

Mansfield Ashfield Regeneration Route – Pavement Failure Investigation. Supplementary report

Background

The Mansfield Ashfield Regeneration Route (MARR) is a 10 km stretch of road running around the outskirts of Mansfield. The route is split into two sections, 'The Southern Section' running from the end of the A617 Rainworth Bypass to the A38 and the 'Western Section' running from the A6075 Abbot Road to the A617 Chesterfield Road.

The road cost approximately £30 million to build. The contractor for the works was MacAlpines (now part of Carillion). The design and supervision of the scheme was undertaken by NCC's partner, Babbie (now Jacobs). The roads pavement was designed to last 20 years without the need for any significant maintenance.

The works were let under an NEC option C contract which at the time was considered innovative as it contained a 'Value Engineering' clause. Value Engineering is a technique for improving value for money, which entails reviewing the design and specification during construction to determine whether or not the same end product can be provided for less money by considering alternative designs, materials and means of construction. Any saving generated is generally split 50/50 between the client and the contractor. As part of one such 'value engineering' proposal the alternative surfacing materials were adopted which meant that the overall pavement thickness was reduced by approximately 20% compared with the original tendered design.

The Road opened in December 2004. Following completion of a maintenance period of approximately 12 months responsibility for the maintenance of the road was handed over to Mansfield and Ashfield District Councils. Ashfield District Council is responsible for the Section between the A38 and A60 and Mansfield District Council is responsible for the remainder of the road including the Western Section.

The surfacing on site was guaranteed for two years. In the first two years post opening, some defects were detected at the Rainworth end of the route, these were rectified by the contractor within the guarantee period.

In April 2010 Nottinghamshire County Council were contacted by representatives of Mansfield and Ashfield District Councils raising their concerns of a number of apparent failures in the carriageway surfacing. A report was presented detailing a number of defects and the results of cores taken through the surfacing.

Conclusion

The following conclusions can be drawn from the above report:

1. A review of the original pavement design has shown the original pavement design to be adequate for the anticipated amount of traffic on the route. The expected traffic data for the route was provided by NCC and therefore the schemes designers Jacobs Babbitte can not be held liable for any failures.
2. The thinner and stiffer material specified as part of the value engineering proposal (HMB 35) was considered suitable at the time of construction and was specified in line with the relevant design standards at the time. Hence, liability cannot be attributed to value engineering. It is worth noting however that the HMB35 material used was withdrawn from general use approximately 2 years after completion of the scheme.
3. A review of the site records and testing has shown that the material complied with the specification and the pavement was constructed correctly. Hence, liability can not be attributed to poor supervision by Jacobs Babbitte or poor construction by McAplines. This is further backed up by recent laboratory tests undertaken by URS/ Scott Wilson.
4. Comparing the anticipated flows and actual flows, a far greater volume of traffic is being carried by the route than expected. In particular a disproportionate increase in the amount of HGV traffic has been observed implying the route is attracting traffic from outside the local area. The worst section is MARR3, the section between Rainworth and the Bellamy Road Roundabout. This section has had 81% of its predicted traffic for a 20 year design life in just 6 years. The remainder of the route is suffering from similar over use but to a lesser extent.
5. The increased traffic has led to a significant decrease in pavement life. An estimate of remaining pavement lives are contained within the report. However, it should be noted these are theoretical and purely based on traffic figures. They do not take into account physical factors such as water ingress caused by cracking, and the effect that other minor defects may have had on the pavement. It is also unclear at this stage the effect that an increase in the rate at which the designed traffic was reached has had on the pavements life. It is recommended that further testing be undertaken to determine the residual life of the pavement.
6. Visual Inspection bears out what is shown by the traffic data in that by far the worst section is MARR3, followed by MARR 4. With MARR3 requiring immediate attention. The site visit also highlighted that a number of joints

in the wearing course are opening up which may lead to further damage of the pavement. It is recommended that these defects are rectified as soon as possible to prevent further damage to the underlying layers.

7. Dynamic Code Penetrometer Tests undertaken on the pavements foundation after removal of the cores have shown the foundation to be in good condition. Giving results similar to those observed during construction.
8. Test on the cores taken have confirmed that despite exhibiting signs of voiding, the material laid did comply with the specification. All other tests undertaken on the cores showed the material to be performing as expected. The only exception to this is deformation resistance of the wearing course which was considered to be poor.
9. Extensive de-bonding between binder and base course layers was noted but no theory was offered as to a possible cause. These problems are likely to have led to a discontinuity of load distribution through the layers and causing the surface layer to crack. Any long term remediation measures will need to remove this de-bonded material (typically the top 100mm), in order to ensure a homogenous pavement is provided and loads can distribute evenly.