Interim Advice Note 29/00 (IAN 29/00)

Long Life Flexible Pavements: Revised Pavement Design Graphs

1. Introduction

1.1 As part of the Highways Agency's on-going research programme, designs for longer life flexible pavements have been investigated, in collaboration with the Quarry Products Association and the Refined Bitumen Association. The major findings were published as:

o Road Trials of High Modulus Base (TRL Report 231)

o Design of Long Life Flexible Pavements (TRL Report 250)

1.2 The outcome of this research was reflected in revised design curves for fully flexible pavements in Interim Advice Note 12 (IAN 12), published in October 1998.

1.3 This Interim Advice Note replaces IAN 12 which is withdrawn with immediate effect. A revised Fig 2.1 for inclusion in Volume 7 Section 2, Part 3 (HD26) of the DRMB is attached and is issued ahead of a formal amendment to the DRMB.

2. Background

2.1 Designs used in the UK since the mid 1980's for fully flexible pavements were based on the performance of a wide range of experimental pavements. Performance trends from these were extrapolated to provide a design life of 40 years. This design life was achieved by staged construction, in which strengthening by overlay was carried out after about 20 years to carry the traffic predicted to occur over the subsequent 20 years.

2.2 Since these designs were developed, traffic levels have increased significantly, with the consequent increase in traffic disruption at roadworks. In May 1996 the option of considering a 40-year design life for very heavily trafficked locations was introduced in DMRB that would avoid the need for structural strengthening during the design life. This option was developed by extrapolating existing design curves, and assumed that pavement thickness would have to increase as traffic increased.

3. Long Life Pavements (using conventional materials)

3.1 Heavily trafficked roads have now carried in excess of 100msa - providing the opportunity to confirm the validity of the original extrapolations. More information has also become available on the performance of heavily trafficked roads, and on the changes that occur in asphalt over the life of a road. These have indicated that deterioration, in the form of cracking or deformation, is far more likely to be found in the surfacing rather than deeper in the pavement structure. The great majority of thick pavements examined have maintained their strength, or become stronger over time, rather than gradually weakening with trafficking.

3.2 The overall conclusion of this research, therefore, is that a well constructed flexible pavement, built above a threshold strength, will have a very long structural life - provided that distress, in the form of cracks and ruts at the surface, is treated before it begins to affect the structural integrity of the road.

3.3 To achieve this long life, it is not necessary to exceed pavement thickness beyond that required for 80msa. Additionally, designs are not recommended to be thinner than 200mm to help achieve "long life". Revised design charts for DBM, DBM50, HDM and HMB35 are attached at Figure 2.1.

4. Long Life Pavements (using New Materials)

4.1 Full scale road trials have also been carried out using a high stiffness roadbase macadam - High Modulus Base (HMB) manufactured to a standard UK composition for dense bitumen macadam (DBM) but using a binder of 15pen or 35pen. The terminology is HMB15 and HMB35.

4.2 The trials demonstrated that the material behaved in a similar way to conventional roadbase macadams, provided that the appropriate mixing, laying, and compaction temperatures were maintained. HMB has a very high stiffness, and therefore offers better load spreading capabilities than either DBM, or heavy duty macadam (HDM). By substituting HMB instead of conventional materials, it is possible to achieve the same life with a thinner roadbase. After allowance has been made for increases in production costs, savings can be achieved compared to conventional DBM.

4.3 Results from on-going research monitoring the longer term stiffness of HMB15 on some road contracts have shown unexpected reductions in stiffness to have occurred. These losses are not related to trafficking. Nevertheless, until the specification of HMB15 and HMB25 materials can be modified to ensure that stiffness either remains static or increases with time, the use of very hard 15 pen and 25 pen bitumen in HMB15 and HMB25 respectively is suspended. Bitumen with a penetration of 35 is a softer more conventional paving grade bitumen and its use is continued. A design curve for HMB35 is included in Figure 2.1 attached.

3. Assessment of Long Life Flexible Pavements

5.1 Many existing flexible pavements already comply with the criteria that will provide long indeterminate lives. Monitoring has confirmed that these thick, well constructed, fully flexible pavements do not deteriorate in the classical manner. Deterioration starts at the surface rather than at the bottom of the bound layers. If the surface of these pavements is maintained, then the pavement will have a long, but indeterminate, structural life.

