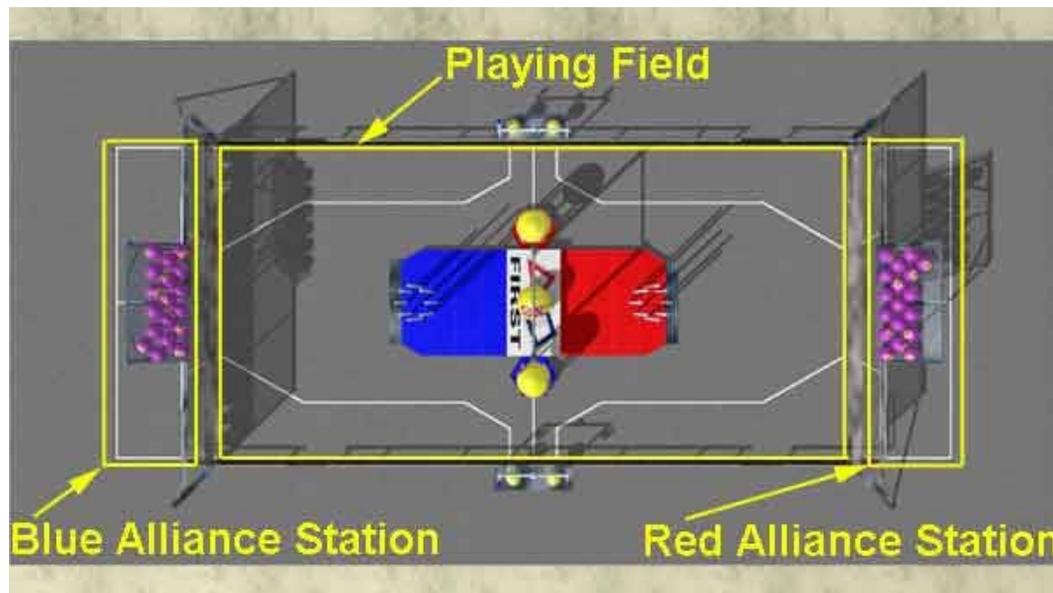


## 3 THE ARENA

[This section includes all modifications through Team Update 14]

### 3.1 OVERVIEW



Note: The animated pictures 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. For example, the stationary goals are positioned back from the steps, not right near them as shown in the renderings.

The Playing Field is a rectangular area in which the Robots compete. The Red and Blue Alliance Stations are rectangular areas, each consisting of two (2) Team Zones, which are located outside of the ends of the Playing Field. The two teams that make up each Alliance play the game from these stations.

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. Specifications and drawings for low cost versions of the field components are available on the FIRST website at [http://www.usfirst.org/robotics/doc\\_updt.htm](http://www.usfirst.org/robotics/doc_updt.htm) (“2004 Low Cost Field – Layout 1, 2, 3, & 4”) (Please also see section 3.5 *Drawing Notes*)

#### 3.1.1 Dimensions and Tolerances

All official dimensions are on the following drawings: (Please also see section 3.5 *Drawing Notes*)

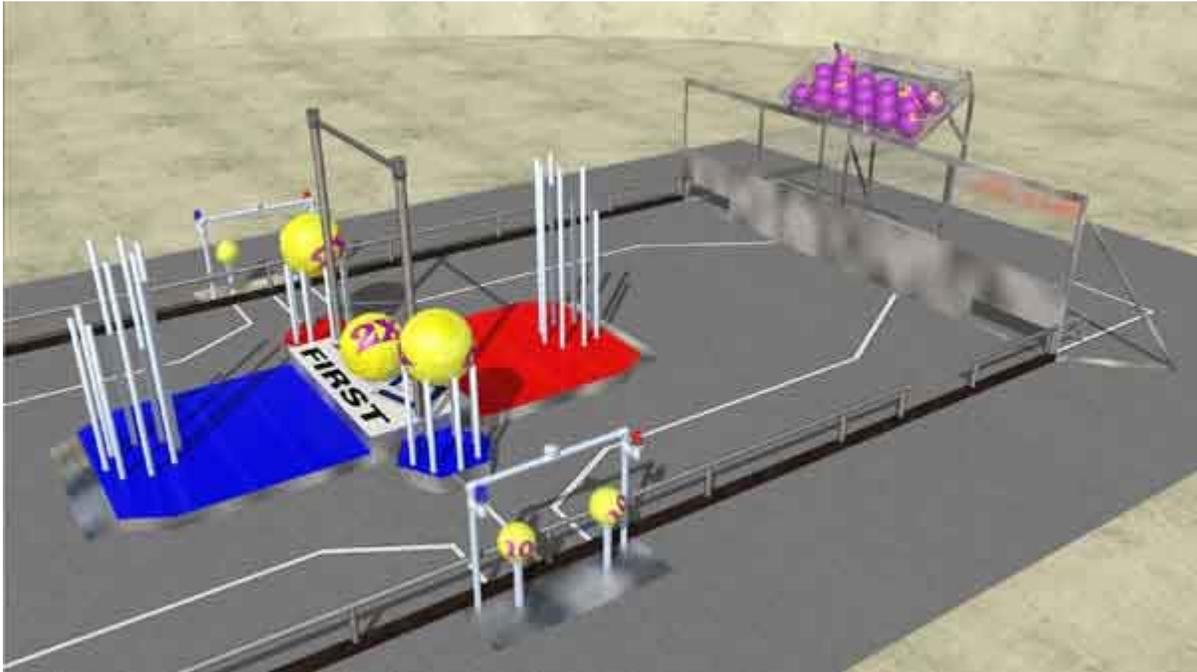
- 2004 Arena Layout and Marking
- 
- 2004 Field Elements – Ball Corral –1
- 2004 Field Elements – Ball Corral –2
- 2004 Field Elements – Ball Release –1
- 2004 Field Elements – Ball Release –2
- 2004 Field Elements – Center Structure –1
- 2004 Field Elements – Center Structure –2
- 2004 Field Elements – Mobile Goal –1
- 2004 Field Elements – Mobile Goal –2
- 2004 Field Elements – Stationary Goal –1
- 2004 Field Elements – Stationary Goal –2
- 2004 Field Elements – Stationary Goal –3
- 2004 Field Elements – Stationary Goal –4
- 2004 Field Elements – Tees and Guard
- 2004 Field – Diamond Plate and Frame mods –1
- 2004 Field – Diamond Plate and Frame mods –2

