Chapter 6

Designs for Recreational Uses

ASPHALT PAVEMENTS FOR NON-VEHICULAR USE

In addition to highways, streets, and parking lots that carry autos and trucks, many other applications for asphalt pavements exist. Sidewalks, bicycle and golf cart paths, playground areas, tennis courts, and site paving are some common applications.

Because of the unique nature of these asphalt pavement applications, a more detailed approach to their design is presented here. In many cases, the primary design consideration is a pavement structure capable of supporting occasional maintenance and emergency vehicles and resisting freeze/thaw cycles. Therefore, a minimum thickness to accommodate these loads may be the basis of the thickness design.

BIKEWAYS, GOLF CART PATHS, RECREATIONAL TRAILS, AND WALKWAYS

It is desirable to blend this type of pathway into the contours of the existing ground to preserve aesthetics and to reduce the impact on the natural environment. Surface drainage should flow away from these pathways wherever possible.

Because of the variety of designs and applications, individual pathway widths are not listed here. For bikeway and golf cart paths in particular, the size and availability of conventional road construction and maintenance equipment may determine width. Generally, a minimum width of 8 feet is recommended; a 12-foot width may be more cost effective. As a safety measure, additional widening on sharp curves is recommended.

Recreation trails and walkways are usually paved to an 8-foot width to accommodate construction and maintenance operations and to provide access for emergency vehicles. It may be desirable to pave a walkway in an urban environment only 4-feet wide (or wider if significant numbers of pedestrians are present). These pavements usually are not designed to withstand repeated loads from maintenance or emergency vehicles, but an occasional heavy-load application can be made without damage.

Construction Practices

Drainage

It is very important to keep water away from the subgrade soil. If the soil becomes saturated, it will lose strength and stability, making the overlying pavement structure susceptible to breakup under imposed loads. Both surface and subsurface drainage must be considered. All drainage must be carefully designed and should be installed as early in the construction process as practical.

Bicycle and golf cart paths should have a minimum slope of 2 percent or 1/4 inch per foot. They should be constructed in such a way that water will not collect at the pavement edge. Areas of very high natural permeability may require an underdrain system to carry water away from the pavement structure.

Subgrade Preparation

Because the subgrade must serve both as the working platform to support construction equipment and as the foundation for the pavement structure, it is vital to ensure that the subgrade is properly compacted and graded. All underground utilities should be protected or relocated before grading. All drainage structures should be completed with the grading. Remove all topsoil, debris, and rocks from the areas to be paved and treat with a soil sterilant to inhibit future flora growth. The subgrade should be shaped properly to meet true alignment and elevation. It should be compacted to not less than 95 percent of maximum laboratory density. The surface should not vary more than 3/4 inch from the established grade.

Areas that show a pronounced deflection under heavy construction traffic indicate instability in the subgrade. Such areas probably require removal of the material and replacement with suitable subgrade soil material such as compacted, crushed stone or compacted, bituminous-concrete base. If a water seepage area is encountered, the subgrade should be drained.

Asphalt Concrete Pavements

Bicycle, golf cart paths, recreational trails, and sidewalks may be constructed in one course or with a separate base and surface course.

The Asphalt Concrete base course should be placed directly on the prepared subgrade in one lift in a thickness of 4 inches or less, and spread and compacted. Compaction is one of the most important construction operations in terms of its contribution to the performance of the completed pavement.

If a compacted aggregate base is proposed, place it on the prepared subgrade and compact it to ensure a hard, uniform, well-compacted surface.

The surface course, or the full-depth Asphalt Concrete base course, should be placed to the true line and grade. Any irregularities in the surface of this course should be corrected directly behind the paver. As soon as the material can be compacted without displacement, rolling and compaction should be started and should continue until the surface is thoroughly compacted and all roller marks have disappeared.

Before placing successive layers, the previous course should be clean. If necessary, a tack coat of diluted emulsified asphalt may be applied.

Pavement Markings

Pavement markings for bicycle paths are covered in the MUTCD under Part XI. Markings are especially important when the designated bicycle lane is to be accommodated on the roadway and shared with motorists.

