

APPENDIX A - COMPLETE LIST OF RULES

- T1. Referees have ultimate authority during The Competition--their rulings are final.
- T2. If a team is disqualified by a referee, their robot is turned off for the remainder of the match, the human player must cease interacting with tubes at the player station, and any points scored during that match will be forfeited.
- T3. If a robot is disabled by a referee, the robot is turned off for the remainder of the match, and any points scored during that match will count. The human player may continue to interact with tubes at the player station.
- T4. A team may not win a match through an advantage gained by breaking a rule, even accidentally. The effect of the infraction on the outcome will be decided by the referees.
- T5. Strategies aimed solely at the destruction, damage, or entanglement of opponents' robots are not in the spirit of The Competition and will not be allowed. Turning over an opponent's robot is not considered damaging and will be allowed, but stabbing, cutting, etc., is illegal. If a breach of this rule occurs the contestant's control system may be disabled by the referees.
- T6. Robot shoving will be allowed and is expected to be quite common; however, if you damage opponents' robots, referees may take action against your team. Possible actions include, but are not limited to: stopping the match to allow the damaged robot to be repaired before resuming play, a complete rematch after repairs have been made, or disqualification of your team and forfeiture of any points scored.
- T7. If a team's robot is damaged to the point that it cannot complete a round on a fair basis, that team may be eligible for a rematch. This decision will be up to the referees.
- T8. If one team intentionally damages another team's robot, it may result in disqualification. However, if the damaged team's robot is considered too flimsy to begin with, the other team may not be disqualified. The ultimate determination will be with the referees.
- T9. Deliberately damaging the playing field, controls, or tubes (using spiked wheels, for example) is strictly illegal and may result in disqualification.
- T10. If a robot damages the playing field, barriers, tubes, or another robot, even inadvertently, and the referees feel that further damage is likely to occur, the referees may decide that corrective measures (such as eliminating a sharp edge) are required to allow the robot to continue competing.
- T11. A robot may not intentionally contaminate the playing field, tubes, goal, or another robot with lubricants.
- T12. After a match, team members are not allowed on the playing field until referees have completed the scoring procedure.

- T13. The barriers in front of the player stations are safety features, not part of the playing field. Robots should not be designed to react against them. Incidental contact with the barriers is acceptable. Pushing a tube against a barrier to allow pickup of the tube is acceptable if the forces applied are not sufficient to damage the barrier or otherwise deform the playing field.
- T14. Robots which become entangled in the barriers or goal will not be freed until after the match has finished, unless the entanglement represents a safety hazard.
- T15. If a robot goes out-of-bounds to the point that it has to apply force to any out-of-bounds surface to rejoin play, its control system will be disabled.
- T16. If one team intentionally moves another robot out-of-bounds, the robot out-of-bounds will be disabled for the remainder of the match.
- T17. Tubes which are knocked out-of-bounds will be placed back into play next to the field border near the exit point without undue delay. Tubes returned to play will not be fed directly to a robot or human player.
- T18. Tubes which are popped will be replaced without undue delay. If a tube pops while being held by a robot, the referees may opt to pause the match and place the replacement tube in the hold of the robot.
- T19. It is not the responsibility of the referees if they damage trapping devices while attempting to retrieve tubes. Please design your robot so that tubes may be retrieved quickly and easily after a match is over.
- T20. No remote communication devices, such as air phones, walkie-talkies, cellular phones, etc., may be used by teams during a match. The wireless communications systems used by FIRST staff have been carefully checked to insure that they do not interfere with the robot control systems.
- T21. During The Competition, teams will be notified of their field positions at least two minutes prior to the start of their match in the staging area. Teams will be allowed a maximum of one minute to set up their robots on the field and a maximum of one minute to remove all robot parts from the playing field following a match. You will have at least 4 minutes before your next scheduled match.
- T22. If a team is not ready to setup their robot on the field, and the two minute notification period is about to expire, and they do not wish to forfeit the match, then they must inform the field coordinator that they are invoking a time-out. Each team may take up to 10 minutes (cumulative) of time-outs during the double-elimination rounds. The duration of a single time-out may not exceed 5 minutes. If a robot is still not ready at the end of the time-out period, the team will forfeit the match.
- T23. During the finals matches (quarter-finals on), each team may take up to 10 minutes (cumulative) of time-outs which can be used to delay the start of a match if their robot is not ready. The duration of a single time-out may

not exceed 5 minutes. Unused time-out time from the double elimination matches is lost.

