The Long Crossing – a review of pedestrian crossings through shuttle-controlled signals

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Summary

Dumfries and Galloway Council have been approached by a developer wishing to form an active travel (pedestrian and cycle) link across Nith Bridge, on the A702, near Thornhill in Scotland. Nith Bridge is an 18th century listed stone arch bridge, with the centre section being 45m long and 4.5m wide.

Shuttle traffic signals are proposed, with an all-red period to allow pedestrians and cycles to cross the centre section safely, a distance of approximately 50m in total.

A crossing of this length is unusual in the UK, however there are examples of crossings over end-to-end over shuttles. This paper reviews installations in operation around the UK, and looks at issues that need to be considered in such a design.

Nith Bridge, Penpont near Thornhill

Nith Bridge is located on the A702, in the parish of Penpont, just outside the village of Thornhill in Dumfries and Galloway. It is an historic 18th century stone arch bridge, carrying the A702 road over the River Nith. It is Category A listed.

Nith Bridge – First Image – Historic Environment Scotland – Crown Copyright

The road is 4.5m wide as it crosses the narrow section over the arch spans which is 45m long. There are refuges built into the cutwaters at the top which provide a convenient place for pedestrians to wait, either to avoid passing traffic or enjoy the views. There are no footpaths provided at present, either leading to or on the bridge.

Due to the narrow width of the bridge, traffic is one direction at a time over the top hump of the bridge. Road narrows warning signs are provided on the approaches and traffic needs to give and take to cross the bridge. There are currently no traffic signals installed and the national speed limit applies, although actual speeds are lower due to the road geometry and hazards associated with crossing a narrow bridge.

The Penpont Trust is proposing a shared footway and cycleway leading upto the bridge, requiring a link over the River Nith. A separate bridge has been rejected primarily on the grounds of cost. The next crossings of the river are located 3 miles to the north, and 6 miles to the south. As a listed structure, a method of safely facilitating a crossing for pedestrians and cycles is required.

In order to allow pedestrians and cyclists to safely cross the bridge, it is proposed that shuttle signals for traffic are installed with an all-red period to allow time for a controlled crossing to run.

Allowing space for a waiting area, the crossing length would be approximately 50m, so a clearance time of 42s would be required at a walking speed of 1.2m/s.

Advice and guidance on signalised crossing facilities

Standalone pedestrian crossings, and signal controlled crossings at junctions, are generally designed to provide straight and direct crossing points between two footways on opposite sides of the road. As engineers we are encouraged to keep crossings short, placed at the narrowest crossing point of the junction, and perpendicular to the footway edges.

There is very little advice as to a maximum length of a crossing. In the superseded LTN 2/95 “The Design of Pedestrian Crossings” it suggested that over 15m a crossing should be staggered and over 11m that consideration should be given to staggering. Note this applied to standalone crossings only and this advice is not in Chapter 6 of the Traffic Signs Manual.

Practical timing limits

Noting that the tables for setting pedestrian clearance times in Chapter 6 have upper limits quoted, these can be used to determine a “maximum” crossing length.

Type	Fixed clearance	Extendable clearance	Additional clearance (variable extends to max)	Additional fixed clearance	Maximum clearance	Length at 1.2m/s
Nearside Puffin Standalone	1-5	0-30	0	0	35	42m

Nearside Toucan Standalaone	1-5	0-22	0	0	27	32.4m
Farside Standalone	3	0-22	3	1	25	30m
Farside Standalone with Countdown	No upper limit	0	0	3	-	-
Pedestrian Countdown TOPAS limits	3-30	0	0	3	33	39.6m
Farside Junction	3	0-12	0	1-3	18	21.6m
Nearside Junction	1-5	0-30	0	0	35	42m

Although of interest here, I don't believe the maximum limits have been set to give an upper limit on crossing width, but more as an indicative limit for controller manufacturers to design to.

Alternatively the normal convention to not allow the overall cycle time to rise above 120s can set be used to determine a maximum practical width. Allowing a maximum of 14s for traffic phases (for example) this gives an upper limit of 72m on the crossing length. With low traffic green times, whether this would work in practice depends on the traffic flows at the site.