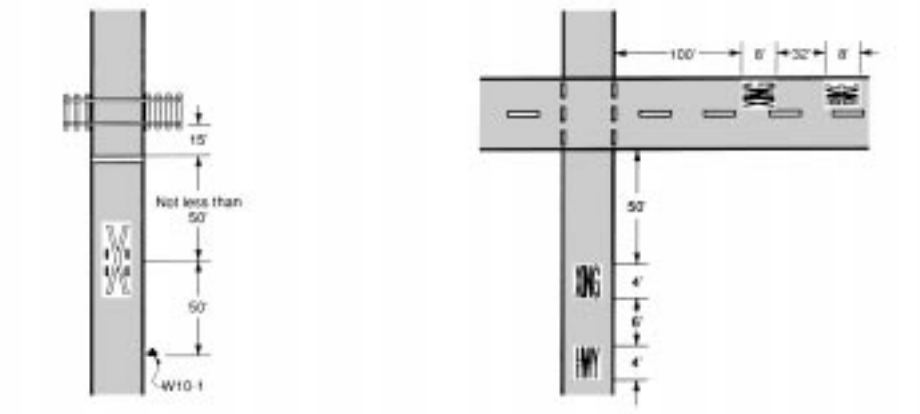


Figure 6-1.

Pavement Thickness

The pavement thickness for bikeways, golf cart paths, recreational trails, and walkways should be in accordance with the following table:

Table 6-1. Thickness Chart: Bikeways, Paths, Trails, and Walkways

A. For Asphalt Concrete Base Pavements

Design Criteria*			Thickness in Inches Asphalt Concrete	
Traffic Class (ADT)	Subgrade Class	CBR	Surface	Total
I	Good	9	3.0	3.0
	Moderate	6	3.5	3.5
	Poor	3	4.0	4.0

B. For Untreated Aggregate Base Pavements

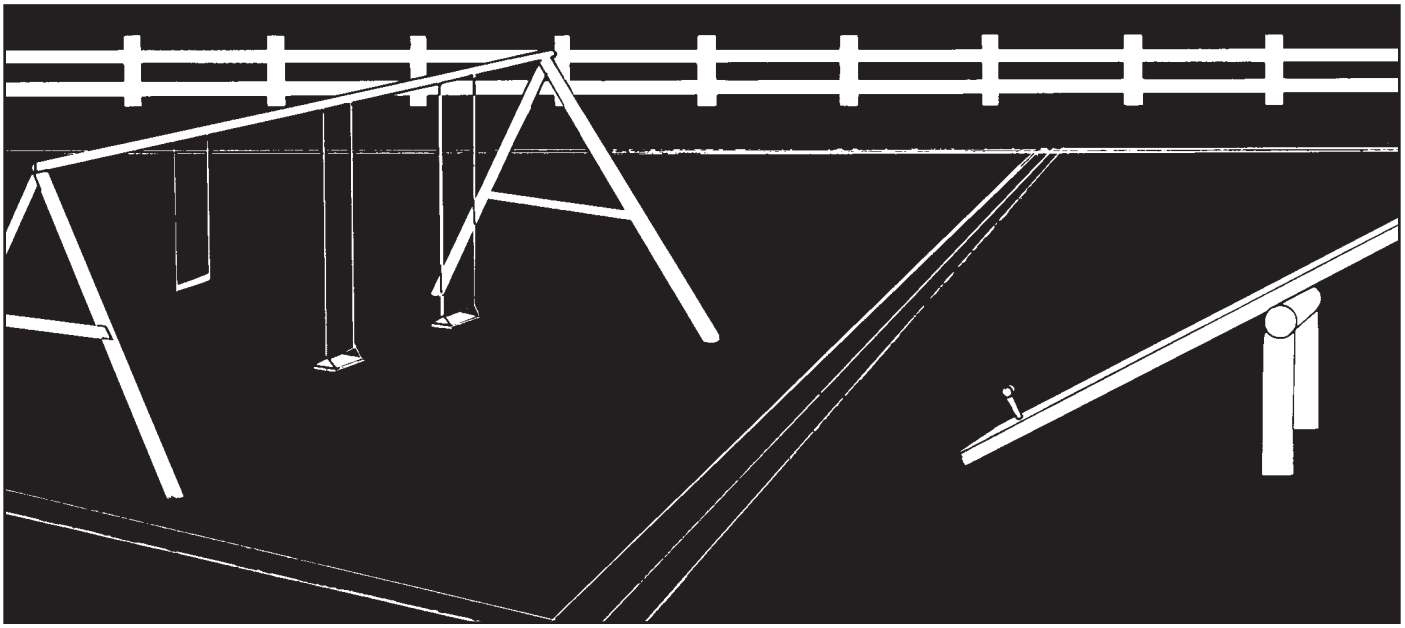
Design Criteria*			Thickness in Inches		
Traffic Class (ADT)	Subgrade Class	CBR	Untreated Aggregate Base	Hot Mix Asphalt Surface	Total
I	Good	9	4.0	2.5	6.5
	Moderate	6	4.0	3.0	7.0
	Poor	3	6.0	3.0	9.0

