AMERICAN SPORTS BUILDERS ASSOCIATION

Asphalt Impurities

In some parts of the country, the crushed stone or sand aggregate used in asphalt may contain clay balls, wood bits, or other forms of contamination. It is impossible to obtain a guarantee from an asphalt producer or supplier against the presence of this material, particularly if their source has a history of such inclusions. Also, since a producer's source of aggregate may vary from time to time, it is impossible to predict whether a particular batch of asphalt from a producer will contain deleterious materials or to rely on the fact that the asphalt from a given producer or supplier has not contained these materials in the past. Therefore, this condition is beyond the control of the contractor and the contractor cannot assume responsibility. In areas where this occurs, it will affect all contractors equally.

If contaminated materials are present, over time, they may degrade, forming carbon dioxide and/or methane gas, creating bubbles in the surface coating or pitting in the surface. In most cases, these problems are minor and can be repaired using conventional patching methods.

Occasionally, in severe cases, an asphalt overlay, using aggregates from a different source, or a change of surface to a textile, modular or roll goods surface, will be required to permanently correct this problem.

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Asphalt Stripping

Stripping in hot mix asphalt has become a more serious problem for recreational pavements over the past decade. Both the asphalt industry and th American Sports Builders Association (ASBA) are taking positive steps to control this problem. It is helpful to the builder as well as the owner to know how to recognize this condition and what steps to take to resolve it.

Stripping is the breakdown of the adhesive bond between the aggregate and the asphalt cement. This process occurs when water gets in between the aggregate surface and replaces the asphalt coating. For the most part, stripping initiates at the bottom asphalt layer and works its way upward, weakening the entire structure through its progression. Cracks then begin to form and may cause the pavement structure to completely disintegrat Common symptoms of asphalt stripping are short hairline cracks, web cracking and puckering.

If stripping is suspected, a thorough investigation must be conducted. Contact a qualified asphalt testing laboratory and, under its direction, provide samples of the pavement to complete the following ASTM tests (samples usually consist of 6" cores of the pavement):

CONDITION	TYPE OF TEST
Asphalt Extraction	ASTM D2172
Asphalt Stripping	ASTM D3625
Indirect Tension (Swelling)	ASTM D4123
Percent Air Voids	ASTM D3203
Field Permeability Test	ASTM D3637

After the condition is accurately diagnosed from the test results, take immediate action through the following remedies:

1. Insure that surface and sub-surface drainage is effective and otherwise correct.
2. Depending on the results of the testing, if necessary, remove the entire affected area and rebuild the court/recreational surface.
3. Depending on the degree of pavement damage caused by stripping, a fiberglass membrane applied over the surface may be sufficient to repair the pavement. Install flexible acrylic coatings over the membrane to complete the surface.

To minimize asphalt stripping in the future, perform the following preliminary tasks:

1. Provide positive surface and subsurface drainage for pavement structures.
2. Add anti-stripping agents to the hot mix asphalt mixture.
3. Use hot, dry and clean aggregate.
4. Use well-compacted, densely graded, asphalt concrete and place it directly on a properly prepared stone base.
5. Thoroughly compact all courses in the pavement.

Asphalt stripping can be a serious concern, but proper planning and immediate diagnosis will help to minimize its effects.

BIBLIOGRAPHY:

The Asphalt Institute: "Cause and Prevention of Stripping in Asphalt Pavements." Educational Series No. 10, Second Edition.

NAPA Education Foundation: "Hot Mix Asphalt Materials, Mixture Design and Construction."

Birdbaths

"Birdbath" is a term commonly used in the tennis industry to describe a low area on a tennis court that holds water. More precisely, the American Sports Builders Association (ASBA) defines a birdbath as any area where standing water more than 1/16" (2mm) (commonly measured using a nickel) remains after drainage of the area has ceased or after one hour of drying at 70 degrees Fahrenheit in sunlight. Birdbaths delay play on the court after rain and may cause staining and/or peeling of the surface.

Among the causes of birdbaths are:

1. Unsuitable material in the subsoil;
2. Inadequate drainage around the tennis court;
3. Improper slope or grade;
4. Inadequate compaction of the subgrade; or
5. Paving error.

Paving and surfacing, even with laser-guided equipment, involves both skill and judgment. The number of variables impacting the paving and surfacing processes makes it unreasonable to expect perfection. Minor depressions in the surface, those less than 1/16" deep or those that drain or dry in under an hour, are considered within tolerance and are acceptable. In a new or recently resurfaced court, however, the contractor should correct birdbaths.