Signalised crossing facilities in the UK

Although unusual, there are a number of signalised crossing facilities in the UK at shuttle signals where pedestrians (and occasionally cyclists) cross the shuttle area from end to end.

The table below summarises a number of these:-

Location	Site type	Crossing type	Nearside / Farside	Distance	Tactile paving	Footpath delineated
Pinfold Lane, Penkridge, Staffordshire	Under railway	Pedestrian	Nearside	18m	Yes	Yes
Seamon's Road, Altrincham	Over canal	Pedestrian	Farside	21m	No	No
Green Lane, Blackburn	Over canal	Pedestrian	Nearside	21m	Yes	Yes
Cool Oak Lane, Brent Reservoir, London	Over river	Pedestrian	Nearside	32m	No	No

Lochburn Road, Glasgow	Under canal	Toucan	Nearside	32m	Yes	No
A830 Beasdale, Highland	Under railway	Toucan	Nearside	50m	No	No
B5239 Standish, nr Wigan	Over canal	Pedestrian	Farside	22m	No	No
Park Road South, Newton-le-Willows	Under railway	Pedestrian	Nearside (farside green man box?)	20m	Yes	No
A590 Derby Arms Underpass, Cumbria	Under main road	Pedestrians and cyclists	Nearside	30m	No	No
Station Road, Carluke	Under railway	Pedestrian	Nearside	13m	No	Yes
Nith Bridge, Thornhill (proposed)	Over river	Pedestrians and cyclists		50m		

Site Visits of Shuttle Sites with Long Crossings

As part of research for the paper, I have visited many of the sites in operation around the country. Please see the recording of my presentation given at the JCT Symposium 2025 for full details. Pictures of selected sites below.

Seamon's Road, Altrincham

Station Road, Carluke

Pinfold Lane, Penkridge

Analysis of sites

The majority of examples are situated within quiet urban settings, although none of them are in particularly busy locations. Distance covered for the controlled crossing / shuttle length tend to be in the range 13-32m, although the rural example near Beasdale in the Highlands at 50m is a notable exception.

Pedestrian Display Types

There are a mix of nearside and farside displays used, largely reflecting the age of the installation and the authority's preference at the time of installation. Each have their usual pros and cons for the differing types of display, which are exacerbated by the longer distance of the crossings.

Nearside Displays

With nearside displays the viewing distance is not an issue when waiting to cross, however there can be a long distance in no-man's land where you are trusting on the timings of the signals to keep you safe from the traffic.

Audible devices can help as well to reassure you that the crossing period is still running as you step out on to the crossing. Green man times can be kept tight as well as required, however this also means the audible sound (if provided) will end well before the crossing is traversed.

Farside Displays

These can give reassurance that the crossing is still running whilst they are on green man, however the usual dilemma zone is created either during the blackout or when the red man appears. They do give a point to aim at for pedestrians which can be beneficial.

Slightly longer green man times can be useful to avoid this, and again audible devices can be beneficial as well.

Also as the crossings get longer, the displays are further away and can become more difficult to see when waiting for the crossing to change; this can be worse in poor weather or for those with eyesight difficulties.

Pedestrian clearance timings

A number of sites use on crossing detectors to allow the long crossing stages to terminate early if possible. However this also can place a lot of importance on correct operation of the detectors to avoid pedestrians being stranded in the middle of a long crossing when the traffic starts to move.

Note also the distances can push the boundary of the detection zone. For common detectors on the market (plus specification extracted from TOPAS for reference):-

- AGD 326 – 24m range

- Yunex Heimdall – 12m range
- TOPAS 2506A – Max crossing width for detectors – 16m

If the crossing is lightly used, and the distance is long, it may be preferable to take the hit and use a fixed clearance.

Tactile paving

A number of sites do have tactile paving. All sites visited had tactile cones and a number of sites also had audible devices.

The layout of tactile paving is necessarily different from standard crossings. Sites that have tactile paving tended to use two or three rows of tactile paving to mark the edge of the kerb, with no tail. Some sites have the tactile paving at a diagonal angle, directing pedestrians out into the centre of the shuttle lane. This is often required at the waiting zone is in a wider part of the road prior to the narrow section.