**See chapter 3 for soil class details*

RECREATIONAL AREAS

The following information and design guidance cover the basic components of building durable, economical asphalt playgrounds.

Because individual designs are based on intended uses and available funds, dimensions and suggested layouts are not included here.



Basketball Courts

A common section of the playground or recreational area is the basketball court. The following information and design guidance cover the basic components of building basketball courts. General guidelines for court layout and dimensions are included.

Court Layout

The basic layout and dimensions of a basketball court and backboard are illustrated in the following figure (6-2).

Court dimensions are:

- Professional: 94 feet long by 50 feet wide.
- High school: 84 feet long by 50 feet wide.

Backboard dimensions are:

- Rectangular backboard: 74 inches wide by 48 inches high.
- Fan backboard: 54 inches wide by 35 inches high.

An unobstructed space of at least 3 feet outside the end lines and sidelines is required. This space would preferably be 10 feet wide. All end lines, sidelines, and other court line markings, except neutral zone markers, must be a minimum of 2 inches wide.

These pavements usually are not designed to withstand repeated loads from heavy maintenance or emergency vehicles, but an occasional load application can be made without damage.

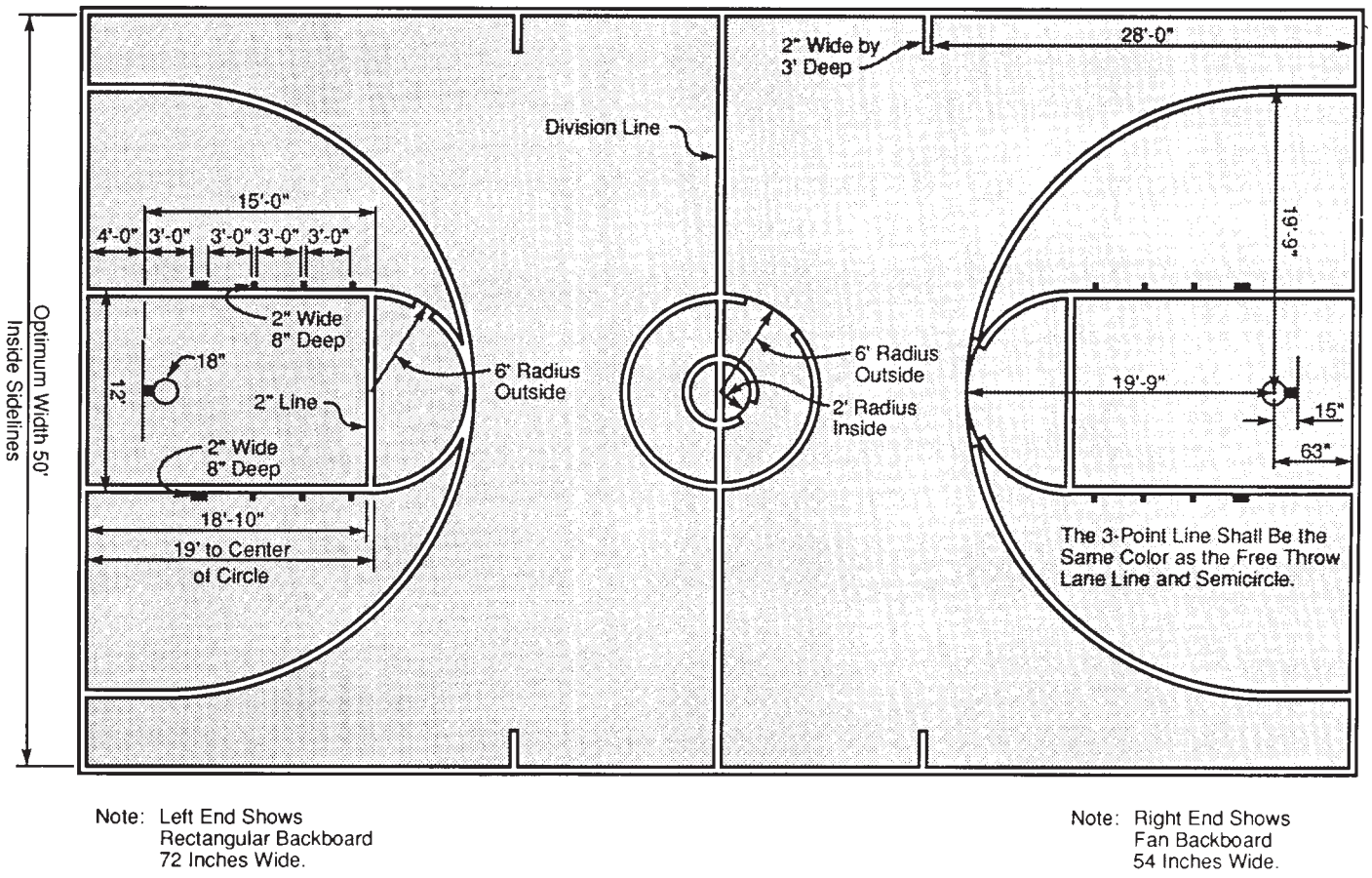


Figure 6-2

Construction Practices

Drainage

Both surface and subsurface drainage should be investigated. If excessive moisture is allowed to accumulate under the pavement, the life of the playground surface may be shortened. If necessary, a system of subsurface drainage must be constructed.

Surface drainage on the playground should be directed to the pavement edges and carried away in suitable channels or drainage facilities. It is recommended that the minimum pavement cross-slope be 2 percent or 1/4 inch per foot to preclude standing water and ensure rapid drainage.

