

## G. General Rules – Regular Category for College (version 2012/08/24)

### 1. The rules of competition at WORLD ROBOT OLYMPIAD are constituted by the WORLD ROBOT OLYMPIAD Advisory Council (“the council” in the following paragraphs).

- 1.1. A surprise additional rule will be announced on the morning of the competition.
- 1.2. The announcement of this additional “surprise” must be handed over to each team in writing.

### 2. Qualification for participation and team composition

- 2.1. Age of participants – Please refer to **Section B** – “Age Group Definition”
- 2.2. Team composition – Please refer to **Section C** – “Team Definition”
- 2.3. Team coach – Please refer to **Section D** – “Coaches”

### 3. Material

The only parts and materials allowed in the construction the Robot are listed below. No other parts and materials are permitted.

- 3.1. Any part from the MATRIX™ or TETRIS™ system with the following constraints:
  - 3.1.1. No more than **eight (8)** DC drive Motors.
  - 3.1.2. No more than **eight (8)** Servos.
  - 3.1.3. No more than two (2) Rechargeable Battery Packs, which are identical to those supplied in the kit of parts.
  - 3.1.4. A total of no more than three (3) MATRIX DC Motor and Servo Controllers or four (4) TETRIS DC Motor and Servo Controllers.
  - 3.1.5. **You may modify the non-electrical parts into any sizes.**
- 3.2. Any LEGO building element with the following constraints:
  - 3.2.1. Exactly one (1) NXT Controller must be used.
  - 3.2.2. The NXT controller must be powered either by the NXT rechargeable AC battery (W979798), NXT DC Battery (W979639), or six (6) AA batteries.
  - 3.2.3. LEGO Motors may be used with the following constraints (per NXT motor port):
    - One (1) NXT Interactive Servo Motor (LEGO Part # W979842)
    - One (1) XL Power Function Motor (LEGO Part # W778882)
    - Two (2) E Power Function Motors (LEGO Part # W979670)

- Two (2) M Power Function Motors (LEGO Part # W978883)
  - One (1) E Motor and one (1) M Motor
  - You are allowed to use any number of NXT conversion cables to connect the Power Function Motors with the NXT (LEGO Part #s W770323, W778886, or W778871)
  - You are NOT allowed to use any of the Power Function Battery Packs (LEGO Part #s W778881 or W778878)
- 3.2.4. LEGO pneumatic elements are allowed. Teams may not modify LEGO pneumatic elements to attempt to change the working pressure limits of the elements.
- 3.2.5. Any LEGO Approved NXT sensor (as indicated by the LEGO Mindstorms NXT Certified – Hardware label) is allowed.
- 3.2.6. Any NXT compatible sensor from HiTechnic, including the NXT Touch Sensor Multiplexer, NXT Sensor Multiplexer and the NXT prototype boards (both solderable and solderless) is allowed.
- 3.2.7. The HiTechnic 9-volt Battery Box that is sold as part of the NXT Sensor Multiplexer set may be used in conjunction with each NXT Multiplexer (i.e. one Battery Box per Sensor Multiplexer). It may be used only in conjunction with and to power the NXT Sensor Multiplexer(s).
- 3.2.8. LEGO-Approved NXT extension cables are allowed. Approved cables are currently only available from LEGO and HiTechnic.
- 3.2.9. Non-NXT electrical elements not specified above are not allowed, with the exception of RCX sensors.
- 3.2.10. LEGO Duplo products are not allowed.
- 3.3. Plastic-coated wire rope with a bare wire diameter of 0.03125" (0.08cm) or smaller. Compatible compression sleeves, clamps and hardware may also be used only in conjunction with the plastic-coated wire rope.
- 3.4. All mechanical fasteners (nuts, bolts, screws, etc.) of any length, any thread type, up to
- 3.5. 0.375" (0.9525cm) diameter. The intent of this rule is to allow teams to use fasteners from any supplier that are substantially the same as TETRIX fasteners. Compatible fasteners are characterized by using the same thread characteristics as TETRIX fasteners. For example, an acceptable substitute for the TETRIX 6-32 thread, 1/2" length socket head cap screw is a 6-32 thread, 3/4" length, button head cap screw purchased at a local hardware store.
- 3.6. Any other non-metal parts are allowed with maximum thickness 0.2cm.
- 3.7. No additional components may be used, however functionless components used only for decoration and are easily removable as wanted are allowed.
- 3.8. Teams should prepare and bring all the equipment, software and portable computers they need during the tournament.

