

# *Centre Line Road Markings-Help or Hindrance?*



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*White line road markings have been around for decades. Centre line markings can influence driver and rider behaviour, depending on the nature of the road, the layout of the markings, and the type of accidents amongst other criteria. Increasing or decreasing the length of the centre lines could be used to influence a driver's speed choice. All these road markings or signs provide valuable information and should be clearly understood by all motorists. Road markings are provided to assist and maintain control of traffic and to enable the safety of all road users, including pedestrians, animals and properties. White lines along the centre of the road have been removed in parts of the UK, with some experts saying it encourages motorists to slow down. So, is it the beginning of the end of for centre road markings? This article delves into the history of white line road markings, their meaning and why some experts say they've outlived their usefulness. However, some drivers have described this view as "Absurd, Barmy and Crazy"! Finally, a conclusion is given.*

# Centre Line Road Markings – Help or Hindrance?

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*“An authorised continuous white line along the centre of the roadway shall indicate that traffic must drive on the left of the line, and when on a stretch of roadway on which such a line has been provided, a driver shall, save for the purpose of entering or leaving land or premises adjoining the right hand side of that roadway, drive to the left of the line”.<sup>1</sup>*

**B**ack in the 70s, during the quiz show – Sale of the Century (GB) - quizmaster Nicholas Parson’s asked a contestant the meaning of double continuous white lines in the centre of the road. The lady contestant answered promptly and confidently saying: ‘no overtaking’. “Wrong” said Nicholas, “it means keep left, do not cross the lines. Ergo, this lady missed out on a prize due to her lack of knowledge regarding white line road markings. The above answer is given by many learner drivers when questioned by their trainer during driving lessons. However, it’s possible to overtake without straddling or crossing continuous white lines and I’m sure most readers will be aware of these instances. White lines have been synonymous with road safety for over a century, and it’s no coincidence that the first white line road markings appeared around the same time as the first wave of mass-produced cars. White lines vary from centre line markings, hazard lines, single white lines, double white lines, single white lines flanked by a broken line on the opposite side, a single white line flanked by a broken white line on your side etc. Also, there are areas of white diagonal stripes or chevrons which separate traffic lanes or to protect traffic turning right. And there are reflective studs which can be used in conjunction with white lines. All these road markings or signs provide valuable information and should be clearly understood by all drivers on the road. Road markings are used to maintain the control of traffic, parking regulations and to enable the safety of all road users, including pedestrians, animals and properties. Today, it is easy to take this simple innovation – white lines – for granted, but the enormous impact they have around the world to maintain lane discipline, and avoid oncoming traffic and other potential hazards - cannot be overstated.

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<sup>1</sup> S.1. No. 294/1964 Road Traffic General Bye-Laws 1964. (Ireland).

All road markings and road studs placed on a highway or on a road to which the public has access as defined on Section 142 of the Road Traffic Regulation Act 1984 as amended by the New Roads and Street Works Act 1991, must be either prescribed by Regulations or authorised by the Secretary of State for Transport for installations in England (the Department of Infrastructure in Northern Ireland (NI), the Scottish Government or the Welsh Government as appropriate.

### **History**

It is not clear whether this is a historical fact or myth, but it is said that the first ever road marking – a continuous central line along the road surface – appeared in Rome on the first Jubilee year which was celebrated in 1300 A.D. The reason was that some 200,000 people gathered there for the occasion which was a considerable number for the roads and tracks of the time. For this reason, Pope Boniface VII ordered a separation line to be painted down the middle of each road. This was not done to separate two directions of travel, but rather to separate the different means of travel: people on foot on one side, horses and carts on the other.<sup>2</sup> With the advent of cars towards the end of the 19<sup>th</sup> century, cars, carriages and bicycles shared roads for decades with no major problems or the need for road markings. But the ever-increasing speed at which cars travelled coupled to the rapidly increasing number of cars and roads – many of which had rather dangerous stretches – soon made road markings a necessity rather than a convenient feature. And here is where history and legend blur together again, although there are some documented cases as to origin. In the US, the first road in which markings were painted was a road in Wayne County, Michigan. The story goes that the person responsible for the maintenance of public roads had the idea for road markings, when he saw a milk lorry dripping a trail of milk on the road. It is not clear whether this is what actually happened or whether the story was later embellished, but the fact is that there is documentary evidence of this road with markings around this time.

