TCEA Mindstorms Robotics Challenge 2013-2014

“Rubble Trouble”

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FINAL VERSION
Revision History

9/14/2013 (Draft Version 1)
1. Original Release of Game Rules

10/15/2013 (Final Version)
1. Modified language in 1.4.5 to clarify the definition of “contained”.
2. Added language to 1.3.4 to define the “South” border wall.
3. Added language to 1.3.6 to clarify that the two sides of the competition field do not have to be set up the same – they may be independently random.
4. Added rule 2.0.13 to disallow teams from de-scoring Radio Towers once in scoring position, however added language to allow teams to recover.
5. Added rule 2.0.12 to require a Bill of Materials before being allowed to claim points for 1.4.1 or 1.4.5 – including “shared” points.
6. Highlighted rule 2.0.6 that requires the robot to be brought into the 12” cube size limitation before being allowed to restart during a match. This is very important for teams to understand.
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(AKA: The guide to the “important stuff”)

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Section 1  Game Description

1.1  Game Background

The 2013-2014 TCEA Mindstorms Robotics Challenge game is titled, “Rubble Trouble” and is designed around the theme of Urban Search and Rescue. Urban Search and Rescue (also known as USAR) is defined as the location, extrication, and initial medical stabilization of victims trapped in confined spaces due to natural disasters, structural collapse, transportation accidents, mines and collapsed trenches. Urban Search and Rescue teams are used in situations of natural disasters such as tornados, floods, and earthquakes, or in deliberate or accidental situations. USAR teams are categorized into different classifications based on the amount of equipment and the specific training the team members have – individual USAR teams may be comprised of up to 150 team members and over a million dollars’ worth of equipment, and a full USAR Task Force may be comprised of several teams and others with specialized skill sets that work together.

Urban Search and Rescue teams are generally associated with local fire and rescue services, but also work with law enforcement, emergency services, government agencies, and private companies, and are composed mainly of volunteers who risk their lives to save others. In Texas, there are two primary USAR Task Forces; Texas USAR Task Force 1 (TX-TF1) and Texas USAR Task Force 2 (TX-TF2). TX-TF1 is the most active USAR organization in the US, and is headquartered in College Station, Texas. TX-TF1 has over 600 trained personnel from over 60 organizations throughout Texas. TX-TF2 is composed of almost 200 trained personnel, and primarily serves the North Texas region out of their headquarters in Dallas, Texas. Both USAR teams in Texas provided support to search for survivors of the World Trade Center attacks on September 11, 2001 and continue to proudly serve Texas, the US, and around the globe in times of need.

Some USAR teams use robotic platforms to help assess the layout and stability of collapsed structures, locate and deliver aid to victims, and perform tasks that might otherwise be impossible or unsafe for human or canine workers to perform. These robots are often remote-controlled but some are fully autonomous due to difficulties in controlling robots through tons of collapsed concrete and steel. The true benefit of robots is their speed of deployment – many robotic platforms can be set up and put to work within seconds of arriving at the scene of a disaster, significantly reducing the time it takes to assess the situation, locate survivors, and begin working on freeing the victims. However, these robotic platforms can be very expensive and require specially trained personnel to use.

TCEA would like for you to help develop a low-cost robotics platform to aid USAR workers. Robots will be tested at the TCEA USAR Robotics Test Facility (the game field).
1.2 Game Pieces

For “Rubble Trouble,” the game pieces consist of red and black plastic partially-interlocking checkers made by the Pressman company and Dura ¾” schedule-40 PVC couplers. A single standard set of checkers contains twelve (12) red and twelve (12) black checkers, and is enough pieces for a single team. TCEA has a deal with the Pressman company to provide game pieces to TCEA teams at a discount; contact TCEA for more details. Teams may also purchase sets of “replacement” checkers online to use in the game (http://amzn.to/Ns4YN8), or they may purchase inexpensive checkers game sets with equivalent parts (for example, http://amzn.to/qf4J3r). Most all checkers sets made by the Pressman company use the correct type of checkers, and can be found in various stores and online. The checkers do not fully interlock, and the checkers are not meant to fully interlock – the checkers have ridges on them that allow the checkers to partially interlock with each other; lifting the top checker has no effect on the lower checker, but twisting the top checker causes motion on the bottom one. Teams should be careful if purchasing checkers from other vendors for use in “Rubble Trouble,” some “chess and checkers” sets use wooden parts that are not equivalent to those used in “Rubble Trouble.” Both links in this document (as well as the deal from TCEA) are for checkers parts made by the Pressman company. The Dura ¾” schedule-40 PVC pipe couplers are “standard” ¾” PVC pipe couplers that can be found at home improvement stores – such as the Home Depot – for less than 50 cents per coupler. The Dura ¾” schedule-40 PVC pipe coupler is designed as a slip-slip coupler that “joins” two ¾” PVC pipes. A coupler is roughly 2.125” long (2 1/8” in height) and have a 1.3125” outer diameter (1 5/16”). The height can vary +/− ¼", and the outer diameter can vary no more than 1/16”. “Rubble Trouble” uses five (5) Dura ¾” schedule-40 PVC pipe couplers for a single team.

