

**Section**  
**6**

# THE ARENA



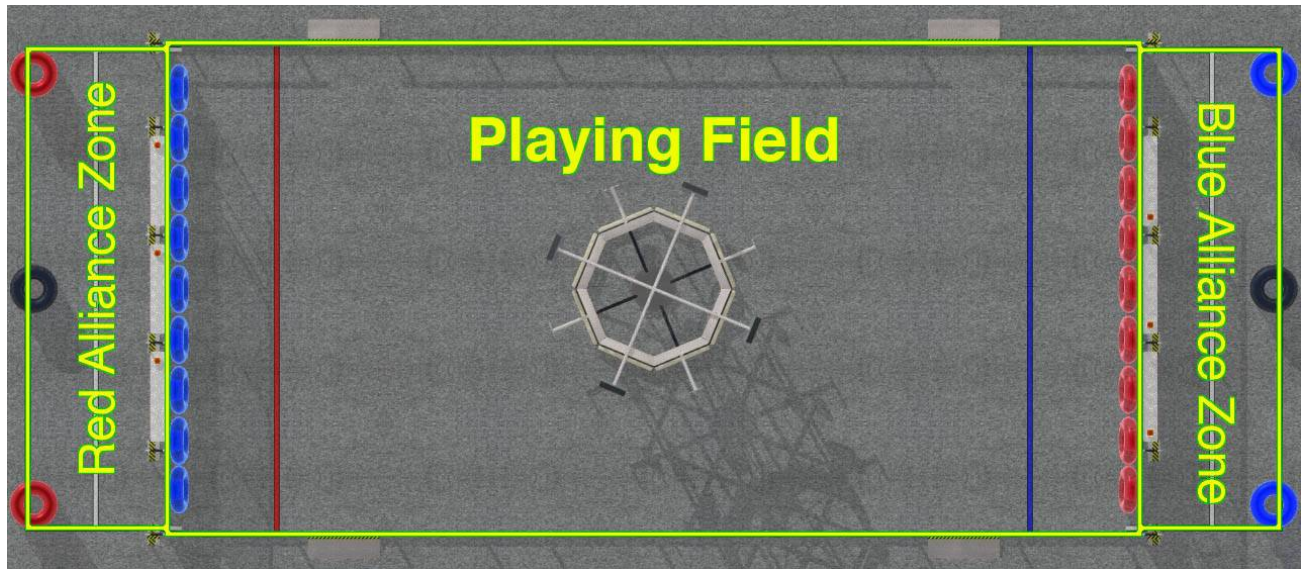
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## 6 THE ARENA

### 6.1 OVERVIEW

The following sections of the manual describe the arena, game, robots and tournament structure used in the 2007 *FIRST* Robotics Competition. Please be sure to read and thoroughly understand Sections 6, 7, 8, and 9 to ensure the best opportunity for success during the competition season.



*Note: The illustrations in this section of the manual are for a general visual understanding of the field only. Teams should refer to the drawings for exact dimensions and field construction.*

The Playing Field is a 26 by 54-foot rectangular area in which the ROBOTS compete. The Red and Blue Alliance Zones are rectangular areas, each consisting of three team stations, which are located outside of the ends of the Playing Field. The three teams that make up each Alliance play the game from these zones.

The specifications below are for the *FIRST* playing fields used in competition. These fields are welded aluminum, which are built to withstand rigorous play and damage from frequent shipping. Precise specifications and construction details of the field elements can be found on the *FIRST* web site at [www.usfirst.org/frc/2007/officialdrawings.html](http://www.usfirst.org/frc/2007/officialdrawings.html). Note that the web site also contains drawings for suggested low-cost versions of the important field elements that teams can build for their own use during the construction and testing of the ROBOT. These drawings can be found at [www.usfirst.org/frc/2007/teamdrawings.html](http://www.usfirst.org/frc/2007/teamdrawings.html).

#### 6.1.1 Dimensions and Tolerances

The exact dimensions and construction details of the fields are contained on the official field drawings. The relevant drawings include:

