The asphaltic lining of Dungonnell Dam

F. F. POSKITT

Mr R. G. Paterson, M

In § 19 the Author describes the test for stability on the slope. Similar tests were conducted at Pedu Dam in Malayasia. 15 in. × 15 in. × 4 in. thick asphalt samples were inclined at a slope of 1:1·7 and left in the open air facing in the same direction as the dam face.

58. The results obtained from these tests were different from those reported by the Author in that flow continued for over 40 days at a rate which decreased slowly with time. Considerable improvement to the resistance to flow on the slope was obtained by adding 0·85% of asbestos fibre to the asphalt mix. This reduced the flow by almost 50%. Flow effectively ceased after 60 days when the top surface of the sample without asbestos had moved 0·4 in.

59. A 'standard' laboratory test was also conducted in which a 12 in. long × 9 in. wide × 2 in. thick sample of upper layer asphalt, including 0·85% asbestos, was placed at a slope of 1:1 in an oven at a constant temperature of 60°C for 12 days. All movement ceased after four days and 88% of the final deflexion was recorded after 24 hours. The total deflexion of the top surface was 0·10 in.

60. This appears to be consistent with the Author's results, although he does not mention the amount of the deflexion which he recorded.

61. The difference between the results obtained in the laboratory and those obtained outdoors can to some extent be explained by the thickness of the samples and how they were positioned, but it is probably due, to a much larger extent, to the higher temperature in the asphalt when it is subject to direct radiation from the sun.

62. In § 51 the Author mentions the danger and discomfort of working on a slope of 1:1·7. At Pedu most people working on the membrane wore thin rubber-soled shoes and most discomfort was caused by hot feet which would not be improved by flattening the slope.

Mr Poskitt

I would like to thank **Mr Paterson** for his interesting contribution pointing out that the addition of short asbestos fibres to the asphaltic mix used at Pedu Dam made a considerable improvement to its resistance to flow down a slope of 1:1·7, and resulted after 40–60 days in a final slope movement of the order of 0·2 in. in 15 in. long samples left in the open air on site.

64. The laboratory samples which he describes were stored at a steeper slope of 1:1 and at a constant temperature considerably higher than night time site temperatures; yet they showed that all movement had ceased after four days, and that it did not exceed 0·1 in. on a 12 in. long sample.

65. Details of the mixes used are not given, but assuming that both the site and laboratory samples used virtually the same mix, and that the compacted specimens were kept equally free from vibration or other external influences during their test periods, a possible explanation of the discrepancy is that the two lots of samples received slightly different amounts of compaction.

66. In this connexion, it would be interesting to know the details of the asphaltic concrete mixes used in both types of sample, and in the actual lining, and also how the voids content of the compacted in situ asphaltic lining compared with the voids contents of the site and laboratory test specimens; also whether any total flow has

Paper published: *Proc. Instn Civ. Engrs*, 1972, **51**, Mar., 567–579.

Downloaded from http://ftp.nowpublishers.com/jpric/article-pdf/52/3/447/2683130/iicep_1972_5302.pdf by guest

been detected to date on the surface of the lining which would correspond in scale to the effects indicated by the test specimens.

67. At Dungonnell, 20 stability tests were carried out during construction on laboratory samples described in § 19, and in all cases no measurable movement was detected within 48 hours. To date there has been no detectable movement in the top section of the asphaltic lining where a length of approximately 15 ft has remained exposed to the atmosphere, nor was any detected elsewhere when the reservoir was lowered for examination eight months after completion of the lining.

68. Several dams with asphaltic linings containing chopped asbestos fibre have been constructed in temperate climates, such as Perlenbach in West Germany, Vianden in Luxembourg, and Schwarzach in Austria, the quantity of fibre added usually being of the order of $1–1\frac{1}{2}\%$. In these cases it is possible that binder contents were slightly increased to assist compaction or to secure improved flexibility and impermeability, and that the necessary degree of stiffness was restored to the mixes to keep them stable on slopes by adding asbestos. Elsewhere, the use of asbestos fibre in asphaltic pavements has already been investigated in detail.[5]

69. Due to the shape, grading and texture of available aggregates it may sometimes be difficult to design a mix for a sloped impermeable lining with a low void content and the necessary balance between impermeability and stability, unless the binder content is increased and asbestos fibre added to restore stiffness. It is my belief, however, that due to cost and the health hazards involved in the use of this material, it is preferable if possible to achieve a mix design which depends for its stability on relatively low binder and voids contents, and on a high degree of interlock between the compacted aggregate particles.

70. Regarding increased safety and comfort, if long lining slopes are flattened to at least two horizontal to one vertical, it was found at Dungonnell that occasional rain was a hazard, and tended to make men working on the lining lose their footing, although with experience they adapted to such conditions. If deeper linings are constructed at similar slopes I feel there would be some merit in incorporating additional safety measures, such as a length of shock-absorbent cushioning positioned each day below the section where work was being carried out.

Reference

5. TAMBURRO D. A. *et al.* The effects of short chrysotile asbestos fibres on the structural properties of asphaltic pavements. *Proc. Ass. Asph. Pav. Technol.*, 1962, **31**, 151–175.

Downloaded from http://ftp.nowpublishers.com/jpric/article-pdf/52/3/447/2683130/iicep_1972_5302.pdf by guest