Are Hurry Calls and Clearance Strategies Needed?

Many of the signalised junctions and roundabouts not just on the strategic road network, have queue detection at the bottom of the off slips at say 160m to 200m from the stopline, or much closer on a roundabout circulatory. Alternatively, the X, IN or SCOOT loop is used as a dual-purpose queue loop which changes the normal mode of control to run a hurry call in an attempt to clear congestion on a particular approach.

Historically, signal roundabouts may have had CLF plans configured or used as backup if MOVA or SCOOT falls off, as a way of guaranteeing coordination and progression around the roundabout with queue loops and hurry call mode for when congestion occurs, usually with call/cancel and prevent periods configured.

For sites on UTC or SCOOT, there may also be clearance strategies configured, either automatically or manually implemented by operators monitoring via CCTV pressing a “big red button”.

For some sites on MOVA, despite, having MOVA facilities to deal with congestion and queues, may also have “Hurray Call” mode configured with queue loops.

Admittedly, historically, with roundabouts running CLF or FT plans and junctions running VA, some additional time may have been needed to assist when there was a random increase in traffic flow or incident, but now with adaptive control being much more widespread, is it appropriate to drop an adaptive mode to basically run a fixed time plan or hurry call, that potentially has never been tested in real traffic conditions?

What do the standards say?

The Traffic Signs Manual Chapter 6 states in relation to Hurry Calls.

8.7.1. A hurry call is used to request the controller to move immediately to a specific stage. It is most often used to give emergency vehicles priority by putting in a demand for a certain stage at the nearest junction. It can be triggered remotely by selective vehicle detection or is sometimes used with a manual switch to provide priority exit for vehicles from emergency services premises (see 24). Hurry calls can also be used as a bus or tram priority measure. They may also be used as a form of queue detection, especially on signal-controlled roundabouts, and to protect against excess queuing from one junction backing up to another junction.

8.7.2. Hurry calls are useful for certain circumstances, but their unpredictability of demand means there is potential for them to reduce the overall capacity of the junction, depending on how often they are called.

The misuse of a hurry call can be prevented by the provision of an override timer, which prevents repeated demands being made within a specified timeframe.

But do hurry calls and clearance strategies make any difference? The interesting part for me is in section 8.7.2 and part of the motivation behind this paper.

"*Hurry calls are useful for certain circumstances, but their unpredictability of demand means there is potential for them to reduce the overall capacity of the junction*,"

Congestion and Causes

There are several reasons for congestion on roundabout circulatory, slip roads or network corridors.

Sub-optimal junction Design. Junction/roundabout at capacity at design stage. How many new designs are submitted with a note such as "intelligent" traffic signals to be installed or queue loops, put in because modelling shows congestion from day one?

Exit Blocking or Downstream Congestion. A blocked downstream exit is a common trigger. If traffic cannot leave the roundabout, vehicles stop on the circulatory carriageway. Once these stationary vehicles block the path of another approach's green light, the entire junction can freeze.

Obstructions. Incidents such as breakdowns, accidents, roadworks on or near the slip road or circulatory create immediate choke points.

Short Internal Storage (Link Length). If the distance between internal stop lines is too short to hold the queue generated by a signal stage, the "tail" of the queue will stick out into the path of other circulating traffic. DMRB CD 116 "*Internal approach lanes less than 15 metres in length can result in the blockage of the exit arm, particularly where HGVs are present."*

Competing Queue Clearance Strategies. Something that is recognised in TOPAS TR2500, with different call/cancel times and Mode Priority levels.

What is not clear to me, is how increasing the green time on one approach, will solve something like the exit from the junction been blocked or a broken down lorry on a roundabout circulatory.

When I worked for local authorities direct or as a consultant, I have put my share of hurry calls in, in fact the very first signal junction I updated/designed to include pedestrian facilities, 35+ years ago had one. The signals operated VA and I was told to include a hurry call in case the pedestrian stage caused excessive queues 150m back to a roundabout.

