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Transport Infrastructure Ireland

# TII Publications



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## 2 plus 1 Road - Pilot Programme

**DN-GEO-03086**  
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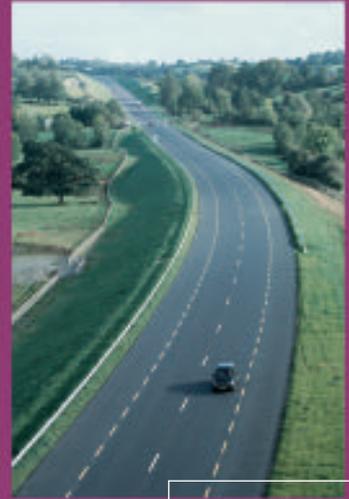
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## 2 plus 1 Road – Pilot Programme





'2 plus 1 Road' -  
a positive measure towards  
safer motoring



Typical wide two lane  
road

Photomontage of typical  
2 plus 1 roadway.

## NRA to pilot new road type

Road safety continues to be an important issue, particularly on national primary single carriageway roads in Ireland. Any new measures that help reduce accidents and fatalities on single carriageway roads must be further advanced. To this end, a working group comprising representatives from National Road Authority, Regional Design Offices, Local Authorities and Consultants has been researching a new road type for the last two years. The view of the group is that the 2 plus 1 Road has potential for use in Ireland because of the poor accident record/characteristics of single carriageway roads and because of the traffic volumes on much of the National Primary network. It is proposed to pilot four 2 plus 1 schemes around the country over the next few years.



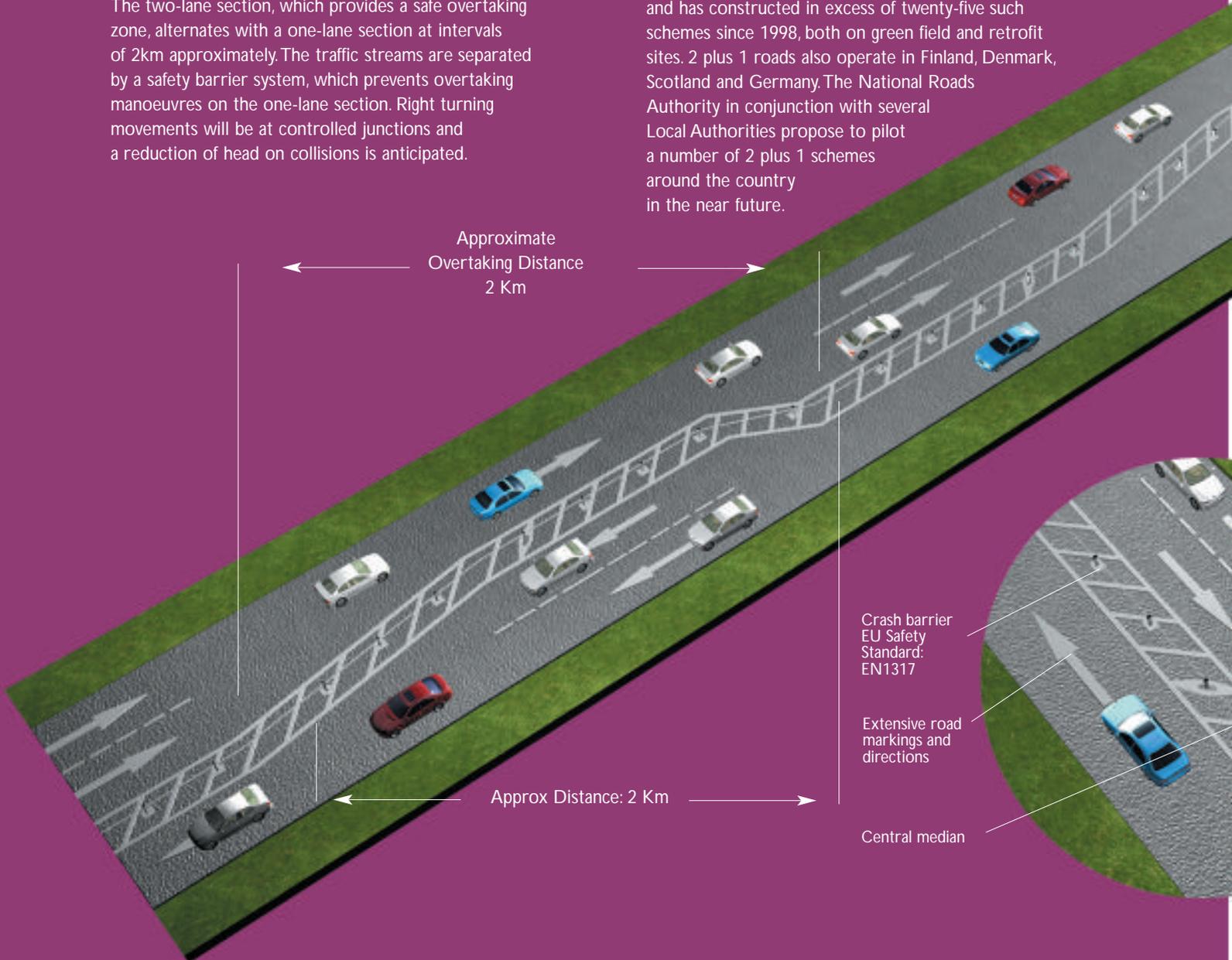
(The NRA would like to thank the Swedish National Roads Authority for the use of photographs)

