Using road plates to reduce congestion

Road plates for transverse openings

QWIRC3 describes the use of road plates to cover transverse excavations in the road. This can reduce congestion by allowing carriageway lanes to be opened to traffic before works are completed, for example during peak traffic periods. TfL encourages the use of plates to reduce congestion

The Mayor of London and Transport for London (TfL) is to implement a targeted Lane Rental scheme in 2012 that will allow TfL to charge companies a daily fee for undertaking road and street works on London's busiest roads at the busiest times. The Lane Rental scheme will help incentivise more efficient working practices and reduce disruption from road and street works, which it is estimated costs the Capital's economy around £750 million a year. Around £300 million of this is on the Transport for London Road Network (TLRN) or on Red Routes.

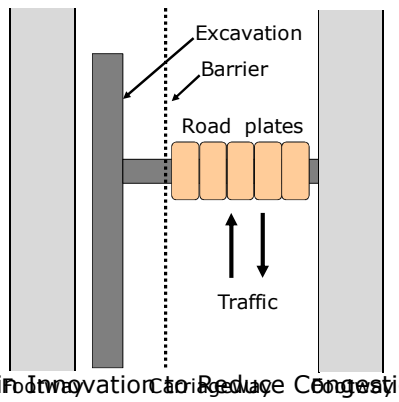
To help minimise the amount of time that works disrupt traffic, there is need to encourage the highway construction industry to deliver a real step change in the way that road and street works are planned and carried out. Greater use of road plates can help to deliver that change.

At present, road plates are used in a limited number of situations and this is partly because of a lack of information on them and guidance on their use. This 'Quick Win Innovation to Reduce Congestion' (QWIRC) Note, produced on behalf of TfL and the DfT, is to provide road works contractors, utility companies, highway authorities and equipment suppliers with information on how to employ road plates at transverse openings to reduce the impact of road and street works on traffic congestion.

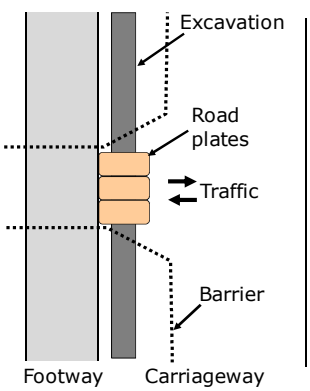
What types of plate are available?

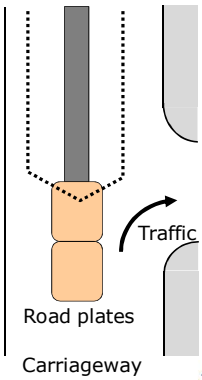
Small metal plates and plastic composite plates are available for use at narrow trenches that run transversely across the carriageway (including those that are slightly angled). These trenches are usually no more than 500 mm wide, but can be up to about 700 mm wide. As well as allowing traffic to use the carriageway, plates are used to provide access to side roads, car parks, retail outlets, businesses and properties. They come with an appropriate anti-skid surface.

Narrow transverse trench



Access to driveway, car park, side road etc.





Plain steel plate, which must have an anti-skid coating, are also used to cover trenches and small rectangular openings. Such plates are readily available and come in a range of sizes, with plate thicknesses up to 25 mm widely available. They are most commonly used for narrow excavations (often less than 500 mm wide).

Why and when should plates be used?

The main reason to use plates is to reduce congestion, although they can reduce the overall cost of the works, (taking into account Lane Rental charges, the cost of the plates and effect on the works) and enhance public perception. Also, a highway authority may prevent lane closures at certain times to make the use of plates more attractive if they avoid the need for immediate or interim reinstatements, or changes in working practices to prevent lane closures in peak periods. The times when plates are often used include:

- Each peak period
- During the day, including both peak periods
- During the week so work is undertaken at weekends
- For special events

The time needed to install and remove shoring and plates must be taken into account at the planning stage, together with the requirements for plant and equipment.

Guidance on plates for transverse trenches

The main requirements for plates at transverse trenches are as follows:

- The plate must be able to support traffic
- The excavation must not be at risk of collapse
- All road users must be able to cross the plates safely, including pedal and motor cyclists
- Noise levels and other environmental impacts must be acceptable

Wheel loading

Plates must be designed for the type and speed of the traffic that may cross them. Plates should be clearly marked with the maximum trench width and maximum speed for which they have been designed. The maximum speed may differ whether plates are surface mounted or recessed. Small metal plates and plastic composite plates have been used extensively on low speed roads. More onerous loading requirements apply to high speed roads. Information on the design loading is available from the TRL Website (www.trl.co.uk/reducingcongestionfromhighwayworks). For example, typical thicknesses of 1.22m (4') wide steel plates (in the direction across the carriageway) that are simply supported on either side or an excavation (i.e. supported on just two sides) and carry heavy goods vehicles are shown below. Thinner plates may be used with different support conditions and lighter traffic, subject to a full design with supporting calculations.

Width of excavation (m)	Minimum length of plate in traffic direction (m)	Approximate thickness of 1.22 m wide steel plate for heavy traffic (mm)
0.5	1.3	25
0.7	1.5	30
1.0	1.8	35
1.2	2.0	40

Shoring

Practical steps must be taken to ensure that any excavation does not collapse, and the 'Red Book', the Construction (Design and Management) Regulations and Construction Plant-hire Association documents should be referred to for guidance on shoring. Forces induced by wheel induced loading are likely to be applied to the road surface nearer to the edge of an excavation when plates are used rather than when they are not. This must be taken into account in the risk assessment to determine whether shoring is not required.

The shoring must enable the excavation to the plated, i.e. it must not protrude above the road surface (or slightly lower if plates are recessed). It will be necessary to fit kick boards and barriers to the shoring or edge of the excavation for times when the plates are not in place.

