REPUBLIC ENEMY

HOW IRELAND'S ROAD AUTHORITIES ARE CONFRONTING BAD ROAD DESIGN

For the first time since 1986, the Republic of Ireland has moved below the average EU road death rate. Employing common sense engineering modifications, victory could now be within sight for the country's safety officials

Image courtesy of Ross Costigan Photography

Every fatal crash on Ireland's roads costs the state Euro 2.2 million (US$3.4 million), every serious collision costs Euro 300,000 (US$466,000) – in total, a Euro 1.44 billion (US$2.23 billion) drain on the Republic's resources. To address the situation, some large-scale safety improvements have been implemented that bigger nations could learn a lot from.

With 28,000 motor vehicle crashes every year, there are nevertheless 20% fewer deaths since the launch of the government's first road safety strategy in 1998 – despite there being over 50% more cars on the road. These sterling efforts are spearheaded by the National Roads Authority (NRA), an independent body with its primary function – as defined under the Roads Act 1993 – being 'to secure the provision of a safe and efficient network of national roads'.

NETWORK UPGRADE

With overall responsibility for the planning and supervision of the construction and maintenance works on the national road network, two main areas of work are currently being undertaken by the NRA. One is a huge roads upgrade, funded by the government and costing around Euro 1.2 billion (US$1.8 billion) a year. This cash is being invested in upgrading six main routes on Ireland's inter-urban network – the key routes into and out of the capital city, Dublin. Prior to the scheme starting in 2001, there were around 5,000km of

The core objective of the Irish government's Road Safety Strategy 2007-2012 is to save over 400 lives

national roads, which were mostly single carriageways (2,500km primary and 2,500km secondary routes). Primary routes tended to consist of a single carriageway and a hard shoulder, while secondary routes were single carriageways without hard shoulders. By 2010, though, 1,250km of motorways and dual carriageways will be entirely redeveloped.

The other significant focus for the NRA is on its road safety remedial schemes. These are not as ambitious – or for that matter costly – as the major redevelopments previously mentioned, but are still making a significant positive difference. In layman's terms, these are small, low-cost projects that have an immediate impact on safety, as Forbes Vigors, the NRA's project manager, Road Safety, explains: "Since 1994, the NRA has had a dedicated budget for road safety remedial schemes," he begins. "We've had a team of six full-time regional road safety engineers based around the country and they coordinate with local authorities to implement the work. To deploy these schemes, we use collision data to identify locations where there are a high number of crashes taking place. We look at each location, analyze the collisions that are occurring and then decide whether or not there is an engineering solution to prevent them." Potential solutions are subsequently costed and implemented. In total, around 100 locations are treated under the program each year. Between 1994 and 2000, the average cost of each scheme was in the region of Euro 12,000 (US$18,000), although today this has inflated to around Euro 35,000 (US$54,000).

The above shows a Type 2 carriageway, which consists of two lanes in each direction, separated by wire-rope safety barriers

"We look at each location, analyze the collisions that are occurring and then decide whether or not there is an engineering solution to prevent them"

ENGINEERING WORKS

There are several types of engineering solutions that are being considered, as Vigors outlines: "There is a strong focus on junctions," he explains, "on enhancing sight distance, improving the visibility of the junction to drivers on the main line by improving signage, and so on." One thing

CHANGING LANES

Wire-rope barriers reduce the severity of run-off-road crashes and eliminate head-on crashes from poor overtaking

Another innovative project in Ireland has been the development of what are known as 'two-plus-one' (Type 3) and 'two-plus-two' (Type 2) road designs, which feature a physical barrier to divide opposing driving lanes. A two-plus-one road has two lanes in one direction and one lane in the opposite direction, which alternates every 1,500m.

Although these roads are new to Ireland, Sweden already has around 1,500km of the Type 3 dual carriageway and 200km of the Type 2, carrying volumes of up to 20,000 annual average daily traffic. Similar to Ireland, Sweden has vast areas where comparatively low flows of traffic result in long lengths of single-carriageway primary roads.

These new layouts have come about to prevent accidents occurring at locations where drivers overtake and cross over into the oncoming lane. Collision statistics in Ireland show that on single-carriageway roads, over 50% of all fatalities occur as a result of drivers overtaking and colliding with oncoming vehicles. A physical barrier between lanes eradicates all head-on collisions.

