones. Course dimensions are:

- Five cones in a straight line.
- Cones are spaced 25 feet apart.
- Cones are aligned perpendicularly to a start/finish line.
- The start/finish line is 25 feet long, or less if the track area for this event is limited in space.
- The minimum distance from any cone to the edge of the Maneuverability course is 30 feet (the 25-foot car turning radius plus the four-foot width of the car plus an extra one foot to have a round number). This minimum distance extends in all directions from every one of the five cones (but not the start/finish cones). A longer distance is preferred, but this is the minimum for a usable track. Shorter distances may be used if there is no choice on the given track, if approved by rally officials.

c. Each car begins at rest with the car's nose even with the start/stop line.

d. The driver may start from any point along the start/finish line. There is no requirement to run once from the left and once from the right. However, a bonus may be earned by starting on each side, once for each run. This is described later in this section.

e. When signaled by the rally official, the car will run out and back, weaving between each cone and the next one, looping the farthest cone, and returning while again weaving between the cones.

f. Scoring is based on the time to complete the course once in a round-trip and then adjusted for penalties and bonuses.

g. Penalties, if any, are added to the raw elapsed time. Penalties are shown for each instance:

- Touch a cone or move it less than six inches: 3 seconds

- Knock over a cone or move it more than six inches = 7 seconds
- Skipping a cone = Disqualification on that run only for not driving the course
- Wheel leaving the ground = 5 seconds
- Finishing outside start/finish cones = Disqualification for that run only for not driving the course
- Driving outside the Maneuverability course prior to finishing the run = Disqualification for that run only for not driving the course
- A rollover or mechanical breakdown severe enough to prevent the car from completing a run will disqualify the car in that run only and require the vehicle to undergo a new inspection following repairs. The new inspection only needs to focus on the car without repeating the driver or battery portions of the inspection.
- Note: If the car slides sideways or spins out while maneuvering, this by itself is not considered a violation, and there is no penalty or bonus. However, if the spin or slide causes the car to violate some other rules, such as sliding off the track or spinning into a cone, then these violations still carry the corresponding penalty.

h. Bonuses, if any, are subtracted from the raw elapsed time. Bonuses are shown for each instance:

- Start from the left side on one run and the right side on the other = 5 seconds bonus for a higher degree of difficulty in driving the course. Bonus applied to the final raw score after both runs have been completed. Starting on the right or the left is optional provided there is a start from each side.
- A car making only one run cannot earn the right-side / left-side bonus.

i. Each car is required to make two runs. The two are averaged to arrive at a final raw score.

j. It is possible that a vehicle will have only one run (such as when suffering a breakdown that prevents a second run). When there is only one run, for any reason, the value of the first run will be included, and the value of a second run will be calculated. The calculation of the second run's value will start with the value of the first run's adjusted raw time (actual time plus any penalties). Ten seconds will be added to the first run's adjusted time. This will be the adjusted time of the second run. The first run and second run will be fed into the event's raw score as normal. Note that if the car uses a calculated second run, it cannot benefit from the right-side / left-side bonus.

k. If a vehicle makes no runs, then that vehicle receives a zero score for the event. It is not otherwise disqualified from any other event or from the overall points scoring and rank.

l. Vehicles will be ranked and awarded points proportional to their placement in the Maneuverability event relative to other cars in their Competition Class. See the scoring description later in the Overall Scoring section.

m. Teams are strongly encouraged to practice this maneuver prior to competition so that the vehicle's stability characteristics and turning radius are known.

n. The Maneuverability event is worth up to 100 points.

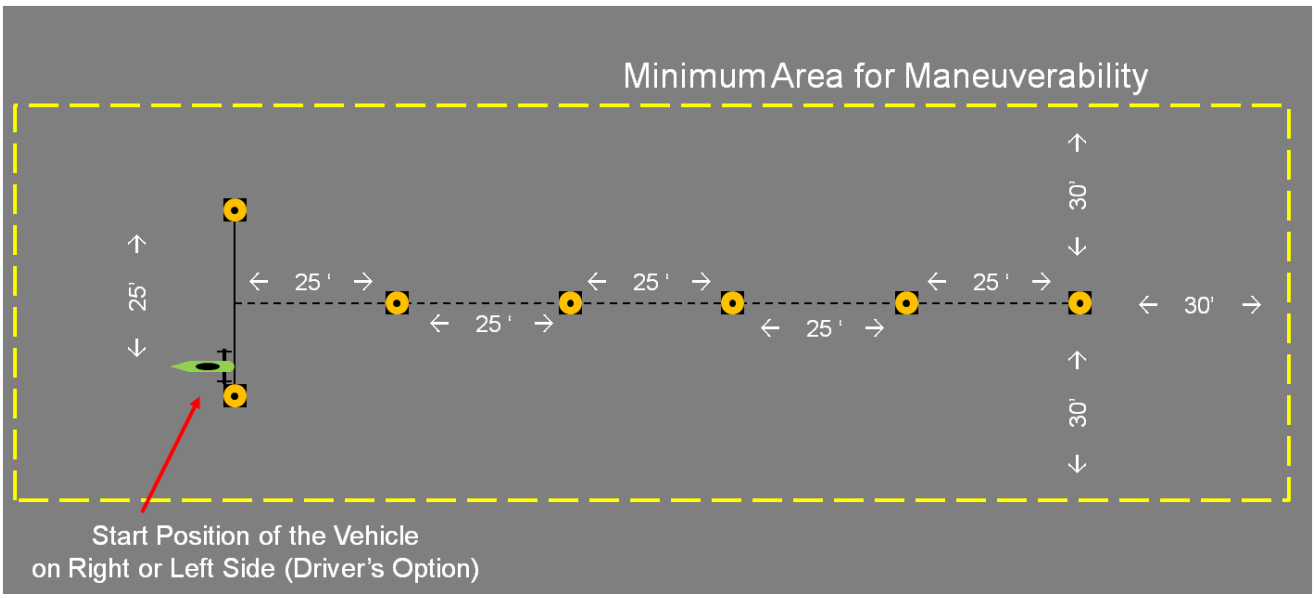
o. Note that the lower the Maneuverability raw score, the better the score in terms of points earned.

p. Separate battery packs may be used for the Maneuverability event.

q. The vehicle must be in the same body configuration for Maneuverability as it is when starting the Endurance event. This includes all vehicle body parts and canopies in place, driver fully buckled into the car with safety equipment being worn, etc. However, a team may use different drivers for each event if desired, as well as different gear settings.

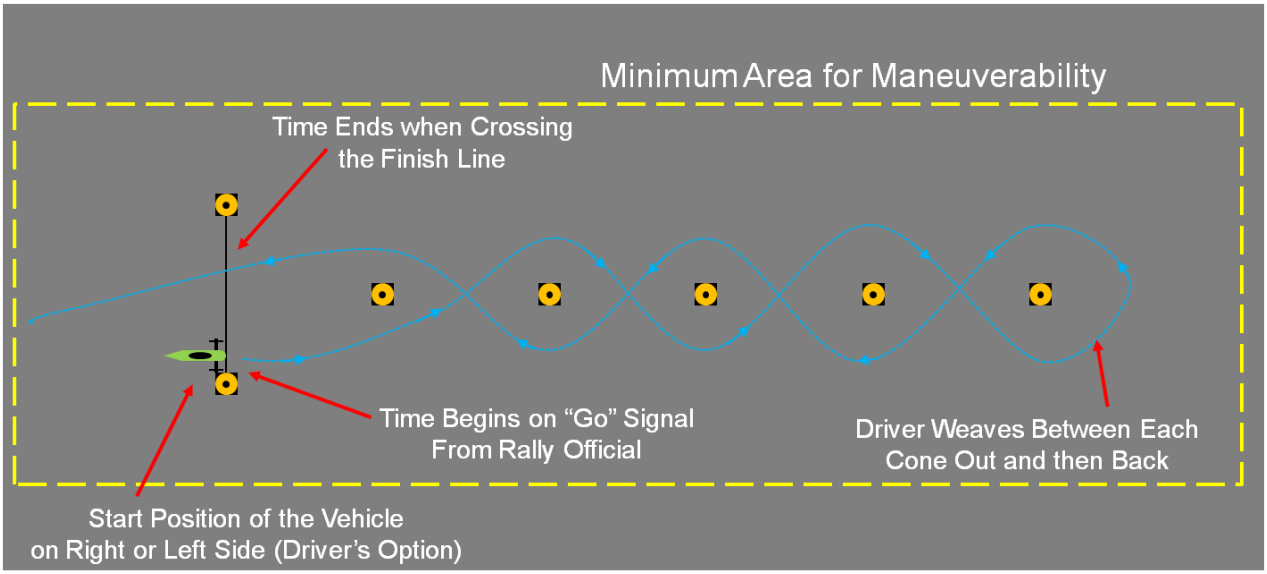
6.3.3 Maneuverability Event Layout

The diagram below shows the layout, including measurements, for the Maneuverability event.



Refer to the earlier rules describing the dimensions.

This diagram shows the path followed by a vehicle as it conducts a Maneuverability run:



This is the sequence of events for a single Maneuverability run:

1. Vehicle is positioned with its nose at the Start / Finish line and stays there.
2. Rally official, at the driver's option, explains the path to be followed.
3. Rally official gives the "Go" signal to the driver and begins timing the run.
4. Driver begins the run, weaving in and out of all cones, looping around the farthest cone, and weaving through all cones again before crossing the Start / Finish line in the shortest elapsed time.
5. Rally officials watch for any violation, as explained earlier in the rules. All violations are noted on the score sheet.
6. Upon crossing the Start / Finish line, the rally official stops the timer and records the raw time on the score sheet.
7. The driver is informed of the time, as well as any violations.
8. If this was the first run, then steps 1 through 7 are repeated for the second run. If it was not the first run, the driver leaves the Maneuverability area for the next event or returns to the staging area. If there are any bonuses, such as for starting from both the left-side and right-side, the driver is informed of this.
9. After the event is completed, the score sheet is tallied to determine each adjusted score by adding penalty times to the raw elapsed times, averaging the runs, and then subtracting bonus times if earned.

