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Transport Infrastructure Ireland

TII Publications



NRA New Divided Road Types: Type 2 and Type 3 Dual - Carriageways

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Transport Infrastructure Ireland (TII) is responsible for managing and improving the country's national road and light rail networks.

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Document Attributes

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Document Attributes

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NRA DMRB and MCDRW References

For all documents that existed within the NRA DMRB or the NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

NRA New Divided Road Types:
Type 2 and Type 3 Dual-carriageways



BENEFITS of the TYPE 2 and TYPE 3 DUAL CARRIAGEWAY ROAD TYPE

There are significant safety and economic benefits associated with the Type 2 and Type 3 roads type, in comparison with the single carriageway as follows:

- Segregation benefits of a dual carriageway
- Reduction in the severity of all accidents
- Reduction in number of head on collisions
- Reduction in driver frustration by provision of overtaking opportunities
- Elimination of uncontrolled right turning movements
- Controlled access on to national routes



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Previous brochure on 2+1 Road – (Pilot Programme) published in 2004 by NRA is superseded by this publication, December 2007.

ADDITIONAL BENEFITS of a TYPE 2 DUAL CARRIAGEWAY

- The Type 2 dual carriageway gives significantly improved capacity for a cost increase of approximately 10% when compared to a Type 3 dual carriageway.
- The removal of the Right Turning Priority Junction type ensures no median gaps and eliminates crossing traffic.
- Bottlenecks can occur at the 2-lane merge section on Type 3 dual carriageways at high operating flows, i.e. 17,250 AADT. The Type 2 dual carriageway avoids the chicane effect, thus improving the capacity and operational safety.

The NRA would like to acknowledge the assistance of the Swedish National Roads Authority (Vagverket) for their technical assistance and the use of photographs which facilitated the production of this brochure.



Type 2 dual carriageway



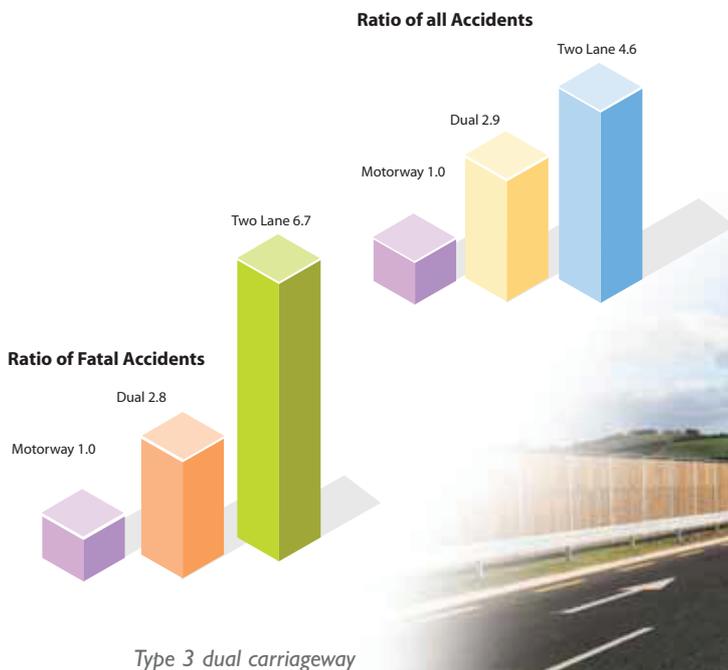
Type 3 dual carriageway

Positive measures towards safer motoring....

Background to Consideration of New road Types

There is a large gap, in terms of capacity, cost and safety, between the standard single carriageway and a dual carriageway with at grade junctions. This has led the NRA to develop other new divided road categories, which provide a capacity range between that of a single carriageway and a dual carriageway, i.e. between 11,600 and 26,500 AADT.

Transport 21 sets out the development of some 1200km of the National Primary road network to dual-carriageway/motorway standard, which some 1600 km of the National primary road network in Ireland will remain as single-carriageway roads due to relatively low traffic volumes. Given the need to provide for vehicles to safely overtake slower moving traffic on two-way roads in a safe and controlled environment the Authority looked to other countries to see if different divided road types could be introduced in Ireland.



