Part 3 – Baseball Field Development & Construction

The information in this document is provided as a general reference guide for the development of a baseball field. Professional and international baseball federations and organizations follow similar guidelines pertaining to the dimensions and needs for baseball field development. The information provided in this document should be used only as a resource in the development of a baseball playing field and the subsequent operational requirements needed for competition; this information does not represent the only means and methods of baseball field development.

This guide is composed of a summary comparison for ball field establishment protocols. These findings may illustrate potential solutions for construction, maintenance and safety for the field of play; however, all areas regarding potential field development may not be identified in this document.

Please note that certain country or regional laws and standards may apply to the construction of athletic fields. Therefore, the guidelines used in this document do not imply that a specific field will comply with worldwide baseball standards. This document was written in 2011

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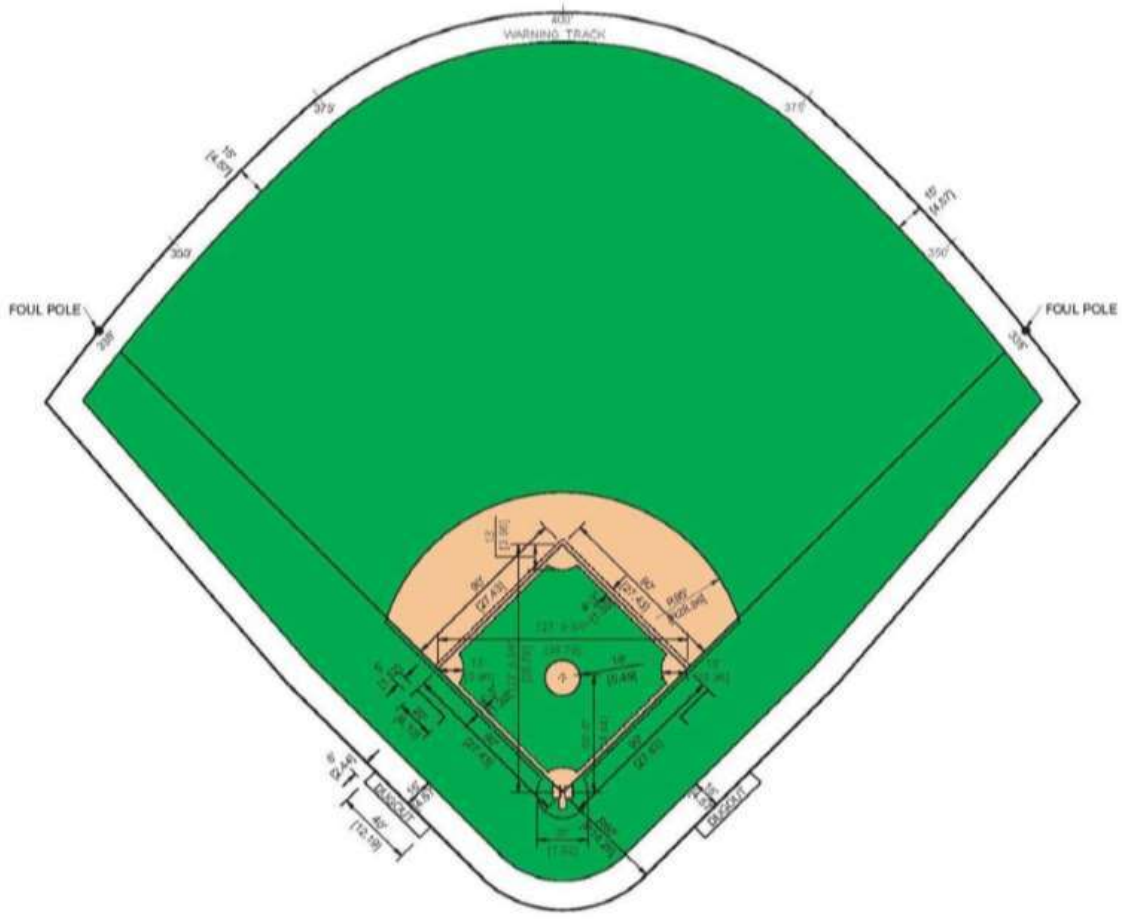
PLANNING FOR A BASEBALL FIELD 1.0

There are many steps to developing a baseball field and for it to be successful the site will require research. It's important to have input from all parties that will be involved with the field(s) development. The following are all very important components of the playing field that should be reviewed and discussed with all of the users. Before you move forward with these specifics, you should consider the following field development issues. They will help you define your goals in developing the field that best suits your budget and your needs

- Issues to consider when choosing a site for your baseball field?
- Location of the area within a city, farm land, city owned land
- Field Orientation- Is the sun going to set in the wrong part of the field?
- Accessibility

- Convenience for players and public
- Transportation issues
- Parking
- Safety of players and guests
- Multi purpose use considerations
- Opportunity for future growth
- For what age group or classification will this field or fields be used by?
- How often will they be used and during what time of year
- Type of construction.
- Performance or Recreational
- Who is going to maintain the field?
- Value engineering
- Cost of development –Design services
- Value Engineering
- Cost of maintenance
- Is the facility to be used for high level play?
- Field Lighting and at what level
- Dugouts, fencing, batters eyes etc...
- Topography of the existing areas
- Natural drainage of the area
- Amount of grading and fill necessary
- Soil of the area (the foundation subsoil and surface topsoil)
- Have they completed an soil borings to evaluate sub soil conditions
- Condition of existing turf
- Utilities, Electricity , Sewage
- Stormwater issues and flood plain concerns
- Construction Time Line – When do you plan to have the field used for play?
- Location of the area – Community, downtown, etc...
- Accessibility for public, deliveries etc.
- Transportation issues- traffic bus schedules, train etc..
- Hotels- what is the closest and can they provide your needs for tournaments
- Synthetic or Natural turf
- Safety

1.1 ESTABLISHING FIELD DIMENSIONS



Determining the size of the field or facility can be difficult. When planning for the field, the layout must meet the regulation standards of the age bracket or professional standards for your proposed level of play.

For a regulation size field, a parcel of land approximately 560 feet (170 meters) by 560 feet (170 m) with room to orient the field properly will provide a seating bowl for 3000 to 3,500 spectators. Additional land would be necessary for car parking. You should plan to allow 355-425 square feet (35-40 square meters) per car for access drives, parking areas, service drives and pedestrian ways.

