M50 Makeover


M50 - M1 Interchange

Over the past decade and a half, the country has witnessed some of the most ambitious infrastructure upgrades seen anywhere in the developed world as the Irish government's National Development Plan played road-building catch-up on a grand scale. The upgrade of 23km of Ireland's most congested motorway, the M50, is a key part of this programme and its successful delivery to date illustrates the best of design and build. That's according to *Jack Sheehan, highways director for Atkins*, the lead consultant for the project's detailed design and site construction supervision.

Dublin's C-shaped ring road was originally planned to divert traffic travelling on national primary routes away from the city. Due to urban expansion, however, it now runs through Dublin's suburbs and serves as a route for Dublin itself, connecting the suburbs. Although construction began back in the mid-1980s, the M50 had originally been conceived more than a decade earlier when it was first proposed in a Dublin Transportation Study of 1971. The north side of the route is located near the entrance to the Dublin Port Tunnel. Anti-clockwise it heads northwest from the tunnel and then veers west at a junction with the M1 motorway. It crosses the dual West-Link toll bridges over the River Liffey in west Dublin, looping around the south-east of Dublin to meet the M11 route (running south to Wexford) at Shankhill, Co Dublin.

The motorway's upgrade is part of the Department of Transport's 'Transport 21' policy, with a Public Private Partnership (PPP) contract signed in September 2007.

Contract Structure

The client is the National Roads Authority (NRA). The PPP contract was awarded to M50 Concession, a consortium comprising Globalvia, SyV Group and PJ Hegarty, the first two being Spanish companies and each weighted at 42.5% of the contract. The design and construct contract then went to M50 (D&C) Ltd which, again, was a Spanish-Irish joint venture, with PJ Hegarty again taking a 15% stake while FCC and Sacyr each took a 42.5% share. The contract – including variations – is worth €250m, with Atkins' contract accounting for €11m of that.

It is fair to say that in terms of design, the NRA got lots of bang for their buck. The contract was for the widening of 23km of motorway as well as the upgrade of seven interchanges to full free flow at the M1, N2 and N3 junctions. The contract also provides for a 35-year concession for the operation and maintenance of 42km of the route. The brief also involved the construction of 21 new bridges of various composition including steel beams, steel box girder and concrete beams. Atkins project manager Richard Neuling emphasises another important aspect of the job. 'The contract also provided for the installation of a communications infrastructure for an ITS system,' he says. The design, therefore, also required the creation of around 100 gantries as well as around 1,000km of ducting for electrical services and information feeds.

The contractor's operational revenues for the motorway will not arrive via a physical toll (the M50 toll plazas were removed last year) but rather by monthly lane availability payments from the NRA to the concession company. Independent of the PPP contract, motorists are charged for using the M50 via an electronic 'free flow' tolling system operated by the NRA.

Road Widening

Widening schemes are generally problematic for a number of reasons. First and foremost is the headache of traffic management on a route which, in this instance, averages a daily flow of around 100,000 vehicles a day. Land take on either side of a proposed widening can also be an issue, both in terms of time and money; any number of hold-ups can happen in terms of planning and property purchase (compulsory or otherwise), not to mention the prospect of paying well over the odds for the land in the first place.

Richard Neuling explains why the M50 project was blessed in this regard. 'When the motorway was being constructed in the '90s, they deliberately left a very wide central reservation,' he says. This in itself was prescient but the original design went further. 'They actually went as far as extending the road pavement foundations into

the central reservation as well,' he says. The principal benefits of this original design were that only one existing bridge on the route needed widening. 'We also managed to keep the hard shoulder in constant operation,' he adds. 'Engineering foresight doesn't always happen, but it certainly happened in this case.'

N3 Interchange

Without talking down the widening aspect of the scheme, it is abundantly clear that the real work was always going to be on the interchanges. Richard Neuling and Atkins site representative Sean McDonnell are certainly in agreement on this point. Of these interchanges, the M3 presented the biggest design challenges even though a version of the interchange had already been submitted at the planning stages. At that time, Arup was the NRA's consultant taking the project through the planning process. Their design, while perfectly workable, presented Atkins with a number of opportunities to improve on build cost efficiency while at the same time reducing the logistical difficulties associated with the interchange's construction.