In “Rubble Trouble”, the game field is based on a training facility that is being used as a testing site to test USAR robots. Black checkers represent Rubble that is potentially hazardous to rescue workers, Red checkers represent Food And Medicine (FAM) for trapped victims, and Dura PVC Couplers represent Safety Pillars used to structurally support a collapsing building.

“Rubble Trouble” also makes use of two “team-provided” game pieces that teams will use during their matches; these game pieces – a Radio Tower and a Safety Barrier – may optionally be built by teams (requirements are provided in the Game Task descriptions that use them) and may be used to help complete specific game tasks. These two game pieces are brought with the team to the competition table when the team is scheduled to compete, used during the game, and are returned to the team after each competition match. These “team-provided” game pieces may be built using any allowed materials, but must be factored in the team’s allowance and Bill of Materials.
1.3  Field Layout

The competition field for “Rubble Trouble” is composed of a simple table frame, 2 competition mats (one for each team), 40 checker game pieces (20 per side; 10 red and 10 black), and 10 PVC Couplers (5 per side). The competition mat chosen for this year is the “Race Against Time” mat produced by LEGO Education (part number W991896, or http://bit.ly/N3Ltfv); Contact TCEA for info on ordering mats.

**WARNING:** Teams that participated in TCEA Robotics in previous years may have purchased these mats already, but the mats made after the 2010 competition season have been redesigned and made of a different mat material (the LEGO part number also changed). The pattern printed on the mat is identical to previous years, and there are no distinguishing marks on the mat, so it may be difficult to distinguish a previous year’s mat from the current year. It is recommended that teams mark the underside of their mats as “2011+” mats immediately upon receiving their mats to identify the mat as a post-2010 mat (taking caution not to mark in an area or in a way that shows through to the front of the mat).

The competition mat was chosen to provide a uniform field layout for the game so that teams and tournaments would be able to reproduce the same field environment for practice and competition. The mat has 5 primary areas that are of interest to “Rubble Trouble” – the Warehouse, FAM Drop Zone, Safety Pillar Sites, Robot Start Zone, and the Safety Zone. The next several sections describe each area in detail.

1.3.1  The Warehouse

The Warehouse is a location within the TCEA USAR Robot Test Facility where Food and Medicine (FAM) is kept. This structure has been damaged due to the “scenario event” for the test, causing debris from the building to fall in random locations within the Warehouse. The Warehouse is a critical building for the success of the test operation, and must be supported by Non-Hazardous Safety Pillars found throughout the test facility. Five (5) FAM pieces are located on the 1st, 3rd, 5th, 7th, and 9th Weakened Structure Marks (where the 1st mark is the mark closest to the double parallel arrows closest to the center wall). Two (2) Debris objects are placed on each of two random Weakened Structure Marks within the 2nd, 4th, 6th, or 8th Weakened Structure Marks.
1.3.2 The FAM Drop Zone

The Food And Medicine (FAM) Drop Zone is a location within the USAR Robot Test Facility where additional FAM objects may be dropped off once the area is cleared of Hazardous and Non-Hazardous Safety Pillars, FAMs, and robots. Once this area is cleared of all game objects AND the robot, Team Members may place a single FAM from their FAM-on-hand onto any Safety Pillar Site of their choice. This action may be repeated as many times as desired, or until the team runs out of FAM-on-hand. The Black Circle is not included in the FAM Drop Zone, only the area INSIDE the black circle is considered IN the FAM Drop Zone.

1.3.3 Safety Pillar Sites

The Safety Pillar Sites are areas within the USAR Robot Test Facility where experimental Safety Pillars have been built. Safety Pillars are lightweight columns of a revolutionary material that can support up to one thousand tons per square inch. The problem with Safety Pillars is that they are biodegradable – once their material is hardened, they begin a destructive process where after 7 days they are unable to support their maximum capacity and each day afterward they decrease rapidly in effectiveness. This makes the Safety Pillar a poor choice for permanent building construction, but ideal for short-term support structures.