Subgrade Preparation

Because the subgrade must serve as both the working platform to support construction equipment and as the foundation for the pavement structure, it is critical that the subgrade be properly compacted and graded. All drainage structures should be completed with the grading.

Remove all topsoil, debris, and rocks from the areas to be paved and treat with a soil sterilant to inhibit future flora growth. The subgrade should be properly shaped to meet true alignment and elevation. It should be compacted to not less than 95 percent of maximum laboratory density. The surface should not vary more than 3/4 inch from the established grade.

Areas that show a pronounced deflection under heavy construction traffic indicate instability in the subgrade. Such areas probably require removal of the material and replacement with suitable subgrade soil material such as compacted, crushed stone or compacted, bituminous-concrete base.

Base Construction

Asphalt Concrete base material should be placed on the prepared subgrade in one lift in a thickness of 4 inches or less. The material must be spread and compacted to the required thickness and density as specified and in the grades and dimensions shown on the plans.

The surface of the completed base must not deviate more than 1/2 inch when measured with a 10-foot straight edge.

Tack Coat

Before placing successive courses, the previous course should be clean. If needed, a tack coat of diluted emulsified asphalt may be applied as a bond coat.

Surface Course Construction

A surface course of Asphalt Concrete may be placed on the previously constructed Asphalt Concrete base. It must be spread and compacted to the required thickness and density as specified and in the grades and dimensions shown on the plans.