6.3.4 Scoring Example Using Two Completed Runs

Example of a Maneuverability raw score calculation with two actual runs, both starting from the same side:

1st Run

Vehicle time to complete the run: 20.10 seconds

Penalties: 1 cone touched (3 sec) and 1 wheel leaving ground (5 sec): 8.00 seconds

Adjusted time for the run = Raw time + penalty time
= 20.10 + 8.00
= 28.10

2nd Run

Vehicle time to complete the run: 19.65 seconds

Penalties: none (clean run): 0.00 seconds

Adjusted time for the run = Raw time + penalty time
= 19.65 + 0.00
= 19.65

Total Maneuverability raw score = (Run 1 adjusted time + Run 2 adjusted time) / 2
= (28.10 + 19.65) / 2
= 47.75 / 2
= 23.875

6.3.5 Scoring Example Using One Completed Run

Example of a Maneuverability raw score calculation with only one actual run:

1st Run – Actual Result

Vehicle time to complete the run: 19.40 seconds

Penalties: 1 cone touched (3 sec): 3.00 seconds

Adjusted time for the run = Raw time + penalty time
= 19.40 + 3.00
= 22.40

2nd Run – Calculated Result

Vehicle time (adjusted time of the first run): 22.40 seconds

Penalties: for not making a second run: 10.00 seconds

Adjusted time for the run = Raw time + penalty time
= 22.40 + 10.00
= 32.40

Total Maneuverability raw score = (Run 1 adjusted time + Run 2 adjusted time) / 2

= (22.40 + 32.40) / 2
= 54.80 / 2
= 27.400

6.3.6 Scoring Example Using Two Runs, One from Each Side

Example of a Maneuverability raw score calculation with two completed runs, one from each side to start:

1st Run – Actual Result

Vehicle starts from the left side of the start/finish line

Vehicle time to complete the run:		19.40 seconds
Penalties: 1 cone touched (3 sec):		3.00 seconds
Adjusted time for the run	= Raw time + penalty time	
	= 19.40 + 3.00	
	= 22.40	

2nd Run – Actual Result

Vehicle begins from the right side of the start/finish line, triggering the bonus

Vehicle time to complete the run:		21.00 seconds
Penalties: None (clean run):		0.00 seconds
Adjusted time for the run	= Raw time + penalty time	
	= 21.00 + 0.00	
	= 21.00	

Total Maneuverability raw score	= (Run 1 adjusted time + Run 2 adjusted time) / 2
	= (22.40 + 21.00) / 2
	= 43.40 / 2
	= 21.70
Subtract the earned bonus	= Maneuverability raw score - Earned bonus
(starting on both right & left sides)	= 21.70 - 5.00
	= 16.70

6.4 Design & Construction (Non-Driving Event)

In Design & Construction, a panel of judges examines the vehicle, inside and outside, and interacts with the team members to ask questions and collect the team's input on the vehicle, its construction, operation, and other interesting, creative, and unique facts about the vehicle. The judges evaluate the car against a set of ten criteria, scoring each one on a "ten" scale. The higher the total points from this evaluation, the better the score.

6.4.1 Participation in Each Competition Class

Standard:	Required
Novice:	Required and judged within the Standard Class
Advanced:	Required
Exhibition:	Not required, and not allowed to participate

6.4.2 Design & Construction Event Operation

a. One or more independent judges will grade each vehicle on these ten areas:
   - Type and quality of the braking system
   - Type and quality of the steering system
   - Strength and design of the frame
   - Type and innovative style of the electrical system
   - Evaluation of all mechanical components of the vehicle
   - Effective use of materials
   - Overall quality of workmanship
   - Creativity in design and construction
   - Safety provisions and effectiveness
   - Overall impression, looks, and roadworthiness

b. The judges employ a scoring form shown later in the rules.

c. The individual scores in all ten areas are summed to reach a total score.

d. Teams may interact with the judges to present their vehicle or point out certain features of the vehicle.

6.5 Documentation (Non-Driving Event)

The Documentation event directs teams to write down the details about their vehicle, team members, and the activities involved in the design, construction, testing, and operation of their vehicle. The submitted material is evaluated by Power Drive judges for a variety of criteria, resulting in several scores collected over each scoring item. The highest total score wins the event.

6.5.1 Participation in Each Competition Class

Standard:	Required
Novice:	Required and judged within the Standard Class
Advanced:	Required including a multi-media entry
Exhibition:	Not required, and not judged if submitted

6.5.2 Point Value toward Overall

a. The entire Documentation portion of the competition is worth a total of up to 300 points.

b. Of this, 100 points (25 points per month) are available through the submission of monthly progress reports.

c. The remaining 200 points are available from the journal that each team submits.

6.5.3 Monthly Reports

a. For each car (not just for each team), the car's team will submit four progress reports on the project. These reports will briefly describe the overall progress, accomplishments to date (as of the date of submission), and/or plans for each vehicle. Each report will clearly indicate within the report the following information and have the following characteristics:

- Team/school name
- Vehicle number and Competition Class
- Month for which the report is submitted
- Minimum of 100 words in length, excluding the report title
- Minimum of two photos, charts, illustrations, and/or diagrams, each with a caption describing the item (caption text does not count toward the 100-word minimum)
- The photos, charts, and other graphics in the Monthly Reports may not have been used in previous Monthly Reports in the same season. Exception: This is allowed if there are at least two other graphical items that qualify in that Monthly Report.
- Reports that don't meet all these requirements will not be awarded any point value.

b. Reports will be submitted as one report for each car, for each month. Therefore, for a team who submits all reports and who has two cars that are not in the Exhibition Class, this means a total of

eight reports. These should be in separate files (if sending files), or as separate links (if sending them as part of a website).

c. The reports should be sent sometime during the months of January, February, March, and April. The report for a given month may be sent no earlier than the first of each month and no later than the last of each month, relative to the month for which the report is made. Power Drive officials will advise teams where to send these reports prior to the start of each season, as well as how to view the reports that have been submitted. Officials may also require different due dates if announced in advance.

6.5.4 Submitting and Scoring Monthly Reports

a. Teams will receive 25 points each month (January through April) in which they post a report. This is an "all or nothing" score. If the report meets the criteria described earlier, the score is 25 points for that report. If it does not, the score is zero.

b. Report submission dates begin on the first day and end on the last day of the month being reported:

January Report	January 1 through January 31
February Report	February 1 through February 28 (February 29 for Leap Years)
March Report	March 1 through March 31
April Report	April 1 through April 30

Officials may change the April 30 due date if it conflicts with the date of the Championship Rally.

c. Given the ongoing changes in technology, the rally officials will employ an all-digital method for report submission. The process will be announced well in advance of the first report due date. In that case, the announced method may modify or replace all or part of 6.5.3 and/or 6.5.4.

6.5.5 Journal

a. The team for each registered vehicle will document the entire vehicle project. Particular attention is to be given to recording the vehicle's design and construction. It is recommended, but not required, that each team retain a copy of the Documentation for its own use during the inspection periods or for other purposes, such as recordkeeping and past reference.

b. The documentation should always be kept current. It should contain discussion notes, calculations, photos, drawings, test results, correspondence, news stories, information about fundraising efforts (donor names, etc.), community support, school and general publicity, students on the team, faculty assisting the team, community involvement, and anything that would help describe the efforts and resources involved in building the vehicle.

c. For Advanced Class only: Additional documentation in the form of a "multi-media" presentation is required of the Advanced Class teams. Multi-media documentation from vehicles of Classes other than the Advanced Class will not be judged. Approved alternative media forms include the following: PowerPoint® and video streaming from a team's website, or other digital means, such as YouTube, Facebook, or Vimeo. The multi-media documentation should be a marketing presentation aimed at potential sponsors, seeking donations of material, cash, or services. It may also be promotional and/or entertaining in nature for the team, school, or sponsors. The presentation should be no longer than five minutes.

d. Given the ongoing changes in technology, the rally officials may employ different methods for Journal submission each season. This method will be announced well in advance of the Journal's due date. In that case, the announced method will replace or modify all or part of 6.5.5 or the method used in the previous season.

e. The deadline for submitting the Journal and all parts of the Documentation (other than the Monthly reports) is two weeks before the scheduled Championship Rally. Example: In 2021, the Championship Rally was scheduled for Saturday, April 30. Therefore, the Journal submission deadline was Saturday, April 16. This deadline may be adjusted by rally officials if the officials deem it necessary.

6.5.6 Scoring Criteria for the Journal

a. Judging on the Journal will be based on:
- Completeness of content
- Journalistic quality
- Effort
- Neatness

b. A detailed scoring guideline is shown in a later section.

6.6 Endurance (Driving Event)

The Endurance event calls for vehicles to run on a closed track for a set time, usually one hour. The vehicle with the most laps wins the Endurance Event, accompanied by a tiebreaker used when lap counts are equal. Due to the number of vehicles, this event usually consists of multiple heats in which designated groups of cars compete. Scoring is then done by comparing the lap counts across all the heats to determine the placings in each Class. The vehicle must make a Pit Stop at some point in the heat to change drivers (assuming race officials require a driver change in this event). This Pit Stop is assisted by a group of Pit Crew members.