Some sites have the suggested pedestrian route marked out in the shuttle lane using coloured surfacing or white lining.

Nith Bridge – Design Decisions

The proposed site at Nith Bridge is fairly unique when compared to many of the other sites that have been reviewed. Particular points at this site:-

1. Long shuttle length 50m
2. Raised “hump back” on bridge
3. Refuges at top which allow pedestrians to wait mid-crossing

Pedestrian detection / variable clearance times

As well as being longer than the other crossings I have reviewed, Nith Bridge is unique in that there are places for pedestrians to wait in the cut waters on top of the central pier. At the moment, these form convenient places to wait to allow traffic to pass. Given the picturesque countryside, it is not unreasonable for pedestrians to want to wait to admire the views at the top. Unfortunately this disrupts the normal assumption of a continuous walking speed through a crossing (normally 1.2 m/s). This also makes the use of standard on-crossing detectors difficult as these will “gap-out” when pedestrians stop.

The long distance of the crossing is also pushing the performance envelope of on-crossing detectors. Therefore a fixed timing may be beneficial at this site.

Pedestrian displays

As outlined previously, the type of displays used (nearside or farside) normally follows the policies of the local authority at the time of installation. In Dumfries and Galloway,

our preference is for nearside displays, although we do have a mixture of nearside and farside sites reflecting a change in policy as nearside technology was introduced and a move to concentrate on nearside displays in recent years.

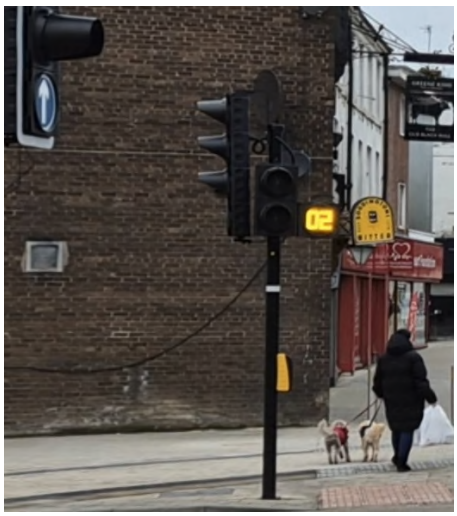
Using nearside displays is therefore preferred. However, the long crossing width, along with refuges at the top of the bridge, can increase the dilemma zone where no displays will be seen. This can be helped by the reassurance of leaving the audible devices running for an extended period, but as we will run fixed clearance time (42s will be required for a crossing width of 50m) the green man time will need to be kept tight to avoid any further additions to the all-red time.

If we used farside displays on the crossing, the long distance would cause difficulties for pedestrians seeing the displays.

This is where a combined crossing solution, combining both nearside and farside display could provide a benefit. We do have form in Scotland for combining nearside and farside display on a crossing, see report here:-

TRL | Trials of farside pedestrian signals at a Puffin crossing

What can also help with a long blackout period is the pedestrian countdown display. This is a well-established technology that counts down the blackout period, and is extensively used in London but has also been used elsewhere in the UK. Due to the long length of the crossing, this will give a reassurance to pedestrians that there is time remaining to cross – or act as a "hurry up" There is always the option for pedestrians of pausing at the refuge at the top.



PcATs over Ring Way in Preston, Lancashire

Standard PCaTS units in the UK are registered under TOPAS 2518A and only need to run up to 30s, which implies a maximum crossing width of 36m. An "export" version with this limit removed will be required here.

By combining nearside, farside and countdown signals we can reap the benefits of each technology at what will be a very unique crossing.

Then there is issue of pedestrians choosing to wait at the refuges. As an historic part of the bridge, the refuges will need to stay, and although we considered filling them in on blocking them off, they will need to stay as part of a listed structure. A call point on a stub pole at the refuge will allow pedestrians to request the pedestrian crossing. This can be a nearside display to give a confirmation of the status of the crossing. Similar to a nearside crossing display on a centre island, this will have a blackout part of the sequence during the clearance period, unless the button is pressed where it will revert to red man.