The finished surface must not deviate more than 1/4 inch when measured with a 10-foot straight edge.

Pavement Thickness

The pavement thickness for playgrounds should be in accordance with the following table:

Table 6-2. Thickness Chart: Playgrounds

A. For Asphalt Concrete Base Pavements

Design Criteria*			Thickness in Inches Asphalt Concrete		
Traffic Class (ADT)	Subgrade Class	CBR	Base	Surface	Total
I	Good	9	3.0	1.0	4.0
	Moderate	6	3.5	1.0	4.5
	Poor	3	4.0	1.0	5.0

B. For Untreated Aggregate Base Pavements

Design Criteria*			Thickness in Inches		
Traffic Class (ADT)	Subgrade Class	CBR	Untreated Aggregate Base	Asphalt Concrete Surface	Total
I	Good	9	4.0	2.5	6.5
	Moderate	6	4.0	3.0	7.0
	Poor	3	6.0	3.0	9.0

**See chapter 3 for soil class details*

TENNIS COURTS

The following information and design guidance cover the basic components of building durable, economical asphalt pavements for tennis courts. General guidelines for the layout and dimensions are included. These pavements usually are not designed to withstand repeated loads from heavy maintenance or emergency vehicles, but an occasional load application can be made without damage.

Court Layout

The basic layout and dimensions of a tennis court are illustrated in the following figure.

Post foundations should be:
- 24 inches in diameter at the top,
- 30 inches in diameter at the bottom, and
- not less than 36 inches in depth.

The dimension between posts is:
- 33 feet on single courts and
- 42 feet on double courts.

New posts are galvanized, 2-7/8 inches in diameter, and equipped with a net-tightening device.

The standard net is:
- 42 feet in length and
- 3 feet-3 inches wide.

An edging of brick, concrete, steel, or treated wood should be installed around the entire perimeter of the court area. Top elevation of the edging should be 1/2 inch below the finished grade level, and the court's surface should be tapered from 6 inches from the edge to meet it.