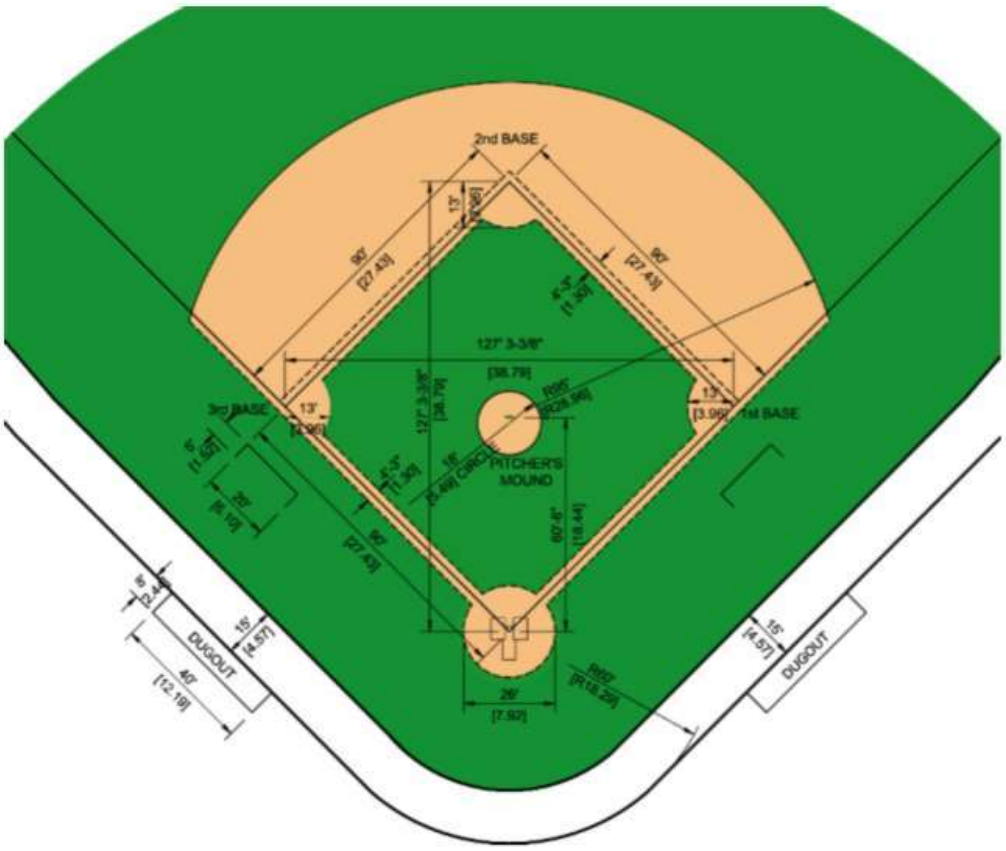


Diagram 1 outlines a regulation 90ft. field layout of infield area.

Based on the level of baseball that you have decided to build for your community, you will need to conform to certain league standards if you are planning to host specific tournaments for age groups. This graph will assist you in determining the potential field sizes.

Diagram 2

Category	Left Field	Center Field	Right Field	Pitching Distance	Distance Between Bases
Senior Competition	321' (98 m)	400' (122 m)	321' (98 m)	60'6" (18.44 m)	90' 27.4 m)
Ages 19-21	321' (98 m)	400' (122 m)	321' (98 m)	60'6" (18.44 m)	90' 27.4 m)
Ages 17-18	321' (98 m)	400' (122 m)	321' (98 m)	60'6" (18.44 m)	90' 27.4 m)
Ages 15-16	280' (85.4 m)	350' (106.7 m)	280' (85.4)	60'6" (18.44 m)	90' (27.4 m)
Ages 13-14	250' (76.3 m)	315' (96.1 m)	250' (76.3 m)	54' (16.46 m)	80' (24.38 m)
Ages 11-12	200' (60.9 m)	200' (60.9 m)	200' (60.9 m)	46' (14 m)	60' (18.29 m)

1.2 SIZING YOUR FIELD FOR CONSTRUCTION

Again this is only a short list of design and construction issues to consider before building the field. Many of these issues trigger other discussions regarding seating for fans, restrooms, concession areas, locker rooms, ticket booths etc... Obtain the services of a design team and field consultant as soon as possible to help you with a plan. We highly recommend a reputable baseball field consultation firm to help guide you along the process.

There are numerous ways to build a field and a main consideration is how small or large your budget is for the project. The type of programming (usage) and amount of programming must be considered when selecting the type of field you plan to construct.

Part of building a field is sizing it properly.

- A regulation field size is approximately 110,000 sq ft o This would include high school to professional level and players 16 years old and up
- A field for 13 to 15 year old kids would have an outfield fence closer to the home plate. These fields would be closer to 90,000 sq ft
- A field for 12 and under age is 60,000 sq ft.

1.3 DETERMINING THE TYPE OF FIELD(S) YOU NEED AND CAN AFFORD

There are basically four types of fields that can be constructed.

- Native Soil fields - most typical among residential communities.
- Modified Native Soil Fields - These are fields that have taken the native soils an added other materials such as sand and organics to improve the soil structure.
- Sand Based Fields - These are high end use fields that are constructed using a modified sand base. These fields drain the best of all three and will be used more due to their draining

characteristics. Another level of the sand based field construction is one that also adds minor amounts of topsoil to sand based systems.

- Synthetic Turf fields - These fields are designed for multiuse sports. There are specific types of synthetics used for baseball. Selecting the turf for a baseball requires extensive research. There are numerous Synthetic turf companies around the world and some are better for baseball and softball than others.

Native soil fields, Amended Native Soil Fields or Sand-based systems must be determined early in the design process. Soil testing should be completed early in the process to determine the type of soils you have at the site. You may even consider one of the new synthetic turf types depending on your budget and climate... For a native soil field the grade should slope away in all directions from the base of the pitcher's mound. The field surface should slope away from the mound at a grade of .75% up to 1.0% for natural native type soil fields. This grade should be maintained into foul territory and beyond to the outfield fence with a slight increase once it has passed over the foul lines by ¼ %. In comparison sand based systems with a subsurface drainage system, would require surface grading of .5 to .75. This type of field will give you much better usage and playability.

Grading a field properly during construction also requires the use of laser grading equipment. To accurately establish grades based on the design you will use there needs to be some type of grading point of reference on the site. Sometimes this is called a benchmark and everything is graded using that reference point.

The photo above is a dual- laser grading set up. There are different types of laser graders. If you cannot afford to use a laser grader there is the old fashion method which is using a transit, survey equipment and string lines. The fields for the Beijing 2008 Olympics were built using this method. Although not exact it is much more accurate than using your eyes.

The MLB Regulation states: "The infield should be graded with a gradual slop from the baselines to the pitcher's plate, which shall be 10" above the home plate." More than a 1% grading would make it difficult to build a baseball field properly because it effects the elevations between the pitcher's mound and plate. It is possible at 1% but you need to make sure the base areas and home plate are all kept at the same elevation and you can obtain the slope required under the rules of mound construction.

On many professional level fields the infield and outfield are practically flat. These professional field systems are sand based meaning they are constructed of 8 to 10 inches of sand on top of 4 inches of gravel. This type of design requires a sub drainage system that includes a series of drain tiles that is very extensive to allow the rain water to flow quickly through the turf and into a storm water system. These materials are tested for bridging to ensure they provide a stable playing surface.