What makes this interchange so testing is the confluence of road, rail and canal in one of Dublin's more affluent suburbs (Castleknock). In the original Arup design, it was proposed to take the carriageway under the rail link and the Royal Canal in an attempt to minimise the environmental impact of the scheme. Atkins revisited this aspect of the scheme and took the view that a better solution might be the creation of a viaduct over the rail and canal links. Richard Neuling acknowledges that this was 'a high risk strategy' in that it necessitated returning to the planning process to re-submit their new design with a new statutory Environmental Impact Statement, a course of action that could potentially delay the commencement of the interchange construction for up to nine months. The advantages of simpler construction, lower costs and time savings, however, made the risk worthwhile.

The new layout offered simplified traffic movements with less counter-intuitive looping away from intended destinations. Capacity was increased at the N3/Auburn Avenue junction and traffic disruption on the N3 was also reduced during construction. The local community also benefited from reduced night-time working.

The viaduct solution also proved to be the most attractive option to both Irish Waterways and Irish Rail. The Atkins solution ensured that there was no need to divert the Royal Canal during construction. More importantly, disruption on the railway was kept to an absolute minimum, allowing Irish Rail to operate services without speed restrictions. Concerns about Atkins' viaduct modification were in terms of the scheme's increased visual impact and increased noise; neither of which proved insurmountable.

The most impressive structures on the N3 interchange are the five-span, 155 metre long concrete viaduct over the railway and canal and the two span twin steel box girder bridges over the M50, with spans of 58 metres and 47 metres, which are set at a 60 degree skew to the motorway. On the M1 interchange there are two three-span curved steel composite bridges, each over 100 metres long and incorporating spans of up to 50 metres.

The International Aspect

From the outset, this was a cosmopolitan project, thanks to the major contribution played by Spanish contractors. This naturally presented its own tests but Sean McDonnell maintains that there were no real language barriers. Rather the differences were cultural: southern European working practices meeting exacting North European building standards.

'Normally, the Spanish contractor would come on site and just get on with the job and they weren't used to the kind of inspection regime we'd have here in terms of quality control,' says Sean McDonnell. A major part of Atkins' role was to assist FCC and Sacyr with the learning curve of dealing with Northern European working practices but Richard Neuling is keen to emphasise the benefits of working with such proactive contractors. 'We had to be very flexible in terms of design,' he says. 'FCC and Sacyr are very strong in design terms. The key to designing for the Spanish contractors was to work as a combined team to produce practical, buildable designs and continually identify opportunities for time and cost savings.'

An example of the success of this approach was when Atkins developed a design solution for the parapet cantilevers on the new bridges using pre-cast elements supported from the edge beams instead of conventional in-situ construction. This offered huge benefits in time and cost savings, with this element of the bridges being completed in three to four days compared to the four to five weeks that would have been typical with in-situ construction. The benefits were maximised where the bridges crossed live traffic while also scoring points for improved health and safety.

There was another international dimension to the project in the sense that Richard Neuling also oversaw a team of over 150 designers taken from Atkins offices in Belfast, Cork, Dublin, Swansea, Cardiff, Glasgow, Edinburgh, Birmingham, Leeds, Warrington, Manchester, Chelmsford, Sharjah and Bangalore. 'The scale of the project and the delivery programme made it necessary to use additional resources and specialists from a large number of Atkins offices,' he says. 'In terms of co-ordination and management, this obviously presents more of a challenge than having everyone under one roof but it is more than offset by the vast range of expertise we are able to draw on. The key to making it work was clear communication of the contractor's needs to all of our teams and by proactively tackling any difficulties that arose to ensure the contractor was given appropriate solutions without causing delays.'

For Richard Neuling, the clearest measure of the project's success is the fact that, despite its unquestionable status as Ireland's most complex road scheme on a site with up to 100,000 vehicles passing through each day, it remains within programme and to budget. 'Standing back from the day-to-day issues and looking at it objectively, the success of the project so far is a huge achievement, both for us and our clients,' he says.


M50 - N3 Blanchardstown Roundabout