6.6.1 Participation in Each Competition Class

Standard:	Required
Novice:	- Required and judged within the Novice Class for determining the Novice Class winner and subsequent promotion to Standard Class - Judged against the Standard Class when determining the Overall Standard/Novice Class points
Advanced:	Required
Exhibition:	Required

6.6.2 Endurance Event Operation

a. This portion of the competition is worth up to 600 points.

b. Vehicles are required to run on a track for a period of one hour (or a different time as specified by Power Drive officials) plus additional time of up to two minutes. This two-minute period is used as part of the tie-breaker procedure described later.

c. At the end of the allowed time, the total number of completed laps is counted. Only completed laps are counted. No partial laps are counted.

d. The tie-breaker procedure breaks ties when two vehicles have the same lap count for any placing. The winner of this phase of the competition will be the vehicle that has completed the most laps or that won the tiebreaker if one or more cars have the same number of completed laps.

e. Race officials will clear from the track any vehicles experiencing a breakdown or loss of power. That portion of the lap will not count toward the car's total. If the car returns to the track, it must do so from the pit area and will begin counting laps again from the last completed lap total.

f. A vehicle that enters the pit area under its own power will be considered to have completed a lap. If the vehicle does not enter the pits under its own power, the last lap is not counted. Note that this is true even if the Pit Row entrance is not located near the start/finish line.

g. For a 60-minute heat, one pit stop with driver change is mandatory. Typically, the “window” for this driver change is between the 20- and 40-minute marks of the heat, as measured from the start of the heat.

h. At the discretion of the Power Drive officials, a different length of time for the heat, a different number of driver changes, and a different window for the driver changes may be specified. This is usually done when running on tracks that necessitate slower speeds or the addition/elimination of driver changes for safety considerations. Here are the most common changes when running on such a track:

- Heat length is 90 minutes, plus the two-minute tie-breaker window
- There are two or zero driver changes required in each heat.
- The driver change windows are between 25 and 35 minutes, and again between 55 and 65 minutes.

i. Teams are encouraged to provide two or more drivers for a given car in each heat. Some teams may not be able to provide for two drivers. Earlier in the “Drivers and Pit Crew” section is a description of the driver change requirements and procedure.

j. Following the inspection and before any of the events (including Endurance), no modifications may be made to the vehicle except for the following:

- Flat tires and other mechanical failures may be repaired or replaced with “like” components (the same tire model, for example).
- Batteries may be replaced with “race day” batteries.
- Gear ratios, steering settings, brake cable tension, driver ballast, and most other items can be changed between events.
- The body, shielding, padding, mirrors, brake light, and similar items may not be changed, except for a repair situation. If this is done, rally officials should be notified to conduct a new inspection of the item affected.

- During an Endurance Event heat, gearing may not change. Even in a repair situation, the same gear ratio should be in effect.

k. It is legal and allowed for a team to make more than the required number of driver changes during a heat. However, at least one of the driver changes must still take place within the designated driver change window. If there is more than one driver change required for a given heat, then at least one driver change must take place within each designated driver change window.

l. It is possible that a repair or similar situation forces a team to make a pit stop for some reason other than a driver change. If any part of that pit stop takes place within the designated driver change window, then the team may execute the driver change as part of the same pit stop. The requirements of how to make the driver change, including the one-driver vs. two-driver scenarios, are not changed. Example: A car suffers a flat tire at the 18-minute mark. The car is taken to Pit Row. The Pit Crew changes the tire in three minutes. During that three-minute period, the team changes its driver. The car returns to racing at the 21-minute mark. This satisfies the driver-change requirement. No additional pit stop is required.

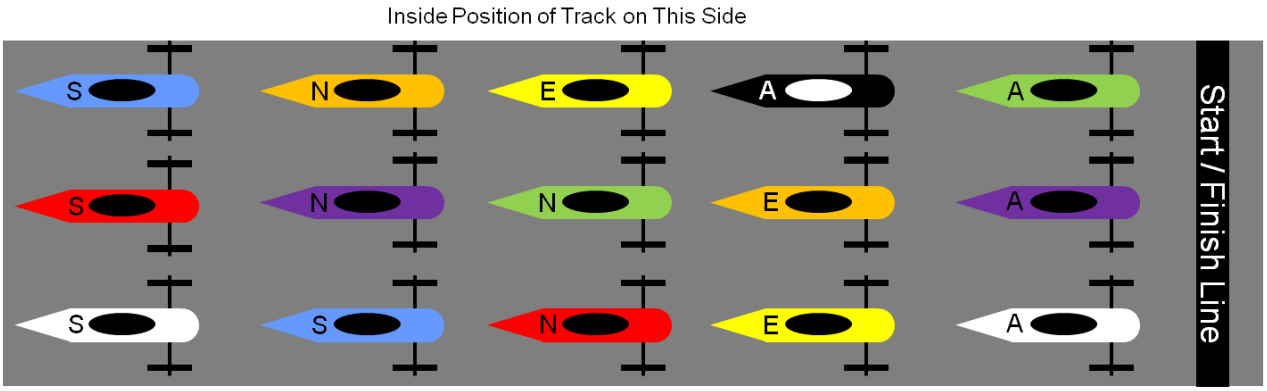
6.6.3 Starting Grid

a. In each Endurance heat, cars are assigned a starting position by the rally officials. There may be multiple heats depending on the number of cars, track conditions, etc., as determined by rally officials.

b. Within each heat, there may be cars from different competition Classes running simultaneously. In fact, this will be normal and common. Even though these cars will be competing on the track together, the results will only be judged within each Competition Class. For example, a Standard Class car will only be judged against other Standard Class cars, regardless of the presence or finishing order of cars from other Classes.

c. There is an exception to the preceding item in which Novice and Standard Class cars are judged against each other. This is for the purpose of determining the Overall points from Endurance, described elsewhere in these rules.

d. When lining up the cars for a heat, officials will group the cars of one Class together. Sometimes a given Class group will be at the front of the heat, sometimes at the rear, and sometimes in the middle. Here is an example of such a grouping:



Starting order of A, E, N, and S

e. Within each Class, rally officials will determine the order of the cars using one of three methods.

- Method #1: For the first rally of the season, the assignments are random for all cars.
- Method #2: Starting with the second rally and continuing for the rest of the season, the order will be based on a combination of the participation and performance histories of the car in the rallies before the current rally within the current season. If needed, there will be a random factor to break ties. Method #2 is described in detail later.
- Method #3: In the event of very unusual circumstances, rally officials may use their judgment in setting the starting order if following the other two methods is deemed infeasible or would cause significant hardship to most rally participants. Example: Impending bad weather could force a very short-notice reduction in the planned number of heats, in which case officials might simply line up the cars and run the modified heat without taking the time to recalculate the heat assignments.

f. Officials keep a record of how each car finished throughout the season. A running average helps determine the starting position for each successive rally. Cars with better participation and better average finishing order are given better starting positions. When computing the starting position, the cars will first be grouped in terms of how many rallies each participated in. Those who were in more rallies (or at least attended them, even if a failure prevented them from competing) are given preference over those who did not participate in one or more.

6.6.4 Start Grid Basic Example

Here is a basic example:

- First rally of the season for Advanced Class:
  - All cars were assigned a random starting order because there is no participation or performance history to use.
  - Car A-70 wins.
  - Car A-50 finished second.
  - Car A-35 finished third.
- Second rally of the season:
  - Car A-70 is given the first position of the start grid among the Advanced Class cars because it participated in, and won, the only rally thus far.
  - Car A-50 starts second. It participated in the same number of rallies as A-70 (one) but finished second in the average finish.
  - Car A-35 starts third, due to participating in the same number of rallies and had the third-best average finish.
  - This continues for all other Advanced Class cars from the first rally, assuming they are also at the second rally.
  - Any Advanced Class car that is running for the first time at the second rally is treated as being in “last place” for the purposes of setting the starting position. All such cars now in their first rally will be placed after the cars that participated in the first rally. Assignments within this group are made at random.

6.6.5 Starting Grid Detailed Example

Here is a more detailed example:

Within a given Class, there are six cars – #11, #22, #33, #44, #55, and #66. There have been three rallies so far, and the season is about to run the fourth rally. Here is how each of these vehicles participated and performed in the first three rallies:

Car #	Rally #1	Rally #2	Rally #3
#11	1st	4th	4th
#22	Did not attend	Did not attend	1st
#33	Did not attend	Did not attend	Did not attend
#44	3rd	3rd	3rd
#55	2nd	2nd	2nd
#66	Did not attend	1st	5th

For Rally #4, this is the starting order, with the reasons why:

Position	Car	Reason
1	55	Best average finish (2nd) of cars that attended all rallies
2	11 or 44	Same average finish (3rd) of cars that attended all rallies, but was tied with car 44; a random drawing will determine which one starts second
3	11 or 44	Same answer as for Position 2
4	66	Only car missing 1 rally – prioritized after the cars that attended them all
5	22	Only car missing 2 rallies – prioritized after cars that missed fewer than 2
6	33	Only car that did not attend any previous rally – last priority

6.6.6 Tiebreaker

Endurance scoring is based primarily on completed laps. The car with the highest lap count is the winner of the event, the car with the second-highest lap count is in second place in the event, etc. The count of legal laps is based on the earlier description, but there is a need for a tiebreaker when two or more cars have the same number of completed laps.

To provide for a tiebreaker, each heat allows special added time at the end of the heat. The tiebreaking process is as follows:

- Cars run on the track as the clock winds down to a full 60 minutes.
- Each car continues racing until the 60-minute time expires. At that point in time, each car is allowed up to two minutes to complete the lap it is on. The car could be anywhere on the track at this instant.
- If the car completes that lap prior to the two-minute mark expiring, then that lap is counted. Otherwise, that lap does not count.
- Only one such added lap is allowed, even if the car completes more than one lap prior to the end of the two-minute window.

- Officials will note the total laps completed, plus the time when the car completes the additional lap (if it does).
- The first criterion for placement is the count of completed laps, including the lap completed during the two-minute window.
- If there is a tie in this count, the tiebreaker is the time at which the car crossed the finish line for its final completed lap. The lower time wins the tiebreaker because that car took less time to complete the same number of laps as any other car that is tied in lap count.

6.6.7 Tie-Breaker Scoring Example

Tie-breaker scoring example:

- The heat is 60 minutes long.
- As the heat nears the 60-minute mark, the three cars leading the heat are Cars A, B, and C.
- At 59:30, Car A crosses the finish line with its 75th completed lap.
- At 59:40, Car B crosses the finish line with its 75th completed lap.
- At 59:50, Car C crosses the finish line with its 74th completed lap.
- At 60 minutes, the checkered flag drops for each car as it crosses the finish line. The two-minute window begins counting.
- The clock does not stop. It continues to run beyond 60 minutes.
- Each car that now crosses the finish line is finished with its heat and is shown the checkered flag. Each car exits the track at its next opportunity.
- At 61:35, Car C crosses the finish line for its 75th completed lap.
- Car C is now done running and exits the track at its next opportunity.
- At 61:55, Car A crosses the finish line with its 76th completed lap.
- Car A is now done running and exits the track at its next opportunity.
- The two-minute window ends before Car B crosses the finish line. Its lap count stays at 75 because it did not complete the lap within the two-minute window.