1.3.4 Robot Start Zone

The Robot Start Zone is where your robot starts the game, and where your robot can be serviced during the game. Robots must have at least one Drive Wheel touching the Robot Start Zone area on the mat, AND the robot must be touching the wall closest to the Robot Start Zone to be considered “IN” the Robot Start Zone (drive wheels are defined as wheels that move when the robot is lifted off the surface of the field). The wall closest to the Robot Start Zone is defined as the “South” border wall, and the wall opposite the South border wall is the “North” border wall – the North border wall is also the “Center” wall that separates the two game fields.
1.3.5 Safety Zone

The Safety Zone is a “Place of Refuge” within the Test Facility. Places of Refuge are generally safe locations within a building or structure that are specially reinforced to resist collapse, fire, or other damage. Places of Refuge are locations where survivors of a disaster event are instructed to reach in order to wait for rescue personnel. Robots may bring FAM objects to the Safety Zone for any survivors who may be present there waiting for rescue teams. Of course in this test no real people are put in harm’s way, so feel free to wear a sock puppet on your hand and pretend you’re saving it from harm. Or better yet, don’t.

1.3.6 Field Setup

The Field Mat for “Rubble Trouble” should be oriented such that the Warehouse area is closest to the center wall. Images depicting the mat in sections 1.3.1, 1.3.2, 1.3.4, and 1.3.5 would all have the center wall running vertically along the left (western) edge of the image. If the mat you’re provided with is not exactly 4’x4’, the mat should be centered on the field such that there is an equal amount of space between the wall and the mat on the 3 sides that does NOT include the center wall; in these cases, double-sided tape (such as double-sided carpet tape) is recommended to help keep the mat in place.

One (1) Red checker must be placed crown-side-up in the center of each of the 1st, 3rd, 5th, 7th, and 9th Weakened Structure Marks (where the mark closest to the double arrows is considered the first mark). The checker MUST be centered to the best of the field resetter’s ability horizontally and vertically on the Mark. These Red checkers are the initial FAM objects on the board.

The remaining Five (5) Red checkers must be given to the Team, and represent the FAM-on-hand. The team may choose to return the Checkers to the Referee or hold in their hand for later use within the game.

Two (2) of the remaining four (4) unused Weakened Structure Marks within the first 9 marks (the 10th mark is unused) must be chosen. On each of those two randomly chosen marks, two (2) Black checkers must be placed in mostly-random positions along the mark. The only requirements for these checkers are that they are centered on the short dimension of the Mark and the two checkers on a single Mark cannot touch each other. These Black checkers represent Rubble within the game.

Five (5) Dura ¾” PVC Pipe Couplers should be placed on the field, upright (the long dimension is vertical) on the mat, each placed in the center of one of the Safety Pillar Sites. The PVC Pipe
Couplers should have the raised lettering side facing UP. These represent Safety Pillars. Safety Pillars WITHOUT Rubble (Black checkers) on them are also called “Non-Hazardous Safety Pillars” (or just “Safety Pillars”).

The remaining Six (6) Black Checkers should be stacked into three pairs, both checkers in the pair facing crown-side-up. Each pair of checkers should be centered (crown-side-up) on the top of each of the three (3) PVC Couplers located within the FAM Drop Zone. Safety Pillars WITH Rubble (Black Checkers) on them are called Hazardous Safety Pillars because the Rubble on top of them are considered a Hazard (Watch for Falling Objects!).

**NOTE:** These pairs of Black checkers placed on top of the center PVC Couplers are INTENDED to be easily knocked off via motion of the PVC Coupler.

The fields for each side DO NOT have to match – the random placing of checkers may be completely random on both sides.

The team must place the Radio Tower and Safety Barrier, if the team has elected to build and use these two team-built game pieces, onto the robot PRIOR to being measured for compliance. These two game pieces must be considered “part of the robot” until they are no longer in contact with the robot. This means these two game pieces must be touching the robot prior to the start of the match, and must be included when measuring the robot for starting compliance. The Team Captain must indicate to the referee what comprises the Radio Tower and Safety Barrier, respectively, and also show the referee how these are represented on the Bill of Materials.