NRA Pilot Projects

The NRA has examined the possibility of segregating opposing traffic flows on low volume roads and has recently piloted two new divided road types, namely a 2+1 road and a 2+2 road, referred to as **Type 3** and **Type 2** dual carriageways respectively. The physical segregation of opposing traffic flows significantly improves safety vis á vis a conventional single carriageway road type.

Type 2 Dual Carriageway:

A divided all-purpose road with two lanes in each direction

Type 3 Dual Carriageway:

A divided all purpose road with two lanes in one direction of travel and one lane in the other direction. the two-lane section, which provides the overtaking opportunity, alternates with a one-lane section at intervals of 2km. approximately

Opposing traffic flows are segregated by means of a barrier within the median of the Type 2 and Type 3 road types. While these road types are relatively new to Ireland, Sweden has now 1500 km of the Type 3 dual carriageway (2+1) road type and 200 km of the Type 2 dual carriageway (2+2) carrying traffic volumes up to 20,000 AADT. Sweden, like Ireland, has large areas of the country where comparatively low flows of traffic result in long lengths of single-carriageway primary roads.



Also like Ireland the Swedes had a poor record of fatal and serious accidents on single-carriageway rural roads.

The Swedish experience of segregating opposing traffic lanes with the wire cable barrier has had most positive safety results and very significant reductions in accident rates have been achieved relative to undivided roads. In particular head on accidents have been virtually eliminated. The overall fatality rate on these segregated roads is more than 50% lower than the rate on similar undivided roads. The Swedish Roads Authority estimates that 40 fatalities a year have been avoided by segregation. Such is the success of these divided road types that another 220 km of this road type is being rolled out in 2007 /2008 in Sweden



Type 2 dual carriageway

A Road Safety Consultant was commissioned by the Authority to undertake an Operational Safety Review and Monitoring review of the N20 Mallow Rathduff Type 3 Dual Carriageway Pilot Programme. This Report highlighted several positive issues regarding the scheme one-year after its introduction, namely:

- The elimination of head-on and overtaking accidents.
- The positive attitude of Gardai and emergency services towards the scheme
- The acceptance by drivers of the lane segregation barrier

A Public Attitude Survey was commissioned by the NRA/Cork County Council and was carried out by an independent company six months after the road opening.



This survey was carried-out in order to ascertain the views of road users to the innovative pilot project. The results were positive with 73 % of drivers interviewed indicating that they preferred the divided layout to a standard single carriageway road type.

Accidents type on Type 3 dual carriageways in Sweden when compared equivalent single carriageway sections

Rate of fatalities and severely injured	Down by 50-60%
Head on collisions	Almost eliminated
Overtaking accident	Reduced by between 40 and 70%
Run off	Reduced by between 12 and 67%
Access roads	Reduction
Junctions	Small changes

Since 2004, the NRA has implemented the following pilot projects on national routes

Road Project	Road Type	Lanes	Project Type	Length km	Year opened
N20 Mallow Rathduff road	Type 3	2 + 1	Retrofit	7	2004
N24 Piltown Fiddown Bypass.	Type 3	2 + 1	Retrofit	8	2005
N24 Cahir Bypass Link	Type 3	2 + 1	Greenfield	3	2007
N2 Clontibret to Castleblayney	Type 3	2 + 1	Greenfield	16	2007
N4 Dromod Roosky	Type 2	2 + 2	Greenfield	9	2007

Adoption of New Road Type: Type 2 Dual Carriageway

The results of the initial Type 3 dual carriageway pilot projects prompted consideration of a Type 2 dual carriageway road type, as a variant on the options between the standard single carriageway and a high quality dual carriageway. The Type 2 road type consists of two lanes in both directions. For safety reasons a four lane undivided road is considered unacceptable on rural sections of the network where a 100kph speed limit applies, so a safety barrier is located in the paved median that separates opposing traffic streams. The primary function of the lane segregation barrier is to prevent crossover and overtaking manoeuvres on these road types. The Swedish Roads Authority has a 2+2 road cross-section in their Road Design guidelines and they intend to construct more of this road type in the future.

A positive measure towards self regulating roads...