Therefore, the winner is Car A with 76 laps. No tiebreaker is needed for this car because no other car had that many laps.

Cars B and C both have 75 laps, but Car B is awarded second place because it completed its 75th lap (at 59:40) sooner than Car C did (at 61:35). Car C is awarded third place.

6.7 Overall Scoring (Multi-Events)

Awarding of “overall” placements is at the discretion of Power Drive officials for a given rally. It is mandatory for the Championship rally.

6.7.1 Overall Scoring Requirements

a. When there are multiple events associated with a rally, it is normal, but not required, to award a series of “Overall” placings across the Standard and Advanced Classes.

b. The Novice Class vehicles participate within the Standard Class as if they were members of the Standard Class for the purpose of the overall scoring.

c. The Exhibition Class only competes in the Endurance event, so there is no overall award for Exhibition Class.

d. The overall winner will be the vehicle that accumulates the most points from Documentation, Braking, Maneuverability, Design & Construction, and Endurance. There are overall champions for Standard (which includes Novice) and Advanced Class.

e. Total maximum overall points available = 1200 with the events weighted as follows:

- Endurance 600
- Documentation 300 (200 for the Journal, 25 from each monthly report)
- Maneuverability 100
- Braking 100
- Design & Construction 100

f. Within each event, points are awarded on a sliding scale such that the winner of the event earns the maximum number of points (shown above), while others in the event earn fewer points on a sliding scale that depends on placement. For Classes that are competing for the overall championship, points will only be awarded to the top 20 finishers in each event.

g. Documentation uses a special scale that only applies to the Journal scoring. That scale awards up to 200 points for the Journal score, yet Documentation can be worth 300 points. Up to an additional 100 points are awarded solely based on the vehicle team’s submission of up to four monthly reports. Each such report is worth exactly 25 points, regardless of other criteria.

h. Here is the scale that will be used for all events:

Placement	Endurance	Documentation	All Other Events
1	600	200	100
2	570	190	95
3	540	180	90
4	510	170	85
5	480	160	80
6	450	150	75
7	420	140	70
8	390	130	65
9	360	120	60
10	330	110	55
11	300	100	50
12	270	90	45
13	240	80	40
14	210	70	35
15	180	60	30
16	150	50	25
17	120	40	20
18	90	30	15
19	60	20	10
20	30	10	5
21st or later	0	0	0

i. If there are fewer competing cars than 20, then no points are awarded for these extra places. For example, if there are 15 cars competing, there are no points awarded for places 16 through 20.

j. If there is a tie score for a given placement, then points are averaged across the affected places. This is true for a two-way tie, a three-way tie, etc.

6.7.2 Overall Scoring Examples

a. Example #1: Two-Way Tie in Documentation (Journal portion) for 3rd place

As seen in the table above, the point amount for 3rd place in Documentation is 180 points. For 4th place, it's 170 points. The average of the two is (180 + 170) / 2 = 175 points. Each of the two tied cars gets 175 points for Documentation. Each car is considered to have won 3rd place, with no car earning 4th place. The next car in placements gets points for 5th place (240).

b. Example #2: Three-way tie in Design and Construction for 1st place

The point amount for 1st place in Design & Construction is 100 points. For 2nd place, it's 95 points. For 3rd place, it's 90 points. The average of the three is (100 + 95 + 90) / 3 = 95 points. Each of the three tied cars gets 95 points for Design and Construction. Each car is considered to have won the event, with no car being awarded 2nd or 3rd place. The next car in placements gets points for 4th place (85).

c. Tiebreakers for more than three-way follow a similar pattern.

d. It is possible that the calculations result in a fractional amount. The fraction is used without rounding. For example, a two-way tie for 3rd place in Maneuverability would result in an award of 87.5 points. This amount, including the fractional half point, is awarded to each vehicle for that event.

6.8 General Scoring Requirements and Restrictions

a. Scoring at Preliminary rallies follows the procedure shown earlier. Rally events may be organized by non-Power Drive organizations, in which case the scoring approaches will be at the discretion of those event organizers. These events are not sanctioned by Power Drive or EVERON but are still encouraged to broaden participation in the activity.

b. All sanctioned rallies will include an Endurance rally. It is optional to include other events, except for the Championship Rally, which will address all the events in Power Drive.

c. Points and event placings accumulated at these events do not affect or carry over to the Championship event with two exceptions:

- If some Championship events are split among more than one rally, then the designated Championship events results will be factored into the Championship rally points and placings. This will be announced in advance. Example: The Braking event is run for the Championship in the next-to-last rally of the season. These results are factored in the Overall Championship awarded at the last rally.
- The starting grid for Endurance includes past performance and past participation as factors that help determine the starting order. The participation and finish order from Preliminary rallies will still be used to determine the Endurance starting order at the Championship rally. This ordering is described in detail elsewhere in the rules.

d. Any calculations made as part of scoring will be rounded off as appropriate.

6.9 Additional Events or Awards at Rallies

a. It is possible that additional events or awards may be used or given at a rally or during a season. Ideas for such events or awards are described in this section. Events other than Endurance, Documentation, Braking, Maneuverability, and Design & Construction do not earn points and are not considered in the overall scoring.

b. Any added event or award is at the discretion of the rally organizers. There is no restriction on what such an event might be, provided it follows rules that relate to safety, eligibility, operations, and rally site operations. Recognition of the accomplishments in any of these events and awards may be considered for a special award, announcement, or both.

c. The following list describes possible additional events and awards. A rally organizer may choose none, one, more than one, and create new events or awards not described here.

    a. Best Pit Crew: This is an award given to the team that appears to have done the best job as a Pit Crew. Common criteria are:

        i. Always wearing and using appropriate safety equipment.

        ii. Strong cooperation and teamwork with each other.

        iii. Effective work during Pit Stops, such as smooth driver entrance and exit in the car, staying out of the way of other cars in Pit Row, proper use of tools, entering the car's Pit Row spot only after their car has come to a stop, etc.

iv. Good attitudes toward each other, competing teams, rally officials, and spectators.

v. Being prepared for inspections and able to answer questions from inspectors.

vi. Execution of extraordinary accomplishments during the rally, such as a creative solution to a problem, a timely repair of something broken or missing, or overcoming a high number or variety of mishaps.

vii. High persistence in doing whatever is necessary (yet legal and ethical) to remain in competition, even if there is no chance for victory by that team.

viii. Generally decided by consensus or vote of rally officials who observed most teams.

b. Best New Team: This recognizes the accomplishments of a "new" team, which typically means a team in the first or second year of Power Drive competition. Among such new teams, the one with the best scoring result is the one recognized with this award, even if they placed out of getting a trophy or similar award. Note that there is considerable overlap with the Novice Class competition here.

c. Best Paint Job: This event calls for independent judges to rate the quality of the paint job of each car. Criteria include creativity of the design, color choices, quality of paint application, cleanliness and shine of the car at the time of judging, and general artistic impression. Optionally, at the discretion of rally officials, there may be a requirement that team performs the paint job, not hired work performed outside the team (even if this work is included in the Parts List of Documentation). The award is chosen based on the consensus or vote of rally officials.

d. Best Driving Team: This award is aimed at recognizing safe, yet effective driving during each heat and event in the rally. It is not limited to Endurance, given that unsafe driving can occur in any event. The following traits would be observed in choosing the winners (based on consensus or vote of rally officials):

i. No unsafe driving tactics, such as driving on the shoulder, cutting off other cars, skidding around corners, speeding between non-Endurance events (such as from Braking to Maneuverability), failure to keep control of the car, etc.

ii. Appears to use good judgment in when and how to make certain maneuvers, such as passing on straights rather than corners, not speeding during Pit Row entrance and exit, avoiding sudden changes in lane position, appearing to be aware of other cars nearby, etc.

iii. Adheres to safety rules during events, such as not passing on a yellow flag, avoiding passing the "chase cars" (except during green flag racing and if it's safe), keeping safety items (helmet, gloves, safety harness) in place, and staying in the safe area of the cockpit (doesn't lean forward, extend legs or arms out, etc.).

iv. Reacts properly to problems, such as staying clear of disabled vehicles, responding quickly and correctly to flags, getting off the track, when possible, when their own vehicle has problems, staying in the vehicle until reached by rally officials, etc.

e. Best Sportsmanship: Award is given to a team displaying exemplary sportsmanship, as recognized by consensus or vote of rally officials. Attitude, respect, cheerleading, grace when winning or losing, avoiding poor displays of frustration during problems, etc., are the expected qualities.

f. Fastest Driver Change: As measured by rally officials (if keeping this statistic), it would be the fastest time as measured by the initial stop of the car in the Pit Row position for the driver change, until first movement of the car to return to racing after the driver change. Time penalties or disqualification may be levied if there are any unsafe or illegal actions during the driver change.

g. Highest Mileage in a Season: As measured by rally officials over an entire season, this is given to the car that travels the most total miles during all the Endurance events.

h. Scholarships: Rally organizers may arrange for sponsors to provide scholarships to one or more participants in the competition. These scholarships may be based on the entire season or an individual competition. It may apply to a specific post-secondary school or be a general award. It may follow whatever eligibility and performance judgment deemed appropriate by the sponsoring entity.

i. Farthest Distance Traveled to Participate: This is simple to compute. It is the farthest a team travels from their home school to reach a rally site. One variation is to determine the total distance the team goes to reach all the sites in a season.

7 Rally Operations

This section covers the activities and roles utilized during rallies. There will be some variation in these, depending on the track, number of heats, weather, and other factors. In all cases, rally officials have the final say in how the rally is conducted. Significant changes to these approaches will be announced in advance when possible.