Once the Radio Tower and Safety Barrier are no longer in contact with the robot, these items are considered Game Pieces from that point on (and NOT as part of the robot). Game Pieces are NEVER allowed to be touched during the match by human hands once they are on the game field.
Figure 6 – Example of a properly set up game board

Figure 7 – Zone Breakdown of Game Board (not rotated to represent correct orientation)
1.4 Game Tasks

In “Rubble Trouble,” a team’s robot must perform specific tasks on the challenge field. In Rubble Trouble, there are six (6) major tasks to perform. These tasks can be completed in any order (unless the Task specifies otherwise), and not all tasks must be performed. Each task completed by the robot accumulates points, though the tasks are not evaluated until the END of the match (unless the Task specifies otherwise) – if a task is completed, and then undone by robot action before the end of the match, then the task is obviously not completed. Some tasks will grant partial points for completing them partially, while others require the entire task to be completed before any points are awarded.

1.4.1 Erect A Radio Tower

The Radio Tower is important for USAR Communication Officers to set up at a disaster site as soon as possible. Not only does the Radio Tower boost communication between rescue workers, but it also acts as a Cell Tower booster to allow victims to possibly communicate with rescue workers on functioning cell phones. Radio Towers properly placed can be used by multiple USAR teams at a single location.

A Radio Tower is a team-supplied item that must be made from Allowable Materials. For a list of Allowable Materials, please see the Administration Manual – all materials used for the Radio Tower must be included on the team’s Bill of Materials. Radio Towers are not allowed to be used without a correctly-formatted and properly completed Bill of Materials. A Radio Tower is considered “Erected” if it is FULLY SUPPORTED by a single wall and extends NO LESS than six (6) inches above the TOP of the wall.

A Radio Tower may be Erected on the East, West, or North (center) walls. Radio Towers Erected on the East or West walls are worth 25 points to the team that Erected the tower, and Radio Towers Erected on the North (center) wall is possibly worth 50 points to both teams. Only one Radio Tower counts per team – the lowest-point tower within the team’s area (the center wall is considered part of both team’s areas) is the only tower that counts for a team.

For example, Team A erects a Radio Tower on their East Wall, and Team B erects a Radio Tower on the Center wall. Team A will receive 25 points for their Tower, but Team B will receive 50 points for their Tower. If Team A had not erected a tower at all, Team A would have also received 50 points for the tower that Team B Erected. If both teams Erect a tower on the North (center) wall, both teams receive 50 points. If neither team Erects a tower, neither team will receive any Radio Tower points. Opposing teams are NEVER allowed to de-score Radio Towers.

Points Awarded for Erecting a Radio Tower on the East or West Walls: **25 points**
Points Possibly Awarded for a Radio Tower Erected on the Center Wall: **50 points**
Maximum Possible Points Awarded for this Task: **50 points**
1.4.2 Remove Safety Pillars from FAM Drop Zone

It is important to demonstrate to the USAR committee that your USAR robot can actually transport Safety Pillars. Do this by completely removing all Safety Pillars from the FAM Drop Zone by the end of the match.

Points Awarded for having NO Safety Pillars within the FAM Drop Zone: **50 points**
Maximum Possible Points Awarded for this Task: **50 points**

1.4.3 Support the Weakened Warehouse Structure

Non-Hazardous Safety Pillars (Safety Pillars without Rubble on them – otherwise just known as “Safety Pillars”) can be used to support the weakened areas within the Warehouse Structure. By supporting three or more Weakened Structure Marks with ONLY Safety Pillars, the stability of the Warehouse can be guaranteed. Safety Pillars must be upright in order to count, and should be the only Game Piece touching the mark.

This task awards 10 points for each Weakened Structure Mark that ONLY has an Upright Safety Pillar touching it, and an additional 50 points for having 3 or more Weakened Structure Marks touching Upright Safety Pillars.

Points Awarded for each Weakened Structure Mark touching an Upright Safety Pillar: **10 points**
Points Awarded for having 3 or more Marks touching Upright Safety Pillars: **50 points**
Maximum Possible Points Awarded for this Task: **100 points**

1.4.4 Deliver FAM to Safety Zone

Another key element to the USAR test is proving your robot can deliver FAM to the Safety Zone. Each FAM you deliver to the Safety Zone is worth 10 points. If you can deliver 8 or more FAM to the Safety Zone, a 50 point bonus is awarded. BE CAREFUL, if any Rubble is within the Safety Zone at the end of the match, all FAM points are nullified (FAM Delivery score will be ZERO).