3.9. Contestants may make the program beforehand.

3.10. Control software must be either NXT® software or LabVIEW for LEGO MINDSTORMS.

### 4. Regulations about the robot

- 4.1. The maximum dimensions of the robot before it starts the “mission” must be within 457mm × 457mm × 457mm. After the robot starts, the dimensions of the robot are not restricted.
- 4.2. Teams are allowed to use only one controller (RCX or NXT).
- 4.3. Any actions or movements by the participants are not allowed to interfere or assist the robot while it is running (performing the “mission”). Teams that violate this rule will be disqualified at that match.
- 4.4. A robot must be autonomous and finish the “missions” by itself in the Autonomous Period. Any radio communication, remote control and wired control systems are not allowed while the robot is running. Teams in violation of this rule will be disqualified and must quit the competition immediately.
- 4.5. If robot is equipped with NXT as a controller, the Bluetooth function must be switched off and downloading programs must be done through USB cable.

### 5. Competition

- 5.1. The tournament will generally follow this agenda:
  - Team Check-in
  - Robot Hardware and Software Inspection
  - Qualification Matches
  - Alliance Selection
  - Elimination Matches
- 5.2. The competition consists of a number of qualification matches (as decided by the Host Country) then elimination matches.
  - 5.2.1. Qualifying Points (QP) will be awarded:
    - Winning teams of a qualifying match receive two (2) QP.
    - Losing teams of a qualifying match receive zero (0) QP.
    - If a qualifying match ends in a tie, all teams receive one (1) QP.
    - If a team is disqualified, they receive zero (0) QP.
  - 5.2.2. Teams will also receive Ranking Points (RP) based on the following:
    - The number or ranking points assigned for each match is that of the losing alliance’s score. The winning alliance will receive the pre-penalized score of the losing alliance as their RP. The losing alliance will receive the final score

(including penalties) of the losing alliance as their RP.

5.2.3. Teams will be ranked from first through last on the basis of their total Qualifying Points (QPs). If multiple teams have the same QP total, then teams will be ranked on the basis of their total Ranking Points (RPs), then highest match score, then next highest match score until the tie is broken.

**6. ALLIANCE SELECTION** - The number of teams in the Elimination Matches will be based on the number of teams in the tournament. If there are 21 or more teams in the tournament, the Elimination Matches will consist of alliances of 3 teams each. If there are 20 teams or less, then the alliances will consist of 2 teams each. There will be a total of four (4) alliances that will compete in the Elimination Bracket. The alliance selection process will consist of a number of rounds of selections, such that all alliance captains will form elimination match alliances consisting of the requisite number of teams. These alliances will participate in a ladder-type tournament to determine the event's Champion Alliance. The alliance selection process is as follows:

- 6.1. Each team will choose one student to act as the team's representative. These representatives will proceed to the competition area at the designated time to represent their teams in the alliance selection. It is recommended that the representative also bring their robot to the competition area as teams making selections may not know team names or numbers, but do know what the robots look like.
- 6.2. In order of tournament ranking, the student representative of the highest ranked team not already in an alliance will be asked to step forward as the Alliance Captain to invite another available team to join their alliance.
- 6.3. A team is available if they are not already part of an alliance, or have not already declined an alliance invitation. If the team accepts, it is moved into that alliance. If a team declines, they CANNOT be invited into another alliance, but are still available to select their own alliance if the opportunity arises. If a team declines, the alliance captain from the inviting team must then extend an invitation to another team.
- 6.4. The process continues until all alliance captains have been designated and chosen one alliance partner.

6.5. If there are more than 20 teams, the same method is used for each alliance captain's second choice (the third member of the alliance) from highest seed to lowest seed ( i.e. 1 -> 2 -> 3 -> 4). Any teams remaining after the lowest seeded captain makes their choice will not compete in the Elimination Matches.

**7. Prohibited matters**

Please refer to **Section E** – “8. Prohibited matters”