7.1 Rally Officials and Their Roles

These are the most common rally officials and a description of their duties. An individual person may perform more than one role. Some might not be utilized for a given rally to conditions such as transponders replacing lap counters, not running certain events at the rally, or the lack of enough volunteers. For other rallies, there may be additional roles not shown here (announcer, ambulance personnel, concessions operators, and similar support roles). All these officials should wear reflective clothing partly for visibility and partly to be identifiable as rally officials. Most who serve during Endurance heats are in communication with other officials via walkie-talkies. Some of the roles provide for a typical number in that role, but the rules do not specific requirement for the number of people in any role. The list is in alphabetical order.

a. Braking Judges: These officials oversee the Braking Event. Typically, there will be four officials at the Braking site:
   - One will stand at the beginning of straight section of track where the cars will accelerate to the stopping area.
   - One will read and reset the automated timing devices that measure speed of the cars as they enter the stopping area.
   - Two will measure the stopping distance of each car as measured from the beginning of the stopping area to the nose (or front wheel) of the car.
   - If there is more than one Braking site in operations, the above roles are multiplied as needed.

b. Chase Car Crew: This is a group of individuals who assist disabled vehicles to return to Pit Row. There is usually one driver and one helper for each chase vehicle. The chase vehicle may be a pickup (with or without trailer), an all-terrain vehicle (with or without trailer), a small tractor with a trailer, etc. There may be more than one chase vehicle.

c. Clock Operator: This person starts and stops the timing clock that measures the length of the racing heats. If no clock is available, then a stopwatch is used, with the time periodically announced. Usually, the Clock Operator also fills some other role during most of the rally.

d. Corner Official: These officials position themselves near each corner. They assist with any problems that develop in the vicinity of their station. Most commonly, this means pushing a disabled car off the track, helping the driver exit the vehicle, waving the yellow flag for other cars to slow down near the incident, and to help load the disabled vehicle onto a chase car. They are equipped with walkie-talkies to communicate with the Track Steward and Chase Car crews. Usually, there are two officials at each corner.

e. Design & Construction Judges: These judges determine the scoring for this event. There are usually at least two judges but there could be many. Current practice is to ask local “car club” members to be these judges since they are knowledgeable about cars and have a good sense of judgment about most things automotive-related. Once the judging is over, they frequently serve other roles during the rally.

f. Documentation Judges: These judges do the scoring of the Journal entry for this event. (These same judges may also evaluate the monthly reports.) These judges follow the scoring criteria listed on the Documentation score sheets. There is no requirement for the minimum or maximum number of judges. The judges will be selected in a way that provides for impartiality in the evaluations. All the scores are totaled and compared to determine the scoring placement.

g. Inspectors: These officials conduct the required inspection of every vehicle and driver before any of the rally events. Typically, they split the workload between driver/electrical and vehicle/mechanical portions of the inspection, as shown on the two-page inspection worksheet form.

h. Lap Counters: These are usually volunteers from teams or the public. Each is assigned one car to watch, and to count the laps as each car completes another one. They also take note of when Pit Stops occur. They utilize any forms that are issued by officials for this role. Lap Counters are not needed when transponders are in use. (Transponders are usually used, so Lap Counters are rarely needed.)

i. Maneuverability Judges: These officials oversee the Maneuverability Event. Typically, there will be three officials at the Maneuverability site:
   - One stands at the beginning of course, lines up the car at the start/finish line, operates the stopwatch, and observes for any violations from the starting end of the cones. This official usually keeps all the scoring sheets.
   - One stands at the far end of the cones. That official watches for violations from that end of the track, shouts out any that are observed, and repositions the cones as needed.
   - One helps get the waiting cars lined up in a safe area while each waits their turn. This official may assist in watching for violations.
   - If there is more than one Maneuverability site in operations, the above roles are multiplied as needed.

j. Pit Row Flagman: This is official who oversees the Pit Row area. In this role, the official helps cars safely enter Pit Row and find their team's spot, controls when cars can reenter the track following a stop, times the driver changes as needed, and watches for violations of Pit Row procedures. The Pit Row Flagman works closely with the Track Steward to apply any black flags and associated penalties. There may be more than one Pit Row Flagman, especially for long Pit Rows or a high number of vehicles.

k. Track Steward: This is the chief official of the rally. In this role, the official may move to any area of the site, assist in any role or activity, and oversee the entire operation. All problems that are not resolved by the other officials are escalated to the Track Steward.

7.2 Preliminary Rallies

a. There will be several “preliminary” rallies held prior to the Power Drive Championship rally. These will vary in number and location, depending on what rally sites can be arranged, calendar considerations, and availability of volunteers. Most will be held in Nebraska but may also be held outside Nebraska. One season may conduct four Preliminary rallies while another season may have three, five, or some other number. There is no set number or location of such Preliminary rallies.

b. Rallies may contain both Preliminary and Championship events. For example, the Braking event for the Championship may be conducted at one rally, while the Endurance event may be held at a different rally. These will be announced in advance of the affected competitions and rallies.

c. The calendar also affects rallies schedules. In a typical season, Preliminary rallies will be held from late March until early May. Rally dates will most commonly fall on Saturdays, but any day could be chosen.

d. Every Preliminary rally will, at a minimum, include the Endurance event. There may be one or more heats of Endurance. The number of vehicles within each heat, the order of those vehicles within the heat, etc., will be determined by the rally officials. This is based on a combination of the following considerations:

- Number of vehicles entered, present, and able to run
- Number of vehicles present within each Competition Class
- Track layout and condition
- Weather, both current and forecast
- Availability of track officials, usually volunteers
- Special requests by participating teams. Examples here include running a car in a later heat after repairing a problem that prevented running in an earlier assigned heat, having (or avoiding) multiple cars from one team in the same heat, leaving early due to a long drive, or to attend a “prom” or other event, etc.
- Any other circumstance that the rally officials feel should be included in the decision

e. Rally officials may include additional events in a Preliminary rally at their discretion. The additional events will match those described later under the “Power Drive Championship Rally” section. These will be announced in advance.

f. At the discretion of the rally officials, the additional events may be counted as “stand-alone” events and/or they may be counted together with the Endurance event to determine overall champions of the Preliminary rally. Any scoring system for such rallies will be announced in advance. Unless announced otherwise, each event in the Preliminary rallies will be scored as described later in the Power Drive Championship Rally section.

7.3 Power Drive Championship Rally

a. To qualify for the Power Drive Championship rally, a team must first participate in at least one of the sanctioned Preliminary events, as described in an earlier section.

b. The vehicle must pass the safety inspection.

c. The vehicle must complete at least one lap of the Endurance event in a Preliminary rally to qualify for Championship participation.

d. If a car is not able to qualify for competition at the Championship Rally via the required Preliminary event participation, that team may run in the Exhibition Class instead. Doing so means that vehicle will not be competing in any other Competition Class or in any non-Endurance event.

e. An exception exists in which the affected vehicle team applies for, and Power Drive officials grant, a waiver that allows competition in a different Class.

7.4 Typical Chronological Order of Activities (assumes all five events)

1. Rally officials wear reflective, brightly marked clothing or safety vests for ease of visibility and identification.
2. Officials set up much of the rally site prior to the team arrivals.
3. Teams arrive and are directed to the parking lot and staging areas.
4. Cars, tools, spare parts, pit area equipment, etc., are unloaded and placed in the team's staging area. This area may be assigned or "first come, first served."
5. A team representative checks in with the rally officials to confirm attendance and registration, and to receive information about the rally. Such information may include the day's schedule of events, heat assignments, rally program, etc.
6. Rally officials hold a meeting with the volunteers who are assisting with the rally operation. These include inspectors, corner workers, Pit Row stewards, chase car crews, lap counter supervisors, etc. Topics covered focus on the events of the rally, how each is to be conducted, the roles of each volunteer, a question-and-answer session, and who to see if additional questions arise during the rally. Walkie-talkies and other equipment are handed out at this time, if not done already.
7. As soon as a car is unloaded and prepared, it proceeds to the inspection area. Inspections include details of the car and its compliance with safety regulations, driver fit inside the cockpit, driver ability to perform certain tasks from inside the car (including the visibility and escape tests), driver equipment and ballast, battery tests or verification it has been previously inspected, a push test of the vehicle's brakes, etc. Details are shown later in the rules on the Inspection Form.
8. Following inspections, the car is prepared for the first event. If there are multiple events being held, the following is the typical order and procedure:
   - Documentation: This entry would have been submitted earlier in the season, generally at least two weeks prior to the date of the Championship rally. Documentation journals are judged during this interval. Teams may retrieve their journal entry, usually from the registration table after the entries have been scored.
   - Design and Construction: Proceed to the Design and Construction judging area. Wait in line until approached by the judges for that event. At a minimum, team members allow the judges to inspect the vehicle in detail both inside and outside. Teams should be prepared to remove body panels, canopy, seats, battery boxes, and other vehicle parts to permit full view of the car and its components. They should also be prepared to answer questions asked by the judges. Teams may point out features of the car if desired. When the judging is complete, officials will direct the driver where to go to return to the team's staging area, or to the next event.
   - Braking: Proceed to the Braking area. Wait in line until directed to run the event by rally officials. Two Braking runs are required. Officials will direct the driver where to go to return to the line for the second run, or to return to the team's staging area, or to the next event. Drivers should take care to remain motionless once they have stopped at the end of the run. This gives the officials enough time to measure the stopping distance. If the driver moves the car prior to this measurement (example – letting the foot off the brake), the longer distance will be the one measured.
   - Maneuverability: Proceed to the Maneuverability area. Wait in line until directed to run the event. Two Maneuverability runs are required. The driver may choose to start from any position along the start/finish line. This is true for each run. There is no requirement to run from both sides. Officials will direct the driver where to go to return to the line for the second run, or to return to the team's staging area, or to the next event. Drivers should take care at the end of the run to slow down quickly to avoid possibility hitting spectators who may be watching too closely to the event's area.

- Unless directed otherwise, the Braking, Maneuverability, and Design & Construction events can be performed in any order. It is normal for all three to be conducted simultaneously to avoid congestion at any one event. Teams are requested to go to the event that has the shortest lines to complete these events more quickly.