Enabling safe overtaking opportunities, these new designs are simple but effective, as Vigors explains: "In a road that was previously 15m wide – where we once had two hard shoulders and two driving lanes – within that space we can now fit a narrow hard shoulder, a single lane, a median barrier, two other driving lanes and a small hard strip. What we've now got is a three-lane road with a barrier in it and we alternate the three lanes so that one driver has two lanes in one direction for about 1,500m and then the oncoming traffic gets about 1,500m."

The Swedish experience of segregating opposing traffic lanes with wire-rope safety barriers has had particularly positive safety results, with very significant reductions in accident rates achieved relative to undivided roads. According to the Swedish Road Administration (SRA), the overall fatality rate on these segregated roads is more than 50% lower than the rate on similar undivided roads.

unique to Ireland is the erection of what Vigors refers to as junction definition posts (JDPs). "These are green and white bollards that are employed to define exactly where the mouth of a junction is. A JDP is placed on each side of the junction mouth, so a driver traveling at speed can clearly see this in front and immediately tell that if they get between the two bollards then they have driven down a side road."

Other visual methods have included the deployment of improved warning signs on the approach to a junction: "In the past, there may have just been a sign indicating that there was a junction up ahead to the right. We have improved on that by changing the road markings to continuous lining. We may also choose to put in a series of right-turn arrows and straight-ahead arrows, which provide drivers with ample warning that they're turning right ahead."

Similar measures have been deployed at bends where there were previously high numbers of drivers losing control. Road markings are altered from a single continuous line marking to a double line, while improved signage alerting drivers of the bend ahead could also be erected or a series of single chevrons used.

There is some sound logic behind this improved utilization of chevrons, as Vigors observes: "Most chevron boards would have three arrows on them and be quite a large unit, about 1.5m wide, so trying to squeeze that in on a bend is sometimes difficult. What we did previously was put in a single chevron, which warned a driver that there's a severe bend ahead, or that they're already on a severe bend. However, it doesn't actually tell you how severe the bend is, or how long it goes on for. What we've been doing is putting in a series of single-arrow chevrons with only one arrow on each. Around 300-500mm wide, we put in a series of them so you would see five chevrons at any one time, which continue all the way around the bend. If the corner is very tight, the spacing between the chevrons closes up: likewise, if the bend starts to ease, the space between the chevrons extends. By doing this, it gives the driver a far clearer picture of how severe the bend is so that they can adjust their driving behavior accordingly."

JDPs provide a highly visible and safe means of alerting motorists to the presence and position of a junction

The NRA has had some enthusiastic feedback about the signage from the driving public and emergency services, but Vigors feels it will take more time before enough collision data is available to statistically assess the results. "There are a number of studies across the world defining the benefits of this approach," he explains. "We're not the only ones doing it, by any means, but it is already proving to be effective."

The National Roads Authority sees improved road design as a positive measure to safer motoring

The NRA often develops very integrated strategies that take into account the bigger picture: improving road safety for pedestrians is just as important as improving safety for drivers. In this regard, pedestrian refuges have played an important role in recent years and are used in towns and villages where there is a main thoroughfare, through which

Ireland has previously had a poor record of fatal and serious accidents in single-carriagway rural roads

The NRA assumes that what works in Sweden will also work on Ireland's roads: a period of intensive research was undertaken prior to a pilot. A Road Safety Consultant was commissioned to produce an Operational Safety and Monitoring Review of the N20 Mallow Rathduff Type 3 Dual Carriageway Pilot. The report highlighted several positive issues regarding the scheme one year after its introduction, including the total elimination of head-on and overtaking accidents. In addition, the Gardai (the Irish police) and emergency services were generally positive about the scheme, while drivers also seemed to accept the lane-segregation barriers, which were selected because they are easily repaired when crashed into and can also be dropped easily in emergency situations.

The results of the initial Type 3 pilot projects prompted consideration of a Type 2 dual-carriageway road type. For safety reasons, a four-lane road was deemed unacceptable on rural sections of the network where a 100km/h speed limit applies, so a safety barrier is located in the median to separate opposing traffic schemes. The SRA in Sweden considers this design variation to be the road type of the future, and Vigors agrees.

The Type 3 carriageway is a divided all-purpose road with two lanes in each direction

"Following the success of the two-plus-one, we've now brought in the two-plus-two – its basically like a dual carriageway, except that the lanes are more narrow," confirms Vigors. "Our new roads we will be using two-plus-twos rather than the two-plus-ones because there isn't a great deal of cost difference."