Type 3 dual carriageway N2 Clontibret to Castleblayney

Having examined the costs at pilot stage the NRA determined that the Type 2 dual carriageway can be achieved at minimum incremental cost and it provides further enhancements to safety and capacity. The Type 2 dual carriageway was then adopted by the Authority as a standard road type for the traffic flow ranged indicated in Table 4 of NRA TD 9/07. It is envisaged that the Type 3 dual carriageway will be primarily used for retrofit projects for the traffic flow ranges indicated in this Table..

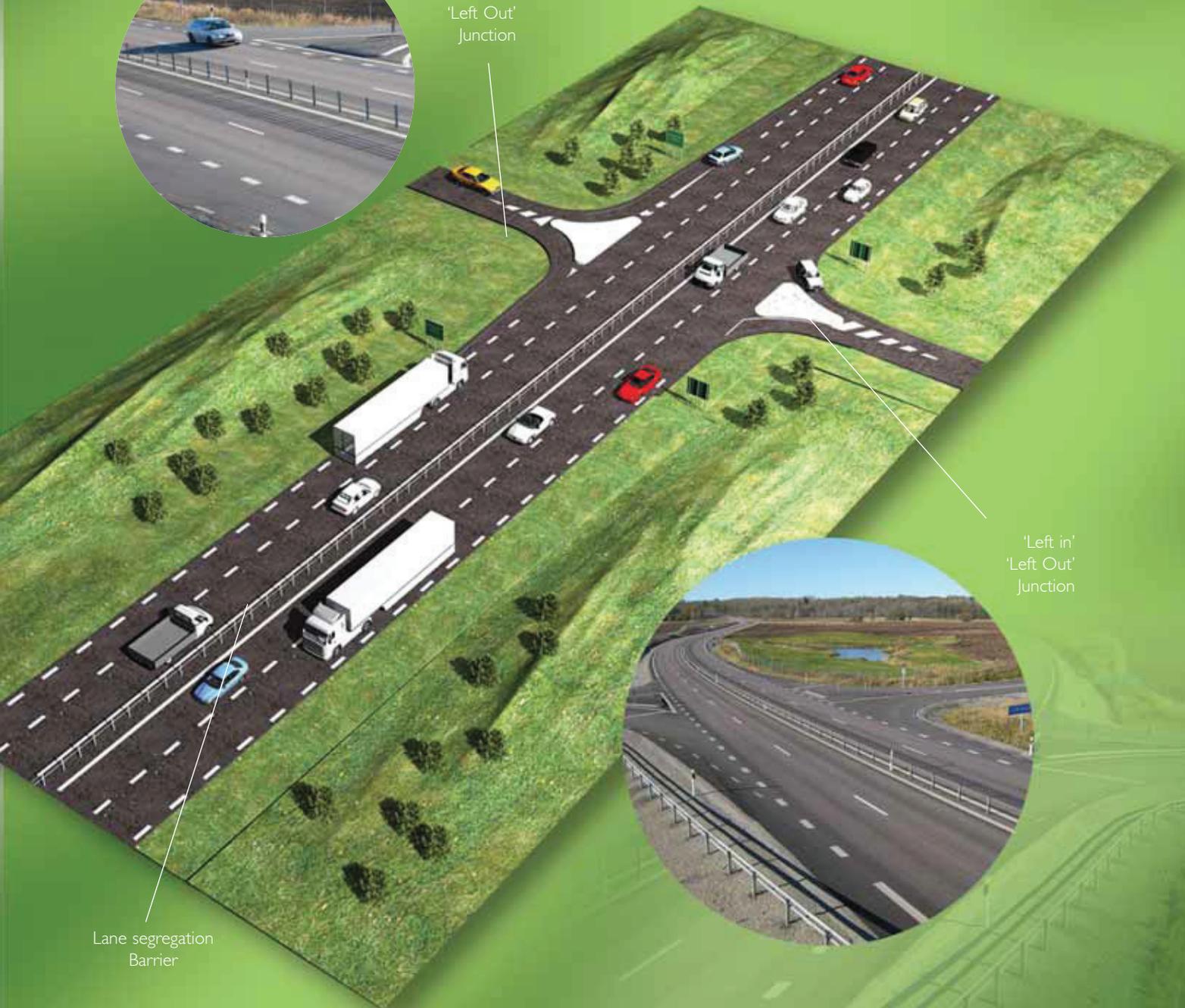
The N4 Dromod to Roosky project that opened to traffic in December 2007 is the first Type 2 dual carriageway to be completed in Ireland. As appropriate with a new road type, the NRA will monitor and review the operation of this project and all future Type 2 and Type 3 dual carriageways.