9. Rally officials, prior to the first Endurance heat of the rally, conduct a driver and team meeting. At that time, certain Endurance rules and conditions will be reviewed. Example topics include heat length, driver change window, use and meaning of flags, warnings about hazards of the track and of disabled vehicles, and anything else that is notable. There is only one such meeting for all heats. The entire team should attend this meeting.
10. Teams should now make final preparations for the Endurance event. This means changing to "race" batteries, moving the team's pit crew equipment and tools into the Pit Row area, getting the first driver buckled into the car, and positioning the team's spotters, pit crew, and lap counters.
11. Typically, there are multiple heats, so teams should be aware of the heat to which each of their cars is assigned. Heat 1 cars should make their way to the start/finish line and locate their place in the starting grid. Officials are there to direct the cars and answer questions.
12. Optionally, rally officials perform a "push test" on each car once it is positioned in the correct grid location.
13. If this is the first heat of the rally, officials pause to play the National Anthem after the heat 1 cars are on the grid and positioned correctly.
14. Once the cars are lined up, officials clear the track.
15. Once rally officials get notification that the corner workers, lap counters, pit row officials, and cars are ready, the green flag drops. At that instant, the clock starts, and cars begin the Endurance heat.
16. Cars may become disabled at any point in the heat. When that happens, corner officials move the car to the side for safety, notify a "chase vehicle" to retrieve the disabled car and its driver, and then return them to Pit Row. Teams should remain in their Pit Row area rather than help retrieve the cars, unless specifically directed otherwise by officials.
17. In some cases, a car becomes disabled very close to, or on, Pit Row, and might not need help from the chase vehicles. Example: A car on the starting grid is unable to move when the green flag drops. The Pit Row Flagman or other officials push the car into the car's Pit Row position or to the side where Pit Crew members may retrieve it and move to Pit Row for repairs.
18. Near the midpoint of the heat, each car makes its pit stop for driver changes. Note that the requirement for a driver change is optional at each rally, as announced by officials prior to the start of a heat or rally. It is possible that there is more than one driver change required, such as in a heat longer than 60 minutes.
19. At the 60-minute mark, the two-minute window for completing the last lap begins. As each car crosses the finish line following the 60-minute mark, the heat is over for that car. A rally official waves the checkered flag at each of these cars, signaling the heat is over for that car. The driver continues around the track and enters the track exit at the next opportunity.
20. Once all cars have completed the heat, rally officials then record the results by noting lap counts and the time of finishing the final lap.
21. Preparations begin for the next heat.
22. Each succeeding heat continues until all heats have been completed.
23. Each heat may have a mix of cars from any of the Competition Classes. Officials group the cars according to their Competition Class on the starting grid.

24. At this point, rally officials tabulate the results for each event, and, if there were multiple events, for the overall score and rankings. Some or all tabulation may have been completed in advance, with only the Endurance results to be added in.
25. Teams should begin packing their equipment and loading their cars into their trailers and trucks.
26. Rally officials will conduct an awards ceremony for each Class, each event, special awards (if any), and for overall awards.
27. The rally is complete.
28. Drive home safely. We want to see you at the next rally and the next season!

7.5 Inspections

a. Each vehicle is inspected before it is allowed to participate in any event of the Power Drive competition. In sections take place at each rally.

b. Each team should furnish a "Student Car Captain" to accompany the vehicle through the inspection process to answer questions about the vehicle and its construction, as well as any deficiencies found during inspection.

c. Vehicles that do not conform to Power Drive regulations for a given Competition Class may not compete in that Class. Vehicles that have failed to pass the inspection phase of the competition will not be allowed to compete at all unless the problems are corrected and the vehicle passes a subsequent inspection. The subsequent inspection may be limited to the item in question if the vehicle passed all other portions of the original inspection.

d. It is possible that a vehicle was not allowed to participate in any preliminary rally because it did not meet requirements, was not built in time, or for other reasons. That vehicle's team may request a waiver to participate in the Power Drive Championships if the non-compliance has been corrected and it passes the inspection of the rally.

e. Drivers who cannot demonstrate compliance with Power Drive regulations will not be allowed to participate. Drivers must present a valid driver's license in advance of the first time that student is to drive in competition. This presentation may consist of submitting a copy of the driver's license, such as during registration, when returning liability forms, etc. Power Drive officials will maintain this copy for use as verification of driving eligibility.

f. Inspections may be arranged prior to the competition if desired and if inspectors are available. This is advisable for first-time participants or if significant vehicle modifications are made between the competitions, so that those unexpected items of noncompliance do not force the vehicle out of competition. These pre-competition inspections do not replace rally-day inspections. They are meant to help teams better prepare for the rally-day inspection.

g. The purpose of the inspection phase of the competition is to judge the safety (construction, braking, stability, and driver compliance) prior to the competition. Modifications to a vehicle's components, such as installing ballast, using different wheel models, rewiring circuits, etc., could significantly alter a vehicle's performance characteristics and make it unsafe. For these reasons, changes to a vehicle's components between the inspection and a competition event are allowed when done on a "like" basis, such as replacing a blown tire, or making gearing ratio changes.

h. Any participant and/or vehicle in the competition can be subject to a post-event inspection, immediately following the heat (if Endurance) or the event.

7.6 Signal Flags

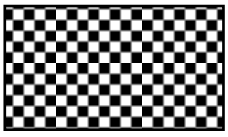
Each rally is governed by signal flags controlled by the track steward, Pit Row Flagmen, and corner workers. Each driver and pit crew member must be versed in the meaning and requirements of the signal flags.

- Green: Signals the start of the heat. Once the heat has started, if used again, it signals that the track is clear and full speed is authorized in this area. If the heat had been stopped earlier, then now the green flag is used to restart the heat from the point at which it was stopped.

- Yellow: Caution. There is a problem in this area of the track. Slow down and prepare to stop if necessary. Fall into line behind the car ahead. Absolutely no passing of other vehicles, or the vehicles (if moving) used by rally officials until clear of the caution zone.

- Black: Warning or Penalty. If a furled (rolled up) black flag is pointed at the driver, it is a warning of reckless or poor driving. Have the team's pit crew chief check with the track steward for clarification or explanation of what was being done wrong. A second offense or a serious violation of rally rules will result in an unfurled (not rolled up) black flag. The driver must pit at the next opportunity and will be assessed a penalty at the discretion of the Track Steward. An unfurled black flag is also used to notify a driver to pit for various mechanical problems (flat tire, dragging part, missing safety glasses, inoperative brake light, etc.). In this case, the flag will be unfurled immediately with no warning. The car and the pit crew should work to correct the equipment problem immediately. Notify the Pit Row Flagman to verify corrective action, and to be re-entered into the heat.

- Red: Cease running immediately. A track emergency is in progress. All cars come to a complete stop in place and await further instructions.



- Checkered: Rally complete. Slow down and return to pit or staging area at next opportunity.

7.7 Lap Counting

a. EVERON supplies an electronic lap-counting mechanism using transponders.

b. Each car will be supplied with a transponder that is mounted on the car following instructions that are provided separately from these rules.

c. Each car team will cooperate with rally officials to verify the transponder signal as part of each rally.

d. EVERON will supply links to the transponder counting system, such as websites that update and display the lap counts and times interactively throughout each heat.

e. EVERON will use a video camera to record cars crossing the start/finish line, and will include a view of the official clock within the video frame, to accurately resolve any potential disputes about number of laps, order of finish, ending times of a given vehicle's heat, etc.

f. It is possible that one or more of the above (transponders, lap-counting wire loop, race monitor computer, video camera, clock, etc.) may fail during a heat or be unable to start at the beginning of a heat. In these cases, the rally officials are empowered to conduct whatever steps are needed to conduct the heat and count the laps. This could include implementing observers to manually count the laps.

g. If a team wishes to dispute any results of this lap-counting, there are two methods available for doing so:

    a. If found during a rally, bring the nature of the possible discrepancy to the attention of the rally officials as soon as the team is aware of it. Rally officials will try to rule on the discrepancy quickly, such as by examining the lap counts and times to see if a lap was inadvertently skipped based on lap times or to detect a malfunctioning transponder. If the team's discrepancy is proven, the lap counts and/or times will be updated at that time and used to determine rally results. Note that the written submission of the team should resemble the lap counting forms shown in Section 8 below.

    b. If the possible discrepancy is found later, or if the team disagrees with the ruling from the preceding method, the team must submit, in writing, detailed lap counts and times, as well as any other evidence of the discrepancy, no later than 5:00 PM local time of the day after the rally in which the possible discrepancy took place. Rally officials will then review the evidence and issue a ruling no later than seven days after the date of the rally. Note that the written submission of the team should resemble the lap counting forms shown in Section 8 below.

7.8 Cancellations

a. If the threat of bad weather or some other condition forces cancellation, teams will be notified in advance of the scheduled competition. Rally officials will make every effort to announce a decision no later than 3:00 PM of the day before the rally. Most rallies take place on Saturdays, so this time is chosen to coincide with the approximate end of the school day, enough time for many teams to avoid a drive to a rally site. Even if the cancellation cannot be announced with that amount of notice, rally officials will broadcast it as soon as possible.

b. Officials will broadcast the notification via email and on the EVERON website. The EVERON contact information and website address are shown later in this document. If teams are still unsure, they can contact a rally official via mobile phone. Please use the following contacts for this purpose:

- Primary contact is Jim Morrow, President of EVERON.
- Jim Morrow's email: morrowjsjr@gmail.com
- Jim Morrow's Mobile Phone: (402) 250-6588

c. EVERON recommends that all teams, just before leaving to go to a rally, check the website for a cancellation notice, even if the weather does not appear to be threatening. Other conditions can cause cancellation, such as the loss of insurance coverage, a problem at the rally site, etc.

7.9 Miscellaneous

7.9.1 Generators

When attending a rally, teams need access to electrical power for battery chargers, tools, phone/radio chargers, power tools, etc. Rally officials make every effort to provide access to power outlets at each rally. This will be the normal case unless announced otherwise. Generators tend to be noise-producers that interfere with rally communications, announcements, team meetings, and audience enjoyment. If a rally announces permission to use generators, and if a team brings a generator, rally officials ask that they are placed out of the way as much as is practical. When used, generators should be of a type that produces lower sound volumes, at or below 70 decibels.

