A MANUAL FOR THE DEVELOPMENT AND CARE OF A BASEBALL FACILITY

by

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Dedication

I dedicate this project paper to the people that are the closest to my heart and without their love and patience this paper and the facility about which this paper is written would not have been possible: my daughters, Kelly and Shea and my wife, Donna.
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Introduction

Communities take great pride in their school and school facilities. Likewise, schools should take pride in providing the best playing facilities possible for its athletes. It is hoped that this manual can serve as a source of information and simplified procedures in planning and constructing a baseball complex.

Purpose of the Study

The purpose of this project was to compile information which could be used by a coach or school administrator who may find himself in a position of trying to construct a baseball facility. This manual is designed to help with problems and to answer questions which may arise as an individual constructs and maintains a baseball complex. The manual is arranged so it can be used from first conception of building to a completed project.

Design of the Project

The manual is divided into four major sections. These are:

1. selecting the site,
2. construction of the field,
3. maintenance of field,
4. drawings and layouts which may be helpful.

Selecting the Site

Factors to Consider

Upon the finalization of planning to build a baseball facility, one of the first considerations must be that of selecting the site on which to build. In most high school situations the selection of the best site is greatly limited to, "Is there a site at all?" One of the first things a coach or manager must do when planning to build a baseball field is to find the site that will best meet the needs of a specific age group.
There are many steps that must be considered which contribute to the making of a good field, and each one requires separate study. Each field will have its own topographical and geographical problems. No single formula will be applicable in every case.

Three major features are common to all excellent baseball fields: good construction, good soil structure, and very good field maintenance (Litwhiler, 1976). A field that has these three features has a reasonable chance of remaining in good condition.

The following checklist of factors to consider may help in selecting the location of a field:

1. availability of the area
2. size of the area
3. topography of existing terrain
   a. natural drainage of the area
   b. amount of grading and fill necessary
   c. soil of the area - foundation sub-soil and surface top-soil
   d. vegetation of the area - condition and value of existing turf
4. location of the area - desirable aspects for players and spectators as to
   a. accessibility
   b. practicality
   c. convenience
   d. transportation
   e. parking
   f. safety
   g. adaptability - multiple purpose consideration
5. funds available
   a. initial cost of area
b. cost of development

c. cost of maintenance

6. orientation of playing field - with special consideration for the safety of players and the comfort of spectators

7. availability of utilities
   a. water
   b. electricity
   c. sewage
   d. drainage outlets

8. time allotted for development

9. adaptability of facility for immediate plans

10. future possibilities of development

Path of the Sun

A study of the playing field as oriented by the compass is a must. Many studies have been made in past years that indicate that the correct place for home plate is in the northwest corner of the field (A Baseball Facility, 1987).

Suggested Order of Construction

1. Secure the services of a surveyor. Place home plate in the northwest corner of the field. This will be the point of reference for all other measurements. Lines should be run to establish location of bases, foul poles, fences, backstops, dugouts, light towers, and other appointments.

2. Elevation and grade lines need to be run. These data will be needed for top-soil depth, irrigation, tiling, and sewer systems.

3. Soil analysis should be taken from different locations.

4. The soil should be sub-surfaced.
5. Install irrigation system and outlet heads (Figure 1). (Lines must be below freeze line of area.)

6. Install tile system-drain outlets and sewer pipes. (Figure 2).

7. Install electric lines, cables, and conduit to lights and scoreboard.

8. Bring in fill to meet grade.

9. Lay out non-grass areas, warning track, skinned portion of infield, in front of dugouts.

10. Replace and prepare top soil.

11. Sterilize soil to kill weeds and insects, if needed.

12. Rework area to grade. Recheck grade and correct any faulty spots.

13. Roll area to firm soil.


15. Build pitcher's mound, bull pen, catcher's and home-plate area with heavier clay mixed soil. (Pitcher's mound specs Figure 3.)

16. Broadcast lime and fertilizer into soil.

17. Finish grade using a pull-behind rake or box drag.

18. Remeasure diamond and recheck grade elevations carefully. Set home plate, pitcher's rubber, and base anchors. Mark all grasslines, circies, arcs, and boxes with chalk line as to know exactly where to and where not to plant grass.

19. Sew grass seed and cover with mulch and water regularly, or place sod.

20. Finish construction of other structures outside the playing field.

*(A Baseball Facility, 1987)*
Figure 1

Irrigation System

Symbols:
0... 360 head
x... 180 head
*... turn key valve
Figure 2

Tiling System

Note:
drain fall 1" per 20'
drains connect to storm drain system
Figure 3

Pitcher's Mound Dimensions
Safety Precautions and Suggestions

When building and constructing any baseball field, there are a number of safety precautions that should be observed. The following is a safety checklist with precautionary measures and suggestions (A Baseball Facility, 1987).