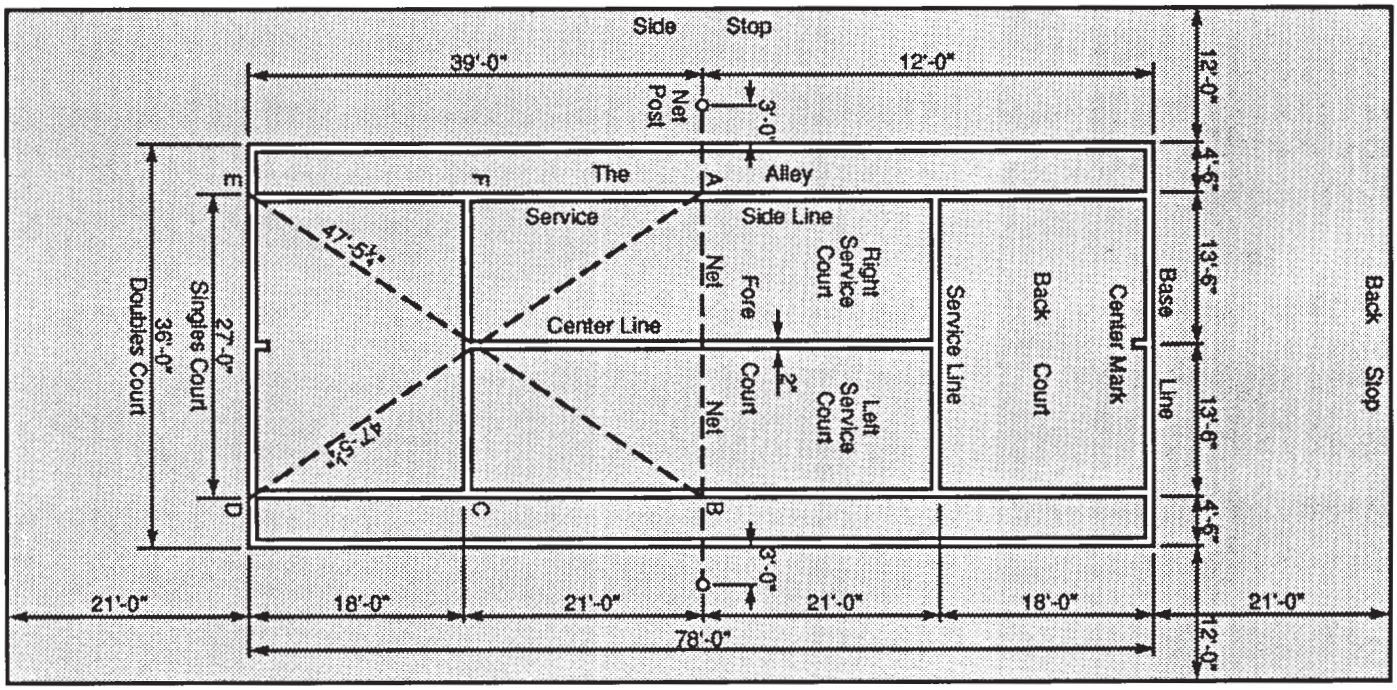


Figure 6-3

Construction Practices

Drainage and Surface Slope

Both surface and subsurface drainage must be thoroughly investigated. Proper drainage is vital to ensure a non-cracked, smooth playing surface for many years. If subsurface drainage conditions are not satisfactory, a perimeter drain is recommended. An Asphalt Concrete base on a suitable type of subgrade soil may not require underdrainage.

In order to drain properly, the finished court surfaces should have a minimum slope of 1 inch per 10 feet on a true plane from side to side, end to end, or corner to corner. The surface should not slope away in two directions from the net.

Subgrade Preparation

Remove all rock, vegetation (including root systems), debris, and unsuitable topsoil from the area to be paved. To prevent future growth, treat the subgrade with an approved soil sterilant. Install all drainage facilities and adjust or relocate utilities.

The subgrade must be shaped to meet true lines and elevations and compacted to not less than 95 percent of maximum laboratory density. The surface of the compacted subgrade must not vary more than 3/4 inch from the established grade. Good compaction is particularly important in tennis court construction, because subsequent settlement of the subgrade may cause cracking in the court surface. In some cases this can render the court unusable.

Base Construction

Asphalt Concrete base material must be placed on the prepared subgrade in one lift in a thickness of 4 inches or less. The material must be spread and compacted to the required thickness and density as specified and in the grades and dimensions shown on the plans.

The surface of the completed base must not deviate more than 3/8 inch when measured with a 10-foot straight edge but must slope 1 inch per each 10 feet on a true plane from side to side, end to end, or corner to corner as indicated on the plans.

Tack Coat

Before placing successive courses, the previous course should be clean. If needed, a tack coat of diluted emulsified asphalt may be applied for bonding.

Surface Course Construction

A surface course of Asphalt Concrete must be placed on the previously constructed Asphalt Concrete base, spread and compacted to the required thickness and density as specified and in the grades and dimensions shown on the plans.

The finished surface shall not deviate more than 1/8 inch when measured with a 10-foot straight edge but must slope 1 inch per each 10 feet on a true plane from side to side, end to end, or corner to corner as indicated on the plans.

Color Finish Course (If Specified)

Before applying the color finish course, the court should be given a water check to determine if there are any depressions (birdbaths). This is done by flooding the surface with water and allowing it to drain. Depressions of sizable dimensions – greater than 1/8 inch – should be patched and leveled with the material recommended by the color finish manufacturer.

The color finish material may be one of several proprietary products and must be applied according to manufacturer's directions.

Playing Lines

Following construction, it is recommended that a minimum of 15 days elapse before applying the playing lines. A latex striping-paint should be used. It should be placed no

thicker than necessary for delineation. Base lines should not be more than 4 inches wide, and playing lines should not be more than 2 inches wide. Base and playing lines must be accurately located and marked in accordance with the rules of the United States Lawn Tennis Association.