7.9.2 Team Member Identification

Teams are responsible for identifying their own team members and others who are allowed to be in the Pit Row area, present on the track when setting up cars, in the staging areas, and all other areas in which the public is not supposed to be. Each team member is encouraged to politely ask unrecognized visitors about their need to be in such designated areas. If questions remain, team members are asked to get a rally official involved.

7.9.3 Power Drive Vehicle Numbers vs. Electrathon America Numbers

All vehicles competing in Power Drive are required to have Electrathon America membership. Such membership includes the assignment of vehicle numbers by Electrathon America region. Power Drive attempts to use the same numbers (but with the added letter designating Competition Class) for the Power Drive program. However, in some cases, such matching is not possible. Power Drive officials will then assign unique numbers to each Power Drive vehicle, even if they are different from the Electrathon America numbers.

7.9.4 Corrections and Improvements

Power Drive officials strive for accuracy in these rules. Occasionally, errors appear in the document, or areas of improvement are found. Teams are encouraged to identify such instances and to notify Power Drive officials of any that are found. Please describe these by notifying *everonpowerdrive@gmail.com* via email. These submissions may be made at any time by anyone. EVERON thanks you for your suggestions!

7.10 Volunteers

Volunteers drive the entire Power Drive program. This is true of the rallies themselves and the work that goes on between rallies and during the off-season. All teams and their followers are encouraged to join with EVERON personnel in stepping up as volunteers to help make each rally and program element a success. Each activity described here in Section 7 needs people to perform these activities in a volunteer role. Please contact EVERON officers, EVERON Board Members, rally officials, team representatives, and others associated with the program and/or the rallies to get involved for the program's success. Your participation is needed and appreciated!

8 Forms and Score Sheets

This section contains the standard forms and score sheets used in the various events and inspections of Power Drive. Note that a different form may be used as desired. The idea of this section is to provide guidance on the types of information that should be collected and recorded for the successful and fair scoring of all events and overall placements.

More specifically, these score sheets follow the formats used in recent rallies. In the case of the Braking form, it assumes use of the automated speed measurement instruments rather than manual speed measurements formerly used.

These will continue to evolve as rally officials improve the scoring and measurement approaches, bring new technology to bear, and as rules change in the future.

8.1 Vehicle Inspection – Physical and Mechanical

Power Drive
Physical/Mechanical Inspection Checklist

1 Inspector – Driver and batteries in the car – Car on template
Car Number: _____ ***Competition Class:*** _____

Driver in the Car

_____ **Check the general dimensions of the car against template measurements (12' x 4')**
_____ **Enclosed body for Advanced Class cars**
_____ **Car numbers easily visible from the side**
_____ **Minimum of three load-bearing wheels**
_____ **Side vision of at least 240 degrees**
_____ **Rear vision of at least 300 degrees**
_____ **Check brake actuation with push test**
_____ **Visible and functioning brake light**
_____ **No wedge shaped or pointed front end structures**
_____ **Roll bar structure protects driver's head and face**
_____ **Driver's head directly under roll bar**
_____ **Roll cage braced front and rear within 3 inches of the top**
_____ **All surfaces that can be contacted by driver have 1/2" foam padding**
_____ **Master disconnect with red 4" triangle reachable by track official**
_____ **Check functionality of master disconnect switch**
_____ **Driver not able to put finger or feet into turning wheels**
_____ **Master disconnect switch reachable by driver**
_____ **Body enclosure removable by driver**
_____ **Driver can activate cutoff switch and exit the vehicle in 20 seconds**

Driver out of the car

_____ **Five-point seat/shoulder belt**
_____ **Padded head restraint capable of supporting 100-pound load**
_____ **Side protection with openings no larger than 6 inches in diameter**
_____ **Frame/roll bar requirements:** ***(1" tubing Standard Class)***
_____ **Frame/bracing of other materials/dimensions** ***(Advanced Class)***
_____ **Frontal frame "bumper" to meet dimensional requirements** ***(8" by 8")***
_____ **Steering actuation to be free moving and easy to operate**
_____ **No "tiller" steering for Advanced Class cars**
_____ **Throttle automatically returns to neutral when released**
_____ **All chains, sprockets, gears, etc., to be covered with guards or body panels**
_____ **Brakes are to be paired (either on two front or two rear wheels) or all wheel**
_____ **Vehicle to have all pneumatic tires**
_____ **Wheels nuts to be pinned or wired to the axle**
_____ **No sharp edges or pointed protrusions on the car**
_____ **If onboard Telematics (not 2-way radio) are installed, then notify Competition director**

8.2 Vehicle Inspection – Electrical and Driver

Power Drive
Driver/Electrical Inspection Checklist

1 Inspector – second driver, followed by first driver when available (drivers 3 and 4 as needed)

Car Number _____ ***Competition Class*** _____

DRIVER 1:_____

___ Helmet (Snell rating of 95 or greater)
___ Eye Protection (safety glasses/goggles)
___ Long Pants
___ Long-sleeved Shirt
___ Leather Driving Gloves
___ Certified at 160 Lbs. with ballast

DRIVER 2:_____

___ Helmet (Snell rating of 95 or greater)
___ Eye Protection (safety glasses/goggles)
___ Long Pants
___ Long-sleeved Shirt
___ Leather Driving Gloves
___ Certified at 160 Lbs. with ballast

DRIVER 3: _____

___ Helmet (Snell rating of 95 or greater)
___ Eye Protection (safety glasses/goggles)
___ Long Pants
___ Long-sleeved Shirt
___ Leather Driving Gloves
___ Certified at 160 Lbs. with ballast

DRIVER 4: _____

___ Helmet (Snell rating of 95 or greater)
___ Eye Protection (safety glasses/goggles)
___ Long Pants
___ Long-sleeved Shirt
___ Leather Driving Gloves
___ Certified at 160 Lbs. with ballast

NOTE: ***In order to progress to other competition events, all inspection guidelines must be met. Teams can modify the vehicles to comply with inspection guidelines.***

Electrical
_____ Gel-Cell or AGM - Lead Acid Batteries (67 pounds maximum) or as listed below by model
_____ Batteries secured in protected location. Separate battery box if outside of frame rails.
_____ Battery box to be nonconductive
_____ Fuse or breaker between motor and battery

Weight: _____ **Certified By:** _____

Rally Battery _____ lbs.

Due to construction and power ratings, these batteries are allowed, regardless of weight:

Optima Red Top	**SC25A**	**SC35A**	**SC75/35**	**75u**	**75/25**
Optima Yellow Top	**D35**	**D75/25**			
Odyssey Genesis	**G42 (VP, VPX, EP, EPX)**				
MK 40					
Exide Orbital	**75/35**				
Champion Vortex	**75/35**				

8.3 Braking Score

This form is representative of the information to be collected. It does not have to be used exactly as shown. The assumption is that the information, once collected in raw form such as shown below, will be loaded into a spreadsheet, or similar automated calculation, to compute the scores and order of finish.

Braking			Distance in Meters				Comments
<rally name and date>			1st Run		2nd Run		
			Time	Distance	Time	Distance	
<team name>	S	1					
<team name>	S	2					
<team name>	S	3					
<team name>	N	4					
<team name>	N	5					
<team name>	N	6					
<team name>	A	7					
<team name>	A	8					
<team name>	A	9					

8.4 Maneuverability Score (Revamped form with new scoring criteria)

This form is representative of the information to be collected. It does not have to be used exactly as shown. The assumption is that the information, once collected in raw form such as shown below, will be loaded into a spreadsheet, or similar automated calculation, to compute the scores and order of finish.

Maneuverability

<rally name and date>			1st Run: Left or Right (circle one)			2nd Run: Left or Right (circle one)			Bonus
			Time	Penalty	Adj. Finish	Time	Penalty	Adj. Finish	(If R & L)
<team name>	S	1							
<team name>	S	2							
<team name>	S	3							
<team name>	N	4							
<team name>	N	5							
<team name>	N	6							
<team name>	A	7							
<team name>	A	8							
<team name>	A	9							

Penalties -

Cone touched	**+3 Seconds**	Moved 6" or less from original position - each time
Cone knocked over	**+7 Seconds**	Knocked over or moved more than 6" from original position - each time
Wheel leaves ground	**+5 Seconds**	Wheel leaves the ground - each time
Skips a cone	**+99 Seconds**	Does not pass between that cone and the next one
Finish outside start cones	**+99 Seconds**	At the finish, does not pass between the two cones defining the Start / Finish line
Drives off the course	**+99 Seconds**	At any time during a run, leaves the Maneuverability course

Bonuses -

Starts on both left & right	**-5 Seconds**

If only 1 run is completed do the following to create a 2nd run:

Vehicle Time of Run #1 + 10 Seconds

If vehicle make no runs, place a "99" in Adj. Finish for both runs

8.5 Endurance Score

8.5.1 Endurance Laps 1 - 100

More pages may be created as needed.

Lap counters, when recording laps manually, will record the completion time of each lap based on the time shown on the rally clock at the time the vehicle crosses the start/finish line or when it enters Pit Row under its own power. The Pit Stops will additionally be noted on the right edge of the form, noting both entry and exit time from Pit Row.

Any special comments should be entered at the bottom in the Comments box. Examples of comments: If a car was not able to start the race with the other vehicles, the time at which a car drops out of its heat, times when a car is towed back to Pit Row by a chase vehicle, etc.