### **Doc Mc Carroll- An Innovative Trailblazer!**

Road markings are one of those things drivers tend to take for granted, but obviously someone had to first think of the idea, and credit for it is given to Doctor June Robertson McCarroll of Indio, California. In 1917, she was driving home in her Ford Model-T at dusk after visiting a patient, when a truck forced her off a narrow road into a sandy ditch. It wasn't the first time that this had happened. Apparently, the truck driver who was transporting a load of chickens had difficulty judging where his half of the road ended.

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<sup>2</sup> Alvaro Ibanez May 2008. *Markings on roads and motorways: How they came about?* [blogferovial.com](http://blogferovial.com)

Later, while driving on another newer road she noticed that the road had a definite middle joint where it had been widened from eight to sixteen feet. The pronounced middle ridge caused cars to stay on their own side. She decided that a centre line painted down the middle of the road would serve the same purpose. Known for her confidence and straight talk, she took her idea to the County Riverside Board and the Chamber of Commerce. They gave her a polite ear but nothing else. She then decided to take direct action. She actually got down on her hands and knees and painted a two-mile-long four-inch-wide line down the centre of the road that passed in front of her house in Indio Boulevard. She was sure her example would illustrate the idea's safety benefit, but change was slow to come. For seven years she wrote letters and petitioned the county and state to adopt the white lines. Finally, with the support of the Indio Women's Club and the California Federation of Women's Clubs - which had previously campaigned to add roadside markers – and to preserve El Camino Real–she prevailed. In 1924, the legislature authorised the State Highway Commission to paint centre lines on 3,500 miles of roads at a cost of \$163,000.

### **Originator Of The Idea**

From Doctor June's idea sprang colours, stripes and other markings on streets and highways to enhance motoring safety. By the time she died in 1954, lining highways was commonplace across the country. However, there was some controversy since two Michigan men – Kenneth Sawyer and Edward Hines – apparently had the same idea before Doctor McCarroll and they even painted some lines on the road. But unlike her, they didn't try to get their State Government to adopt their idea. Therefore it appears that Doctor June McCarroll rightly gets the credit as the originator of the idea. Today, we take for granted white lines along the centre of roads and forgot that it was the tireless and persistent determination of a remarkable woman that led us to adopt this simple but very important idea. Doctor McCarroll is also credited with opening the first library in Coachella Valley as well as being the one doctor to practice medicine in all of Coachella Valley in the early 1900s. She was the first doctor appointed by the Bureau of Indian Affairs in 1907 and later California State officially designated a stretch of Interstate 10 near Indio as "*The Doctor June McCarroll Memorial Freeway*".<sup>3</sup>

### **Your 'Faithful Companion'**

White lines along the centre of the road have been removed in parts of the UK, with some experts saying it encourages motorists to slow down. So, is it the beginning of the end of for centre road markings?

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<sup>3</sup> As told to the Los Angeles Times (12 October 2003). [weirduniverse.net](http://weirduniverse.net)

You are driving along the road when the broken white line that has been your ‘faithful companion’ for so long – separating your car from oncoming traffic - suddenly disappears. But will the absence of your ‘faithful companion’ make you slow down and be a safer driver? The first trials to remove the central white line from roads were held in the UK around 2006. Wiltshire County Council stopped repainting some lines when roads were resurfaced between 1997 and 2002. The authority concluded there were safety benefits to removing them from roads with a 30mph or less speed limit. White lines have since disappeared in about 20 roads in the county. More recently, sections of three roads – one in central London and two in Croydon – had their lines removed as part of a small trial, which began in 2014. Transport for London (TfL) suggested there has been a “*statistically significant reduction in vehicle speeds as a result of removing the central markings*”. Speed reduced by as much as 8mph in one road, it added. A report by TfL in the trial in London suggested white lines gave drivers a “psychological sense of confidence”. Alan Bristow, Director of Road Space Management at TfL said trials in London were still being “monitored closely to understand the longer-term effects”. He said the results had been “positive”, but added: “*There are no plans for any removal of road markings*”.