5.2 Research into identifying and assessing these existing pavements is continuing and will be published shortly. Advice will place much greater emphasis on visual condition rather than deflection - as already indicated in DMRB Volume 7 (HD30).

Attached

Figure 2.1 Design Thicknesses for Flexible Pavements

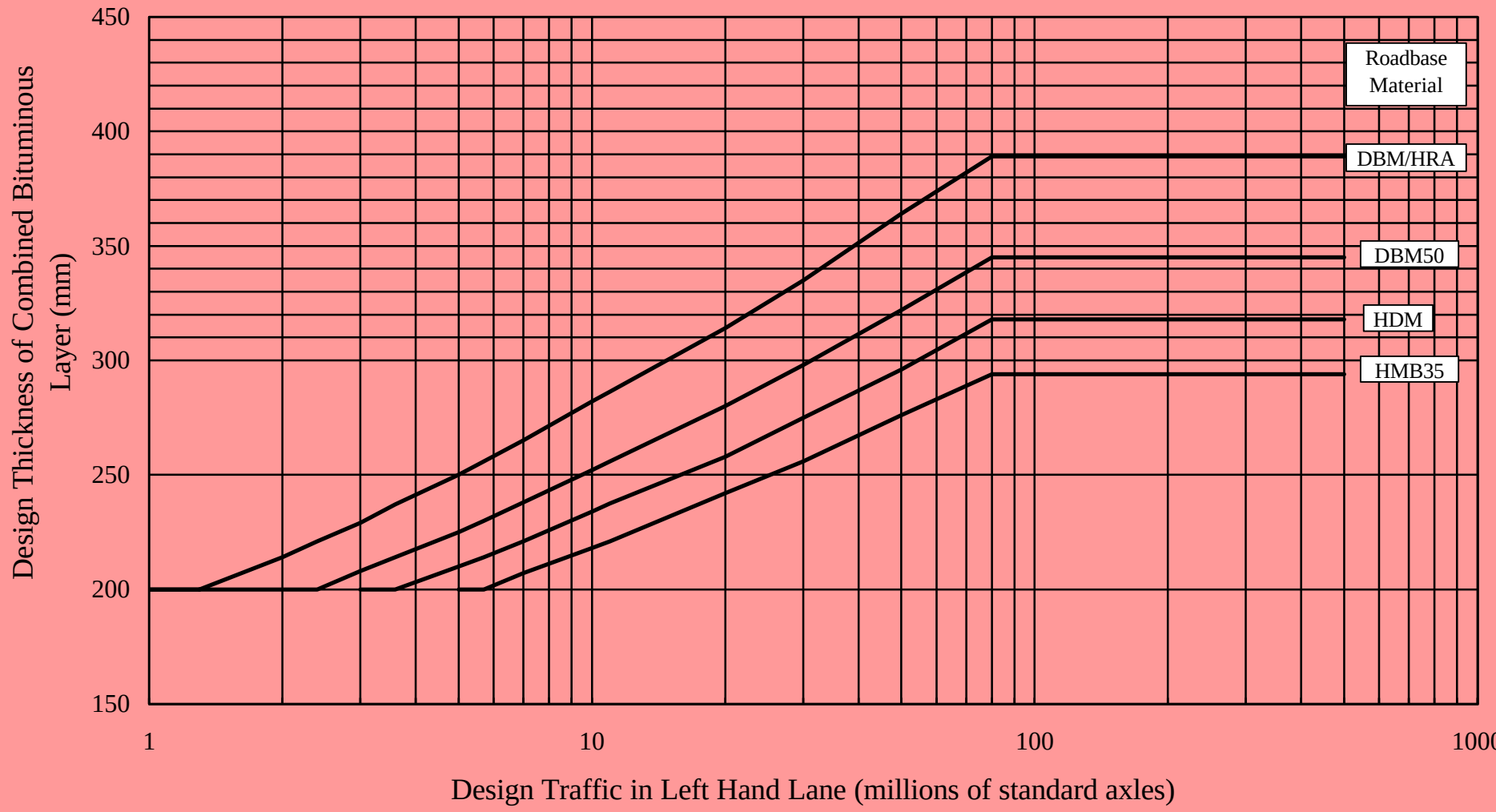

FIGURE 2.1 Design Thicknesses for Flexible Pavements