Surveyors should be asked to make continuous grade checks throughout the construction process on all graded materials. The surveying should be completed during all phases of construction to validate the sub base, irrigation, root zone, infield, mounds, home plate and bullpens are installed at the proper heights. Sloping the field slightly will speed surface drainage from the diamond area, including the runoff from the tarps that cover the mound, plate and sometimes the entire field. However, some groundskeepers feel that this isn't necessary if a grade of 1% is true and there is not a pronounced ridge at the edge of the grass built up by wind or over dragging.

Again there are differences in opinions related to field design and construction and the MLB rule book only sets required measurements and recommendations for grass location and orientation. The general consensus above is to build it with a consistent slope and use the best materials so it plays safely.

Let's recap some of the discussion above. Remember to:

- Determine type , size and number of events
- Design field to accommodate the usage
- Develop maintenance plan to provide consistent and safe playing conditions
- Develop budget - confirm funding is in place.
- Then Start construction!

1.4 BUILDING FIELDS TO MEET THE LEVEL OF PLAY

To provide a range of field level construction techniques we will break down the field into 3 levels of play and construction.

1. Professional (sand based system)- Typically a sand based field with drainage stone and a series of drain tiles under the entire field
2. Collegiate (Sand based or amended system) - Typically a sand based field with modifications. It could have partial sub drainage
3. Recreational (Native soil system)- Typically a native soil field, possibly amended sand based soil, no underdrain system
4. Synthetic Turf - Normally with cut-outs for baseball at the bases home plate and pitcher's mound)

All fields should be constructed with an automatic irrigation system. A consistent water source is required to maintain healthy and safe fields of play. In some areas synthetic fields require irrigation to cool the turf and also will require a water source for managing the clay areas.

The general difference in the above field types is the drainage design and the level of maintenance you have available. Specification development for building the field will also be a required component of the field you will build. Selecting the correct sub soil materials and growing mediums will determine your maintenance budget. These selections will dictate integrity, cost and type of surface you will plan to install for the entire field including the infield, mounds, warning track and turf type etc...

As mentioned there are various types of fields and they all can be categorized under a generic name called the Natural Turf System. Your field can be composed of a Native soil root zone material, a modified native soil root zone material or a sand based root zone material. All of these Natural Turf Soil Systems are composed of three layers. The sub base, the growing medium and the turf.

The growing medium for a Native Soil field System is 6 to 8 inches of root zone. The growing medium can be as simple as a screened topsoil blended with amendments and re applied to the surface. The sod or seed is the final layer. For natural grass playing fields, the native soils may need to be treated and conditioned with organic material. A testing agent with a background in this type of soil analysis should be hired to test the native soils and provide a recommendation for soil amendments in turf areas of the infield.

The Sand based field (Normally most expensive) is composed of three layers as well. Sand based systems allow for rain water to pass through the soils. Drainage performance is determined by the modifications to the native soil and by the amount of slope on the surface. The sub base (which is in both native and sand based) is rolled and compacted to a specific standard for stability. In sand based sub drainage field there is a series of drain pipe covered in a 4 inch layer of pea gravel and the 8-12 inch sand base layer covers the pea gravel which bridges so it will not fall through into the gravel layer. There are specific types of specifications for these materials as well as underground irrigation systems. The finish surface again is sodded or seeded.

Sand based systems are basically large “putting greens” designed to allow the water to flow through the turf and root zone layer into a series of sub drains. This has been the ideal method of natural turf construction for many years but it comes with a higher initial cost than native soil field construction. The sub base areas of these type fields are composed of gravel and a series of drains lay throughout the field that remove water quickly. In some cases over 5 inches in an hour.

The goal is to design the field so it will drain as quickly as possible without losing the integrity of the playing surface. Using a native soil construction with no sub drains will require more of a finish grade to allow the rain water to flow. This unfortunately can cause construction issues with the infield if you are trying to build a regulation field.

FIELD CONSTRUCTION 2.0

2.1 USING FORMS TO SEPARATE THE MATERIALS DURING CONSTRUCTION

During the construction of the field it is highly recommended to reduce contamination of soils. For example: When you place the sand next to the infield clay or warning track mix during construction, you should keep a clean separation of these materials so the grass is growing ins sand and your clay is not mixed with your infield mix or warning track etc.. This can be managed by installing “forms” on the field before the soils are placed. I have seen wooden forms (as shown in the photo above), metal forms or even plastic forms. After the materials are placed you would remove the forms from the field. I suggest they be removed before you lay the grass. In the photo the forms are placed after the gravel layer is applied to the field and they are set to the height of the root zone and infield mix allowing for more accurate placement of soils.

2.2 TURF AND SOD SELECTION

It’s important to take the time to select the proper grass for your field. Options are seeding, sodding, sprigging or synthetic. Seeding is an option if you have the time to grow it in properly and the resources to do it right. On Many projects the schedules do not allow time for seed establishment. In the southern states sprigging is common of Bermuda type turf grasses. Small stolens are planted and the cultivated to spread and grow over the entire field. I have seen sprigs become fully established in a month. This is a great method of turf growth because you eliminate the rootzone barrier you bring in when you sod. In most cases natural turf sod is used and installed in big rolls. These big rolls are 30-50ft long and 3-4 feet wide, an entire field of 100,000 sq ft can be laid in a couple days. When selecting your grass you need to choose a turf type suitable to your region. There are thousands of turf types around the world and many have been specifically designated for your climatic region.

This is a hand type sprigging methods but they also have machines that perform the same application.

2.3 SUGGESTED ORDER OF FIELD DESIGN, DEVELOPMENT AND CONSTRUCTION

- Hire your sports turf manager, or field consultant.
- Develop maintenance budget and begin to order equipment. A reputable field contractor can install a professional level field in 45 days so it's important to be ready to take care of it when they lay down the grass.
- Secure the services of a qualified surveyor and field contractor and or field project director. Making small mistakes during the planning period could result in costly maintenance problems down the road.
- If you're sodding the field, locate the grass source and determine the type you need based on your area. It's important to do this early in the process so you can have the turf tested and growing properly before it harvested.
- Determine elevation and grade lines to confirm what existing grades are and how they will change to allow your field to drain properly.
- Have a soil analysis completed to find out what type of soils your site consists of. You will want to send the soil sample to a certified testing service that understands the difference between testing soils for roads, builds and sports fields. They are very different tests. They will test for particle size, percolations, soluble salts and PH.
- Roto-till hard pan and subsurface soil if your site proves to be an impermeable surface. • Install irrigation system mainlines and outlets.
- Excavate and pour concrete footings for light towers, dugouts, stands and locker room.
- Install the drain tile system, drain outlets, sewer system.
- Install electric lines, cables, outlets to light towers, dugouts and stands
- Lay out stabilized areas; haul in aggregate for warning tracks, paths to home plate in front of dugouts, coach's box, on deck, and fungo circles.

