Accepted Manuscript

State of the Art: Asphalt for Airport Pavement Surfacing

Greg White

PII: S1996-6814(17)30006-8
DOI: http://dx.doi.org/10.1016/j.ijprt.2017.07.008
Reference: IJPRT 109

To appear in: *International Journal of Pavement Research and Technology*

Received Date: 8 January 2017
Revised Date: 12 July 2017
Accepted Date: 25 July 2017

Please cite this article as: G. White, State of the Art: Asphalt for Airport Pavement Surfacing, *International Journal of Pavement Research and Technology* (2017), doi: http://dx.doi.org/10.1016/j.ijprt.2017.07.008

State of the Art: Asphalt for Airport Pavement Surfacing

Abstract

Airport runways and taxiways are commonly comprised of a flexible pavement with an asphalt surface. Marshall-designed asphalt with sawn grooves is the most frequent airport asphalt surface material. However, some airports have adopted alternate asphalt mixtures for improved resistance to shear stress and for increased surface texture, allowing grooving to be avoided. Of the alternate asphalt mixtures, stone mastic asphalt is the most commonly reported. Resistance to shear stress is a critical performance requirement for airport surface asphalt. Shear stress resistance minimises the risk of rutting, shoving and groove closure. However, fracture resistance must not be ignored when developing even more shear resistance asphalt mixtures. Significant distress in airport asphalt surfaces, compliant with the traditional prescriptive specification, has increased interest in a performance-based airport asphalt specification. Commonly reported distresses include groove closure in slow moving aircraft areas and shearing in heavy aircraft braking zones. Development of reliable performance-indicative test methods is expected in the future and will enable warranted performance-based asphalt mixture design for airport surfaces.

Key words

Airport; Pavement; Asphalt; Surface

1 Introduction

Many airport runways, taxiways and aprons are constructed of flexible pavements with asphalt surfaces. The performance of the surface is critical to the safe operation of aircraft. The design methods for airport asphalt surfaces, like airport pavement structures, was primary developed in the 1940s and 1950s by the US Army Corps of Engineers (the Corps) [1]. Many airports and aviation authorities retain the basis of the Corps methods in current airport asphalt design, specification and construction practice. As a result, the majority of airport asphalt surfaces are constructed from a 40-60 mm thick, 14 mm (nominal maximum aggregate size), densely graded and Marshall-designed asphalt [2]. Grooves are generally sawn transversely in runway surfaces to promote aircraft skid resistance [3].

In recent years, aircraft have become substantially heavier and more demanding of airport pavement surfaces [4]. Moreover, the quality of bitumen, an essential ingredient for adequate airport asphalt performance, has decreased [5]. It follows that the traditional and empirical airport asphalt specification has failed to guarantee good airport asphalt surface performance [6]. Rather, in some cases, compliant and well-constructed airport-quality asphalt has not performed adequately under aircraft loading [7-11].

To address these issues, coupled with a desire to avoid runway grooving, some engineers have revisited the mix design, specification and construction of airport asphalt surfaces. Alternate asphalt mixture types, such as Stone Mastic Asphalt (SMA) and Open Graded Friction Course (OGFC) have also been adopted by some airports [12]. Further deviation from the traditional approach to airport surface asphalt specification is expected to overcome challenges.

The paper summarises the state of the art and future opportunities relating to asphalt mixtures for airport pavement surfacing. This paper does not address base and binder course asphalt mixtures, with the focus being on asphalt for runway surfacing. Although critical to airport asphalt surface performance, the bond with the underlying pavement layer is a function of the underlying pavement and the construction specification. The surface layer itself has little impact on the durability or strength of the bond achieved [13]. Surface layer bond to the underlying pavement is not considered in this paper. First, regulatory requirements are summarised and the traditional Marshall specification is outlined, before the effects of bitumen changes and more demanding aircraft are presented. Second, common distress modes are described and lead to defining airport asphalt surface performance requirements. Third, the contribution of the constituent materials to adequate performance is discussed before alternate asphalt mixture types are considered. Finally, test