- T24. **We strongly encourage you to develop and wear team uniforms, including identifying hats and t-shirts that display company and high school team names and/or logos. This will help the audience, announcers, judges and spectators identify you and your robot.**
- P1. Prior to the start of each match, teams will be assigned a color: Red, White, or Blue. This color will be used to determine the placement of the robot, human player, and drivers & coaches around the playing field. Figures 1.1 & 1.2 show the color-based layout of the playing field.
- P2. During setup for each match, robots may be placed in any orientation within the designated starting area, but may not touch the 4x4 boundary.
- P3. During a match, five members per team (two "drivers", two "coaches", and one "player") are allowed in the designated areas next to the field. Operator badges will be supplied by FIRST at each event and must be worn by these team members for field access.
- P4. The two drivers and human player must be students from a pre-college team partner school.
- P5. During a match, the robots may only be operated the drivers and/or by software running in the on-board control system.
- P6. The drivers and coaches must remain at the driver stations during the match, and may not reach over the playing field or player stations.
- P7. Human players must remain at the player stations during a match, and may not reach over the playing field or team operator areas.
- P8. Inside the player station, adjacent to the playing field, is a three foot interaction zone. Although this is part of the player station, players may not apply weight (stand, sit, kneel, etc.) to this portion of the player station during a match. Reaching and/or leaning over the interaction zone, such as to grab or throw tubes, is ok.
- The interaction zone is intended as a safety feature to help prevent potentially dangerous contact between robots and humans. Please exercise caution when reaching into the interaction zone.**
- P9. The player stations are not considered part of the playing field, and are thus off limits to the robots. (*See rule T15.*)
- P10. For safety reasons, no part of a robot may touch the human players. If this occurs due to an intentional act, the team causing the safety hazard will be disqualified. If this occurs by accident, the robot causing the safety hazard will be disabled. The referees will decide whether the violation was intentional or an accident.
- P11. For safety reasons, no robot may launch a projectile of any sort, including tubes, toward the player stations or driver stations, with the one exception

noted below. If this occurs due to an intentional act, the team causing the safety hazard will be disqualified. If this occurs by accident, the robot causing the safety hazard will be disabled. The referees will decide whether the violation was intentional or an accident.

- It is acceptable for a robot to launch tubes, but no other types of projectiles, toward the player station assigned to the same team as the robot.
- P12. During a match, no team member may intentionally touch any robot, except for reasons of personal safety. If this happens, the team will be disqualified.
- P13. During a match, no driver or coach may intentionally touch a tube, except for reasons of personal safety. If this happens, the team will be disqualified.
- P14. A human player may choose not to return tubes to the playing field. However, any tubes which leave the player's station, such as by rolling or being pushed out of the boundaries, will be returned to the playing field near the player's station without undue delay.
- P15. Human players may use only their bodies to interact with the tubes. Special clothing and/or equipment will only be allowed for those who demonstrate a need based on a physical disability.
- P16. Each team will start with 3 tubes in the interaction zone at their player station, and 6 tubes on the playing field. The tubes on the playing field will be arranged in stacks as shown in Figures 1.1 & 1.2.
- P17. Each match will last for two minutes. It will begin when the control system is enabled and end when it is disabled, unless whistled dead by the referees.
- P18. Final scoring will begin when all tubes come to rest or upon a referees' decision. Team members will not be allowed onto the field until all scoring is complete.
- P19. Final Scoring - Phase I
- Each tube on any peg is worth 1 point. A tube will count as "on a peg" if any part of the peg, including the end flange, passes through the hole at the center of the peg. See Figure 1.3 for an example.
 - Each tube on or above the center of the top of the goal is worth 1 point. A tube will be considered "on or above the center of the top of the goal" if the rotational axis of the goal passes through the open middle of the tube, and the tube is above the bottom of the apex bracket.
- P20. Final Scoring - Phase II
- Each tube on or above the center of the top of the goal doubles the score.