- Replace or prepare native topsoil - from soil analysis formula, mix in soil structure amendments. This material can be stockpiled on site. Again if you are building a sand based field system you will remove all of the soil from the existing field and replace it with a pea gravel drainage system and sand based root zone for the growing medium.
- Sterilize native soil materials if possible. Taking care of the weeds in this material can save a lot of money trying to spray out weeds in the future.
- Roto-till the soil for uniform and thorough mixing. Rework the area to grade elevations with laser grader
- Recheck grade elevations with surveyor's report.
- Roll the area to a firm soil.
- Install backstops, fences, scoreboard, flag pole, foul line marker.
- Build a pitcher's mound
- Spread a starter fertilizer
- Finish grading with laser device.
- Remeasure diamond and recheck grade elevations carefully.
- Set the home plate, pitchers plate, base anchors.
- Mark all grass lines, circles, arcs and boxes with chalk or lime.
- Plant the area (seed, vegetatively, or sod)
- Build your bullpens and install warning track
- Finish construction and installation of dugouts, light towers, stands, locker rooms, showers, toilets, storage space, concession stands, and parking lots

2.4 INFIELD SKIN CONSTRUCTION

Many developers and field contractors make the mistake of believing that the skinned area should be flat and have no grade. In reality these areas require some surface drainage. They are sometimes pitched about .4% towards the 95 arc. This allows the

water to move off the field's rain cover after a storm. Because of high use, weather etc, the centre of the base paths which are normally made from the same infield clay has a tendency to become "swale like" and hold surface water. If the .5% fall is carried through the baseline, there would only be a ¼ inch drop on the 6 foot wide baselines and behind home plate. These grade tolerances are not noticeable and improve surface drainage dramatically. Application of the infield clay is critical and should be applied the same way you grade the roost zone material. Use a laser grader.

The Infield skin or clay area should be very firm but also have the ability provide safe footing for all ages. This balance of material, water and maintenance is more art than science. The material on the infield, baselines should be the same and should be at least 5" deep. The mix should be premixed and to approximate percentages of:

60% sand, 30% clay, 10% silt

The Infield Clay or skin mixture is normally red in colour and a soil conditioner or amendments can be applied to the infield material and implemented at a depth of ¼ inch.

Although the % of the sand, clay and silt is very important the particle size is equally as important. Obviously the material should have no particles larger than 1/8 of inch in width and no thicker than 1/16 of an inch.

2.5 HOW TO BUILD A PITCHER'S MOUND

The pitcher's mound is the focal point of the field as it relates to the game. Games are won and lost by how well the pitcher throws the ball. There are numerous ways to build a mound - there is no one right way. However, all pitchers' mounds have similar materials. When choosing the materials and products to build the field with two bullpens, remember that five pitcher's plates will be required: one for the main mound plus two in each bullpen. The Pitcher's Plate is also called a pitching rubber or pitcher's box. Pitcher's plates are made of rubber and are 24 inches long and 6

inches wide. The plates normally come in a block form with a steel tube through the middle to provide support. Typical providers of these plates are Hollywood or Jack Corbet/Schutt style bases.

Tools and materials required for constructing a mound:

- plate compactor
- hand tamp
- Transit – a surveying instrument with a telescope that can be rotated completely around its horizontal axis; used for measuring vertical and horizontal angles.
- 6-foot level – a calibrated glass tube containing liquid with an air bubble inside, mounted on a frame and used for measuring whether surfaces are horizontal.
- landscape rake
- garden rake
- an assortment of shovels - round point and flat
- string
- 24-inch metal spikes
- 2-3 plywood planks
- hammer
- water and water hose
- 6-10 tons of hard infield mix (50% clay, 10% silt, 40% sand) per mound
- 6-10 tons of regular infield mix (30% clay, 10% silt, 60% sand) per mound
- cart or loader to transport the infield mix around the field
- 1-2 wheelbarrows or small carts
- 3-4 volunteers

In some cases, clay bricks are used to build the mound. The photo shows the use of moist clay bricks. Hard clay comes in bags and bricks. Either will work fine but for maintenance, the bags are preferred.

2.6 CLAY BRICKS

In order to locate the proper position of the pitcher's plate on a regulation baseball field, the home plate location must be identified by a hired surveyor. Once that is completed, following the steps below to identify the location of the pitcher's plate. A tape measure, string and five wooden stakes will be needed.

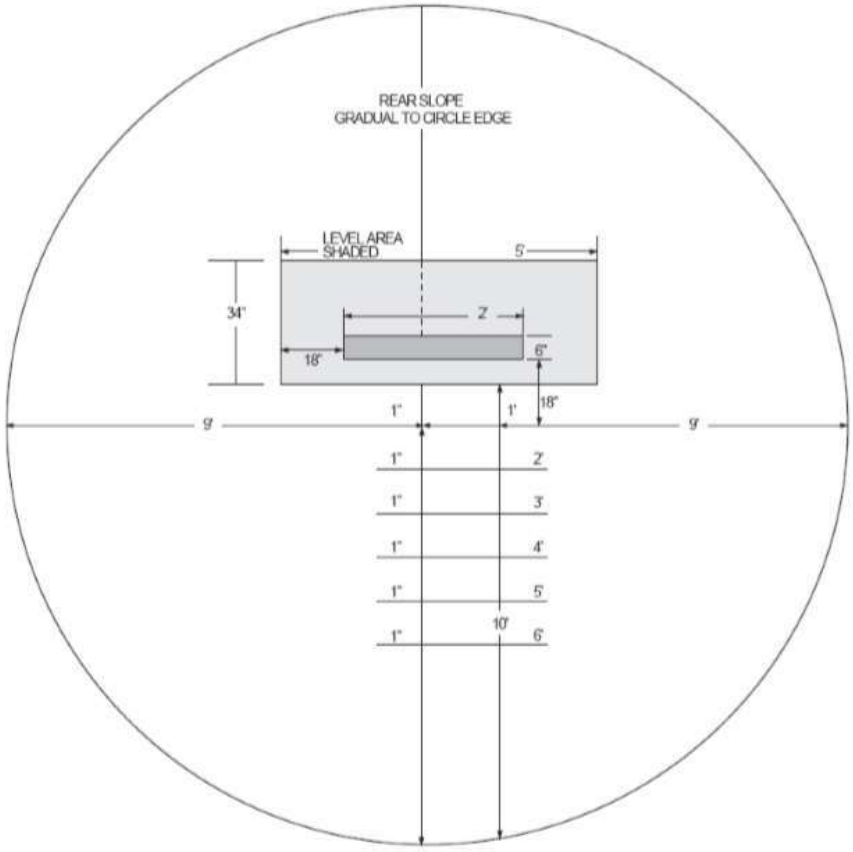
1. The apex of home plate will be used for all measurements of the infield. After determining the location of the home plate, make sure the field distance and angles can be achieved without obstruction.
2. From the back point of the home plate, measure exactly 60 ft. 6 inches from the apex (or tip) of the home plate to the front of the pitcher's plate. Hammer one stake at this location. For youth baseball fields, adjust the field dimensions accordingly.
3. With the tape measure and string, measure a distance of 127 feet, 3.375 inches from the apex of home plate. This measurement will be the centre of second base. Hammer one stake at this location.