### **Visibility Distance**

There are a variety of factors that influence the visibility distance of road markings. It is increased when a line is wider, has a higher mark-to-gap ratio or has a higher coefficient of retro-reflected luminance (in the day time, higher contrast with the road surface). Visibility distance is adversely affected by glare from oncoming vehicles, dirty headlamps or windscreen and especially by rain; the glass beads which produce the night time luminance are drowned by excess water, greatly reducing the brightness of the line. Older drivers also see a marking less well than younger drivers; someone seventy years old might suffer a reduction in visibility distance of more than 20% compared with drivers still in their twenties. The marking regime prescribed in the UK generally gives adequate levels of guidance in good conditions, i.e. where the road is dry, the driver is young, the vehicle has clean, powerful headlamps and there is no glare from oncoming vehicles. On roads with high traffic speeds, wider lines should normally be adopted where alternatives are prescribed. It is important that guidance markings are well maintained. Severe wear reduces both effective width and retro-reflective performance, and hence the visibility distance. However, road markings have limitations. Visibility of the markings can be limited by snow, debris and water on or adjacent to the markings. Marking durability is affected by material characteristic, traffic volumes, weather and location.

However, under most highway conditions, markings provide important information while allowing minimal diversion of attention from the roadway.<sup>4</sup> Road markings can be completely obliterated by snow. Their conspicuity is impaired when wet or dirty, and their effective lifespan is reduced if they are subjected to heavy traffic. It is essential that road markings should not prevent a carriageway from standing draining properly. Even a thin film of water can be dangerous in winter when it may freeze.<sup>5</sup>

### **“Absurd, Barmy and Crazy”!**

So why do motorists slow down when there is no white line(s)? Tracy Jessop, Assistant Director of Transport at Norfolk County Council said: *“In most cases we’ve noticed some positive impacts on the road network and there have been reductions in speed”*. Ms. Jessop added that experiments have been extended to roads cycle routes that cross cities. She went on to say: *“Drivers change their behaviour because they no longer feel that they have their own lane, so they tend to be more attentive, more cautious, and that does reduce their speed. It also reduced their journey times because they all became a little bit more aware of people around them, and that has been very helpful for casualty reduction”*.<sup>6</sup> Edmund King, President of the Automobile Association (AA) said he asked followers on Twitter whether central white lines should be removed and people had told him the idea was “absurd, barmy and crazy”. Mr. King said faster roads “definitely” required centre lines adding that new cars fitted with lane departure systems also required white lines. He added that schemes did work on “smaller quieter roads” but warned geographical differences could be “confusing to other road users”. He said the concept of “shared space” on roads comes from Dutch engineer Hans Monderman, who removed traffic lights, lane markings, and even kerbs in some towns and cities. *“In medieval Dutch villages, with little through traffic, it can work well and pedestrians and cyclists can interact with drivers”*, Mr. King said. But he added: *“It depends on the road whether it will work or not”*.<sup>7</sup>

### **Meaning of Centre White Lines**

- A broken white line marks the centre of the road, you must keep to your left but you may cross over if it’s absolutely safe to do so.

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<sup>4</sup> Manual on Uniform Traffic Control Devices. US Department of Transportation. Federal Highway Administration. [mutcd.fhwa.dot](http://mutcd.fhwa.dot)

<sup>5</sup> Traffic Signs Manual, Chapter 5. Road Markings 2018. DfT London TSO.

<sup>6</sup> John Harrison. February 2016. BBC News. *Are roads safer with no white lines?*

<sup>7</sup> John Harrison. February 2016. BBC News. *Are roads safer with no white lines?*

- When a broken white line(s) on the road become longer and the gap between them is shorter, this indicates that you are approaching a hazard.
- Single or double continuous white lines mean keep left, you must not cross.
- Double white lines where the line nearest to you is solid - means you must not cross or straddle it. However, if you need to enter land or premises you may cross over if it's absolutely safe to do so. Also, you may cross to pass a parked vehicle, road works or other obstruction or if a police officer directs you to do so. (In GB, you may cross the line if necessary, provided the road is clear, to pass a stationary vehicle, or to overtake a cyclist, horse or road maintenance vehicle, if they are travelling at 10mph (16km/h) or less).
- If there are double white lines in the centre of the road and the line nearest to you is broken, you are allowed to cross over provided it's absolutely safe to do so. However, you must be able to get back before the line becomes solid again. Throw-in arrows will indicate that you need to get back to your lane.
- Reflective studs may be used in conjunction with white lines.
- A single white line runs along the edge of the carriageway help keep the driver stay clear of the side of the road, allowing for a safer journey for everyone. Some edge lines will have "raised ribs" or "rumble strips" to alert drivers if they are straddling the edge line.<sup>8</sup>