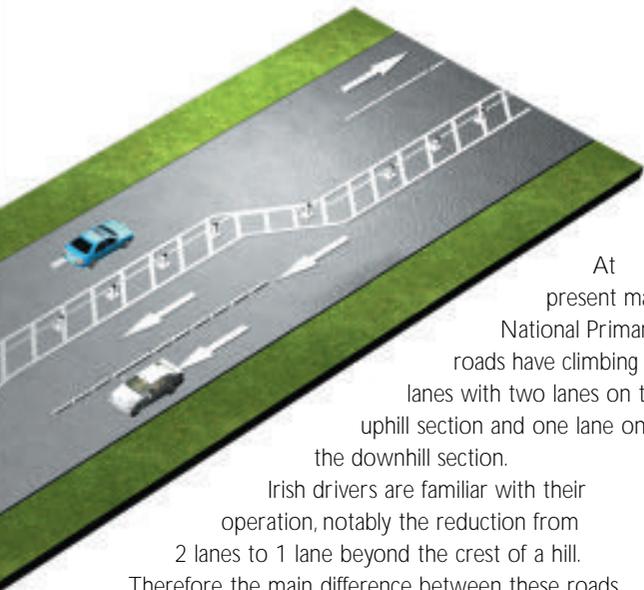


## A '2 plus 1 Road'

A 2 plus 1 road consists of two lanes in one direction of travel and one lane in the opposite direction. The two-lane section, which provides a safe overtaking zone, alternates with a one-lane section at intervals of 2km approximately. The traffic streams are separated by a safety barrier system, which prevents overtaking manoeuvres on the one-lane section. Right turning movements will be at controlled junctions and a reduction of head on collisions is anticipated.

Sweden has led the way in research and development of the 2 plus 1 road type with safety barrier systems and has constructed in excess of twenty-five such schemes since 1998, both on green field and retrofit sites. 2 plus 1 roads also operate in Finland, Denmark, Scotland and Germany. The National Roads Authority in conjunction with several Local Authorities propose to pilot a number of 2 plus 1 schemes around the country in the near future.





At present many National Primary roads have climbing lanes with two lanes on the uphill section and one lane on the downhill section.

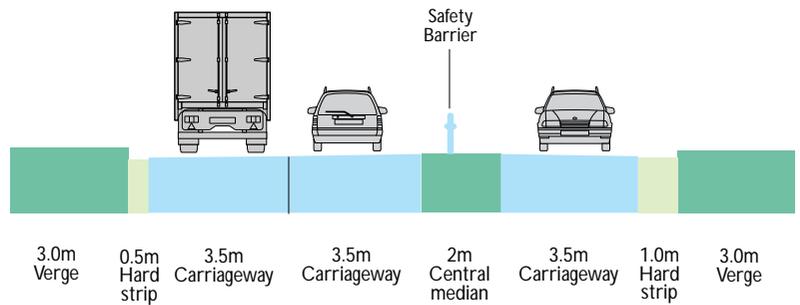
Irish drivers are familiar with their operation, notably the reduction from 2 lanes to 1 lane beyond the crest of a hill.

Therefore the main difference between these roads and the new 2 plus 1 road type is the existence of a safety barrier between the opposing traffic streams.