- Each vertical row of tubes doubles the score. A "vertical row" occurs when a team has at least one tube on every peg on one corner of the goal. Separate vertical rows may be achieved on separate corners. Alternately, if a team has at least two or three tubes on every peg on one corner of the goal, they will achieve two or three vertical rows, respectively.
- P21. All decisions regarding scoring will be made by the referees.
- P22. The winner of a match is the team with the highest score.
- P23. In the event of a tied score the following tie breaking conditions will be applied in the order below until the tie is won:
- The team with the highest tube in a scoring position wins the tie. To be considered highest, it must be the highest tube on or above the center of the top of the goal. If no tubes are in that position, it is the tube on the highest level of pegs. Subtle variations in height for a given level of pegs will not be considered.
 - The team with the most tubes in scoring position in the highest level of the goal. This starts at the top level of pegs and progresses to the lowest level of pegs until the tie is broken.
 - The team with the most tubes (of any color) in their player station.
 - The team with the highest tube not contacting the floor.
 - The team with the tube closest to the center of the base of the goal.
- P24. Robots may not intentionally move or prevent the free rotation of the goal by placing objects underneath the triangular base of the goal. However, it is acceptable for a robot to move or block the goal via other means.
- F1. All field dimensions listed in Section 2 are ± 1 " non-cumulative.
- F2. Tubes will be inflated to size, not pressure. All tube dimensions listed in Section 2 are ± 1 ".
- F3. The playing field carpet will rest directly on the floor except where otherwise noted.
- F4. The central goal will rest directly on the floor. The carpet will overlap the circular disk by three inches, and will be attached to the disk via heavy duty staples.
- S1. Safety first. Due to the nature of the event in which electrical equipment, springs and tools are used, safety will not be compromised.
- S2. Safety glasses must be worn by all team members in the driver stations and player stations during matches, and in the pit area when working on robots. They are also highly recommended if your neighbor(s) in the pit are working on their robot.
- S3. Any robot which causes a safety hazard during a match will be disabled.

- S4. If at any time the referees determine that a robot is likely to cause safety hazards in future matches, the robot must be modified to the referees' satisfaction or it will not be allowed to compete.
- S5. No energy stored in a rubber band may be used to launch any projectile. This does not apply to the latex tubing provided in the Kit. However, the inner tubes are the only projectiles the latex tubing may be used to launch.
- S6. Projectiles must have a frontal area greater than or equal to 10 square inches and be shaped to avoid eye injury.
- S7. **Do not tamper with the power supply, batteries, chargers, speed controllers, joysticks, or any other control system component except as noted in the control system rules.** Tampering could result in failure or malfunction of the control system, and lead to a safety hazard or damage to the robot.
- S8. Remove batteries from the robot while making adjustments to your robot. Due to the strength of the motors in the Kit, it is important to keep fingers away from the gears while your robot is connected to a power supply.
- S9. The batteries may deliver more than 100 Amperes. Do not let the wires come into contact with any metal surfaces. Route wires carefully to avoid damage and short circuits, which may cause serious burns, fire, and/or permanent destruction of the batteries.
- M1. The energy used by the robots in The Competition must come solely from:
- electrical energy derived from the onboard battery packs
 - storage achieved by deformation of springs or the latex tubing provided in the Kit
 - compressed air (or vacuum) stored in the air accumulator
 - a change in the altitude of the device's center of gravity.
 - storage achieved by deformation of springs purchased from Small Parts, Inc. (SPI) Latex tubing from SPI may not be used as a spring.
- M2. Robots must sit, unconstrained, inside a 36" square footprint and be no more than 48" high at the start of a match. The weight of the robot, including batteries and control system, may not exceed 120.0 pounds.

Size \leq 36" long x 36" wide x 48" high; Weight \leq 120.0 pounds

Keep in mind that these are maximum dimensions. It is recommended that robots be designed for slightly smaller dimensions and weights in order to allow a degree of tolerance for oversized/overweight mechanisms and differences in measurement between the team and the official inspection. Many teams have discovered the hard way that reducing size and weight while preserving functionality is no easy task after the robot has been constructed.

Also, many shippers such as UPS will not ship packages as large as a full robot. Many teams have found it helpful to make ease of disassembly and reassembly one of the design goals.