### **3-Dimensional Effect**

Centre line markings can influence driver and rider behaviour, depending on the nature of the road, the layout of the markings, and the type of accidents along a stretch – amongst other criteria. Increasing or decreasing the length of the centre lines could be used to influence a driver's speed choice. Reducing the distance and spacing of the central markings on roads with lower speed limits may encourage road users to slow down. Increasing the width of the centre line or creating a hatched section encourages drivers to stay away from the middle of the road. This also affects a driver's speed choice by decreasing the perceived width of the carriageway, and increasing a vehicle's proximity to the road side. This approach can also be combined with painting to create a three-dimensional effect when observed from a driver's or rider's point of view. One Australian paper<sup>9</sup> looked at the effects of wide centre markings with painted hatching, and found that they reduced speeds. The researchers set out that the marking created an enhanced peripheral visual speed perception, leading to drivers estimating that they were travelling at higher speeds, and therefore slowed down.

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<sup>8</sup> Alvaro Ibanez May 2008. *Markings on roads and motorways: How they came about?* blogferovial.com

<sup>9</sup> Godley, S.T. *et al.* Ergonomics 2004; 47 (3) : 237-56. *Perceptual lane width, wide perceptual road centre markings and driving speeds.*

### **Centre White Lines & Channelization**

Centre lines are used for hazard marking (e.g. use of double white lines at bends). They may be used with hatching for channelization, in order to reduce lane width and increase the separation between the two directions of traffic, which may be particularly desirable on bends. The increased segregation does not necessarily reduce speeds however e.g. **Kennedy and Wheeler, 2001A.**<sup>10</sup> The absence of centre white lining can increase uncertainty for drivers and removal of the white lining on moderately narrow rural roads has therefore been suggested as a means of reducing vehicle speed. Results for the village of Stiffkey in Norfolk, where speeds were already low, indicated a slight reduction in mean speed when the centre white line was removed **Kennedy and Wheeler, 2001A.**<sup>11</sup> Unpublished research indicated a reduction of 7 mph in mean speed in Starston, another Norfolk village, when the centre white line was removed. **Yagar and Van M. Aerde (1983)**<sup>12</sup> found that the addition of a centre line had little effect on driving speeds.

### **Better Road Safety**

In order to achieve safe and efficient operation of a highway network, it is essential that all signing provided is necessary, clear and unambiguous and gives its message to road users at the appropriate time. The message must be easily understood at the point it is needed, neither too soon that the information may be forgotten, not too late for the safe performance of any necessary manouvere.<sup>13</sup> For road markings to be effective they need to be clearly visible both day and by night. Road Markings have two principal functions. The first is symbolic: the driver needs to have learned, for example, that a hollow triangular marking with its apex downwards means “Give Way” (*inverted triangle Ed*). The second is guidance, centre lines, edge lines and lane lines help drivers to maintain their lateral position on the road. The guidance function is less critical (although still important) in daylight or on lit roads because there are many visual clues available to enable the driver to judge course and position. On unlit roads at night, conditions are very different; the visual stimuli in the distance and to the sides of the road are largely absent. Road markings then become the most important aid in enabling the driver to follow the road. Some markings, for example, hazard lines and double white line systems have both symbolic and guidance functions. Collaborative European research has shown that drivers need to be able to detect guidance markings at a distance equivalent to a minimum of two seconds of travel time.

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<sup>10</sup> Kennedy, J. V. & Wheeler, J. H. (2001A). *Norfolk Quiet Lanes Schemes*. (TRL Report 564). trl.co.uk

<sup>11</sup> *Ibid*

<sup>12</sup> Yagar, S. & Van M. Aerde, (1983). *Geometric and environmental effects on speed on two-lane rural roads*. Transportation Research Record.17A, 315. (TRL Report 564). trl.co.uk

<sup>13</sup> Traffic Signs Manual, Chapter 5. Road Markings 2018. DfT London TSO.