Queue loops and hurry calls with SCOOT

If you had asked me 20 years ago, what Mode of control to use for a large signal roundabout or interchange I would have said SCOOT, after all, the circulatory is a small network and you want progression and coordination from one node to another. This was before multi-stream or linked MOVA, when different roundabout nodes had to be included in a single multi-phase stage to fix the linking. I suspect most signal junctions on the NH still on SCOOT are for historical reasons only. A large interchange roundabout is not a corridor with an entry and exit at each end, but a

closed loop where congestion at one circulatory stop line can quickly spread around the roundabout.

Previously I have spent hours developing clearance strategies, trigged by queue loops, or occupancy and congestion from SCOOT loops, on large interchanges operating SCOOT, trying to stop a roundabout locking up, or queues extending down the slip road onto a dual carriageway with a 70mph limit. These were often requested by the client or safety auditors, to be seen to be doing “something”, it has mostly become a “standard” and expected at every large installation.

There would be separate fixed time UTC plans usually for each entry arm and a couple for the circulatory. These could be manually implemented if there was a control room monitoring the junction. Or with more work and access to a common database and lots of detection, (expense), automatically implemented.

The only one that every really worked for me, was holding all roundabout circulatory on green and limiting the entries to a minimum for a couple of cycles. A slightly shorter circulatory green still with minimums, then dropping back onto SCOOT.

A well and regular (every five years or when major network changes occur[1]) validated SCOOT installation helps. With all detection working correctly, but who has the money and resources for that? SCOOT validation is not something drivers see, unlike fixing potholes. Who is going to spend money on a system that is meant to be “adaptive” to changes in traffic flow?

To quote Jackie Davies: “*Under SCOOT control, if you get a disruption that takes a traffic lane out of action, you need to tell the SCOOT model that a lane is out of action, so it needs babysitting a bit. Overall, though, I guess my view would be that if you need queue loops and so on, it's worth re-visiting the validation parameters, as it may be possible to get SCOOT to make better decisions based on your validation parameters, provided it knows about any physical changes to the junction.”*

SCOOT whilst good for progression is a bit to clunky for roundabouts with short links and a danger of internal queues blocking roundabout exits. A four (or eight) second cycle time change every 2:30 (or 5:00) minutes when running a 60 second cycle time may be too little too late.

However, as Jackie says, having to tell the SCOOT model that a lane is taken out, maybe ok for planned works of several days duration, but no good for a broken-down lorry at the stop line downstream of a busy motorway off slip, even with multiple different SCOOT plans configured.

Queue loops and hurry calls with MOVA

MOVA control is the default mode of control for most junctions on the NH network. Previously DMRB required Adaptive Control for all Highways England signal installations. With the September 2025 release of DMRB TD101, this was changed to determination by modelling and discussion with the overseeing organisation.

In the NH East Region, prior to me joining NH five years ago, in addition to X and IN detectors, there were additional queue loops further down the off slips and near the roundabout exits (dual purpose X loops) to detect queuing traffic. The queue loops when triggered, would drop MOVA control and introduce a hurry call(s) before returning to MOVA control once the hurry call had expired. This can take several minutes with the signals performing sub optimally.

AG44 the MOVA traffic control manual, does suggest the use of queue detection, including the addition of larger separate queue loops as MOVA loops may fall between gaps in stationary traffic. However, a queue loop at 160 -200m from the stop line which may have 35 vehicles in the lane requiring 70 seconds of green to clear (2 seconds /vehicle at sat flow of 1800pcu) in my opinion is too far away and too late to do anything even if the exits or roundabout circulatory is clear. Correspondingly a queue loop on the circulatory using an X loop at 15m from the stop line, to keep an exit clear is too close and requires a long call, short cancel time, as it will possibly have stationary traffic on it most cycles. Unfortunately, a long call time will not keep an exit clear. In my view AG44 is a little out of date.