Because site selection, design and construction can involve compromise, over time, even properly designed and constructed courts may develop birdbaths over time. During design and construction, a proper balance must be struck between the risk of some problems over the long term versus the cost of extensive remediation prior to construction. Tennis courts sometimes are built on sites which are reclaimed or which have been deemed unsuitable for other purposes. In such cases, less than ideal subsoil, grade or drainage conditions may exist. Additionally, over time, new circumstances may arise which lead to settling or drainage problems.

The owner's expectations regarding repair of birdbaths should be based on the nature of the birdbaths that exist to be repaired and the amount of money budgeted for the repair. For example, the owner should understand that birdbaths created by improper compaction or unsuitable materials may reappear later due to further settlement, while repairs to birdbaths caused by improper slope or grade may only move the water to a different area on the court.

Owners also should understand that available repair methods and materials are imperfect. Asphalt resurfacers and acrylic patch binders are water-based materials. After they are installed flush with the surface, they may shrink due to dehydration, allowing the area to once again hold water. Asphalt patches and acrylic repairs require time and proper weather conditions to cure. Further, patching materials can be installed only to an effective depth of approximately ½". For these reasons, even a skilled contractor may make several site trips to "fine tune" a repair. Complete removal of standing water may be impossible. Generally, the owner should accept that repair of birdbaths is only a means of reducing the inconvenience they cause and extending the useful life of the court.

The number, size and depth of birdbaths is another consideration. The existence of multiple birdbaths or major depressions of ½" or more may indicate more serious problems. Repairing multiple or deeper birdbaths is labor intensive and often results in cosmetic imperfections, which may require resurfacing to correct. The larger the birdbath, the more difficult it can be to repair. Prior to repairing numerous birdbaths or major depressions, the owner should discuss the cost and alternatives, such as installing an overlay. In some cases, only reconstruction will provide a long-term solution.

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Blisters or Bubbles

Blisters or bubbles in the color coating on asphalt and concrete courts most often are caused by moisture between the pavement and the coating material, within or beneath the pavement. Since both asphalt and concrete can absorb moisture, moisture trapped below the slab can be drawn up through the pavement or moisture may come from the pavement itself if the slab is incompletely dried or is experiencing severe drainage issues prior to the application of coating materials.

Whenever water is present on, in or beneath a tennis court pavement, heat from a warm day can draw the moisture upward to the surface where, if trapped, it vaporizes and expands. Most modern tennis court coatings are semi-permeable and allow a small amount of moisture to escape. However, if larger amounts of moisture are present, if too many coats of surfacing have been applied, if the coats are too thick or if impermeable coating materials have been used, the water cannot escape and the trapped vapor breaks the bond between the coating and slab, forming a bubble. Bubbles also may form between layers of coating.

Bubbles may also be caused by contamination of base materials during construction. Salts, organic residues, curing agents, clay balls, dust balls and oil spills are all materials that can cause bubbling or blistering in a tennis court surface. Blisters may also occur if a surface is not properly cleaned prior to application of color coatings and, therefore, the new coatings do not properly adhere to the surface.

When recoating an existing court, it is important to note how many coats of surfacing already are present, and if there are many layers, to consider removing the old coats before applying a new surface. Where many layers of coating are present, each additional layer of coating reduces the permeability of the surface and increases the likelihood of bubbling.

Small bubbles may be punctured with an ice pick or nail and pressed down, which may make them re-adhere if there is still liquid or semi-dry binder under the bubble. If not, adhesive must be injected with a syringe to facilitate bonding. Large bubbles may be cut open and reattached to the pavement with an adhesive.

In most cases, installation of a vapor barrier in construction, proper base construction techniques, proper drainage, adequate curing of the slab prior to coating and proper installation of coatings should prevent formation of blisters. In rare cases, however, even when permeable materials and proper methods are used, environmental conditions may result in the formation of an occasional blister.

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Cracking of Asphalt Tennis Courts

The most common problem with asphalt tennis courts is pavement cracking. Cracking in asphalt is caused, at least in part, by the natural tendency of asphalt to shrink as it weathers, oxidizes and ages. In addition, asphalt loses its flexibility as it ages, making it more brittle. Since shrinking and becoming more brittle with age are properties of the material, cracking in asphalt tennis courts is inevitable.

Quality design and construction can minimize or delay cracking but cannot eliminate it. Once cracking begins, no matter which method is used for the potential exists for cracks to reappear.

There are many types of asphalt cracks. Surface cracks include hairline cracks (small irregular cracks present over large areas of the court), alligator cracks (a pattern of interlocking cracks over the surface resembling an alligator hide) and shrinkage cracks (a random pattern of interconnected cracks with irregular angles and sharp corners). In most cases, surface cracks do not affect the play of the game; however, if untreated, they will develop into more serious cracks and will require more extensive repair.