Although the pitching distance is 60 ft. 6 inches from the front of the pitcher's plate to the apex of the home plate, the actual circle around the mound is measured from a point that is 18 inches in front of the pitcher's plate. The mound should be built within the 9-foot radius from this point. A common mistake of placing the pitchers plate in the centre of the mound is very common. Remember to double check your measurements to ensure you do not build your mound in this fashion.

2.7 LAYOUT OF PITCHERS MOUND

Suggested Layout of Pitching Mound

This Diagram No. 3 supplements and, in cases of difference, supersedes Diagram No. 2.



Pitching Mound: An 18' diameter circle, center of which is 59' from back of home plate.

Locate front edge of rubber 18" behind center of mound.

Front edge of rubber to back point of home plate, 60'6".

Slope starts 6" from front edge of rubber.

The degree of slope from a starting point 6" in front of the pitcher's plate to a point 6' toward home plate shall be 1" to 1', and such degree of slope shall be uniform.

Level area surrounding rubber should be 6" in front of rubber, 18" to each side and 22" to rear of rubber. Total level area 5' x 34".

2.8 PROPERLY CONSTRUCTED PITCHER'S MOUND

Next, set the distance, height and exact location needed to establish the mound using a transit or laser levelling tool. The top of a pitcher's plate on a professional field mound is 10 inches above the top of the home plate. Check this measurement using a string from the centre of home plate, over the pitcher's mound to second base. Keep this string available as it will be a guide to determine if the plateaus (the tops of) of each area are centred.

4. After setting the distance to the pitcher's plate, find the circumference (edge or perimeter) of the mound. For example, on a regulation baseball field, the pitcher's plate is 60 feet, 6 inches from the apex of home plate. From the front of the pitcher's plate, measure 18 inches. This will be the centre of the mound. The diameter of the mound is 18 feet on a regulation baseball field.
5. It is now important to remove four inches of existing material from the circle. Lay several plywood planks around the edge of the mound so the turf will not be damaged while the mound is constructed. Using strings and 24-inch spikes can help keep the construction on track after setting the mound height. A string stretched across the mound from first base to third base with spikes placed at the base of the mound can help. If a transit tool is not available, a "line level" may be used. This instrument is not 100% accurate but is adequate. Use this cross line to check height as needed.
6. Use the plate compacter, as shown in the photo to the right, to harden the area.

7. Use the regular infield mix to build the base. The base is the area directly under the plateau of the mound. When the mound is completed, the plateau will be 5 feet wide and 36 inches deep. To build up the plateau, raise the base in one-inch increments. Water and tamp (or pack) the area after each increment until the height of the mound is approximately four inches from the finish height.
8. Next, place the pitcher's plate in the desired location. Using a string stretched from home plate to second base, identify the centre of the mound and the centre of the pitcher's plate. It is helpful to mark the centre of the pitcher's plate with a pen and lineup that mark with the string.
9. Check the level and height of the mound using a transit.
10. Begin to add the hard infield mix around the pitcher's plate to set it in place. Use the hand tamp during this process. A small level is also helpful to ensure that the pitcher's plate is level.
11. Continue to build the plateau in 1-inch increments, alternating the process of adding the clay, tamping and watering, until the desired height is achieved. Always follow with rolling or compacting a small 1'ton roller is a choice.

12. Once the plateau is built to the desired height, the construction of the slope will begin. Remember the fall (or slope) is one inch per foot towards home plate.
13. Lay a straight plywood plank (measuring approximately 10 feet in length) at the front of the pitcher's plate and mark the plank every 12 inches, starting the first mark 6 inches from the pitcher's plate. Raise the end of the plank that falls toward home plate so it is level with the pitcher's plate.
14. The entire landing area in front of the pitcher's plate is made from the hard infield mix. This area is approximately 7 feet wide and 8 feet long. The sides and back of the mound can be made from the infield mix, using the same procedure used to build the pitcher's mound until the slopes are completed. Check the height of the plateaus throughout the process.
15. Maintaining moisture is the key to a proper pitcher's mound. The mound should not dry out and crack. The goal is to keep the mound moist so it is pliable, giving the pitchers superior footing. The use of a tarp secured with spikes to cover the mound when the field is not in use is strongly suggested.

2.9 MOUND SOIL CONSISTENCY

Mound soils should be kept moist yet firm. Detailed Moisture management is key to having proper clay areas. The area where the pitcher's foot lands after the pitch is extremely important and needs to be kept consistent with moisture. Finding a local clay provider for this material will benefit most organizations when building fields. For international construction projects, clays can be found in various locations such as brick factories and pottery facilities.

If the mound dries out and begins to crack, it can be moistened and the levels can be constructed again, but this process may take a few days. Depending on the severity of the problem, the field may not be playable while the repairs take place. Keeping the mound covered by a tarp when not in use and using a throwing mat during practices will help maintain the moisture content.

When the mound becomes wet during significant rainfall, a material such as calcined clay can be added to the top and raked in lightly. Please note that it is important to remove this material entirely after the game and replace it with new infield mix. If this is not done, the mound clays will not bond properly, and the holes that pitchers use for stable footing will develop too quickly and become deeper than needed. Each field will require two bullpens on each side of the field. You will need five home plates: one for the main field and two for each bullpen.

