Asphalt pavements have a long history of outstanding performance for airfield applications. In 1939, as plans were being developed to build a national airport in our nation’s capital, the Asphalt Institute worked closely with the Army Corps of Engineers (COE) and other federal agencies to ensure that proper design, materials, and construction practices were utilized. Upon completion of Washington National Airport in 1940, over one million square yards of airfield were paved with hot-mix asphalt (HMA).

While much has changed in both the asphalt and airfield pavement industries over the last 63 years, many things have not. Just as the Asphalt Institute worked with those agencies in 1939 to introduce a relatively new paving material to build Washington National, we are working today with the Federal Aviation Administration (FAA), the Army Corps of Engineers, the Air Force and the Navy to assist them in making the transition to the use of Superpave for airfield pavements.

Current Airfield Specifications

The Army, Air Force and Navy use the unified DOD/FAA guide specification UFGS-02749, HMA for Airfields, for their airfield pavements.

FAA’s standard HMA airfield specification is Item P-401 found in AC 150/5370-10A, Standards for Specifying Construction of Airports, well known by many for its Percent Within Limits (PWL) pay criteria. In December 2001, the FAA issued Engineering Brief 59 which provided guidance and an interim specification for using Superpave mixtures, titled P-401(SP). Just like UFGS-02749, the P-401(SP) specification can be used in lieu of the standard P-401 by getting approval through the Regional Office. It can be used on any type of airport pavement, such as aprons, taxiways, etc., with the exception of runways that support aircraft heavier than 60,000 pounds.

PG Binders

All three federal airfield specifications mentioned above, UFGS-02749, P-401 and P-401(SP), allow the use of Performance Graded (PG) binders. Since these guide specifications are used throughout the U.S. and abroad, they must provide general guidance to the designer. While most states use the PG system, some still use viscosity grading. The designer should consult with the local DOT to determine which grades are typically being used and available in the project area.

The challenge for the designer is to translate the PG selection guidelines developed for highways to airfield applications that have different methods of characterizing traffic and loads. Guidance suggests determining the “standard grade” used on highways designed for less than 10 million equivalent single axle loads (ESALs) over 20 years for the particular lift being placed. This standard grade should be sufficient for most General Aviation airports that see relatively light aircraft.

“Grade bumping” from this standard grade should be considered for pavements that accommodate heavy traffic, high tire pressures, slow or standing traffic, such as stacking on taxiways, and channelized traffic. Grade bumping is a provision of the Superpave system to upgrade the asphalt binder stiffness to increase rutting resistance. Specific grade bumping guidance is shown in Table 1.

Note that tire pressure is the criteria used for military aircraft, while aircraft weight is used for civilian aircraft. Military fighter planes are relatively light in weight, but operate on extremely high tire pressures that may cause rutting. The tire pressures of civilian aircraft, however, can be characterized fairly accurately by aircraft weight.
Superpave Mixes

Superpave mixes have been used a number of times on airfield projects in recent years. The first military airfield application was in 1997 on a runway at Little Rock Air Force Base in Arkansas (see story in Asphalt 1998).

A runway at Volker Field in Wisconsin was overlaid with Superpave two years ago. This runway supports both extremely heavy military cargo aircraft as well as fighters with very high tire pressures. Even under these tough traffic conditions, the initial grooving of the asphalt surface has held up extremely well.

The first FAA approved application of Superpave for an airport runway occurred in 1999 at Griffin-Spalding Airport in Georgia. For this 2-inch overlay, Georgia’s standard highway Superpave specification was used. The Airport Manager recently stated that performance has been outstanding, looking as new as the day it went down.

The North Carolina Division of Aviation placed Superpave on a new connecting taxiway at Andrews-Murphy Airport in 2001, and followed in 2002 with Superpave on several additional projects. The Aviation Division worked closely with the Division of Highways to select the state’s standard 9.5 mm Superpave surface mix for these projects. Last year, two general aviation airports in Kentucky used state funds to overlay their runways with Superpave mixtures.

Old System, New Properties

While the military’s UFGS-02749 and the FAA’s P-401 standard specifications use the Marshall mix design system, they incorporate essentially all the Superpave aggregate quality properties. Extremely durable and angular aggregate are required with only a minimal amount of rounded natural sand allowed.

The gradation is dense and typically meets the gradation requirements of a fine-graded Superpave mix. This dense, tight surface is important to airfields, which must be impermeable to water and air. A major difference in the distress modes of airfield pavements compared to highway pavements is that airfields tend to be more prone to oxidation and raveling from weathering that shows up in the form of block cracking. This phenomenon occurs because most airfield pavements cannot take advantage of the healing effect of regular kneading by passing wheel loads.

While it may be fair to say the airfield pavement community has been slow to adopt Superpave mixes, there is rationale in their caution. They have seen relatively good performance obtained from current specifications, especially in terms of rutting.

Superpave was developed for highways and was emphasized to be more resistant to rutting. The biggest general concern with airfields has not been rutting, but weathering and longitudinal joint deterioration. As the military and FAA continue to gain experience with Superpave mixes, they will move towards making it a standard on airfield projects.

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