1. Know the proper orientation of the field to the sun.

2. Make sure the playing area is level and obstruction-free.

3. Have a warning track to warn player of his approaching a fence.

4. Use a home plate with a beveled edge, flush with ground.

5. Use a double-sided first base.

6. Use pop-off, beveled second and third bases.

7. Have water outlets on field, flush with ground, and covered.

8. Fences
   a. Have posts on outside of playing area.
   b. Eight-foot in height is recommended, round smooth pipe on top, and no sharp ends of wire exposed.
   c. Anchor the fence at bottom so it will not curl up.
   d. Behind home plate and in center field there should be a dark green backdrop to cut down the glare and make the ball more visible.
   e. Place a gate near each dugout and a large maintenance gate in outfield.

9. Dugouts
   a. A four-foot fence in front protects the player and keeps balls in play.
   b. Have roof high enough so to not bump heads.
   c. Use no support poles in front, if possible.
   d. Wooden floor panels over concrete should be placed because steel cleats are extremely slick on concrete.
   e. Install a water cooler in dugout.
10. Light towers, poles, scoreboards, and flag poles must be located outside of playing area.

11. Bullpen areas should be located outside playing area and oriented in the same direction as the mound.

12. Batting practice safety
   a. Fungo circles should be placed in back of portable backstop so that fungo hitter will be out of the line of batted balls.

13. Bleachers
   a. Put a guard rail or fence around top and sides.
   b. Have a once-a-year inspection of bleachers by a qualified person, such as an architect, fire marshall, or building inspector.
   c. Have a blanket liability insurance coverage on entire ball park.

Soil, Drainage, and Irrigation

Top Soil

Agronomists describe good top soil as a sandy loam that is fertile, friable, of good granular structure, well-aerated, and with high infiltration qualities of porosity and permeability insuring easy drainage (A Baseball Facility, 1987). It is unlikely that local soil will measure up to the agronomist’s definition of ideal soil. Top soil can be treated to improve its condition. Economy usually dictates that the existing local soil be used and "doctored" for suitability. Good top soil structure is necessary for satisfactory results of drainage and maintenance.
Soil testing is greatly superior to the guessing method for determining what the soil is lacking. The agronomist can determine percentages of materials and compaction ratio and can recommend a formula of certain amendments that can be added to improve the soil structure.

**Drainage and Grade Elevations**

Before discussing the details of laying out a field, it is necessary to have an appreciation of the importance of adequate drainage - both surface and sub-surface. Inclement weather obviously affects the condition of the field. It is desirable and necessary to have a field playable as soon as possible after a rain and also in the early spring. A field that is laid out on flat land and has heavy, impervious soil may be useless for days after an ordinary rainfall.

Good drainage should alleviate rainwater by surface run-off, percolating through the soil, or through sub-soil tiling. The ideal field should be a crowned or turtlebacked area that has a gradual slope of 1%, one foot per 100 feet, in every direction, from the edge of the grass circle around the pitcher’s mound to the limits of the entire playing area including foul territory where possible (Litwhiler, 1976).

The field should be constructed to withstand heavy traffic. Poor drainage means more compaction; more compaction means shallow roots and poor turf. Good drainage and good soil structure of the infield area are most important. This is especially true of the skinned portion. A well established turf in the outfield, regardless of grade, will absorb a tremendous amount of water.

The rule book states, "The infield should be graded with a gradual slope from the baselines to the pitcher’s plate, which shall be 10 inches above the base line level" (Official
High School Baseball Rules, 1989, p. 8.). The intent of the rule is 10-inch elevation above home plate, not the baseline. The grade elevation would be slightly under 2% in accordance with the 10-inch high pitcher’s rubber (Official High School Baseball Rules, 1989). Agronomists and turf managers indicate that 1% grade is sufficient and 3% is too much (A Baseball Facility, 1987). The rapid run-off would make it difficult to maintain a good turf, and most of the water would run onto the skinned portion which is the most important area to keep dry. Also, this grade would cause a well-bunted ball to roll foul.

Baseball coaches and managers have the mistaken idea that the skinned area should be flat and have no grade, probably because the rule book states that the *baselines and home plate area should be level* (Official High School Baseball Rules, 1989, p. 8). In reality these are the areas that need surface drainage the most. Because of the heavy use and blowage, the center of the base paths have a tendency to become *dished* and hold surface water. If the 1% is carried through, there would be only a half-inch drop on the baselines and a one-inch drop behind home plate. These minute differences are not noticeable and improve surface drainage.

**Irrigation System**

The first installation in a new area should be the irrigation system. It will require the deepest digging because the pipeline must be laid below the frostline. The exact depth will vary with local environment and depth information may be acquired by checking local building codes. The capacity of the system will depend on a number of factors, such as pipe size in the main and secondary lines, water pressure to the site, and friction loss.

Main lead-in lines should be four to six inches in diameter. The auxiliary lead-in should be no less than two inches in diameter. Plastic tubing (pvc pipe) is the least expensive and easiest to use to conduct water to sprinkler head and water outlets.
Outlets with turn-key on and off capabilities should be placed behind the mound and around the perimeter of the area in back of first, third, and home bases along the fence line. These outlets are used to hook up hoses which can be used for numerous clean-up and maintenance projects. The most common sprinkling system used today is the "toro" pop-up heads system. This system is installed with four lines set up to be independently operated by a timing device in a central control panel. Each line is activated electrically and will operate for a time which is set according to the conditions of the field. The system can be set up to activate any time during a 24-hour period (Robey, 1975).