- M3. All robots will be weighed and measured during the practice day at each Competition event and may be re-inspected anytime during an event. If modifications to your robot are necessary to meet the above requirements, they must be completed before seeding matches begin.
- M4. **Teams are expected to design and build robots to withstand vigorous amounts of interaction with other robots.** (See also rules T6-8.)
- M5. Until the controls are enabled at the beginning of each match, robots and any appendages, extensions or projectiles must remain unconstrained within the 36"x36"x48" starting size. Once a match begins, robots may extend beyond that limit under their own power.
- M6. Robots must be designed to operate by reacting against the surface of the playing field, the innermost face of the 4x4 field border, the goal, the tubes, the other robots, and the air. (See Section 2.2 for Field Diagrams.)
- M7. **Robots must display their team company and school names and/or logos. The judges, referees, and announcers must be able to easily identify them by name. In addition, team numbers must be displayed on at least two opposite sides (180 degrees apart) of the robot. Numbers should be at least 3 inches high and clearly visible from a distance of not less than 50 feet.**
- M8. During a match, robots may be manipulated only by the normal operation of the wireless programmable control system.
- M9. Gaining traction by using adhesives or by damaging the surface of the playing field or the tubes is not allowed. (See also Rules T9-10.)
- M10. During any Competition event, any mechanism which will alter the operation of the robot may not be added or removed after the first match of the seeding rounds unless mandated by the judges for rule compliance reasons. However, mechanisms existing on the robot may be reconfigured between matches. Also, the control system may be reprogrammed as described in the control system rules between matches.
- M11. No substitute robots are permitted; however, functionally identical replacement parts are allowed.
- M12. Only items listed under the PNEUMATICS section of the Kit list may be used to store, generate, or transmit compressed air or vacuum, with the following exceptions:
- Suction cups may be fabricated from legal Kit parts, as defined in rule K1 below.
 - Pneumatic fittings from Small Parts, Inc. may be used.
- Custom-made pneumatic fittings, air cylinders, pumps, air accumulators, and so forth are not allowed, even if they are created from components included in the kits. Also, valves, syringes, tubing, and so forth from SPI or outside sources may not be used for pneumatics.**

- C1. The control system is provided to allow wireless control of the robots. The Transmitter box, Receiver box, servos, speed controllers, RNETs, antennas, batteries, battery chargers, power supply and joysticks may not be tampered with, modified, adjusted or marked in any way, with the following exceptions:
- the dip switches on the Transmitter and Receiver may be set for custom operation.
 - the user programmable code in the Receiver may be customized.
 - the speed controllers may be calibrated as described in the Tekin REBEL Owner's Manual.
 - The connectors on the ends of the 12 AWG wires on the Tekin REBEL Speed Controllers must be removed. Do not remove the connector on the 24 AWG, 3 wire PWM cable.

Tampering includes drilling, cutting, machining, gluing, rewiring, etc. All items listed in Rule C1 must be mounted without alteration. Do not write on or otherwise mark control system components.

- C2. Do not attach tape, stick-on hook & loop fasteners, glue, or other adhesives to control system components. We will re-use many of these components, and these items can be difficult to remove. Instead, use clamps, straps, or existing holes for mounting. The only exceptions to this rule are:
- Tape may be used to secure the position of the trimmers on the Joysticks in order to prevent accidental changes in calibration.
 - Stick-on hook & loop fasteners may be used to attach the speed controllers.

For mounting control system components, use mechanical fasteners, such as cable ties, straps, or brackets. Do not use tape, stick-on hook & loop fasteners, glue, or other adhesives.

- C3. The black/almond project box is intended to serve as a mounting point for the rocker switches and potentiometers and to enclose the associated wiring. You may modify the project box in any manner to accommodate your needs. It may not be used on the vehicle.
- C4. **Only the wire supplied in the Kit may be used to conduct electricity.** Additional wire is not permitted.
- C5. Electrical devices may only be wired as described in Section 4. Some important facts are listed here in Section 3.3.
- C6. The 12 gauge wire must be used for connections from the batteries to the speed controllers, from the speed controllers to any motors, and from the batteries to the Receiver box.
- C7. The 16 gauge jacketed cable must be used for any device connected to a relay output.

- C8. The 22 and 24 gauge wire may only be used for connecting sensors (limit switches, reed switches, rocker switches, air pressure switches, potentiometers) to inputs or for extending the PWM cables.
- C9. **Relay outputs may not power more than one device per output.** (The double-solenoid valve is considered one device, because the diodes may be used to route power to only one solenoid at a time.)
- C10. **Only the Receiver, speed controllers, and muffin fan may be connected directly to the battery outputs.**
- C11. The battery contacts inside the Skil drill shells must be used to draw power from the batteries. If the handle part of a drill shell is cut away from the main body, the wire side of the contacts must be insulated with heat shrink tubing or electrical tape to prevent short circuits.

It is strongly recommended that the contacts be used in conjunction with the handle of the drill shell and the battery clip at the end, as they are designed to hold the battery snugly yet allow for easy changeover of batteries.