2.10 CONSTRUCTION OF HOME PLATE AREA

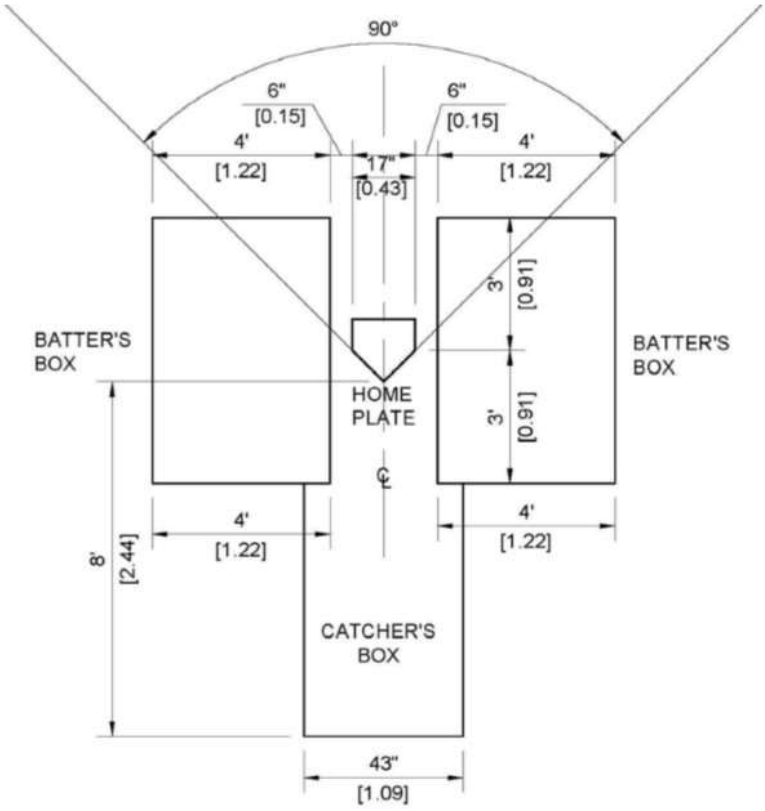

Types of clay used in Home plates are similar to mound clays


Above photo of a modified Mizuno Homeplate. Notice required bevelled edging

The home plate is made of rubber and has five points. A regulation home plate is a 17inch square with two corners of the square removed. The dimensions of home plate are 17 in. by 8½ in. by 8½ in. by 12 in. X 12 in. The home plate is set into the ground with the point at the intersection of the lines that extend from home plate to first base and third base. The 17 in. side of the plate faces the pitcher. The two 12 in. sides face the first and third baselines. The top edge of the home plate should be bevelled (have a slanted edge). Home plate is set into the ground, level with the ground. The homeplate illustration above is a Mizuno style home plate. They provide a tray type system for replacing the plate when it is worn. The Schutt Bury-All type home plate is the most used throughout the country for higher level play.

2.11 LAYOUT OF HOME PLATE AND BATTER'S BOX AREA

A metal template is used to score the ground so the chalk box can mark the batters boxes and catcher's box.



AUXILIARY REQUIREMENTS 3.0

3.1 IRRIGATION SYSTEMS

An irrigation system is required in order to grow the grass and take care of clay areas. The design of the irrigation system varies depending on how large your foul territory may be. The place of irrigation heads on the infield should be kept at a minimum. Usually there are only 4 irrigation heads. These irrigation systems require extensive pressure at the head of about 70psi. In addition the irrigation system you will need quick couplers to connect hoses to so you can water down the infield daily. Its critical to design the irrigation as not to have water hit the infield clay or base lines. Hire an irrigation designer to help with the development of your system. Irrigation systems require constant monitoring to ensure they are operating properly. Place of the irrigation heads so the field is level is also very important.

3.2 BATTING CAGE

Around the home plate a batting cage is placed to keep baseballs from entering the stands during batting practice. This is a portable structure which is 20ft wide 15ft deep and 10 ft tall. It is wrapped in a net and all the poles are padded around the edging. This is a very large structure so moving it on and off the field will require a large gate (20ft wide) and a level area to place the cage directly off the field.

3.3 SYNTHETIC TURFS

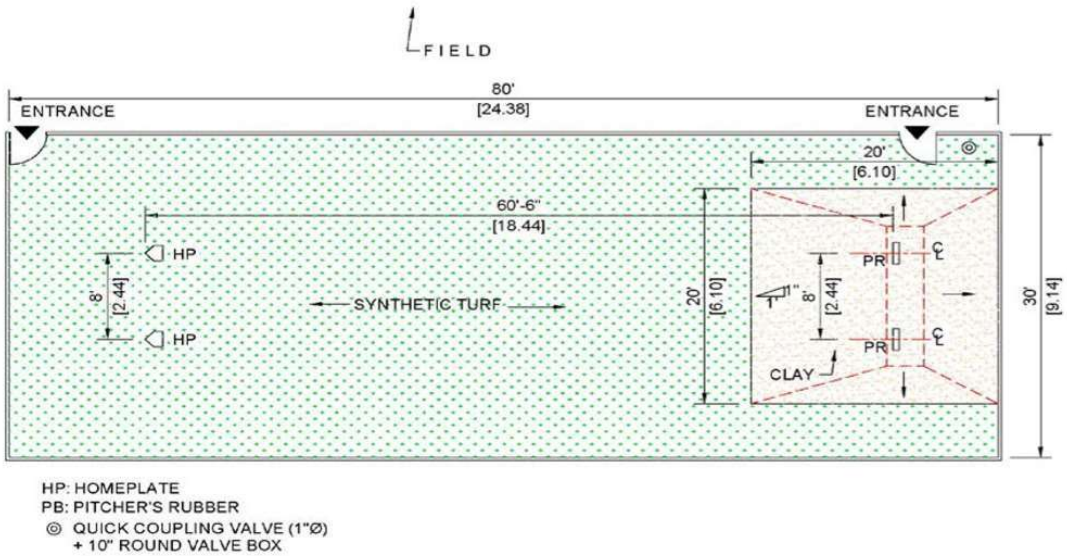
Although it is preferred that baseball be played on natural grass, in many areas where there are domed stadiums, there is a need to install synthetic fields. Another quantifier for installing synthetic turf baseball fields is the cost of annual maintenance, weather and usage of the field. There are numerous reports and documents that give details stating annual maintenance is less on synthetic which is accurate, but it should be noted that there is still a need to staff games for tarp use and pre-game operations so these maintenance cost should be considered.

There are multiple types of synthetics. Many of the synthetic turf types are not preferred for baseball so evaluating the company's products and history is very important. As mentioned the most common design in MLB and the Japanese leagues is to install cutouts for the bases, pitcher's mound and home plate. The measurement of these areas varies slightly as 1st and 3rd base are identical with a measured triangular design of roughly 27ft x 27ft. 2nd base is also triangular. Use

the MLB dimensions guide to ensure you have planned for the properly sized cut-outs. The pitchers mound and homeplate are the same dimensions as the MLB rules.

3.4 BULLPENS

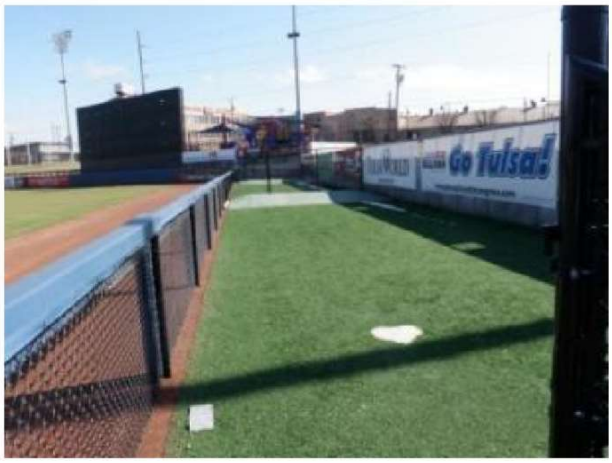
On each professional level field there is a requirement to have 2 mounds on each side of the field. These are call bullpens. It is preferred that they be located off the field of play to reduce possible injury to the player however with proper sloping of bullpen mounds on the field that concern can be addressed. The bullpens are constructed exactly like the main mound and they should be designed to be throwing in the same direction as the main field mound and plate.