The sprinkler system of a field is a very important and labor-saving system if the field is to have a well-maintained turf. Funds may dictate that a system which covers the entire field may not be possible. If this is the case, at least five heads should be placed around the infield (Daugherty, 1972). This type of system should be installed and guaranteed by a dealer.

**Tiling System**

The purpose of the tiling is to drain rain water from the playing field as quickly as possible. A coach is very concerned about playing the contest at its scheduled time. Tiling the area will require additional construction money, but this is money well spent.

Tiling plans should be drawn in accordance with information gathered from (a) surveyor's elevation stakes, (b) surface grading, and (c) the direction of natural water flow of the area, including catch basins and storm drains which will carry water away from the playing field (A Baseball Facility, 1987). Most concern should be given over the skinned portion of the infield, the base paths, and the home-plate area. A well-turfed infield and outfield will absorb and hold a great deal of water. Games have been called because of the skinned area becoming slippery (A Baseball Facility, 1987).
As a principle, the tile should be laid in shallow trenches, 18 to 24 inches from the surface, and the trench should be wider at such vital spots as around each base and home plate. Tile should always be laid at right angles to the direction of flow from the surface grading. Four-inch, perforated drain tile should be placed in the shallow trenches. Large rock or stone will then cover the drain tile and along both sides. Next, a smaller size gravel should be used for a four to six-inch level. Then a small pea gravel should form a two-inch layer on top with your sand and clay infield materials backfilled to form the infield grade (A Baseball Facility, 1987).

The primary tile line should follow the base lines all around the infield. The lowest point of the infield will be at the edge of the outfield grass. This is the area where a wind-blown ridge is often found which prevents good surface drainage. A shallow tile line should be placed there. All tile lines should connect and flow to a storm drain or a natural water source, such as a creek or stream (A Baseball Facility, 1987).

Field Surfaces

Natural

Natural grasses should be selected from strains that have proved successful in the local geographical area, having a high tolerance for drought, compaction, disease, and local temperature variations, winter and summer. The grass should also have resistance to heavy wear and traffic and the ability to recover from injury rapidly and completely (Day, 1973). There are two methods which natural grasses can be produced. These methods are sodding and seeding.

Natural grasses are less expensive than artificial surfaces. However, such surfaces may require more intensive maintenance which may make the long-range cost effectiveness more escalated.
Turfgrasses. An abundance of information can be found in publications from the Virginia Cooperative Extension Service on the different types of turf grasses that are available. The largest factor in determining which grass is the best for the field is the geographical area. Factors such as annual rain fall and temperatures in both winter and summer will play a major role in selecting which grass is right for a field.

Kentucky 31 tall fescue is a large, coarse-bladed grass that will provide a very dense turf if seeded very heavily. This grass has great resistance to wear and good tolerance for drought and disease. This variety makes a fine turf for football or the outfield in most temperature zones. It may not be a good choice for the infield because of its tendency to become ragged and to clump. It is helpful to visit ball parks in the area and compare what type of grasses were used and how these grasses have done.

Sodding. Sodding may be necessary to establish a turf in short time. The cost of sod and laying it correctly both contribute to the expense of this method (Daugherty, 1972). Seeding is not only less expensive, but it also gives a smoother and more even surface. It usually takes two years’ time to get the wrinkles out of the sod.

If sodding must occur, the soil is prepared the same way as it was for seeding. Make sure there are no depressions, pockets, nor soft spots. Select sod, preferably from nursery stock, that is weed-free and does not have manure or fertilizer burn. The sod should be cut as thin as possible and yet handle well. The maximum root and soil thickness should be from one-half to three-fourths inches below the base of the blade. Thin-cut sod will weigh less and is easier to handle; it lies smoother and will root more quickly. Strips should be cut 12 to 16 inches wide and the rolls from five to six feet long for convenient handling (A Baseball Facility, 1987).

Before laying the sod, mark out the infield grass line, firm the soil, and water with a fine spray. Place the first row of sod to the marked-out grass lines and always work away
from these lines. The second and subsequent rows should be laid smooth, firmly butted, and so that the joints of the sod do not overlap. Care must be taken to do a thorough job of placing the sod. The sod should be tamped lightly to insure good contact. Cracks between joints should be top dressed with soil and overseeded. A recommended mixture for top dressing is sterilized soil, sphagnum peat moss, and sand. A light roller can be used but do not allow the sod to creep ahead of the roller. The sod should be watered thoroughly with a fine spray and kept moist for at least 10 days. Later on, the amount of moisture should be increased and the frequency of application decreased. After the sod has rooted, a heavier roller can be used to firm the contact and smooth out the sod (A Baseball Facility, 1987).