<b>2007 FRC DRAWINGS</b>			
<b>TITLE LINE 1</b>	<b>TITLE LINE 2</b>	<b>DWG NO.</b>	<b>SHEET/S</b>
2007 Field	Layout and Marking	T07-0100	1 Sheet
2007 Field Rack	Fabrication	G07-0001	3 Sheets
2007 Field Rack	Weldments	G07-0002	1 Sheet
2007 Field Rack	Sub-Assemblies	G07-0003	1 Sheet
2007 Field Rack	Assembly	G07-0004	1 Sheet
Drivers Station Panel	Fabrication	F05-0001	1 Sheet
Drivers Station Panel	Assembly	F05-0002	1 Sheet
Drivers Station Support	Fabrication	F05-0003	1 Sheet
Drivers Station Support	Assembly	F05-0004	1 Sheet
Corner Support	Fabrication	F05-0005	1 Sheet
Corner Support	Assembly	F05-0006	1 Sheet
Field, Rail	Fabrication & Assembly	F05-0007	1 Sheet
Field, Rail / Gate	Fabrication & Assembly	F05-0008	1 Sheet
Field, Top Rail	Fabrication & Assembly	F05-0011	1 Sheet
Field Plastic Panel	Fabrication	F05-0012	1 Sheet
Field Outrigger	Fabrication & Assembly	F05-0013	1 Sheet
Hinge Insert	Fabrication	F05-0015	1 Sheet
Field Corner Panel	Fabrication	F05-0016	1 Sheet
Field Corner Panel	Assembly	F05-0017	1 Sheet
Field Corner Top Rail	Fabrication & Assembly	F05-0018	1 Sheet
Field Entry Ramp	Fabrication & Assembly	F05-0020	1 Sheet
Field Gate Hanger	Fabrication	F05-0021	1 Sheet
Field Trip Guard	Fabrication	F07-0023	1 Sheet
2007 Vision Target	Fabrication & Assembly	F02-0202	2 Sheets

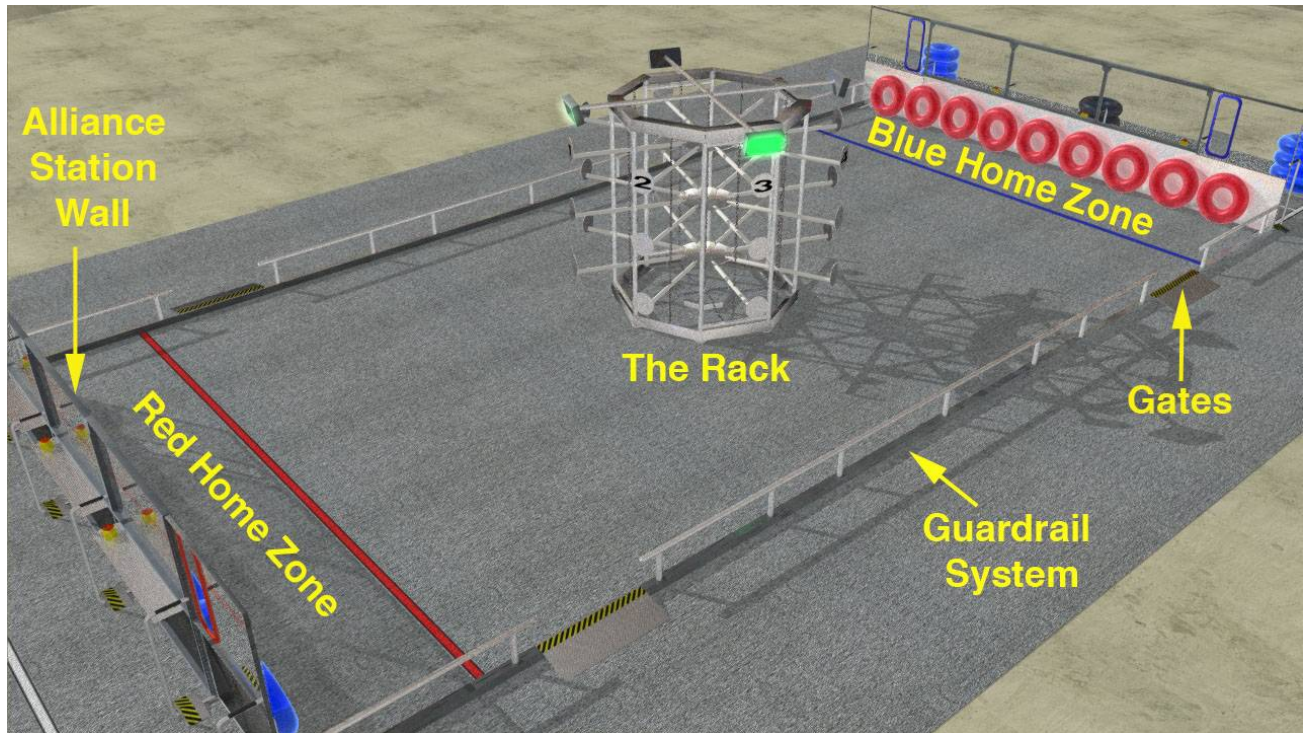
Where surfaces are indicated as flush, expect variations as much as 1/4 inch. This is not considered abnormal and is part of the game challenge. The reasons for these variations are numerous; different arenas are manufactured at different sites, set up by different volunteers, and undergo different temperature extremes. Volunteers and *FIRST* staff at each competition site will do their best to make the Arena and its elements as close to nominal as reasonably possible.