Pavement cracks include heat checking (a hairline crack pattern which follows the direction of rolling), structural cracks (large cracks which penetrate the asphalt pavement), reflection cracks (which occur in asphalt surface overlays and mirror a crack pattern in the pavement underneath), radial cracks (which appear at the point where the concrete net post, light pole or fence post footings meet the asphalt court surface) and settlement cracks (which result from paving over a poorly compacted or poorly drained subbase).

There are at least four methods of crack repair – crack filler, infrared patching, proprietary fabric repair system and full depth repair with either crack filler or hot mix asphalt. Repairing many cracks may leave the court with an unattractive, freckled appearance; however, resurfacing will correct this unsightly condition.

Because there are various causes of cracking, differences in sizes and numbers of cracks, and various options for crack repair, an owner would be wise to consult an experienced contractor or design professional to determine the best options for repair. It is important to note, however, that eventually cracks will reappear or new cracks will form. All methods of repair will provide some additional life for the court and some methods will extend the useful life of the court by many years, but if the owner is seeking a long term solution, the court should be reconstructed.

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Observations on Newly Coated Tennis Courts

Occasionally, owners express concern over unexpected conditions observed in new courts. Many of these conditions are normal.

After the first few rains, for example, soap bubbles will appear on the surface of a newly coated court. Detergents are added to coating materials to insure that colored pigments are dispersed throughout the coating material. While soap bubbles probably will not be visible on an indoor court, the court may be slippery, particularly if there is high humidity or condensation in the building, or if players have wet shoes when they walk on the court. Since there is no rain to wash the detergent off the surface of an indoor court, the slippery condition may last for a week or two. Players should exercise particular caution against slipping when using a newly constructed or newly resurfaced court.

Newly applied color coatings may have slight variations in color from one area to another but should appear to have a uniform color and texture when viewed from 25' (7.620m) away.

Owners, anxious to try out a new surface, may use the court before it is fully cured. When a player stops quickly or twists his shoe, the color coating may become detached from the asphalt bound undercoats. This is particularly true if the player has tennis shoes with deeply grooved patterns on the soles. Play should not be allowed until proper curing of the surface has occurred.

Tennis shoes will leave white scuff marks on a newly surfaced court. The number and severity of sneaker marks will decrease over time and owners should not be concerned by them. Black-soled shoes, however, make particularly unsightly marks on tennis court surfaces. Many shoes with dark colored soles will leave prominent marks on the surface.

Excessive ball wear and ball fuzz adhering to the court may be evident on a new court. This happens because of the sand used to regulate the speed and play of the court. Like a new sheet of sandpaper, a new tennis court is more abrasive than a used one.

New concrete courts may show some "ghosting." When the concrete used in construction contains lime, the lime may migrate up through the coating, leaving a white residue. The migration of lime can be minimized by proper preparation of the concrete pavement before color coating.

Due to the nature of the material, concrete is difficult to coat. Even a well-constructed, properly coated concrete court may show small areas of peeling. These areas should be touched-up immediately to prevent further damage to the court surface.

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Pinholes

Pinholes occur on acrylic surfaces from time to time. The causes of this aesthetic condition include a number of factors that are difficult to predict prior to application. These factors often act in combination..

Conditions that can effect the formation of pinholes in the surface finish include:

- The texture of the surface underlayment. Courser textures are more prone to pinholes. Some of the current SuperPave asphalt mixes provide a coarser texture than some of the older available mixes.

- The drying conditions during application. Hotter weather tends to increase the potential for pinholes, as the higher surface temperature causes the rapid evaporation of water from the coating mix.

- When mixing the paint, air bubbles and foaming can form; these may result in the formation of pinholes.

Once the pinholes are a part of the surface structure they are very difficult to overcome.

Pinholes have no adverse affect on an acrylic finish if the correct number of applications has been applied. Acrylic sport surfaces are designed to allow water vapor to pass through them.

The finish surface should have a uniform texture for consistent play characteristics. Pinholes are so small they should not affect the surface texture nor do they affect the longevity or playability of the surface. Therefore, they are considered acceptable.

Regulating Pace

Players often classify tennis courts by their pace. The speed with which balls come off the surface, and the relative effect of ball spin after a bounce, produce courts which are rated as slow, medium or fast.