Maintenance. The individual responsible for the maintenance of baseball fields, usually the coach, must not neglect, even for a short time, the necessary requirements of good turf management. This is very important in regard to baseball fields because they are subjected to heavy usage, which means the turf will need constant care and attention.

All turf needs water for establishment, growth, and repair. If nature does not provide enough rain, then man must provide water. Turf specialists state that the field should be watered infrequently but thoroughly; water seldom but well (Gardner, 1977).

When the grass starts to show wilt, the area should be soaked to a depth of 6 to 10 inches. This may be at regular intervals of every four to five days in hot, drought-like conditions. Deep watering encourages desirable, deep root growth. Where as only light, frequent sprinklings encourage shallow surface roots, compaction, crab grass, and many other weeds to grow (Gardner, 1977).

Turf must have nutrients of nitrogen, phosphorous, potassium, and lime for establishment and continued good growth (Daugherty, 1972). The formula for correct amounts and the chemical ingredients should be determined by a soil analysis of specific
areas and with consideration to the type of grasses involved. Local agricultural stations or soil conservation service can make this analysis and give the necessary specific information.

All athletic turf should have an application of complete balanced fertilizer at least once each year. This should be supplemented by additional applications of nitrogen during the growing seasons.

It is considered good practice to aerify the area before applying fertilizer and lime. After aerifying, the grass should be dragged with a mat to knock particles off the grass leaves; then the grass should be watered to minimize chances of burning. Aerifying the turf will also help keep the soil open and provide needed porosity to that oxygen and moisture can feed the roots (Daugherty, 1972).

Artificial

Artificial grass can be used anywhere natural grass is used and, in addition, many places where natural grass cannot be used. Its advantages are many. It will withstand constant use all year long with no stay-off periods for watering. Artificial grass is approximately 65% less costly to maintain than natural turf. For example, there is no watering, no mowing equipment needed, no fertilizer required, and requires less labor costs. It will provide an even playing surface with no soft or hard spots, balls will bounce evenly, and there are no unusual wear spots, as found in natural turf. Disadvantages of synthetic turf are friction-caused burrs, as well as the high initial cost of installation. The cost of installing artificial turf can be calculated by using six dollars per square foot times the area which is to be covered (Penman, 1977).

Synthetic grass is actually a tufted carpet made from polyvinyl chloride, a urethane plastics. This process results in the carpet resembling real grass. Manufacturers have intentionally imitated real grass because of its traditional appearance on playing surfaces. The thickness of the carpet base can vary; the height of the grass blades varies; and the
composition and thickness of the subcarpet base can vary. When considering artificial
glass, manufacturers should be contacted to receive samples, cost estimates, guarantee
information, installation information, and subsurface procedures before making a decision as
to which one would be best for a particular situation (Penman, 1977).

Dirt Area

The dirt area or stabilized area refers to warning track, on-deck circle, fungo circle,
coaches' box, path to home plate, and the area in front of the dugouts, including a lane
along the sideline fence. The materials used in these area are aggregates that are
specifically stabilized to stand excessive wear and tear of constant traffic (Daugherty, 1972).
The purpose of the warning track is obvious. It is a safety factor to warn players of their
proximity to the outfield fence.

Recommended installation procedure is to use three to four inches of coarse fill,
such as crushed rock and cinders, and then top with two to three inches of a finer
aggregate. The aggregate materials are many: limestone of a "dirty" three-eights inch
grade, crushed brick, clay mixed with coarse sand, crushed red stone and clay, mine slag,
and steel mill slag. Sometimes these aggregate are sprayed with a light coating of asphalt
for binding purposes (A Baseball Facility, 1987).

Laying Out and Constructing the Field

In laying out the field, it is highly recommended that a surveyor and his surveying
instrument be available. Obtaining the correct dimensions and right distance is a must the
first time this is done.

With home plate situated and secured, it is then possible to place the bases and the
pitcher's mound. From the posterior of home plate, first base is exactly 90 feet to the outer
back edge of the base. When shooting this line, 320 feet should be measured from home
plate to the right field foul marker. (Figure 4). Next, the second base distance should be
Figure 4
Field Dimensions
calculated from the back point of home plate to the middle of second base by measuring 127 feet, three and seven-eighths inches. The middle of second base should be in a direct line from home plate and extend through the middle of the pitcher’s rubber. At this time, measure 60 feet, six inches from the back tip of home plate and place a stake for the pitcher’s mound. Details of constructing the mound will follow. The same procedures for establishing third base and the third-base foul line should be followed as for first base. The distance from first base to third base needs to be the same as that between home plate and second base (Official High School Baseball Rules, 1989). A diagram is provided for additional information. (Figure 5).

Seeding

Depending of the availability of seeds appropriate for the geographical area, only the best seed should be obtained. Surpassing all other in quality is seed which is derived from inert matter, chaff, and seeds from other grasses or weeds. Certified seed will also give assurance of maximum percentage of germination and full weight (Turf Tips, 1982).

The amount of seed needed will vary with the type of grass selected. Examples: Kentucky blue grass is usually seeded at four pounds per 1,000 square feet; tall fescues up to 15 pounds per 1,000 square feet when seeded alone. If a quick germinating cover grass is to be mixed with the seed, not more than 15% annual rye should be used (Turf Tips, 1982).