## 6.2 PLAYING FIELD

*Note: The official Playing Field description, layout, dimensions and parts list are contained in the “2007 Arena Layout and Marking” Drawing. Diagrams and dimensions below are for illustrative purposes only.*

### 6.2.1 Boundaries and Markings

The carpeted Playing Field is 26 feet 8 inches by 54 feet, bounded by two Alliance Station Walls and a Guardrail System.



The Alliance Station Wall is 6-1/2 feet high. The entire Alliance Station Wall is 26 feet 8 inches wide, centered on the ends of the field. The wall is composed of a 3-foot high base of diamond plate aluminum topped with a 3-1/2-foot high transparent acrylic panel.

The Guardrail System is a 20-inch high horizontal pipe with vertical supports mounted on a 3" aluminum angle. A shield is attached on the field side of the Guardrail system, extending from the floor to the top of the guardrail, and running the length of the guardrail. The Guardrail System defines the borders of the Playing Field except where it is bounded by the Alliance Station Wall.

Four gates in the Guardrail System allow easy access to the Playing Field for placement and removal of ROBOTS. The gates are four feet wide and are located in each quadrant of the field. The gates are closed and shielded during game play.

A HOME ZONE is located at each end of the field. The HOME ZONE is the 8 foot by 26 foot 8 inch area bordered by the diamond plate wall of the Alliance Station, the polycarbonate walls of the playing field, and a colored line on the playing field. This line is made of a two-inch wide strip of gaffers tape. The HOME ZONE for each ALLIANCE is located at their end of the field, and the gaffers tape is colored red or blue to indicate to which ALLIANCE the HOME ZONE belongs. The tape is considered part of the HOME ZONE. Each element of the HOME ZONE border is projected vertically upwards when determining if an object is within the zone.



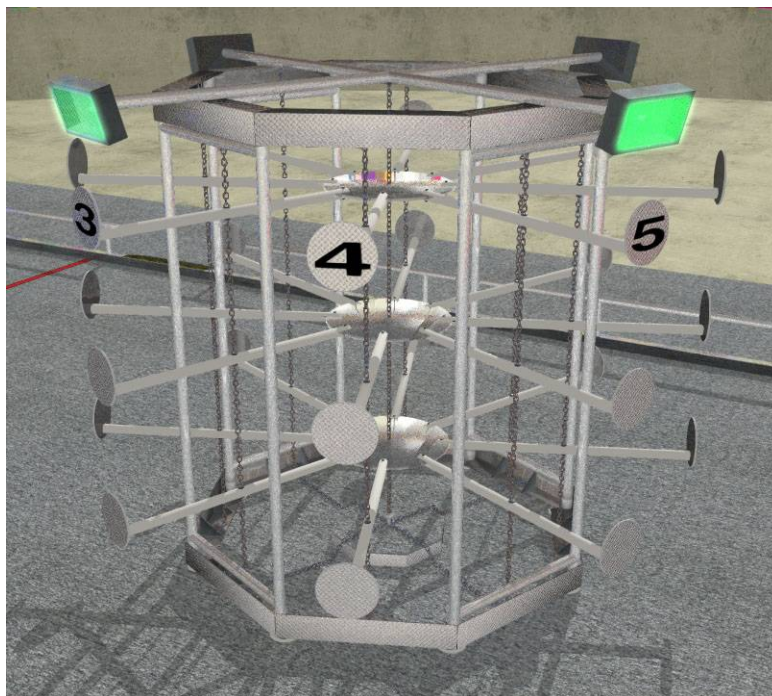
## 6.2.2 The RACK

The center of the Playing Field is occupied by the main scoring structure, known as the “RACK.” ROBOTS hang GAME PIECES on the “SPIDER LEGS” of the RACK to SCORE the LEGS for their ALLIANCE.

The RACK is an octagonal framework made of 2 inch OD aluminum pipe. The structure measures approximately 10 feet tall, and eight feet in diameter (face to face).

To constrain the motion of the RACK, the structure is connected by a set of loose chains to a small platform located at the center of the field. The platform is firmly attached to the floor of the Playing Field. The slack in the chains connecting the structure to the platform permit the RACK to translate approximately one foot in any direction, and freely rotate around the platform.