Type 2 dual carriageway

Type 2 Dual Carriageway: Cross Section



'Left in'
'Left Out'
Junction



'Left in'
'Left Out'
Junction

Lane segregation
Barrier

CAPACITY OF TYPE 2 DUAL CARRIAGEWAYS AND OTHER DESIGN ISSUES

The Type 2 dual carriageway is to be considered as a cross section option at flows in between 11,600 Annual Average Daily Traffic AADT (i.e. the capacity limit of a standard single carriageway) and 20,000 AADT in the design year. At the lower end of the range a Type 2 dual carriageway will normally be preferable to a single carriageway, while at the upper end it could be considered instead of a dual carriageway.

The proposed width of the traffic lane is 3.5m. The second lane should function mainly as an overtaking lane only and its width is also 3.5m. On Type 2 dual carriageway projects cyclists and pedestrians will be encouraged by signage to use an alternative route, for example the old national primary route.



Nevertheless, for safety reasons, appropriate hard standings within verges will be provided for pedestrian usage.

From Table 4 of NRA TD 9/07: Recommended Rural Road Layouts

Type of Road	Pavement Width (m)	Capacity (AADT) for Level of Service D	Edge Treatment	Junction Treatment at Minor Road	Junction Treatment at Major Road
Type 3 (7.0m +3.5m) (Primarily for retro fit projects)	13.0	14,000	1m hard strip on one lane side 0.5m on two lane side	Restricted number of left in/left out or ghost priority junctions	Priority junctions or at-grade Roundabouts
Type 2 Dual 2 Lanes Carriageways 2x 7.0m)	16.5	20,000	0.5m hard strips both sides	No gaps in central reserve Left in/Left out	At grade roundabouts and compact grade separation
Type 1 Dual 2 Lanes Carriageways (2x 7.0m)	21.6	38,100	2.5m hard shoulders both sides	No gaps in Central Reserve Left in/Left out	Left in/Left out and Full grade separation



Example of Compact Grade Separated Junction

JUNCTION STRATEGY FOR TYPE 2 DUAL CARRIAGEWAY

Type 2 dual carriageway is designed so as to minimise the number of junctions and to provide drivers with straightforward junction layouts. No gaps are to be provided in the central reserve, an enhanced safety feature of a Type 2 dual carriageway. The following junction types should be permitted for use on Type 2 dual carriageway.

- **Compact grade separation**
- **Roundabouts**
- **Left-in / Left out Junctions**

Minor intersections should be suppressed on the Type 2 dual carriageway and local traffic with low traffic volumes should cross over or under the new route.



Example of Left in Left Out Junction

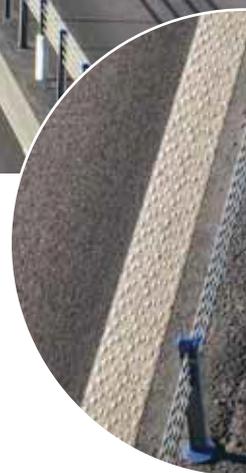
Roundabout under construction at end of 2+2 Road Project in Sweden



THE LANE SEGREGATION BARRIER

Opposing traffic flows are segregated by the use of a barrier within the median of the Type 2 and Type 3 dual carriageway road types. In Sweden and on the NRA pilot projects, wire rope barrier has been chosen because it is easily repaired when hit and can also be dropped easily in emergency situations. Experience gained with the pilot projects indicates that a wire rope barrier does not present a problem for Irish drivers and the number of hits of the barrier is relatively low.

Alternative forms of light barrier being developed to EN 1317 Standards will be kept under review by the NRA.



**A positive measure
towards safer motoring...**



NRA Divided Road Types, Type 1, 2 and 3 Dual Carriageways

Type 1 Dual Carriageway



Median
Barrier

Type 1 Dual
Carriageway

Type 2 Dual Carriageway (2+2)



Type 2 Dual
Carriageway

Lane
segregation
Barrier

Type 3 Dual Carriageway (2+1)



Type 3
Dual
Carriageway

Lane
segregation
Barrier





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