Seed is usually sown on the surface with a broadcast type seeder. The seeder should be calibrated to release the correct amount. Broadcast one half the seed in one direction and spread the other one half of the seed at right angles to the first spreading (Turf Tips, 1982). Plastic covering can cover areas where grass should not grow, such as the skinned portion of infield and warning tracks.
Figure 5

Infield Layout
After the seed is spread, the area should be raked and a light roller applied to firm seed to soil. Mulch or straw, three bales per 1,000 square feet, should be spread to protect the seed from birds, erosion, and to help keep in moisture. After mulching, the soil must be moistened with a fine spray and kept wet constantly so germination can continue without interruption (Turf Tips, 1982).

Another method of sowing grass is hydroseeding. Seed, fertilizer, and a mulch are mixed with water and sprayed over the entire area. This type of seeding is more expensive and does not give as even a spread of seed (Turf Tips, 1982). Grass may be sown by spreading seed with the fertilizer truck when it spreads 10-10-10 plant food on prepared top soil. While this method does work, it is difficult to control the direction of the seed.

Base Anchors

The "Hollywood" type base is an asset to the game and should be used when possible (Daugherty, 1972). It is tough, durable, convenient to handle, and permanently located.

First, three base anchors should be formed in concrete. A form of plywood, 16 inches square and 12 inches deep, should be filled with concrete and the metal receptacle placed in the center. Allow concrete to set 24 hours. Measurements should be taken to locate the bases while chalk lines are placed down both base lines. The outside edge of first base and third base should touch the outer edge of the foul line; the back of the base will be exactly 90 feet from the apex of home plate. With these spots marked, dig a hole, three feet by three feet and at least 16 inches deep. A chalk mark should be placed on the foul line string at 90 feet. This is where first and third bases will be placed. With the base inserted into its receptacle, set the concrete block into the hole and move it to its exact location. Then the base can be removed and dirt filled around the concrete allowing the
receptacle to be flush with the playing surface. Place a rubber base plug in the receptacle when the base is not being used as well as when dragging the field (Daugherty, 1972).

Second base can be placed following the same procedure as described above for first base. The only exception is that second base should be placed at 127 feet and three and three-eighths inches from the back of home to the middle of second base. One of the four corners of the base must be facing home (Daugherty, 1972).

A board may be laid across the hole made for each base before filling in order to check to see that the base receptacle is flush with the ground. These type bases, when installed properly, will provide several years of maintenance-free duty.

**Pitcher’s Mound**

Pitching is a very important aspect of baseball. Therefore, a great deal of attention should be given to the construction and maintenance of the pitcher’s mound.

To construct the pitcher’s mound, measure exactly 60 feet, six inches from the back of home plate and drive an elevation stake leaving a 10-inch protrusion out of the ground. This could have been done when second base was placed. The mound area should be built on a nine-foot radius starting from a point 18 inches in front of the elevation stake. The diameter of the mound should be 18 feet with 10 feet in front of the rubber toward home plate and 8 feet from the rubber toward second base (Official High School Baseball Rules, 1989).

The top portion of the mound should be a flat alley, 30 inches on each side of the stake, 18 inches in front of the stake, and 24 inches behind the stake. Fill or build the mound with a heavy clay mix, packing, rolling, and tamping as the soil is being placed as it progresses up to cover the 10-inch elevation stake. It is now assured that the mound is the right elevation and the pitcher’s plate or rubber can then be set on the flat alley of the mound. From this alley, contour evenly and gradually to the perimeter of the mound circle.
The slope should drop one inch for each foot of the mound toward home plate (Official High School Baseball Rules, 1989).

The pitcher's rubber should be placed by using a carpenter's square off the line from home plate to second base in order to acquire an exact right angle to home plate. The best type rubber to purchase is the four-sided rubber which is hollow inside. This rubber will not bow up after time and can be rotated to a new side as needed (A Baseball Facility, 1989).

Backstops

There are many different ways to install and make backstops. Here are some suggestions for making it the most satisfactory one possible.

1. Install an all upright backstop.

2. Height will vary, but all seated fans and pressbox should be covered from direct foul balls.

3. No over-hang type backstop should be used, because this will take away from the natural play of the catcher.

4. Backstop should be installed at least 45 feet from home plate with regulation distance 60 feet from home plate (Official High School Baseball Rules, 1989).

5. The center section should be 40 feet long and at a right angle to the axis of home plate (Official High School Baseball Rules, 1989).

6. Wings should be 12 to 15 feet high, extended parallel to the foul lines, and run to the dugouts (Official High School Baseball Rules, 1989).

7. Fence posts should be on the outside of the playing field.

8. The bottom rail should be tied down or some type of concrete support should be used to hold the bottom of the fence secure, so it will not bend up with time.
9. A green backdrop should be on the center section of the fence and should be at least six feet high (Official High School Baseball Rules, 1989).