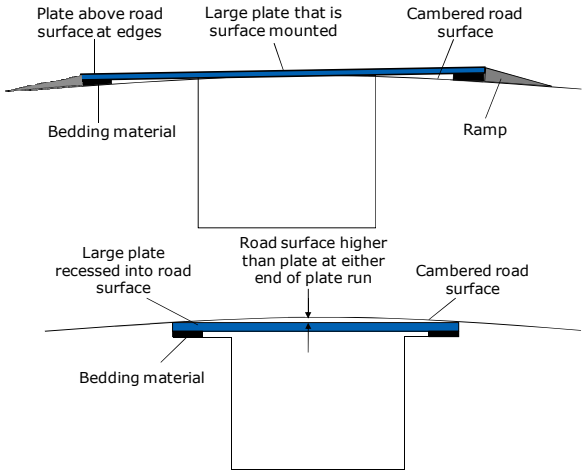
Handling

Small road plates are easy to handle and place. However, even if they are easily handled by two persons, mechanical handling is preferred for long runs.

Large road plates can weigh several hundred kilograms so lifting equipment must be available on site which has appropriate reach. The safety zone may need to be increased when they are being positioned so they do not swing into traffic.

Road profile considerations

Small road plates are designed to be surface mounted and, being small, they are likely to follow the road profile without the need for bedding material.



Large steel plates are less likely to follow the road profile than small plates when there is a camber. Bedding material should be used to support the edges, and to prevent rocking and local flexure. Ramps should be formed at edges to smooth vertical height changes greater than 6 mm (see *Traffic Advisory Leaflet 07/96*), taking into account all road users.

It may be possible to avoid large ramps by recessing the plate into the road surface. It is necessary to bed the plate so it is uniformly supported and some ramping will be required when the plate is not level with the road surface.

Fixing

Plates must be secured so they are not displaced by traffic. Information on the braking and traction forces is available from the TRL Website.

Some small plates have fittings that engage with the sides of the trench just below the road surfacing to provide some resistance to displacement by traffic at transverse trenches. Plates can be fixed to the road by bolts, although it may not be necessary to fix every plate in a run. Fixing arrangements may vary depending on the plate type and the manufacturer's recommendations, and may also depend on the type and speed of traffic. Fixing should also be sufficient to prevent theft and vandalism. Small plates can interlock to provide additional stability and security. Bolts should ideally be countersunk below the surface of the plate.

As an alternative to bolting, composite plates may be secured by a locking mechanism that extends out against the shoring or sides of a trench. It may be necessary to use a locking mechanism on every plate, but this method of fixing may be more straightforward than bolting in terms of time required.

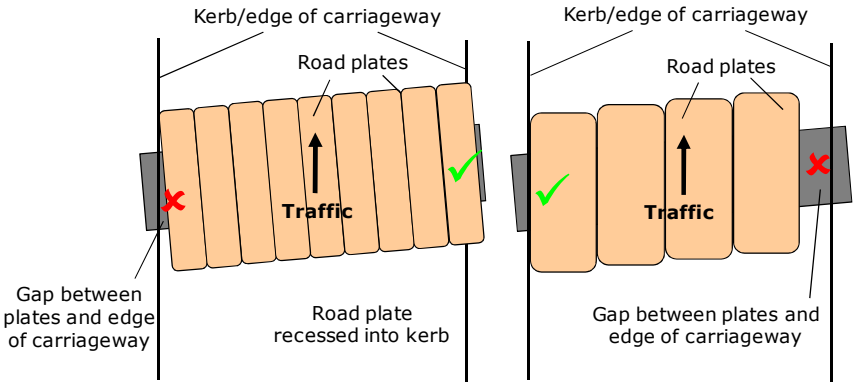
Large steel plates must be bolted down. Recessing provides additional resistance against braking and traction forces. Generally, the noise induced when large plates are trafficked will be lower the better they are fixed and the more uniformly they are supported. Rubber pads should be avoided at the positions of the bolts because they can become unsecured when the rubber is loaded and unloaded.

Signing, visibility and lighting

Ideally, road users should cross plates at a reasonably uniform speed with little braking. The 'Red Book' and *Chapter 8* guidance should be followed. Ramp warning and slow signs should be used, whether plates are recessed or surface mounted. If required, signs should indicate the maximum speed at which the plates should be crossed. It may be necessary to introduce a lower speed limit through a Temporary Traffic Regulation Order with appropriate enforcement. Small surface mounted metal plates have been trafficked at speeds up to 30 mph. Some surface mounted composite plates are up to 80 mm above the road surface at their highest point, so the speed at which these are crossed needs to comply with the manufacturer's recommendations.

Road lighting should be considered to improve the visibility of plates and help road users cross them safely (see *Traffic Advisory Leaflet 07/96*).

Practical issues



Care is needed to avoid gaps between plates and the edge of the carriageway at the end of trenches that are not normal to the carriageway. All gaps must be protected. If necessary, plates should be extended into the footway or verge to prevent gaps. Plates that do not interlock can be staggered and extended on only one side of the carriageway. The full width of openings should be plated to avoid TfL's Lane Rental charges.

Case study: an innovative use of welded plain steel plates

A trench running diagonally across the carriageway, and approaching one metre in width, was covered by a series of 30 mm thick steel plates. These were large plates that overlapped the edge of the trench substantially, and all the plates were welded together to form one large, stiff, heavy plate that was sufficient to resist traffic loading. The plates were bolted to the carriageway and ramps formed around all edges. The plates were in place for over seven weeks at a busy road junction without any reported problems. This approach was feasible at this site because regular access to the trench was not required.

This Note has been prepared by TRL Limited under the 'Reducing Congestion' project funded by DfT and TfL and has been approved by TfL.

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