3.5 INDOOR OR COVERED HITTING TUNNELS

In order to allow the players to receive adequate batting practice time it is highly recommended to have a covered batting tunnel available for each team. This not only reduces the wear on the field but also allows players to hit at there on leisure without setting up all of the BP equipment. A typical batting tunnel is 17ft wide and 80 long and 10 ft high. Hanging them by cables is preferred. If using a poled structure they will need to be padded. The tunnel will have adequate lighting high enough above the net to not allow lights to be broken. The flooring of the tunnel is a Astroturf type product and the homeplate is painted on the turf. Normally there is not a pitcher's mound in these structures but it depends on the teams needs. That being said, there will need to be power available for pitching machines and a water source to repair the mound if one is constructed.

3.6 BULLPEN LOCATED OUTSIDE THE OUTFIELD FENCE



The bullpen is the area where pitchers practice before and during the games. Each bullpen should provide space for two pitchers and two catchers to work at the same time; however, bullpens at recreational or youth fields provide space for one pitcher and one catcher. Each bullpen should be constructed with regulation pitcher's and home plates. The average distance between the two bullpens on a regulation field is 8 feet measuring from the centre of each pitching rubber. The pitcher's mounds and home plate areas in the bullpens must be constructed the same way as mentioned previously and should, if possible, be oriented in the same direction as the main field. Special care should be given to the bullpen mounds, because this is where the pitchers will spend much of their time in practice and game preparation.

A common method in bullpen mound construction is to have a “wooden” backstop constructed to reduce the soil movement to the rear of the mound and maintain a consistent 18" flat area to the rear of the pitcher’s plate. This method can only be used if the mound is off the field of play.

There are two most common locations for the bullpens:

1. In foul territory alongside left field and right field lines. These mounds will require the slope to be very gradual as not to cause a trip hazard for the outfielders.

2. The preferred areas for the bullpens are off the field yet in sight of the dugouts and field of play.

   Bullpens in foul territory are considered dangerous for pitchers and catchers because the players are exposed to the batted ball during play. Other players need to provide protection to those in the bullpens during the games and workouts if the bullpen is located in foul territory. A communication system between the dugout and the bullpens for field manager, pitching coach and the bullpen coach should be considered for higher level or competitive fields.

3.7 RAIN COVERS OR TARPS

Tarps save games therefore if you have one you need to use it. More importantly the application process of the tarps should be completed in the shortest time possible in order to save the field from a rain out. Most tarp crews can place all the tarps on the field in less than 2 minutes. Every field is required to have rain covers to cover the mound, homeplate and bullpens. Every professional

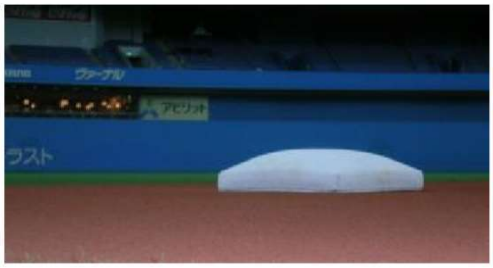
stadium is require dot have a full infield sized tarp. These covers are now light weight and can be managed by 10 to 12 people. The full size infield covers are recommended. They are normally 175ft x 175 ft and are white or have a reflective colour on one side to reduce heat and the other side is sometimes dark to retain heat from the sun.


It's common that these large tarps are stored on a 30ft long 30 inch high culvert that the cover is folded and rolled onto. Some people use ropes to place help place the cover on the field quickly. The key is practice. Once the tarp is placed on the field it will require weighted sand bags. Approximately 50 sand bags should be prepared to use in case of high winds.

3.8 BASES

All fields require 3 bases. The base is a 15 inch square that is set flush with the infield skin. The bases are all set in fair territory. The bases should not be taller than 3 inches and the tie down type of bases is not recommended as they tend to pop out of the ground and could cause injury.

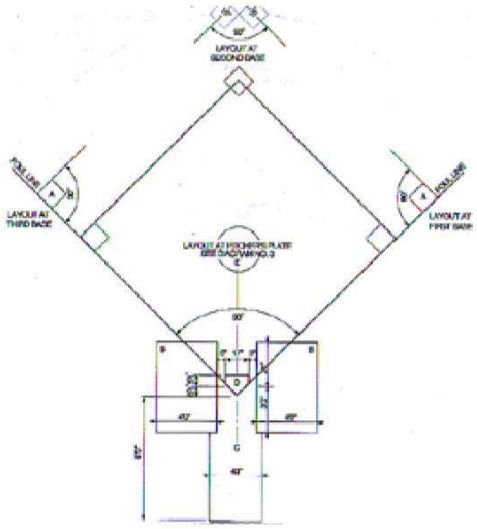
Hollywood Style Base " Schutt Bases & Anchor is the preferred base for MLB and Professional Baseball fields



3.9 ANCHORING OF BASES

The base is held in place by an anchor, or metal sleeve, placed in concrete. To set the anchor into the ground, dig a hole 12 inches square and 12 inches deep and fill it with 6-7 inches of concrete. This hole will serve as the base. With a carpenter's square, find the centre of the base by measuring 7 1/2 inches in from each side of the base. This is where you will hold the anchor while you poor the cement into the formed box. Next, prepare the anchor by taping the hole at both ends with duct tape. This will help keep the inside of the anchor clean of concrete while you are filling the formed box. Insert the anchor into the centre of the concrete. After the concrete has hardened, remove the wooden forms there were used to support the concrete and place the concrete block in the ground making sure the anchor is perpendicular (at a 90 degree angle) or square to the foul line or in the centre of second base.

3.10 LOCATION AND POSITION OF THE BASES

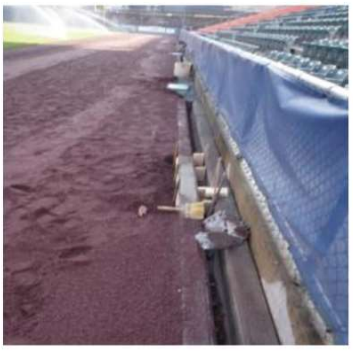


First Base and Third Base: The outside edge of the first and third bases should touch the outer edge of the foul line (the foul line should be a minimum of 2.5 inches in width and no more than 4 inches). The back edge of the base will intersect exactly 90 feet from the apex of the home plate.

Second base is located by measuring from the apex of home plate, 127 feet 3 3/8th inches from home plate, and the outfield sides of the base, a further 7 1/2 inches. Set the chalk lines at the back edge of the base and dig a hole as above. Square the anchor with the baselines from first and third bases.

The top of each anchor should be about 1.2 inches below the dirt surface.