- C12. The Skil drill motors may be powered only by the Tekin speed controllers.
Do not connect the drill motors to the relay outputs.
- C13. No more than one motor may be powered by each Tekin speed controller.
- C14. The Delco seat motors and Delphi tape drives may be powered by the Tekin speed controllers or the relay outputs.
- C15. Two 0.1 μ F capacitors, included with each speed controller, must be installed on each motor connected to a speed controller, as described in the Tekin REBEL Owner's Manual.
- C16. One 20A circuit breaker (provided in the Kit) must be installed in series with each drill motor. The circuit breaker must be accessible for inspection at each Competition event.
- C17. One 30A circuit breaker (provided in the Kit) must be installed in series with the positive terminal on each battery contact, such that all battery output flows through this breaker before being distributed to the Receiver, speed controllers, fan, or other battery. The circuit breaker must be accessible for inspection at each Competition event.
- C18. Only the 9 volt power supply included with the Kit should be used to power the Transmitter box. Use of an alternate power supply could damage the Transmitter box or RNet and is therefore prohibited.
- C19. Do not connect 12 volt power or ground wires to the relay outputs. Doing so will cause a short circuit and may damage the Receiver.
- C20. Do not connect power or other outputs to the sensor port on the Receiver. Power for sensors is available from the sensor port.
- C21. Any sensors used on the robot must be connected directly to the sensor port on the Receiver, and may not be wired in series with the motors, pumps, or valves.

- C22. RNetS may not be used in the Pit Area at any Competition event. A tether must be used for bench testing.
- C23. If the control system is damaged due to improper wiring or misuse, FIRST will charge for repair or replacement of the affected items. (*See Section 3.7 for details.*)
- C24. Robots must only be operated with both batteries present and wired in parallel.
- Operating a robot with only one battery can permanently destroy the battery. Don't do it!**
- C25. All wires distributing power with a constant polarity (i.e. not a relay or speed controller output) must be color coded as follows:
- Use Red 12 AWG or White 16 AWG wire for +12Vdc.
 - Use Black 12 or 16 AWG wire for GND.
- C26. **Teams are responsible for any software bugs introduced into the Receiver's control program when using a custom program. If a software bug negatively impacts the performance of a robot during a competition match, it will not be grounds for a rematch or even a pause in the match.**
- K1. Each robot must be constructed exclusively from materials provided in the Kit of Parts ("the Kit") supplied by FIRST, with the following additions and exceptions:
- 2' x 4' x 1" ROHACELL™ P170 structural foam shipped to each team from FIRST.
 - Material available from outside sources, as explained below.
 - Material satisfying the unlimited quantity criteria, as explained below.
 - The Kit container, part packaging, and any documentation in the Kit container may not be used to build the device.
 - Adhesive tape may not be used except as an electrical insulator.
 - Lubricants may not be used except to reduce friction within your own robot.

Outside Sources - Small Parts, Inc. Catalog

Each team receives an account with a \$425 credit balance which will be debited for the actual purchases you make. You may go beyond this dollar limitation for prototyping or to purchase spare parts, but your team is responsible for paying the balance on the account. See Appendix D for more details on accounting and ordering.

Up to \$425 worth of materials purchased from Small Parts, Inc. may appear on your final robot. Items which appear below in the unlimited quantity category do not count against the \$425 limit when used as described.

It has been brought to our attention that the actual prices of components purchased from Small Parts, Inc. may not match the prices printed in the catalog. Please use the catalog prices when calculating the cost of robot components from SPI for compliance with the \$425 limit.

If you use only a portion of what you buy from Small Parts, you may prorate the dollar amount used to the smallest quantity listed for purchase in the catalog. For example, if you buy 5' of rod which could have been purchased by the foot, but end up using only 6", you may calculate the amount used as the purchase price for one foot.

Outside Sources - Additional Hardware List

Materials on the Additional Hardware List may be obtained from any supplier, but in limited quantity. A specific list of materials and maximum quantities/dimensions is provided in Section 3.6. Cost is not considered.

If an item on the Additional Hardware List is available from Small Parts, Inc., then it may be purchased from SPI without being counted against the \$425 limit on materials purchased from SPI. However, any amount of the item purchased from SPI above and beyond the quantity allowed in the Additional Hardware List will count against the \$425 limit. Obviously, any item purchased from SPI will count against your credit limit, regardless of whether or not it is listed in the Additional Hardware List.