Where surfaces are indicated as flush, there may be variations either direction of as much a 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.

The balls are made of rubber and are expected to undergo a lot of robot and person handling. They are likely to become misshapen and may become ovular instead of round. Because of a variety of environmental conditions at various competition sites, their resilience and elasticity are expected to vary. Because of these reasons, balls will be inflated at each site to their stated 13" dimension measured at their Equator (the manufacturing seam of the ball). Since misshapen balls are expected, they are considered to be part of the game challenge.

## 3.2 PLAYING FIELD

*Note: The official Playing Field description, layout, dimensions and parts list are contained in the "2004 Arena Layout and Marking" Drawing. Diagrams and dimensions below are for summary purposes only.*



### 3.2.1 Boundaries and Markings

The carpeted Playing Field is 48 feet by 24 feet, bounded by two Walls and a Guardrail System.

The Guardrail System is a 20-inch high horizontal pipe with vertical supports mounted on a 3" aluminum angle. A 3/16" stranded steel cable runs through the vertical supports mid way between the angle aluminum and the top pipe.

The following locations have 20-inch high polycarbonate shields attached on the field side of the Guardrail system (the shields have holes in them so they can be moved by field attendants):

- each of the four corners of the field,
- each of the four gates
- each Ball Tee Station.

The Wall is 7 feet high: a 3-foot high base of diamond plate with a 4-foot high transparent acrylic top.

In each quadrant of the Playing Field, there is a two-inch-wide white line of gaffer's tape on the Playing Field carpet running from the Wall to the Ball Tee Station.

There is a 2-inch white line running across midfield.

### 3.2.2 Center Structure

*Note: The official Center Structure layout, dimensions and parts list are contained in "2004 Field Elements - Center Structure" Drawings. Diagrams and dimensions below are for summary purposes only.*

#### 3.2.2.1 Upper Deck & Pull-up Bar

The Upper Deck is a stationary 4' x 8' x 12" platform at midfield; the surface is polycarbonate; the sides are diamond plate.

A Pull-up Bar, made of 2.375 inch galvanized steel pipe, spans and rises from the Upper Deck; its height is 10 feet from the carpet to the top of the bar.

#### 3.2.2.2 Lower Decks and Stationary Goals

The Lower Decks are stationary, 6-sided polygons measuring 8' x 8' x 6", the surface is Red or Blue textured HPDE, and the sides are diamond plate.

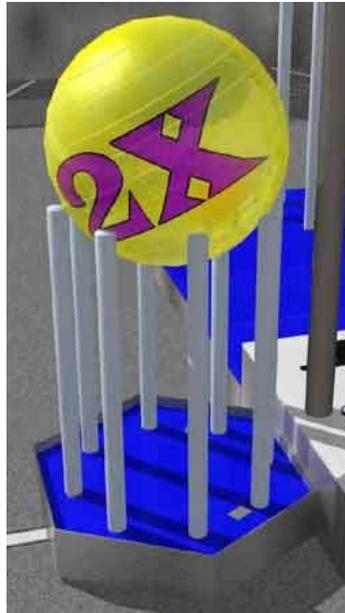
The end contains a full- width diamond-plate staircase of three 1.5-inch rise by 3 inch run steps. (The run of the top step is 3.5 inches – this dimension was incorrect in the initial Low Cost Playing Field Drawings).