3.11 WARNING TRACK CONSTRUCTION



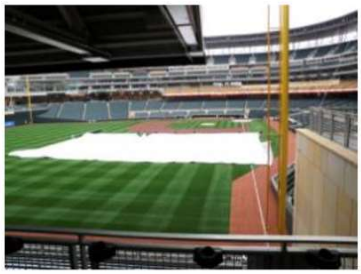
Warning tracks materials are constructed from different materials. A red crushed brick material is normally used. The brick material needs to be smaller than 1/8th of an inch in size. It is normally 4 inches in depth. It is known as a warning track as it warns the player of the wall and is usually different in textures and colour than the grass. The warning track material is a stone must meet a specification that will not be to large in stone or stone that has sharp edges. The warning track is typically graded to drain away from the field if fencing allows. (photo above shows a slot drain system placed next to the concrete field wall to collect rain water)

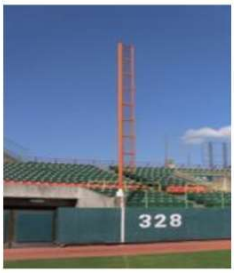
On average the depth is four inches of material and must be installed over a sub base that has met compaction criteria. In most ballparks on a regulation field the warning track is 15ft in width and it surrounds the entire field. It should be noted that some federations requires specific dimensions of track size so be sure to consult your federation before determining the exact size.

3.12 BATTER'S EYE

On professional baseball fields and some college a batters eye is required, The batters eye above illustrates the fabric not being dark enough. Light and objects can be seen through the cover very easily. A dark solid covered product is used to cover the batters eye frame work normally steel structure to handle wind loads etc.. It's a required structure for pro fields. This is placed 5 ft behind the outfield fence and ranges in size from 60ft wide to 30ft tall depending on the slope of your field. In the major leagues it can be 40x80.

3.13 FOUL POLES





The foul pole indicates the location of the foul line in the right and left field areas. It is normally located directly behind the fence. The foul pole is actually design to be in Fair territory so be cautious when setting the pole to ensure it is not outside the foul line. The poles for baseball are typically 30 ft tall and have a 2 foot wing that is located on the fair side of the pole. In some MLB parks they are 45 feet tall. The wing should come to the top of the outfield fence.

3.14 BACKSTOP CABLING SYSTEM

Most backstops are constructed of chain link fencing in the non professional facilities as it is more durable where as the professional level uses a netting system suspended by poles cables. A design of this backstop should be developed to ensure the catcher can make plays close to the backstop without injury or the backstop interfering with the ball. Backstops range in size. Typical backstops can be 75 feet wide and be 24 feet tall. It is advised to hire a structural engineer when designing your backstop as various countries require certain standards on weight and support structures.

3.15 DUGOUTS

The dugout structure provides a safe area for players to observe the game. Normally the sizes of these structures are about 60ft so they can contain a roster size f 20m players plus coaches. Covering the dugouts is recommended so to keep the players dry during a rain delay. Inside the dugout there will be a bench normally made of wood and the floor materials would be rubberized. The dugout does not need to be “sunken” or below field grade but doing so allows for fans behind the dugout to see the field of play without obstruction. On the amateur level it is advised to place a fence in front of the dugout to protect players from foul balls.

Dugouts and Bat Boxes

In addition to a bench the dugout should have a compartment for storing up to 25 bats and helmets during the game.

3.16 FENCING AND PADDING


Safety of the players is a key component to baseball field construction. The need to install padding is required in professional ballparks and for stadiums that may wish to host future pro games. However, padding for college level or recreational level is not normally required. Placing padding around all walls and fence posts help the athlete to perform with confidence in the field. Most ballparks have padding behind homeplate on the wall or fencing to reduce bad ricochets from pass balls. Selecting a good padding is similar to selecting a synthetic turf. You get what you pay for. Higher end padding options last much longer and provide better protection.

3.17 TURF PROTECTION

As part of the batting practice setup there is a need to protect the grass in the areas around homeplate and in front of the mound from ground balls and foot traffic. The products used in these areas vary but the best has been a geo-clothe type material that has a enkamat type backing or a windscreen type product you see on tennis courts. These are placed on the turf just before batting practice begins and removed after batting practice.

3.18 SCOREBOARD AND VIDEO BOARDS

Each ballpark requires a scoreboard. These must be placed behind either the right field or left field fence. They are recommended to not be placed in centre field as this becomes a problem with the batters eye. Scoreboards' vary in size shape and technical abilities. The need to size the scoreboard according the distance of the seating bowl and so fans can see it from any seat in the ballpark is

recommended. In some cases the scoreboard is also a video board but more likely they are two separate boards placed in left and right field.

3.19 FIELD LIGHTING

There are pros and cons related to lighting fields. They can be very costly but the extended use of the field will allow for more play time. Unfortunately more play time will increase the wear and tear of your field. Planning for these issues before you determine the light needs will save you some operational headaches. You will need to hire the services of a qualified electrical engineer to establish the power for lighting systems. Companies such as Musco, GE and Hubble are known worldwide and they can assist you in these designs.

There are different levels of lighting required for different levels of play. The chart below will provide you with a general concept of what is being used in other countries. The US uses the FT foot candles and Europe uses the lumens or LUX

Part 4 – Baseball Field Maintenance

INTRODUCTION

Preface

The information in this document is provided as a general reference guide for the maintenance of a baseball field or facility. Professional and international baseball federations and organizations follow similar guidelines pertaining to the dimensions and needs for baseball field development. The information provided in this document should be used only as a resource in the development of a baseball playing field; this information does not represent the only means and methods of baseball field development.

This document is a summary comparison of field establishment processes. These findings may illustrate potential solutions for construction, maintenance and safety for the field of play; however, all areas regarding potential field development may not be identified in this document.

Please note that certain country or regional laws and standards may apply to the construction of athletic fields. Therefore, the guidelines found in this document do not imply that a specific field does not comply with worldwide baseball standards. This document was written in 2006.

About the Author

Murray Cook, President of Brickman Sports Turf and field consultant for Major League Baseball and the Baseball Tomorrow Fund, has over 30 years of experience in the management of professional, collegiate and youth baseball fields worldwide. Mr. Cook, in collaboration with the Baseball Tomorrow Fund, created this document to provide a resource for baseball field development and field maintenance for organizations involved in all levels of the game.

About the Baseball Tomorrow Fund

The Baseball Tomorrow Fund is a joint initiative of Major League Baseball and the Major League Baseball Players Association. The program is designed to promote and enhance the growth of baseball throughout the world by funding programs, field projects, equipment, uniforms and other selected program expenses to encourage and maintain youth participation in baseball and softball. Since its inception in 1999, the Baseball Tomorrow Fund has awarded more than $10 million in grants to organizations that serve thousands of children across the United States, Canada, Latin American, the Caribbean, Europe and Asia. To further facilitate the growth of youth baseball and softball, the Baseball Tomorrow Fund established a national used equipment drive initiative with the support of the Major League Baseball Clubs in 2005.

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FIELD MAINTENANCE 1.0

1.1 DEVELOPING A FIELD MAINTENANCE PLAN

Providing adequate field maintenance is the key to a safe and quality baseball program and facility. Significant time and resources are required to maintain a field properly. Developing a feasible field maintenance plan is a very important part of any baseball or softball program.

Planning