When the surface causes the ball to skid and the angle of the ball coming off the surface is lower than before the bounce, the surface is described as "fast." A surface on which the ball comes off at the same angle as before the bounce is described as "medium." A surface on which the ball comes off the surface at a higher angle after the bounce is described as "slow." Generally, the rougher the texture, the more the surface will grip the ball and the slower the surface will play.

Acrylic-coated hard courts are rated as medium to fast. However, the speed of these courts, which is determined by the amount, shape and size of the sand or rubber particles mixed with color coating, can be modified. Altitude also has an impact on the size of sand that may be required to achieve the desired pace. Specifying the grade and amount of aggregate material to achieve a specified pace is highly technical; for that reason, it is important to rely on an experienced tennis court builder or coatings manufacturer familiar with local conditions to mix sand and/or rubber with the coating material.

It is important to know that the pace of an acrylic-coated tennis court will change over time. The surface will be slower when new. As the courts age and weather, some of the texture will be worn away, especially in the areas of most frequent use, and the courts will become faster. When the pace of the court becomes too fast or too inconsistent, the courts should be re-coated.

When cushioning is added to a hard court, to a limited degree, the thickness and density of the cushioning affects the pace of the game, as well. Thicker and less dense cushioning absorbs ball energy, providing a slower, lower bounce. Less thick or denser cushioning provides a quicker, higher bounce.

Clay and fast dry courts generally produce medium to slow play. To some degree, the pace of these surfaces can be modified by maintenance practices. Rolling the courts compacts the material. The firmer a court is maintained, the faster it will play.

Grass and synthetic turf are considered fast since the ball skids low, giving a player less time to make the shot. As with clay and fast dry courts, the pace of these courts can be modified slightly by maintenance practices.

The ideal court speed is strictly a matter of player preference. Players with a strong serve and volley game usually prefer a medium to fast surface. Baseline players, or those playing strictly recreational or social tennis, often enjoy longer rallies and a shot placement/spin type of game. For them, a slow to medium court is recommended.

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Rust Spots

In some parts of the country, the crushed stone aggregate used in asphalt may contain iron. It is impossible to obtain a guarantee from an asphalt producer or supplier against the presence of this material, particularly if their source has a history of providing aggregates containing iron. Also, since a producer's source of aggregate may vary from time to time, it is impossible to predict whether a particular batch of asphalt will contain iron or to rely on the fact that the asphalt from a given producer or supplier has not contained iron in the past. Therefore, this condition is beyond the control of the contractor and the contractor cannot assume responsibility. In areas where this occurs, it will affect all local contractors equally.

If iron is present, it may oxidize, forming rust spots or streaks in the surface of the court. These spots or streaks, while unsightly, will not affect play or shorten the useful life of the court.

The manufacturers of some acrylic tennis court surfacing systems produce a rust inhibitor product, used as a filler coat in surfacing. While this product has been used with success, there is no guarantee that rust spots will not occur.

An asphalt overlay, using asphalt from a different source, or a change of surface to a textile, modular or roll goods surface, will be required to permanently correct this problem.

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Squeegee Marks

Acrylic color surfacing systems are generally applied with a squeegee in multiple coats. Most systems include one or more filler coats, followed by two to three coats of color. Some systems also include texture or cushion coats between the filler and the top coats.

There are several theories regarding the application of color coatings. Some manufacturers and contractors recommend that coats of color be applied in alternate directions – one coat lengthwise, one coat crosswise and so on. Others believe that all coats should be applied in the lengthwise direction since the flow of play in tennis is almost entirely lengthwise. Still others believe that color coatings should be applied in a crosswise direction since the shorter crosswise pass may result in more uniform application. In any case, coating systems must be applied smoothly to a uniform thickness over the entire court surface. This requires an experienced applicator and careful attention to the technique.

Even when color coatings are applied with care by a skilled operator, some squeegee marks and other slight variations in color and texture are inevitable. This is because the formulation of acrylic causes components to migrate to the edge of the material as it is being applied. As a result, an observer will be able to locate the spot where the acrylic material was poured on the surface, where the squeegee operator turned to make a pass in the opposite direction or where one pass overlapped another. Squeegee marks will be more visible on lighter colors and more common when coatings are applied in hot weather or when they include coarser sand. Humidity, angle of the sun when the acrylic is applied and other factors also may affect frequency and visibility of these marks.

Due to the nature of the material and the human element in tennis court construction, squeegee marks are likely to occur, like marks in newly vacuumed plush carpet or newly mown grass. They will not affect play and will become less visible as the court wears and ages.

While squeegee marks are within industry standard, more serious flaws – ridges, drips, tool marks, foot prints, bucket marks and areas of excess material - are unacceptable and should be corrected by the surfacing contractor.

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