### Application of the 2 plus1 road by NRA

The National Primary road network has an overall length of approximately 2800 km which carries 31% of all road traffic. The National Development Plan (2000-2006) when fully implemented will deliver approximately 1200 km of the National Primary road network to a high quality dual carriageway/motorway standard.

As indicated overleaf these roads have excellent accident characteristics. The remaining 1600 km of the National Primary road network will consist of single carriageway roads.



**Fig 1: Proposed 2 plus 1 Cross Section**

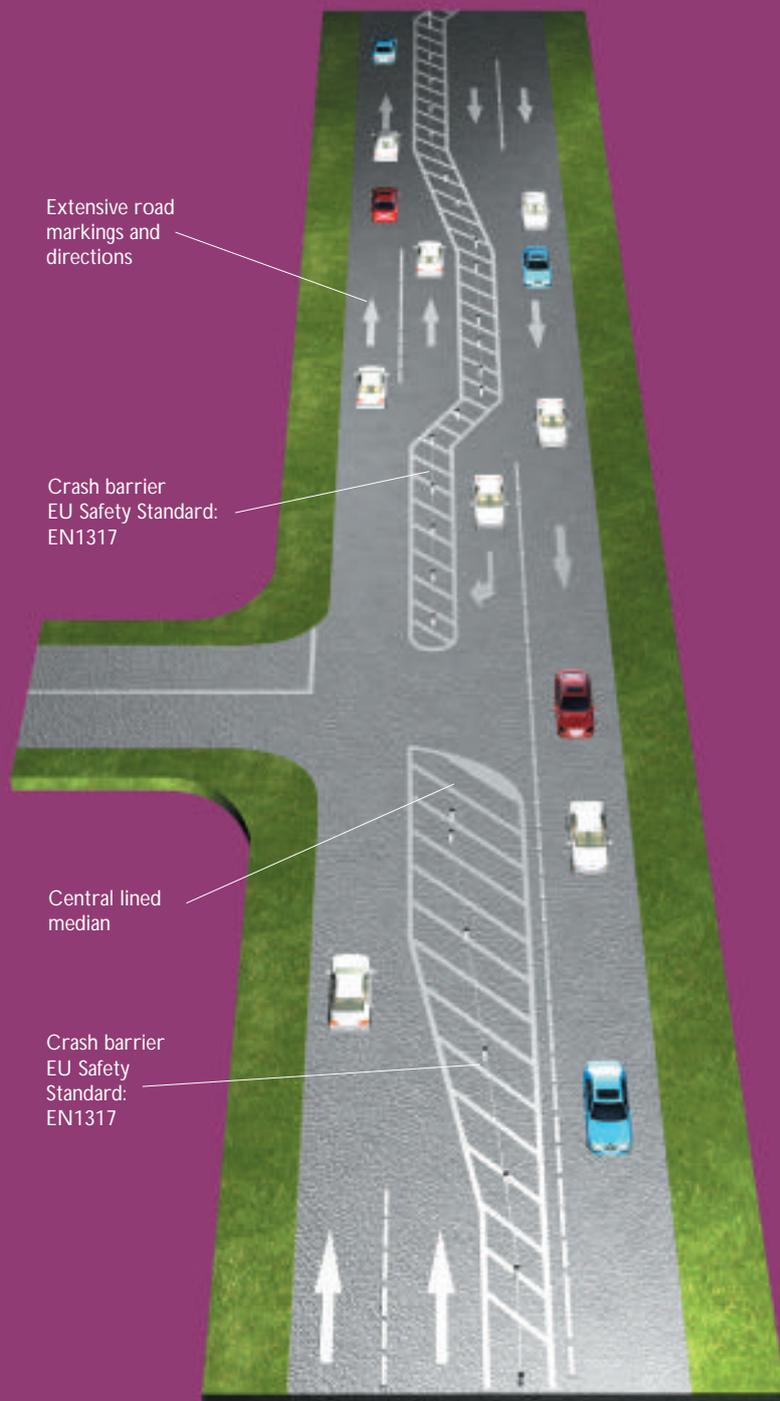
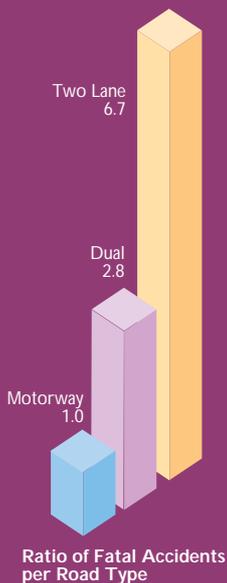
The 2 plus 1 road type will be considered for new National Primary projects on routes to which the high quality dual carriageway/motorway standard does not apply. This applies to approximately 700km of new projects, with a potential of retrofitting an additional 150km on existing routes. Therefore this road type potentially applies to thirty per cent of National Primary roads.