Warning Track

The warning track is a stabilized area which runs adjacent to all fencing around playing field. This area should be at least 10 feet from the fence and not more than 30 feet from the fence (Official High School Baseball Rules, 1989). The purpose of this area is to warn players of their approaching the fence when attempting to make a play on a batted ball.

Dugouts

A baseball facility should have dugouts to protect players from the weather. Dugouts may be built on ground level or at various depths. The layout of the field and the amount of room available may be factors that will determine the type of dugout to be built. The ground level dugout with a concrete pad floor with drains is easy to keep clean. Dirt can be swept out onto the area in front of the dugout, and then the dugout can be washed out with a water hose. In most high school situations where the head coach is the only groundskeeper, making maintenance easy is very important. (Figure 6).

Some factors that need to be considered in a dugout are as follows.

1. Length - The dugout should be long enough to accommodate players and coaches. A length of 40 feet will allow 25 people to sit on the bench at one time. It is better to make the bench too long rather than too small (A Baseball Facility, 1987).

2. Height - The dugout should be high enough so that occupants can stand up without bumping their heads. If possible, the entire front should be open, without support poles.

3. Width - The dugout should be wide enough to allow traffic flow back and forth. A reasonable width is eight feet.
Figure 6
Dugout
4. **Location** - The front edge of the dugout should be parallel with the baseline, and the center point of the dugout should be positioned so it will have the same distance from home plate and the base on that particular side (*A Baseball Facility*, 1987). Example: A dugout 40 feet long would be 25 feet up the line from home plate, or 25 feet + 40 feet + 25 feet = 90 feet.

5. **Building materials** - Block and brick with a pre-formed concrete roof works well. Always brick structure when possible. This saves time and money in painting (*A Baseball Facility*, 1987).

6. **Special features** - Special features include a water cooler; a toilet at one end; electrical outlets; water outlets; bat rack; shelves and coat hangers on the back wall; and portable benches instead of permanent ones.

**Fencing**

It is recommended that the sideline and outfield fence be constructed from galvanized chain-link fence. This fence should be from six to eight feet high in accordance with the age group that is playing on the field. Fence posts should be on the outside of the playing field. The barbed ends of the fence should be toward the ground, and the rounded edges should be toward the top of the fence (*A Baseball Facility*, 1987). Gates should be placed near each dugout and two 10-foot maintenance gates in the outfield.

**Spectator Seating**

Permanent grandstand type seating is the most desirable. The number of seats needed will vary with each school and the level of baseball being played on the field. An example of permanent seating is a 16-row-high by 40-feet-long section directly behind the backstop which will seat 486 people (*A Baseball Facility*, 1987). This is enough seating for most high school games.
Factors to be considered when purchasing bleachers are as follows.

1. **Maintenance** - After bleachers are erected, how much upkeep is necessary?

2. **Safety factors** - Bleachers should be enclosed with a chain-link fence around them to prevent spectators from falling. Steps should have hand rails on both sides for spectators’ safety.

3. **Elevation** - Bleachers should have a walkway along the front with steps on both ends and be high enough to see over both dugouts and the back drop.

4. **Expansion capability** - Bleachers should have the capability for addition of extra seating later as needed without major problems.

5. **Pressbox landing** - The top of the grandstands should be capable of supporting a pressbox.

**Pressbox**

The pressbox does not need to be a very large or expensive structure. Most grandstands can provide an area to support a pressbox, 24 feet by 8 feet, with a side landing for a door (*A Baseball Facility, 1987*). (Figure 7).

Included in the pressbox should be a place for the scoreboard operator and official scorekeeper, a public address announcer, and space for radio broadcaster and the press.

**Scoreboard**

An electronic scoreboard should be available for use on all baseball fields. That which should be listed on this board are names of teams, total score, number of balls and strikes, outs, inning number, and a hit or error designation. This type of scoreboard could be donated to a field by a commercial sponsor.

The scoreboard should be controlled from the pressbox with a remote control unit hooked up to an underground cable. The board should not be placed dead center in the
Figure 7
Press Box
field where it may interfere with the hitter's background. The scoreboard should be visible from both dugouts.

Concession Stand - Restrooms

A concession stand and restrooms are assets to the facility and program. These two additions will enhance the use of the facility during games which may attract large crowds. The concession stand can be a very profitable endeavor the baseball for team. Restrooms, in most instances, are required for public health. (Figure 8).

The size of the toilet area and number of fixtures will depend on the peak load for which the facility is designed. The women's toilet area should contain a minimum of two lavatories and four toilets. The men's toilet area should contain a minimum of two lavatories, two urinals, and two toilets. These fixtures should be wall-mounted for easy maintenance of the area. Toilet areas should be partitioned. One toilet should meet standards for the handicapped and should include a door that opens outward. A drain must be provided in the floor, and a hose attachment should be provided nearby. Air removal in toilet areas should be directed outside at a rate of 30 changes per hour (Penman, 1977).