Points Awarded for each FAM with no Rubble in the Safety Zone: **10 points**
Bonus Awarded for having 8 or more FAM with no Rubble in the Safety Zone: **50 points**
Maximum Possible Points Awarded for this Task: **150 points**
1.4.5 Contain Rubble

In a Search and Rescue Mission, the most important person is the rescuer. It’s the job of the rescuer to rescue the greatest number of people in the shortest amount of time, while posing minimal risk to the rescuer. The USAR robot should facilitate in reducing the risks of the rescuer whenever possible.

Rubble is made of potentially hazardous materials – it could be made up of asbestos, biological hazards, chemicals, or anything that can harm people or the environment. Therefore, it is important to contain the Rubble if possible to protect rescue workers who might come in contact with it. Your robot is tasked with containing as much Rubble as possible.

Containment of Rubble can be performed in one of two ways:

1. Erecting one or more Safety Barriers around Rubble
2. Containing Rubble within the Robot

A Safety Barrier is defined as, “Any structure that completely surrounds the perimeter of one or more Rubble.” The Safety Barrier is a team-supplied item that must be made from Allowable Materials. For a list of Allowable Materials, please see the Administration Manual – all materials used for the Safety Barrier must be included on the team’s Bill of Materials. Safety Barriers are not allowed to be used without a correctly-formatted and properly completed Bill of Materials.

Rubble is considered “contained within the robot” if the Rubble is in physical contact with the robot, but not in contact with any other game piece (except those also contained within the robot), field element, or the mat.

Robots that use a Safety Barrier technique to contain Rubble can deploy Safety Barriers for Hazmat teams to properly dispose of the Rubble at a later time, whereas robots that contain Rubble within the robot cannot be handled by rescue workers and reused for multiple building structures with Rubble. Therefore each Rubble surrounded by a Safety Barrier is worth 10 points each, and Rubble contained within the robot is worth 5 points each.

Points Awarded for each Rubble contained within a Safety Barrier: **10 points**
Points Awarded for each Rubble contained within the robot: **5 points**
Maximum Possible Points Awarded for this Task: **100 points**
1.4.6 Empty the Warehouse

USAR Ground Robots are primarily tasked with searching through damaged buildings for trapped victims. In this task, the Warehouse will be considered “completely searched” and “Empty” if no game pieces (except Safety Pillars) are touching the area defined as the Warehouse by the end of the match.

Points Awarded for an “Empty” Warehouse: **50 points**
Maximum Possible Points Awarded for this Task: **50 points**
Section 2  Game Specific Rules

These rules are here to define game-specific actions or specifications, on top of or in replacement of any general rule that might be in place.

Starting Points
2.0.1 Teams start out with 100 points.

Robot Start Configuration
2.0.2 Robots must start the match with at least one drive wheel touching the Robot Start Zone AND must be touching the wall closest to the Robot Start Zone. Robots may start the match at any location within the Robot Start Zone and in any orientation as long as these rules are followed.

2.0.3 At the beginning of the match, the robot shall be no larger than a 12 inch cube, unrestrained – the “Robot” is defined by everything the team brings to the table for the game (including team-supplied game pieces). This means that at rest, with nothing holding any part of the robot back, the robot’s dimensions measure no more than 12” x 12” x 12” in size. There is no weight limit on the robot. While the robot is active in play, there is no restriction on the size of the robot.

Robot Recovery and Restarts
2.0.4 During match play, team members are allowed to “recover” their robot during play from anywhere on the game field – this is equivalent to having a recovery team retrieve the robot from the test facility. If a team decides to recover their robot (by initiating touch contact with the robot):

- Any game pieces touching the robot (except team-supplied game pieces) are removed from play.
- The robot is “disabled” and immediately returned to the Robot Start Zone.

A team is allowed to “recover” their robot an unlimited number of times. There is no point deduction for recovering the robot, but instead there is a time penalty. The time penalty is a period of time, beginning from the time the human operator initiates contact with the robot to be recovered, that the human operator must wait before being allowed to restart their robot.

- The wait period is, in seconds, the number of times the robot has been recovered that match.
  - For example, the first time a robot is touched, it must wait 1 second from the time it is first touched before being restarted. The second time the robot is touched, it must wait 2 seconds before being restarted, and so on...
2.0.5 Rubble “contained within the robot” is considered “part of the robot” for purposes of robot recovery, and is not removed from play during a robot recovery. Rubble is considered “contained within the robot” if the Rubble is in physical contact with the robot, but not in contact with any game piece, field element, or the mat.