#### PROPOSED ROAD STANDARD FOLLOWING COMPLETION OF THE NATIONAL PRIMARY PROGRAMME, AS OUTLINED IN NDP

| Road Type                    | Length |
|------------------------------|--------|
| Standard 2 Lane              | 750km  |
| 2 plus 1                     | 850km  |
| Motorway or Dual Carriageway | 1200km |

Head on collisions account for 20% of accidents on two lane roads but account for 37% of fatal accidents. Single vehicle accidents account for 24% of accidents on two lane roads but account for 30% of fatal accidents. The NRA considers that the 2 plus 1 Lane Road Type with a safety barrier will significantly reduce fatal head on collisions on single carriageway roads and reduce the severity of all accidents.

In Europe there is a move towards self-regulating roads as it is recognised that the over reliance on enforcement does not ensure safe driving behaviour. The 2 plus 1 road is a step in this direction.



## The main advantages of using the 2 plus 1 road type

The main advantage of 2 plus 1 roads is enhanced safety. The separation of opposing traffic streams in a 2 plus 1 road prevents cross over accidents including head-on collisions.

In Sweden, it has been estimated that a 2 plus 1 road type with a safety barrier led to an overall reduction of 50% in fatal accidents when compared to a single carriageway road. This was achieved largely by the elimination of head on collisions and a transfer of accidents from the fatal category to the minor injury category (Bergh, Carlsson, 2001).

Therefore the primary benefits of the 2 plus 1 is the overall reduction in the incidence of fatal accidents and in the severity of accidents in comparison to the single carriageway road.

**In Sweden, it has been estimated that a 2 plus 1 road type with a safety barrier led to an overall reduction of 50% in fatal accidents when compared to a single carriageway road.**



The provision of overtaking sections every 2km reduces driver frustration and the provision of a central safety barrier eliminates imprudent overtaking. Provision for right turning movements will only be at designated junctions.

Analyses of the economics of two-lane roads have indicated that the 2 plus 1 is a slightly more economic solution than the wide single carriageway.

## The main disadvantages of using the 2 plus 1 road type

It is proposed to use a safety barrier to separate the traffic streams. Irish drivers and motorcyclists will be unfamiliar with safety barriers on single carriageway roads and will be required to adapt to this new situation. There will be a need to clearly explain the operation of this new road type to the general public.

Experience in Sweden indicates that the presence of the safety barrier slightly increases the number of minor injury accidents but decreases by 40 to 55 percent the fatal and serious injury accidents.



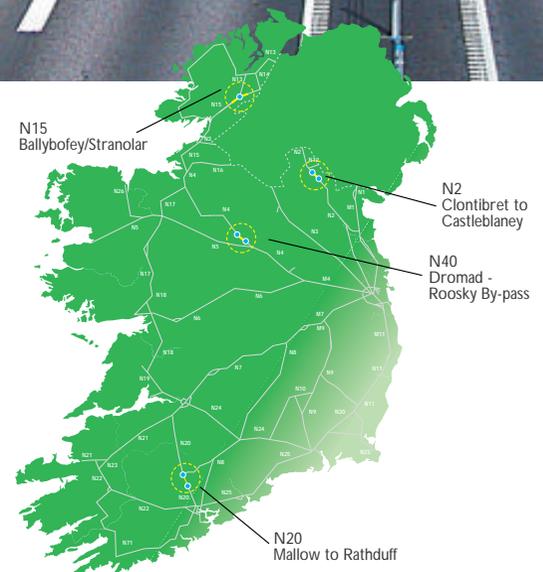
Property owners adjacent to 2 plus 1 roads may be required to drive longer distances to access their property as the safety barrier prevents all right turns from the main road other than at designated junctions.

On the one lane section of the 2 plus 1 road type, road users driving behind a slow moving vehicle (e.g. tractor) must travel until the next two-lane section is reached in order to overtake.