Each Lower Deck contains a 28" diameter octagonal Stationary Goal formed by 2" PVC Posts (1-1/2" ID and just under 2" OD) at each apex.

The five Goal Posts closest to the Upper Deck are 8'; the other three are 6', measured from the carpet to the top of the pole.

### 3.2.3 Mobile Goals

*Note: The official Mobile Goal, layout, dimensions and parts list are contained in "2004 Field Elements - Mobile Goal" Drawing. Diagrams and dimensions below are for summary purposes only.*



The Mobile Goal is a 36"x 36" hexagon mounted on casters, with either a red or blue textured HDPE surface and diamond plate sides. It contains a 28" diameter octagonal Basket formed by one 2" PVC Post (1-1/2" ID and just under 2" OD) at each apex.

Each Mobile Goal Post is 4 feet high as measured from the carpeted surface of the Playing Field.

The Mobile Goal weighs approximately 112.5 pounds.

### 3.2.4 Ball Delivery System

*Note: The official Ball Delivery System, dimensions and parts list are contained in "2004 Field Elements - Ball Release, Ball Chute" and "2004 Field Elements - Tees / Corral / Paddle" Drawings. Diagrams and dimensions below are for summary purposes only.*

The Ball Delivery System is an automated part of the Field Control consisting of a Ball Release, Ball Tees, and Field Control.



The Ball Release stores eighteen (18) Small Balls and is mounted above each Alliance Station.

A framed Ball Tee Station is located on each side of the Playing Field at the midpoint. Each Ball Tee Station contains two Tees to support the Bonus Balls. Each Ball Tee is associated with its nearest Ball Release.

Red and Blue lights mounted on the Tee Station indicate when a Bonus Ball has been removed during the Autonomous Period.

### 3.2.5 IR Beacons

Centered on the top of each Tee Frame is a light beacon that continuously emits an infrared signal across the playing field during a match. Each beacon emits at the same IR frequency, but sends pulse trains of different pulse widths. The beacon nearest to the red moveable goal will transmit a Type-1 signal, and the one nearest the blue goal will be Type-0. These signals are detectable by robot-mounted IR receivers that are tuned to the beacons' frequency. The receivers provide direct input to the robot's control system when they sense an IR signal.

FIRST has supplied appropriate code that allows teams to program their robot's controller to make decisions based on a received signal and discriminate between the two Tee locations. Thus teams may create mechanisms on their robots to locate and track a beacon during the autonomous period. The Kit contains four IR receivers and materials needed to build a beacon.

### 3.2.6 Ball Chute

*Note: The official Ball Delivery System, dimensions and parts list are contained in "2004 Field Elements - Ball Release, Ball Chute" drawings. Diagrams and dimensions below are for summary purposes only.*



Located in each corner of the Playing Field is a Ball Chute to allow the robots to pass Small Balls through the Wall from the Playing Field into the Ball Corral (described below) within each Team Zone. The dimensions of the Ball Chute are 48" wide and 16" tall.

The Kickoff field had an angled piece of 1-1/2" x 1-1/2" aluminum angle in the opening with the outside of the angle facing up (~1-1/8"). In the final configuration, there will be a vertical piece of 1/4" thick aluminum with the same vertical dimension. The ball dynamics are the same in either configuration. Drawings will reflect this change.