2.0.6 While the robot is “disabled” within the Robot Start Zone, the team may change programs or repair/rebuild the robot. No new outside parts may be added to the robot, but parts may be removed – and once they are removed, and the robot restarted, they may not be re-added to the robot. The robot may be started again anywhere within the Robot Start Zone as long as ALL of these following conditions have been met:

1. Some part of the robot is physically touching the Robot Start Zone AND the wall closest to the Robot Start Zone.
2. **The robot is no larger than 12” cubed** – referees will estimate robot size, and if the referee determines the robot is likely still within size the team may immediately restart the robot. If the referee feels the robot is not within size, the referee will quickly remeasure the robot.

Field Variance and Game Debris

2.0.7 Robots must be able to handle some field variances, such as tolerances in board length/width/height and slight waviness in the field mat. Teams should not rely on specific field attributes that can vary with tolerances (such as the amount of spacing under the center wall, the vertical angle of the field walls, etc…) when designing their robots.

2.0.8 Teams may request that any element - that is not a part of a robot or was not present on their half of the playing field at the start of the match – be immediately and permanently removed from the field of play at any time during a match if that element resides on their half of the playing field. Such elements would be considered, “debris,” and could be (but is not limited to) stray parts from the opposing team’s robot and/or game pieces from the opposing side of the playing field. These elements are to be held by the referee until the end of the match.

Special Game Piece Interactions

2.0.9 Safety Pillars are fragile while being transported – your robot is not allowed to transport more than ONE (1) Safety Pillar at a time. If your robot is ever in contact with more than one Safety Pillar, the referee will remove all Game Pieces (except team-supplied Game Pieces) in contact with your robot from the game board as a penalty and will require your robot to return to the Robot Start Zone.

2.0.10 FAM are perishable items, and special care must be taken while in transport. Your robot is not allowed to transport more than ONE (1) FAM at a time. If
your robot is ever in contact with more than one FAM (except in the Safety Zone), the referee will remove all Game Pieces in contact with your robot (except team-supplied Game Pieces) from the game board as a penalty and will require your robot to return to the Robot Start Zone.

2.0.11 If the FAM Drop Zone is “Empty” — meaning there are NO Game Pieces (including team-supplied Game Pieces) and NO robot partially or completely within the area — human operators (team members) may place a single FAM onto any Safety Pillar Site from their supplied FAM-on-hand (the extra Red checkers given to the team prior to the beginning of the match). This action may be repeated once the FAM Drop Zone is emptied again until all FAM-on-hand has been put onto the field.

2.0.12 Teams must have a properly formatted and correct Bill of Materials to be allowed to score any points for tasks 1.4.1 and 1.4.5, whether the team uses any of their own team-supplied game pieces or not. Even if the scoring conditions are met without any input from the team, the absence of a properly formatted and correct Bill of Materials negates any score for those tasks.

2.0.13 Radio Towers successfully erected on the Center Wall may not be intentionally or unintentionally de-scored. If a Radio Tower is successfully erected (and meets all of the requirements of a successfully erected Radio Tower) - and either robot then de-scores the Radio Tower - the opposing team (from the team who de-scored the Tower) will receive points for an erected Tower but the team who de-scored the Tower will not; unless, of course, a tower is successfully erected on the center wall by either team by the end of the match.

2.1 State Championships Variation

It has become a kind of tradition to have a variant to the rules for the State Championships. This gives teams an extra “something” to strive for, and if known in advance teams can design for it in the beginning.

2.1.1 In the State Championships ONLY, a Radio Tower erected within 12 inches of a team’s Safety Zone receives a 50 point location bonus. This will be measured with a ruler from the outer edge of the Safety Zone graphic on the surface of the mat closest to the Safety Tower to an exposed portion of the Safety Tower (must be line-of-sight, cannot measure through a wall). A team may only receive one location bonus.

2.1.2 In the State Championships ONLY, there will be a 25 point bonus for using exactly one Safety Barrier.
2.1.3 In the State Championships ONLY, robots that are COMPLETELY OUTSIDE any defined area on the game field at the end of time are awarded 50 extra points. This means robots cannot be partially or completely within the Warehouse, Safety Zone, FAM Drop Zone, Robot Start Zone, or a Safety Pillar Site.

2.1.4 In the State Championships ONLY, the ranking score will be determined by averaging ALL THREE (3) matches played by a team – no scores are dropped.
Section 3  Scoring Examples

In this section, some scoring examples are presented. This is designed to help teams and referees understand the task rules, scoring method, and game field layout. However in some of these scoring examples the robot is NOT going to be shown, and the robot condition in these situations will be noted.

3.1 Scoring Example #1

No Scoring Examples Defined Yet.