Unlimited Quantity Items

The following items may be used in unlimited quantity subject to the following criteria. (*See rule K9*)

- Fasteners, washers and adhesives -- if used for joining and fastening purposes only.
- Fasteners -- if used as pins in a linkage or as hinge pins.
- Crimp-on spade connectors -- if used to conduct electricity, used with the proper gauge wire, crimped properly, and fully insulated, such as the Thomas & Betts units provided in the kits.
- Adhesive tape -- if used as an electrical insulator.
- Lubricants -- if used to reduce friction within your own device.
- Teflon tape -- if used around the threads of pneumatic fittings to prevent leaks.
- Shrink wrap tubing of any diameter -- if used for electrical insulation.
- Pipe fittings (tees, reducers, elbows, and angles) -- if used to join sections of pipe
- Endcaps -- if used to cap pipe.

- K2. Many of the materials in the Kit are raw materials. They are intended to be used for manufacturing structural or mechanical parts for your robot.
- K3. There is no restriction on the total quantity of sprockets/pulleys and chain/belt that can appear on your robot. However, there is a restriction on the amount which can be obtained from outside sources other than SPI. (*See the Additional Hardware List and Rule K4 .*) Any quantity above the amount listed on the Additional Hardware List must therefore be purchased from SPI, or manufactured from raw materials available from either the Kit, the Additional Hardware List, or SPI.
- K4. As denoted in the Additional Hardware List, each team may purchase from an outside source sprockets (not gears) and/or pulleys and additional chain and/or belt, with the following conditions:
- On your final robot, you may use no more than a combined total of 4 sprockets and/or pulleys from outside sources other than SPI.
 - On your final robot, you may use no more than a combined total of 10' of chain and/or belt from outside sources other than SPI. There are no restrictions regarding pitch or width of chain and/or belt. However, you may not purchase a wide belt, slice it lengthwise, and use more than a 10' length in the final robot.
 - These components must be "commercially available," strictly *off-the-shelf* only. No custom or special orders.
 - A double-sprocket or double-pulley assembly counts as two sprockets or pulleys, respectively.
- K5. Gears (not sprockets) must be purchased from SPI, or manufactured from raw materials available from either the Kit, the Additional Hardware List, or SPI.
- K6. The dimensions for sheets and boards listed in the Additional Hardware List represent the maximum length and maximum width which may be purchased, not the total area. The thickness represents a fixed quantity, not a maximum.
- K7. The dimensions for rods and shafts listed in the Additional Hardware List represent the maximum length that may be purchased for a given diameter of rod/shaft.
- K8. You may purchase only one of the three types of 1/2" or thicker wood listed in the Additional Hardware List; Plywood, Chipboard, or Particleboard.
- K9. Items listed as unlimited quantity items, when used without satisfying the criteria for unlimited use, must be purchased from SPI against the \$425 limit or manufactured from raw materials available in the Kit, from the Additional Hardware List, or from SPI.
- K10. Net material is allowed; however, if it is used to entangle opponents' robots, the referees may disallow it.

- K11. For safety reasons, you may not fabricate your own springs. However, it is acceptable to elastically deform and relax materials not designated as springs as long as the rate at which the energy is released does not exceed the rate at which the energy was stored. This is intended to allow reasonable use of the elastic properties of materials without creating unsafe conditions caused by sudden the release of stored energy in materials not designed to act as springs. Materials which are designated as springs include: All items listed in the Springs section of the Kit List, and compression, tension, torsion, constant force, and washer springs available from Small Parts, Inc. Latex tubing from SPI is not considered a spring.
- K12. A limited number of replacement parts will be made available by FIRST upon justified request. Otherwise, lost or damaged Kit materials may be replaced only with identical components of the same material, dimensions and treatment at the team's cost.
- K13. Materials in the Kit may not be changed chemically with the following exceptions:
- rope ends may be singed to prevent loose ends or to bind them together
 - resin and hardener may be mixed to produce epoxy.
 - metal may be heat treated in order to improve surface hardness
 - metal may be anodized to improve appearance
- Completely melting and recasting a material is considered a chemical change. However, merely heating a material, such as a sheet of polycarbonate or ROHACELL™, in order to bend it into a new shape without cracking is not considered a chemical change.
- K14. The mailing tubes provided in the Kit are considered packaging material and may not be used during any Competition event.
- K15. All unused parts and materials must be returned to FIRST for proper recycling.
- K16. The control system is the property of FIRST and certain components must be returned at the conclusion of The Competition. The control system is not for sale. Teams wishing to borrow the control system for a limited amount of time after The Competition may do so by following the procedures outlined in Section 5.5. For teams that wish to operate their robots after this period, FIRST can provide basic instructions on how to refit the robots to use off-the-shelf remote control systems.