### 3.3 SCORING OBJECTS

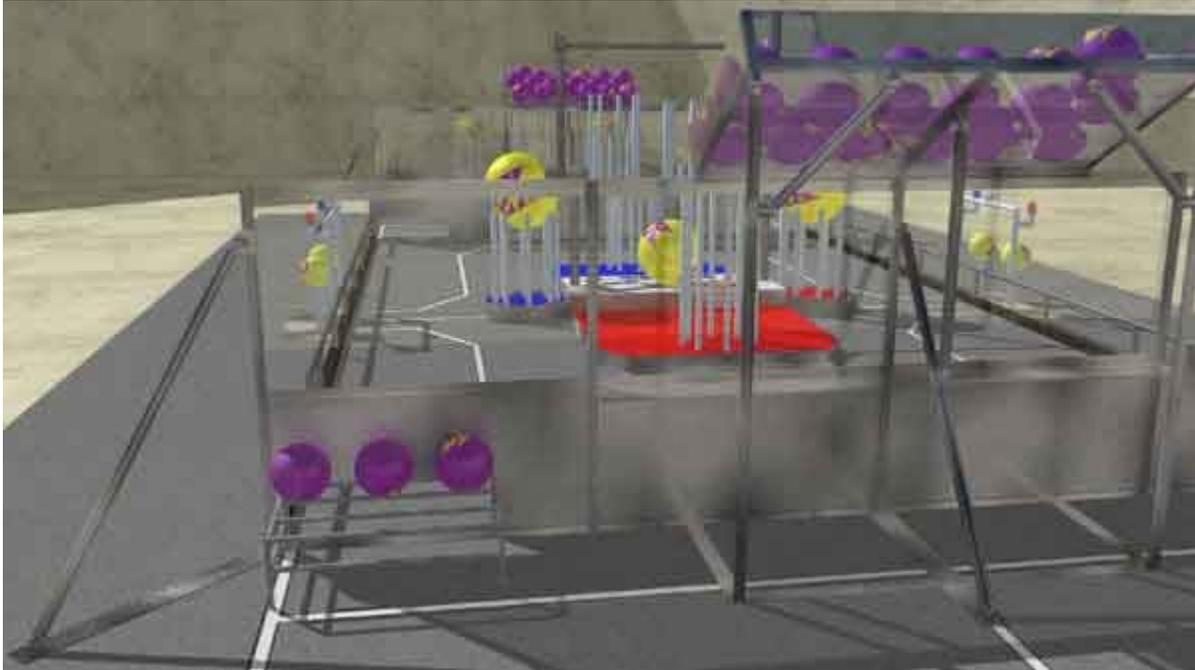
Small Balls are purple, 13-inch diameter, rubber balls with a yellow "5" point value on one side.

Bonus Balls are yellow, 13-inch diameter, rubber balls with purple "10" point value on one side.

Large Balls are yellow, 34-inch diameter, rubber balls inflated to 30-inch diameter with a purple "2X" on one side.

### 3.4 ALLIANCE STATIONS

Each Alliance Station is 8' x 24', split into two mirror image 8'x12' Team Zones.



*(The Ball Release supports are for illustration purposes only. The actual support system may be different.)*

#### 3.4.1 Boundaries and Markings

Each Team Zone shares the Wall with the Playing Field and has its outer and rear edges marked with tape on the carpet. The Team Zones share the downrigger support for the Ball Release as a common side from the center of the Wall.

Three feet behind the Shelf is a white-taped line on the carpet named the Starting Line.

#### 3.4.2 Shelf

Attached to the Wall, at a height of 3 feet, is a 42" wide by 9.5" deep diamond plate shelf to support the Team's Robot Controls. Attached to each shelf is a competition port cable for connecting the Operator Interface to the Field Control for power and communications. Two feet above the Shelf, on the center Wall pole, is a pocket to support the Operator Interface Radio.

#### 3.4.3 Ball Corral

*Note: The official Ball Corral dimensions and parts list are contained in "2004 Field Elements – Tees / Corral" drawing. Diagrams and dimensions below are for summary purposes only.*

Each Team Zone contains a 4'w x 30"d x 16"h Ball Corral abutting the Ball Chute. It is constructed of one-inch square aluminum with two crossbars on top and sidebars. The side facing the Shelf has no side bar.

At the start of each match, there will be 3 Small Balls on top of each ball corral.

### 3.5 DRAWING NOTES

- Change one of the “Steps to Deck” dimensions. The diamond plate “competition” steps to the lower deck (from the carpet) were produced with one dimension slightly different than published in the Low-cost Field Drawings. The “run” (horizontal dimension) on the top step is 3.5”, not 3”.
- Additional Information: The 3.5” casters specified on the mobile goal drawings are **in stock** and available from TCH ([www.tchweb.com](http://www.tchweb.com)) in Buffalo, NY. There is a \$50 minimum order if you use the website to order. If you call 1-800-465-6281 (the number listed on their website), there is **no** \$50 minimum. There is plenty of stock on hand. Orders ship the same day if placed by 2PM ET. Orders ship via ground (which takes 5 days at the most), 2nd day, and overnight.
- Supplier for the White Gaffer’s Tape for field markings: Go to <http://www.tapemonster.com>
  - Order Shurtape PC-628 2” x 60 yds White Gaffers Tape for the lines that run from the Alliance Stations to the Ball Tees. It is ~\$10 per roll
  - Order Shurtape PC-628 3” x 60 yds Black Gaffers Tape for the line that runs the full length fo the field to cover the carpet seam. It is ~\$16.50 per roll.
- Supplier for plastics & HDPE: Go to <http://www.plasticsupply.com/> Plastic Supply Inc., located in Manchester, NH, is available to help you with all of your plastic material needs for the 2004 FIRST Robotics Competition. Identify yourself as a FIRST team and give them your team number. [800-752-7759 or 603-669-2727; Fax 603- 668-1691; Email: [plasticsupply@conversent.net](mailto:plasticsupply@conversent.net)]