Four vision system targets are located at the top of the RACK, at 90-degree intervals around the periphery. The vision system targets are illuminated panels measuring 8 by 16 inches, with the top of the panel approximately ten feet from the floor. Each panel is located directly above the ends of the set of “SPIDER LEGS” beneath them. The panels are back-lit by a series of cold cathode tubes mounted in an aluminum enclosure. The vision system targets are illuminated during the entire game.



A series of chains are suspended from the top edges and center of the structure. The chains support three “SPIDERS” upon which the GAME PIECES may be hung. The spiders are located at approximately 24 inches, 58 inches, and 92 inches above the floor. Each SPIDER is made of a central disk of 1/2 inch polycarbonate, two feet in diameter, from which eight 2-inch OD aluminum “SPIDER LEGS” extend. As it is hanging from the chains the entire SPIDER assembly, and each SPIDER LEG within that assembly, can move within a large range of horizontal motion.



The 24 SPIDER LEGS constitute the set of scoring locations on the RACK, on which the GAME PIECES can HANG. Each five-foot long SPIDER LEG is attached to the central disk of the SPIDER with a loose pivoting joint that allows it to freely rotate in the horizontal plane. The end of the leg has a retaining plate, known as the SPIDER FOOT, made of a 10-inch diameter disk of diamond plate aluminum. The SPIDER FOOT prevents GAME PIECES from falling off once they are placed on the SPIDER LEG. Each SPIDER LEG is designed to allow one or two, but no more, GAME PIECES to HANG from it in permissible positions. A short length of flexible rubber hose, known as the STINGER, is attached to the back of the SPIDER FOOT. The STINGER helps prevent GAME PIECES from being knocked out of position once they are HANGING.

## 6.3 GAME PIECES

The GAME PIECES are toroidal tubes made of inflatable plastic. When inflated, each GAME PIECE is approximately 32 inches across the outer diameter. Each toroid has an inner diameter of approximately 13 inches, and a height of approximately 9-1/2 inches. There are three types of GAME PIECES used in the game.

### 6.3.1 RINGERS

The “RINGERS” are made of translucent plastic. They are colored red or blue, with no other identifying markings. Each ALLIANCE will start the game with 18 RINGERS of their color. Nine of the RINGERS will be located in the ALLIANCE ZONE, and nine of the RINGERS will be set up against the Alliance Station Wall at the far end of the playing field.

### 6.3.2 KEEPERS

The “KEEPERS” are similar to the RINGERS, except that a broad white band inscribed with the *FIRST* logotype is imprinted on the outer circumference of the toroid. Each ALLIANCE will start the game with three KEEPERS, one per ROBOT. A KEEPER can only be SCORED during the AUTONOMOUS PERIOD.