## Introduction of the 2 plus 1 road type in Ireland

Initially there will be four pilot projects on national primary roads. These 2 plus 1 projects are as follows:

|                      |                               |                  |      |
|----------------------|-------------------------------|------------------|------|
| <b>Co. Cork:</b>     | N20 Rathduff to Mallow        | Retrofit         | 9km  |
| <b>Co. Leitrim:</b>  | N4 Dromod -Roosky             | Green field site | 8km  |
| <b>Co. Monaghan:</b> | N2 Clontibret to Castleblaney | Green field site | 15km |
| <b>Co. Donegal:</b>  | N15 Ballybofey Stronolar      | Green field site | 16km |





These projects will allow for the traffic, operational and safety assessments of the 2 plus 1 road type in Irish conditions. Driver behaviour and attitude will be monitored as well as accident characteristics.

The first project is a retrofit project on an existing 9km section of the N20 Rathduff to Mallow road. It is expected that this project will be completed by the end of 2004. The other projects will be implemented over the next few years and will be monitored for a number of years after opening.

### **Publicity for this new road type**

All of the above schemes will be going through a formal planning process, which will involve significant consultation with local residents. In advance of this process, a local publicity campaign will accompany each of these pilot schemes. The National Roads Authority will co-ordinate the raising of awareness of this new road type both nationally and at a local level in consultation with the local authorities involved.

### **FREQUENTLY ASKED QUESTIONS**

#### **How will pedestrians and cyclists be catered for?**

As shown on the cross-section (Fig.1) the overall width of pavement on the single lane side is 5.75m, consisting of a 1.0m hard shoulder, a 3.5m carriageway and a 1.25m hard strip adjacent to the safety barrier. This affords sufficient carriageway width to allow a vehicle to safely pass a pedestrian or cyclist and is as least as great as that provided on the national secondary network and most regional roads.

In addition, on the new 2 plus 1 road projects (approximate length of 700km) cyclists and pedestrians will be encouraged by signage to use an alternative route, for example the old national primary route.

#### **How will access to land and properties be provided for?**

Access to land and properties adjacent to the 2 plus 1 will be provided by means of left in and left out turns and by designated U turns. Diversion lengths will be kept to a minimum but some inconvenience to local landowners may be experienced, particularly on the retrofit schemes.



### **What happens if I have a breakdown on a 2 plus 1 road?**

On the one-lane section there is a width of 5.75m, which provides sufficient width for two trucks to pass. Breakdowns on the two-lane sections will not pose a problem, as there is a paved width of 8.25m. In the event of a serious accident a contraflow will be set up.

### **Why use a barrier on a 2 plus 1 road?**

The purpose of any safety barrier system is to contain and redirect errant vehicles, preventing the vehicle from crossing the safety barrier to the opposing lane.

The 2 plus 1 road type developed in Sweden includes a safety barrier and has led to a 50% reduction in fatalities. Where a barrier system is used for the separation of opposing traffic streams in a 2 plus 1 road, head on collisions are virtually eliminated and there is a transfer of accidents from the fatal category to the minor injury category (Bergh, Carlsson, 2001).



Early research indicates that where the opposing traffic streams are separated by means other than a barrier system there is a 25% reduction in accidents. However a more significant reduction in accident rates is achieved using a barrier system and for this reason a safety barrier system will be included in the pilot 2 plus 1 projects.

Cross over accidents in Ireland are almost twice the rate of Sweden or the UK, thus highlighting the need for a barrier system. The containment level achieved by the safety barrier system will comply with EU standards (EN 1317).

### **How much does the 2 plus 1 road type cost?**

From 2004 NRA cost estimates, the 2 plus 1 road type costs €3.586 million/km. This compares to €3.763 million/km for a wide single carriageway. There is however a higher maintenance cost associated with the 2 plus 1 road type.

**The Swedish Experience:  
950km of 2 plus 1 road constructed  
by the end of 2003 with over 50%  
reduction in fatal accidents  
on these roads.**

## ADVANTAGES OF THE 2 PLUS 1 ROAD TYPE

- Reduction in the number of fatalities due to cross over accidents \*
- Reduction in the severity of all accidents \*
- Reduction in the number of head on collisions \*
- Elimination of uncontrolled right turning movements
- Controlled access onto National Primary Roads
- Reduction in driver frustration by the provision of overtaking opportunities every 2km approximately
- A positive measure towards self-regulating roads

(\* based on international research findings)

## DISADVANTAGES OF THE 2 PLUS 1 ROAD TYPE

- Slight increase in number of material damage accidents \*
- Need for maintenance of the safety barrier system
- Potential inconvenience for landowners adjacent to a 2 plus 1 road

(\* based on international research findings)





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