Location: **Heat #:**
Date: **Car:**

Lap	Time	Lap	Time	Lap	Time	Lap	Time	Pit Stops
1	:	26	:	51	:	76	:	
2	:	27	:	52	:	77	:	Start :
3	:	28	:	53	:	78	:	
4	:	29	:	54	:	79	:	End :
5	:	30	:	55	:	80	:	
6	:	31	:	56	:	81	:	
7	:	32	:	57	:	82	:	Start :
8	:	33	:	58	:	83	:	
9	:	34	:	59	:	84	:	End :
10	:	35	:	60	:	85	:	
11	:	36	:	61	:	86	:	
12	:	37	:	62	:	87	:	Start :
13	:	38	:	63	:	88	:	
14	:	39	:	64	:	89	:	End :
15	:	40	:	65	:	90	:	
16	:	41	:	66	:	91	:	
17	:	42	:	67	:	92	:	Start :
18	:	43	:	68	:	93	:	
19	:	44	:	69	:	94	:	End :
20	:	45	:	70	:	95	:	
21	:	46	:	71	:	96	:	
22	:	47	:	72	:	97	:	Start :
23	:	48	:	73	:	98	:	
24	:	49	:	74	:	99	:	End :
25	:	50	:	75	:	100	:	

Comments:

Lap Counter:

8.5.2 Endurance laps 101 - 200

Location: **Heat #:**
Date: **Car:**

Lap	Time	Lap	Time	Lap	Time	Lap	Time	Pit Stops
101	:	126	:	151	:	176	:	
102	:	127	:	152	:	177	:	Start
103	:	128	:	153	:	178	:	:
104	:	129	:	154	:	179	:	End
105	:	130	:	155	:	180	:	:
106	:	131	:	156	:	181	:	
107	:	132	:	157	:	182	:	Start
108	:	133	:	158	:	183	:	:
109	:	134	:	159	:	184	:	End
110	:	135	:	160	:	185	:	:
111	:	136	:	161	:	186	:	
112	:	137	:	162	:	187	:	Start
113	:	138	:	163	:	188	:	:
114	:	139	:	164	:	189	:	End
115	:	140	:	165	:	190	:	:
116	:	141	:	166	:	191	:	
117	:	142	:	167	:	192	:	Start
118	:	143	:	168	:	193	:	:
119	:	144	:	169	:	194	:	End
120	:	145	:	170	:	195	:	:
121	:	146	:	171	:	196	:	
122	:	147	:	172	:	197	:	Start
123	:	148	:	173	:	198	:	:
124	:	149	:	174	:	199	:	End
125	:	150	:	175	:	200	:	:

Comments:

Lap Counter:

8.6 Documentation Score Sheet

Power Drive

Documentation Evaluation Form

Team: _____ Vehicle: _____

Parts List Included?: _____ If not, vehicle is Exhibition Class Only!

Evaluation by: _____

Scoring 10-point scale:

1	Documentation was submitted
2	At least one element of the category being scored is present
3	More than one element of the category being scored is present
4	At least a few elements are present and understood
5	Most elements are present and show an average quality level
6	Most elements are present, and done at an above-average level
7	All elements are present and understood, with a few of them well done
8	All elements are present, easy to follow, with most of them well done
9	All elements are clearly present, and each well done
10	Outstanding for high school students – See guidance in each category

Categories and Their Elements:

Completeness of Content - Information contained in the Journal. Examples:

- Description of this Power Drive team
- Team members, their backgrounds, and roles
- Description of sponsors and supporters
- How the vehicle was designed, built, and evaluated for correct functionality and performance
- Complete description of how the team operated and participated
- A score of ten should only be given if a person of average mechanical skills could recreate the car based on the contents of the Journal.

Completeness of Content Score: _____

Journalistic Quality – Journal is put together in a way that not only communicates the effort but does so in a way that conveys some of the excitement of the project. Examples:

- Looking beyond the "nuts and bolts" of the vehicle's construction
- Creativity in the Journal's presentation of the material
- Production values of the Journal, such as good photography, strong use of English, and page layouts
- For Advanced Class only, the quality of the multimedia presentation
- A score of eight should be given if the material is well-ordered, smoothly presented, and follows a logical order
- A score of ten is given if the Evaluator additionally feels the emotions, trials & tribulations, and energy that the team experiences in the project.

Journalistic Quality Score: _____

Effort – The amount of work that appears to have been put into creating the Journal. Examples:

- Attention to detail in text-level descriptions
- Charts, diagrams, photos, illustrations, and graphics that supplement the text
- Inclusion of formulas, scientific principles, and evidence of applying things learned from a classroom
- Consistent way of presenting the material
- A score of ten is given if most members of the team contributed, with each one being thorough in his/her contribution

Effort Score: _____

Neatness – The appearance of the Journal. Examples:

- Spelling, vocabulary, punctuation, and grammar
- Page layout, margins, headers, and footers
- Readability and legibility, including font size, use of captions, and margins
- A score of ten is given if the Journal gives the appearance of being well-crafted with extremely few errors seen.

Neatness Score: _____

Overall – How well all the elements come together. Examples:

- Informative, gave solid details of the vehicle and team
- Interesting, held the Evaluator's attention
- Entertaining in how the material was presented, such as by telling a story of the team and its vehicle

- Well-ordered, using approaches such as chronological order, the parts played by each team member, sections covering each major system of the vehicle, etc.
- All elements of the Journal come together for the good of the presentation
- A score of ten is given if the Journal stands out in how it delivers the material in a highly effective manner.

Overall Score: _____

TOTAL SCORE – Sum of the scores of the five categories: _____

Judge's Comments: (rest of the page)

8.7 Design & Construction Score (Revamped form with new scoring criteria)

8.7.1 Evaluation (Page 1)

POWER DRIVE

Design & Construction Evaluation

Rally Location: _____ Date: _____

Team: _____ Car #: _____

System	Evaluation Criteria and Considerations	Score
Brakes	Effectiveness of style, stopping power, reaching controls, integration into car	
Comments:		
Steering	Effectiveness of style, range of wheel turn, detachable, cockpit placement	
Comments:		
Frame	Apparent strength, economy of material, stable, well-assembled, symmetrical	
Comments:		
Electrical	Neatly installed, economy of wiring, carefully insulated, no loose connections	
Comments:		
Mechanical	Effective linkages, freely-working, reliable, easily reachable, innovative design	
Comments:		

8.7.2 Evaluation (Page 2)

Design & Construction Evaluation

Materials	Appropriate choice, economy of usage, strength vs. weight, innovative usage	
Comments:		
Workmanship	Appears clean, consistent quality, attention to detail, well-integrated parts	
Comments:		
Creativity	Innovative, effective application, lower-cost, better reliability, easily repaired	
Comments:		
Safety	Effective protection, reliably safe, meets vs exceeds rules, present throughout	
Comments:		
Overall	1st impression, roadworthy, looks great, pride of ownership, want to drive it	
Comments:		
	Total Score	

8.7.3 Explanation of Criteria (Page 3)

Explanation of Design & Construction Evaluation Criteria

System	Criteria Term	Explanation
Brakes	Effectiveness of style	How well does the chosen type of brake work?
	Stopping power	Do the brakes appear to be very capable of stopping the car?
	Reaching controls	How easy is it for the driver to reach the braking controls?
	Integration into car	How well is the braking mechanism integrated into the car?
Steering	Effectiveness of style	How well does the chosen type of steering work?
	Range of wheel turn	How sensitive is turning radius vs. turn of the steering wheel?
	Detachable	Is the wheel easily detachable for a driver change?
	Cockpit placement	Is the steering mechanism well-placed in the cockpit?
Frame	Apparent strength	How strong does the frame appear to be?
	Economy of material	Is the material inefficiently used or appear to be wasteful?
	Stable	How stable does the frame seem to be, even when turning?
	Well-assembled	Are things put together well, aligned, and correct lengths?
	Symmetrical	Is the frame built the same front vs. back, and right vs. left?
Electrical	Neatly installed	Are the cables and components cleanly installed?
	Economy of wiring	Is the wiring efficiently used or look to be wastefully used?
	Carefully insulated	Is all insulation on the wires and components intact?
	No loose connections	Are there are any loose connections or wobbly components?
Mechanical	Effective linkages	Are linkages working (brake cable, rack & pinion, axles, etc.)?
	Freely-working	Do all controls operate easily, and in a correct range of motion?
	Reliable	Do all the mechanical components appear to be reliable?
	Easily reachable	Can the driver reach and operate all mechanical items easily?
	Innovative design	Do mechanisms display signs of innovation or improvement?

8.7.4 Explanation of Criteria (Page 4)

Explanation of Design & Construction Evaluation Criteria

System	Criteria Term	Explanation
Materials	Appropriate choice	Do the materials appear to be appropriate for each use?
	Economy of usage	Are materials used without waste and efficiently?
	Strength vs. weight	Do materials appear to be strong without being too heavy?
	Innovative usage	Do materials display signs of innovation or improvement?
Workmanship	Appears clean	How much quality does the construction show, is it clean?
	Consistent quality	Across all parts of the car, is workmanship consistently good?
	Attention to detail	Does it seem to have strong attention to construction details?
	Well-integrated parts	Are all the different parts integrated to each other well?
Creativity	Innovative	Is the design of the car or its components unusual yet good?
	Effective application	Are the creative ideas built and used well?
	Lower-cost	Do creative changes in the car appear to result in lower costs?
	Better reliability	Do creative changes in the car appear to be more reliable?
	Easily repaired	Do creative components appear to be easier to repair/replace?
Safety	Effective protection	How effective are each of the safety components?
	Reliably safe	Do the safety items appear to be reliable in collisions/rollovers?
	Meets vs exceeds rules	Do safety items only meet the rules or do they exceed them?
	Present throughout	Do safety considerations appear everywhere in the car?
Overall	1st impression	What is your overall impression of the car, especially initially?
	Roadworthy	How well will the car perform across multiple conditions?
	Looks great	How good is the paint job, decals, graphics placement, etc.?
	Pride of ownership	Does there appear to be "pride of ownership in the car & team?
	Want to drive it	How much do you want to try driving the car?

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About EVERON

EVERON is a 501(c)(3) Nebraska non-profit company whose aim is to promote science, technology, engineering, and mathematics education. Its primary means of doing so is the ***Power Drive*** program, in which teams of students collectively design, build, and compete in small electric vehicles. These competitions are conducted in organized rallies, primarily in Nebraska. Since its inception in the 1998-1999 school year, the ***Power Drive*** program has seen thousands of students build hundreds of electric vehicles. Many of these students have gone on to careers in engineering, automotive, aeronautics, vocational trades, and many other endeavors. The ***Power Drive*** experience has helped them learn to apply the lessons of the classroom to the real-world problem of how to build a car from scratch, make it move, and then how to make it move well. Please contribute to your local ***Power Drive*** team and to the general program through EVERON. Call or email any of the contacts shown above for more information, and to make contributions.