If a color finish has been applied, the striping paint should be from a manufacturer and of a type recommended by the surface coating manufacturer. It should be painted in accordance with the paint manufacturer's standard specifications. Traffic, oil, alkyd, or solvent vehicle-type paints should not be used.

Tennis Court Overlays

There are many reasons for overlaying an existing tennis court. For example, it may have a badly oxidized or aged surface, poor drainage, or a poorly constructed base. Each of these conditions and their severity should be considered in determining the required overlay pavement thickness.

Many items should be considered when determining the most sound and economical procedures to follow in resurfacing a tennis court. Therefore, it is strongly recommended that a qualified asphalt paving contractor, one experienced in tennis court construction, be consulted.

Pavement Thickness

The pavement thickness for tennis courts should be in accordance with the following table:

Table 6-3. Thickness Chart: Tennis Courts

A. For Asphalt Concrete Base Pavements

Design Criteria*			Thickness in Inches Asphalt Concrete		
Traffic Class (ADT)	Subgrade Class	CBR	Base	Surface	Total
I	Good	9	3.0	1.0	4.0
	Moderate	6	3.5	1.0	4.5
	Poor	3	4.0	1.0	5.0

B. For Untreated Aggregate Base Pavements

Design Criteria*			Thickness in Inches		
Traffic Class (ADT)	Subgrade Class	CBR	Untreated Aggregate Base	Asphalt Concrete Surface	Total
I	Good	9	4.0	2.5	6.5
	Moderate	6	4.0	3.0	7.0
	Poor	3	6.0	3.0	9.0

**See chapter 3 for soil class details*

ASPHALT-RUBBER RUNNING TRACKS

High schools and colleges are increasing the demand for outdoor and indoor asphalt-rubber running tracks and runways for long jump, high jump, and pole vault. For information on track size, number of lanes, and other features, refer to the Amateur Athletic Union or other official specifications.

Construction Practices

Subgrade Preparation

Remove all large rocks, debris, and topsoil from the area to be paved. All vegetation, including root systems, should be removed. To prevent future growth, treat the subgrade with an approved herbicide. Install all drainage and utility facilities, and properly backfill and compact the subgrade.

The subgrade must be properly shaped to meet true lines and elevations. It must be compacted to not less than 95 percent of maximum laboratory density. The surface of the compacted subgrade must not vary more than 3/4 inch from the established grade.

Areas that show pronounced deflection under construction traffic indicate instability in the subgrade. If reworking and additional rolling do not correct the situation, the areas must be removed, replaced with suitable material, and compacted. The use of Asphalt Concrete base or coarse granular material is recommended.

Base Construction

Asphalt Concrete base material must be placed on the prepared subgrade. The material must be spread and compacted to the required

thickness and density as specified and in the grades and dimensions shown on the plans.

A minimum thickness of 4 inches is recommended. In general, a total base thickness of 4 inches or less should be placed in one lift.

The surface of the completed base must not deviate more than 1/2 inch when measured with a 10-foot straight edge.

Asphalt-Rubber Surface Construction

Several manufacturers supply rubber material for use in asphalt-rubber surface mixes. Obtaining advice from these companies is suggested. Because many members of the APAI are familiar with various mixes, information may also be obtained by contacting members in your area.

If an asphalt-rubber mix proves to be uneconomical or impractical, an alternative recommendation would be to specify an asphalt sand mix.

The surface course material must be placed on the previously constructed Asphalt Concrete base, spread, and compacted to the required thickness and density as specified and in the grades and dimensions shown on the plans. A minimum thickness of 1 inch is recommended.

The finished surface must not deviate more than 1/4 inch when measured with a 10-foot straight edge.

Tack Coat

A tack or bond coat of CSS-1, SS-1, MC-70, or an approved alternative must be applied at the rate of 0.02 to 0.05 gallons per square yard between each course. The surface must be cleaned of all dust, dirt, or other loose material before the bond coat is applied. If emulsion is used, it must be diluted with equal parts of water or as specified in the proposal.