Having examined the costs at pilot stage, the NRA determined the Type 2 carriageway can be realized at minimum incremental cost and provides further safety and capacity benefits.

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Image courtesy of Ross Costigan Photography

Road deaths in Ireland fell from 396 in 2005 to 368 in 2006, then to 338 in 2007

Gateways inform drivers that they are moving from a rural area into a more urban scenario

vehicles are often traveling at speed. As well as formal pedestrian crossings, these informal refuges also have big safety benefits as they mean pedestrians only have to check for oncoming traffic in one direction, before crossing to a solid island and then checking again in the opposite direction before reaching the other side of the road.

CONSISTENT APPROACH

Of course, influencing behavior enough to make sure drivers do not travel at dangerous speeds in the first place is likely to reap the biggest reduction in accidents involving pedestrians. To achieve this, there are several approaches that the NRA has adopted.

"We have implemented a consistent approach to traffic calming in such locations," Vigors details. "Firstly, we've got the approach to the traffic-calming gateway or the speed limit gateway. What we're trying to do here is to change the drivers' view of the road ahead – to make them see clearly that they are going from a quiet rural setting to a more formal setting, where the verge and road is cut more regularly. We put signs in place warning people that there's traffic calming ahead so not to overtake.

"Then at the gateway itself we have large gateway signs clearly indicating to the driver that they're now entering an urban area, where the speed limits are clearly signposted. These signs are very tall and make the road appear more narrow than it actually is, which can produce a result in terms of reducing the speed of the vehicles as they enter into the zone."

Although innovative, such solutions are not particularly high-tech. Ireland is not yet a nation under scrutiny by CCTV surveillance or incident detection systems, or home to vast armies of VMS or VASS telling drivers how to behave. Nor do any of the previously mentioned solutions rely on algorithm-based science that is beyond the comprehension of the humble driver.

"This one small program focusing on the road detail has reduced Irish annual road deaths by around 7%"

Instead, what are seemingly simple strategies in fact deploy one of the most underrated human qualities – common sense. It is somewhat refreshing in an era where the state-of-the-art is so readily called upon to solve a problem to be discussing the traffic-calming merits of what is effectively an optical illusion – making the road appear narrower. Surely part of the reason that drivers in Ireland are responding so well to the likes of simple bollards, road markings and signage is because the guidance they provide is both logical and instantly comprehensible. The overwhelming cost benefits associated with such techniques are simply the icing on the cake.

Vigors is rightly proud of the NRA's efforts and believes the systematic way of working has been crucial: "You specifically target where you've got difficulties on the road network. Instead of aiming to treat every single junction in the country, what we aim for is to treat every junction where there was a difficulty first and foremost, then move onto improving the rest."

This one small program has reduced Irish annual road deaths by around 7%. Despite the success of his work and the contribution that safe roads and safer vehicles can make, Vigors believes that road users share a major responsibility to make roads safe: "We all like to blame the roads but it's just not the case. I'd love for Irish drivers – for all drivers – to be more aware of the part they play in crashes that are occurring." Whatever the allocation of responsibility between roads, vehicles and drivers, EuroRAP estimates that this one Euro 10 million (US$15.5 million) program alone will save over 500 lives during its economic life and be worth around Euro 700 million (US$1.08 billion) to the Irish economy. With such figures in mind, the work of Vigors and his team must be one of the best buys in Ireland. ■

"What the Irish National Roads Authority has done is not rocket science – but it has demonstrated what competent attention to detail and systematic targeting can achieve.

In most developed countries, deaths and serious injuries are concentrated on main regional routes which will never be replaced by new roads. In most developing countries, deaths are concentrated on national routes that will, over decades, eventually be brought up to the standard needed for busy trade routes. Ireland is at the end of a period of rapid national development. Its road deaths have been greatly reduced by a combination of new trade routes and detailed attention to main regional roads.

What has been done in Ireland can be done in any country with good crash data or data from iRAP road inspections. The process focuses on main regional routes and involves paying attention to safety detail at hundreds of sites. The costs are small but the lives saved and injuries prevented are huge. If this strategy was adopted worldwide, millions of lives would be saved over the next decade."

John Dawson, chairman, iRAP

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INTERNATIONAL ROAD ASSESSMENT PROGRAMME