If the visibility is less than this, drivers tend to adjust too late when the road changes direction. They run too close to the centre line on left-hand bends and too close to the edge on right-hand bends. (*Advanced drivers? Ed.*) The higher the prevailing traffic speed the greater the visibility distance required to maintain this two-second “preview time”. If is not provided, drivers tend to miss the curve or proceed in a series of staggers.<sup>14</sup>

### **White Line Composition**

The effectiveness of white line road markings owes much to chemistry and specifically to titanium dioxide (TiO<sub>2</sub>). White line markings can only serve a purpose if they can easily be seen by all road users, in all in all conditions. Titanium dioxide plays a crucial role in ensuring this is the case. It is among the brightest white substance in the world and the way it interacts with light means, even at night or in poor weather conditions, white road markings display prominently in car headlights. This gives motorists the best possible chance to follow the road safely. White line road markings are made using thermoplastic resin mixed with titanium dioxide pigment and glass beads. The pigment provides a bright white highly visible colour, and the beads act as ‘retroreflectors’ – which means they reflect some light back to its source. At night the light from a car’s headlights will reflect from the white line markings back to the driver, helping him to see the road easily. Titanium dioxide used in white road markings helps to prevent traffic accidents by making it possible for drivers and cyclists to travel more safely. Without bright white light road markings, more and improved street lighting could be required, with high economic cost. Many countries have specific requirements to ensure that road markings are bright, visible and clear. For example, within the European Union (EU), road markings are required to meet minimum performance standards based on their luminance, day-time visibility, night-time visibility, skid-resistance and durability.<sup>15</sup> Such standards are perhaps part of the reason we are living in an age when road safety standards have never been better. Since 2010, the number of fatalities recorded each year on EU roads has fallen by nearly a fifth<sup>16</sup> and the EU has a strategic target to halve the number of road deaths between 2010 and 2020.<sup>17</sup> While there is a huge range of factors that contribute to road safety – titanium dioxide certainly has an important role to play in the prevention of KSIs on our roads.

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<sup>14</sup> Traffic Signs Manual, Chapter 5. Road Markings 2018. DfT London TSO

<sup>15</sup> European Federation: *White lines save lives*. tdma.info

<sup>16</sup> European Commission: *2016 road safety statistics: what is behind the figures?*

<sup>17</sup> European Commission: *2016 road safety statistics: what is behind the figures?*

## Conclusion

Road markings are used to maintain the control of traffic and to enable the safety of all road users, including pedestrians, animals and properties. Today, it is easy to take the simple innovation – white lines – for granted, but the enormous impact they have around the world to maintain lane discipline, and avoid oncoming traffic and other potential hazards - cannot be overstated. White lines along the centre of the road have been removed in parts of the UK, with some experts saying it encourages motorists to slow down. So, is it the beginning of the end of for centre road markings? You are driving along the road when the broken white line that has been your ‘faithful companion’ for so long – separating your car from oncoming traffic - suddenly disappears. But will the absence of your ‘faithful companion’ make you slow down and be a safer driver? The first trials to remove the central white line from roads were held in the UK around 2006. Wiltshire County Council stopped repainting some lines when roads were resurfaced between 1997 and 2002. The authority concluded there were safety benefits to removing them from roads with a 30mph or less speed limit. White lines have since disappeared in about 20 roads in the county. White centre line markings have been with us for a long time and many drivers will attest to their usefulness. They are after all; road signs (markings) giving us advance warning of hazards ahead. This then, must surely help us to drive more safely and confidently. It’s hard to imagine “naked roads” bereft of any type of helpful information which we have become so familiar with. Removing white lines road markings would be akin to removing all upright warning signs, signs that give us important information of upcoming hazards. Whether or not, white lines will be eventually removed from our road remains to be seen. However, in the meantime, drivers will continue to be guided by those bright “retroreflectors” to assist them in reaching their destination more quickly, more safely and unscathed. Finally, Dutch engineer Hans Monderman *et al* may have a point, but Edmund King’s followers on Twitter clearly demonstrated their objection to the removal of central white lines when they categorically stated that the idea was “absurd, barmy and crazy”.