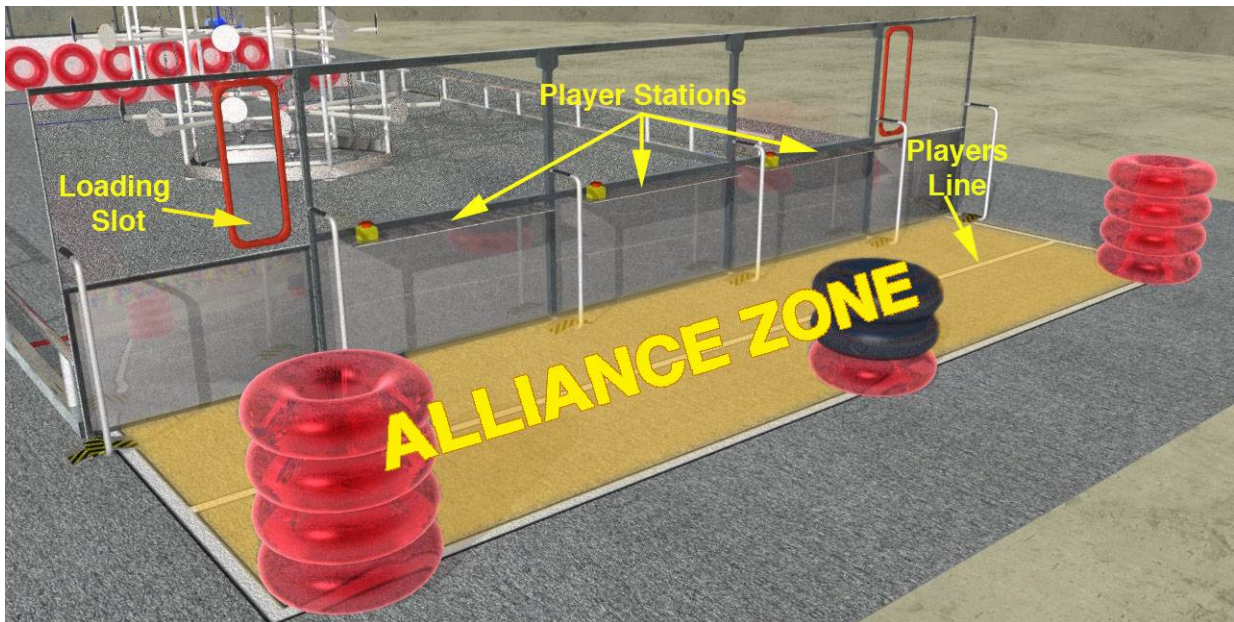
### 6.3.3 SPOILERS

“SPOILERS” are similar in size and shape to the other tubes, except that they are made of opaque black plastic. Each ALLIANCE will start the game with two SPOILERS located in their ALLIANCE ZONE.



## 6.4 ALLIANCE ZONES

The two ALLIANCE ZONES are located at either end of the field, behind the Alliance Station Walls. Each ALLIANCE ZONE is a 26' 8" x 8' area, and includes three identical player stations. All team members stand behind the Alliance Station Wall during the match, where they can move freely within the Alliance Zone.



### 6.4.1 Boundaries and Markings

Each ALLIANCE ZONE shares the Alliance Station Wall with the Playing Field and has its outer and back edges marked on the carpet with white gaffer tape. The ALLIANCE ZONE extends eight feet back from the Alliance Station Wall, and is the width of the field. Four feet from the Alliance Station Wall, the Players Line is marked on the carpet with a two-inch wide white gaffers tape. The ALLIANCE ZONE includes the area behind the PLAYER'S LINE. The tape boundaries are considered "in" the Alliance Zone.

### 6.4.2 Player Stations

Attached to the Alliance Station Wall are three aluminum shelves to support the alliance robot control systems of the three teams. The support shelf measures approximately 60 inches wide by 12 inches deep. There is a 4-1/2-foot long by two-inch wide strip of Velcro tape ("loop" side) along the center of the support shelf that may be used to secure the ROBOT controls and Operator Interface. Each setup location includes a competition cable, which attaches to the "Competition Port" of the Operator Interface. This cable provides power for the team's Operator Interface and controls communications with the ROBOT. Emergency Stop (E-Stop) buttons for each team are located on the left end of each Player Station shelf.

### 6.4.3 The CHUTE

The CHUTE is an opening at either side of the Alliance Station Wall, through which student team members may pass RINGERS and SPOILERS to the ROBOTS and/or enter them onto the field. The CHUTE is located in the upper portion of the Alliance Station Wall, and is approximately 31 inches tall by 9 inches wide. The CHUTE is outlined with a colored rim to aid visibility (either red or blue, to match the corresponding Alliance Zone at that end of the field). RINGERS and SPOILERS may be passed from the ALLIANCE ZONE through the CHUTE and on to the Playing



Field. Four bungee cords are positioned at the edges of the CHUTE that can hold GAME PIECES in position in the CHUTE so that they may be retrieved by passing ROBOTS.

## 6.5 DRAWING NOTES

The materials required to construct the “*Rack ’n’ Roll*” playing field are commonly available from multiple sources. In most cases, teams should be able to obtain all the materials required to construct a practice field from local hardware stores, home improvement centers, and/or industrial supply resources. If all materials are not available through your local outlets, some sources for field construction materials are listed below:

- Supplier for the Gaffer’s Tape for field markings: Go to <http://www.tapemonster.com>
  - Order Shurtape PC-628 2” x 60 yds Red Gaffers Tape for the line that marks the Red Alliance End Zone. It is ~\$8 per roll.
  - Order Shurtape PC-628 2” x 60 yds Blue Gaffers Tape for the line that marks Blue Alliance End Zone. It is ~\$8 per roll.
  - Order Shurtape PC-628 2” x 60 yds White Gaffers Tape for the lines that mark the Team Zones. It is ~\$8 per roll.
  
- Supplier for plastics & HDPE: Plastic Supply Inc., located in Manchester, NH. Go to <http://www.plasticsupply.com/> or call 800-752-7759 or 603-669-2727 (Fax 603- 668-1691; Email: [plasticsupply@conversent.net](mailto:plasticsupply@conversent.net)). Identify yourself as a *FIRST* team and give them your team number.