Buildings should be located close enough for convenience but at a distance which will provide for the safety of all individuals. If initial capital is not available for construction of such buildings, the construction should be included in the final facility completion. The Building Code states that public stadiums must have one toilet for every 100 people, one lavatory for every 150 people and one water fountain for every 1,000 people that the stadium will seat (Virginia Statewide Uniform Building Code, 1988).
Figure 8
Concession / Rest Rooms
Lighting

Due to the expense involved, lights may not be reasonable. Nevertheless, consideration for lights should be given when planning and constructing a field. A field with lights can be used by more people and can be more convenient for players and spectators.

The main objective in lighting a field is to provide sufficient quality illumination for comfortable and accurate visibility (Crookham, 1982). A good lighting project is expensive and need only to be installed once. It is easy to make costly mistakes. A subject of this technical nature should be explored with people who are specialists in this field. Local lighting engineers can be of great assistance.

Factors to consider about lighting are as follows:

1. **Planning** - Even if installing lights are not in the immediate plans, a lighting specialist should be contacted before construction begins. Small items now may save time and money later if lights are added. Example: Placing plastic conduit pipe underground may save in having the field dug up later.

2. **Poles** - All poles or towers should be on the outside of the fence.

3. **Wires** - All wires should be underground.

4. **Control panel** - The control panel should be located where it can be locked and secured from the public.

5. **Financing** - Total funds may not be needed to purchase lights. Some manufacturers have multi-year payment plans available.

There are several different types of lighting systems available for use on baseball fields. Each has its own set of pros and cons for its intended use. The old incandescent fixtures on wooden poles are the least expensive lighting systems to purchase; however, the yearly electrical expense is much greater than the high pressure, sodium-type fixtures (Crookham, 1982). The orange color factor of the sodium lighting system is generally
considered this system's major drawback. The sodium-type fixture, when placed on
concrete poles, is energy-efficient and cost-effective (High pressure, 1980).

When beginning the process of lighting a baseball complex, an electrical engineer or
lighting consultant should be contacted. This individual will be vital in making sure the
project is completed correctly during the initial phase.

Parking

The need to provide off-the-street parking is a major concern in the design of a
baseball facility. Parking areas should be located on the perimeter of the facility and the
flight of foul balls considered in its location. The size of the parking areas should
correspond with the facility's attendance capacity. Approximately two acres of parking is
required for every 1,000 spectators the ballpark will seat (Flynn, 1985).

Parking areas should be made of hard surfaces, such as gravel or pavement. Each
parking space should be clearly marked. When night games are necessary to be played at
the facility, adequate lighting should be provided in all parking areas (Flynn, 1985).

Maintaining the Field

Adequate and constant maintenance is vital to a good field. A field that is neat,
well-manicured, and well-groomed attracts both teams and spectators. Everyone connected
with the game takes pride in an attractive field. To have a field with a pleasant appearance
indicates that much time is being spent keeping it that way. As fields are built,
consideration should be given to hiring a full-time groundskeeper. If money is not available,
usually the coach will be the person who will have to make sure the field keeps the desired
appearance. Keeping the field in shape every day will save time and money in the future.

Mowing

The infield and outfield grass should be mowed often enough so that the grass
does not grow more than one inch to an inch and a quarter above the desired length.
Different types of grass will vary in the lengths to which they should be cut. Blue Grass and Merion should not be cut lower than one and one-fourth inches in height. Tall Fescue grasses (k 31-Alta) thrive best on a two-inch cut. Zoysia and Bermuda grasses should be cut to a one-half to three-fourths inch length (*A Baseball Facility*, 1987).

A longer cut may be used on fields that are not being used regularly. The longer cut permits greater photosynthesis, developing stronger healthier grass. If the longer height of grass is desired, this desired height should be obtained gradually over several mowings.

Reel or rotary types of mowers can be used as desired. Mowers should be kept sharp. A dull blade bruises the grass and leaves a yellowing appearance after cutting. The mower should not be moved too fast. A mowing procedure that is popular is mowing both the infield and the outfield in patterns. This can be accomplished by alternating mowing directions (Gardner, 1977).

There are five different procedures for mowing both the infield and the outfield. (Figure 9).

**Infield**

a. First, mow from the third base foul line to second base.

b. Next, mow from the first base foul line to second base.

c. One procedure is to mow in a circle around the mound.

d. Mow a half circle around the infield part of home plate.

e. Finally, mow in a straight line home plate to second base.

**Outfield**

a. Mow from third base to the fence down the left-field foul line.

b. From first base mow to the fence down the right-field foul line.

c. From second base, mow straight out to center-field fence.

d. Mow the infield edge of outfield grass, working toward warning track by going back and forth.
Figure 9

Infield Mowing Procedures
e. Mowing the outfield edge of grass on warning track, working towards infield grass should make a more attractive field.

For illustrations of the outfield methods see Figure 10. The reason for using different mowing methods is to make the grass coverage denser. If the grass were to be mowed the same way each time, there would be many bare spots (A Baseball Facility, 1987).