Other crossing facilities

Tactile rotating cones and audibles will be provided; tactile paving will all be installed to mark the edge of the waiting area and directed at a angle on to the centre of the bridge.

Other considerations

The site is on a section of road under the national speed limit, although speed surveys have shown that actual speeds are lower due to the geometry and hazards present.

The signals will rest on red awaiting a demand to change. MOVA control will be used.

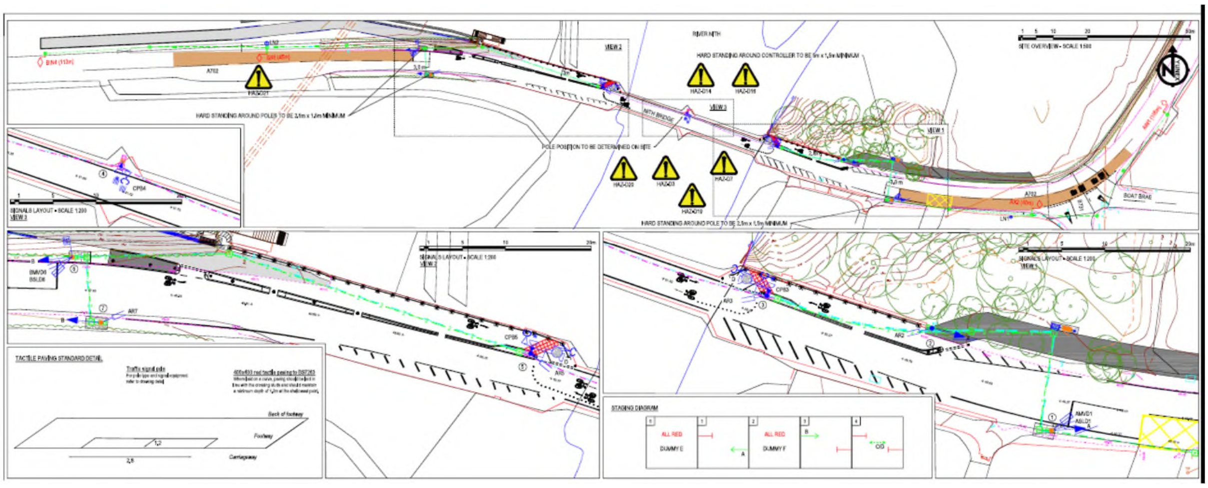
For traffic control a standard shuttle arrangement will be used, with overhead detectors for all-red and loops for the In and X detectors. Overhead detectors will be provided at the stopline to ensure cycles wanting to use the carriageway to cross the bridge are detected.

The controller will be programmed to service a pedestrian demand after either traffic stage to keep waiting times down but will not be allowed to run two pedestrian stages per cycle.

Yunex Traffic have worked on a design on behalf of the developers, and have proposed to use their Plus+ system to minimise ducting requirements; the council doesn't hold any records of the construction make-up of the bridge, although it assumed that some depth is available as there are existing utilities carried on the bridge. Steel ducts will be specified assuming a shallow depth will be required.

Proposed design

The design has been recommended for planning approval by the council, the final proposed design is illustrated below (design by Yunex Traffic).


RIVER NITH
HARD STANDING AROUND CONTROLLER TO BE 5m x 1,5m MINIMUM
SITE OVERVIEW - SCALE 1:500
VIEW 2
VIEW 3
VIEW 1
A702
HARD STANDING AROUND POLES TO BE 2,1m x 1,2m MINIMUM
POLE POSITION TO BE DETERMINED ON SITE
HARD STANDING AROUND POLE TO BE 2,5m x 1,5m MINIMUM
NITH BRIDGE
BOAT BRAE
SIGNALS LAYOUT - SCALE 1:200
TACTILE PAVING STANDARD DETAIL
Traffic signal pole
Back of footway
Footway
Carriageway
STAGING DIAGRAM
ALL RED
DUMMY E
ALL RED
DUMMY F