**Dragging Infield**

The nail drag should be used if the area is very solid from heavy rains. The screen drag should be used behind the wheel tractor, starting by the outfield grass and making a complete lap of the skinned area. The second lap should begin half-way between the area that has not been raked or dragged. At this half-way point the mower should be moved all the way to the right field foul line. A right turn should be made to the infield side going along the area that has been dragged. At the third base foul line, a right turn should be made, going to the immediate left of the area that was dragged on the last swath. The dragging should be continued in this manner until the entire area has been covered. By going in this semi-circle path there will not be any short turns, thus keeping the drag from digging in during the turns (A Baseball Facility, 1987). When dragging the skinned area the procedure should alternate from clockwise to counter-clockwise. This can prevent uneven spots.

By keeping the drags at least six inches away from the grass, loose dirt does not get into the grass and form a "lip" in the grass. A regular hand garden or lawn rake should be used in the area along the grass outlines.

If a lip should start to form at any time where the grass and skinned area meet, a hose with a nozzle which can relinquish force should be used to wash the dirt back into the skinned area. Should dead grass be washed onto the dirt area, it should be raked up as soon as the dirt area becomes dry.
Figure 10

Outfield Mowing Procedures
Another way to drag the skinned area is by the circular method. This is accomplished by starting at the third base foul line and making a spiralling circle from infield to outfield grass. This circular spiral should be nine to ten feet in diameter. Drag all the way to the first base line. This method of dragging fills in the small dips, thus keeping the infield in a very smooth condition. It should be done at least once every three days. The direction should be reversed for the next time this method is used (A Baseball Facility, 1987). Diagrams for dragging the skinned area will be found in Figure 11.

Maintenance Equipment

Many pieces of equipment are of great aid in the maintenance of a field. Some of the tools and equipment needed are rakes, brooms, shovels, wheelbarrows, tamperers, drags, tarpaulins, water hoses, push mower, riding mower, edge cutter, line marker, paint marker, fertilizer spreader, aerifying equipment, and grass vacuum. Material needed for proper maintenance of a field are line markers, fertilizers, Diamond Dry, stock pile of sand, stock pile of top dressing, line paint, herbicides and pesticides, top soil, and clay.

Adequate and constant maintenance is vital to a good playable field. A dressed-up field that is neat, well-manicured and well-groomed draws both teams and spectators. Everyone concerned with the game takes pride in an attractive field. A field with this appearance indicates that much time is being spent in keeping it that way. A proper maintenance checklist can be used for recommended maintenance (Appendices A and B).

Fall Renovation

Fall is the best time (October) to prepare a field for the next season. A good job here will save time and leave a minimum of work needed in the spring. Renovations which should be performed are as follows:
Figure 11
Dragging Diagrams
1. Aerify the turf from several directions.
2. Apply fertilizer and lime.
3. Reseed or sod bare areas.
4. Rebuild the mound - home plate areas and bullpens.
5. Fill in any low spots on infield and drag.
6. Cover mounds to cut down on run-off.
7. Repair fences, dugouts, screens, etc.
8. Turn off water and drain all pipes.
9. Remove nets and canvas from batting cages.
10. Take down and store all signs and banners.
11. Store all field and maintenance equipment

Summary

The construction and maintenance of a baseball facility demands an organized, business-like, professional approach. The purpose of this manual was to compile information which could be used by a coach or a school administrator who may be found in a position of constructing or maintaining a baseball facility. The manual is divided into four major sections: selecting the site, construction procedures, maintenance of the field, and drawings and layouts which may be helpful. The information provided is arranged so it can be used from the first conception of building a baseball complex to its completion.
References


Turf Tips. (June, 1982). Virginia Polytechnic Institute and State University, Extension Division. Publication 430-213.

Appendix A

Proper Maintenance Checklist
Proper Maintenance Checklist

The following is a checklist for recommended maintenance:

Name of Facility: ___________________________ Date: _____________________

Daily routine before practice:

_____ Remove tarps from mounds and home plate.

_____ Wet down skinned portion and baseline.

_____ Put out bases.

_____ Put up protective screens.

_____ Place portable backstop.

Daily routine after practice:

_____ Remove bases and place rubber receptacles.

_____ Drag the skinned portion of the infield.

_____ Rake the mound and home area.

_____ Rake base paths.

_____ Cover the mounds and home with tarpaulin.

_____ Rake bull pens.

_____ Replace screens and backstop.

_____ Water field if needed.

_____ Sweep out and wash down dugouts.
Appendix B

Gameday Checklist
Opponent: __________________________ Date: ________________________

**Game day check list:**

- Remove tarp.
- Mow the grass.
- Scarify skinned area with spikes.
- Drag smooth - rake mounds - base paths - home area.
- Water down diamond.
- Set chalk lines.
- Paint outfield foul lines.
- Place screens for bullpen.
- Place batting cage.
- Paint or wash bases.
- Ready bullpens.
- Hang flag.
- Clean dugouts.
- Pick up litter.
- Check scoreboard.
- Check lights.
- Check and clean out pressbox.
- Check public address system.
- Check and clean concession stand.
- Clean rest rooms and locker rooms.