In the East Region I generally use one or two experienced MOVA engineers to do my MOVA validation. Both use the facilities already in MOVA for identifying oversaturated links and maximising capacity of oversaturated links. As MOVA can also identify undersaturated links at the same time, this is much better than relying on a single queue loop that has no idea what the congestion is around the rest of the junction.

To quote Jackie *again "I do agree that MOVA will automatically adjust to cope with disruption on the network, and it's the best tool for that kind of standalone junction.*

Within my NH Region the sites are not actively monitored via a control room/CCTV and no manually implemented clearance strategies are configured. Instead, congestion is handled locally by the controller/MOVA.

Removing hurry calls and queue loops, an epiphany

When working for a small independent consultancy I was asked to attend a large five arm signalised roundabout following multiple complaints about congestion and delays at the roundabout. The A14/A10 J33 is a large roundabout to the north of Cambridge. The A10 is one of the main routes to Cambridge and the A14 from the north and there are several business parks to the south of the A14 accessed from the roundabout. The signals are operated and maintained by Cambridgeshire County Council.



Figure 1 A10/A14 Milton Interchange

The southbound queue on the A10 during the morning peak, used to extend back beyond the northern entry to Milton village and drivers used to rat run through the village to use the unsignalled road from Milton village to try and jump a 2km queue. The congestion and queuing was northbound in the evening.

There are two controllers, one the northwest corner the other on the central island in the south, at the time, both operating two stream MOVA. The entries and the roundabout circulatory all had queue loops and hurry calls. In addition, Cambridge Rd had loops at 50 and 120m to call an extended “all red” period to create gaps for the unsignalled arm.

When I arrived on site early in the early morning peak, there were already long queues on all approaches and the circulatory was congested.

Looking in the controllers via handset, watching the manual panel and roundabout, I could see controllers were bouncing between the circulatory and entry hurry calls, triggered by external queue loops and even with the “prevents” running, not allowing MOVA to regain control and become established. I turned all the hurry calls off in both controllers and just let MOVA control the signal timings. This, gradually during the remaining peak reduced the congestion. Over a couple of weeks with MOVA in full time control, drivers got to realise there was no benefit in rat running as there were no queues southbound and the roundabout itself was free flowing. Later MOVA was upgraded and revalidated, without external queue management strategies, always remaining on MOVA. There is little congestion even now, I use the junction a couple of times a month, as my NH office is a couple of miles up the A10.

Joining NH in 2021 as Asset Lead for traffic signals in the East Region, and since then, whenever there was a report of faulty queue loops, or a site is revalidated, external queue loops and hurry calls have been turned off, leaving queue detection and response to MOVA IN and X loops and MOVAs own oversaturation and maximising capacity features to sort congestion.

All the signal junctions around the East Region now run MOVA, without any external queue management strategies.

I do the technical check of all refurbishments and third-party schemes in the Region and do not accept any designs with external queue management strategies. Within the East Region signal specification any strategy that removes MOVA control is to be avoided, especially conflicting hurry calls. I thought it would be good to get some numbers to support removal of separate queue loops and hurry call modes.

Confirming a theory

Anecdotal evidence and experience of both me and some other much more experienced MOVA engineers over several years, have shown that there is no benefit dropping MOVA to run separate queue management strategies to reduce congestion, especially at signalled roundabouts. So how to get some numbers to support our theory?

To the best of my knowledge no one has done any comparison of modelling of a junction with or without external queue clearance strategies. They just seem to be a facility to have, to be seen to do “something”, mitigate queues on a slip road and “protect the main line” and because it costs a lot of money to install it must be “better”, the “Emperors new traffic management”.

We had just had a signalised roundabout revalidated on MOVA, the A1/A141 Brampton Hut. This had originally been operating MOVA, but for a couple of years due to multiple MOVA detector failures, CLF plans with separate queue loops and hurry calls were in operation. Queue loops where located 200m from the stop line on the slips, on the roundabout circulatory and the unsignalled arm which called an extended “all red” to help vehicles out of the service area and lorry park in the southwest. See figure 2 below.

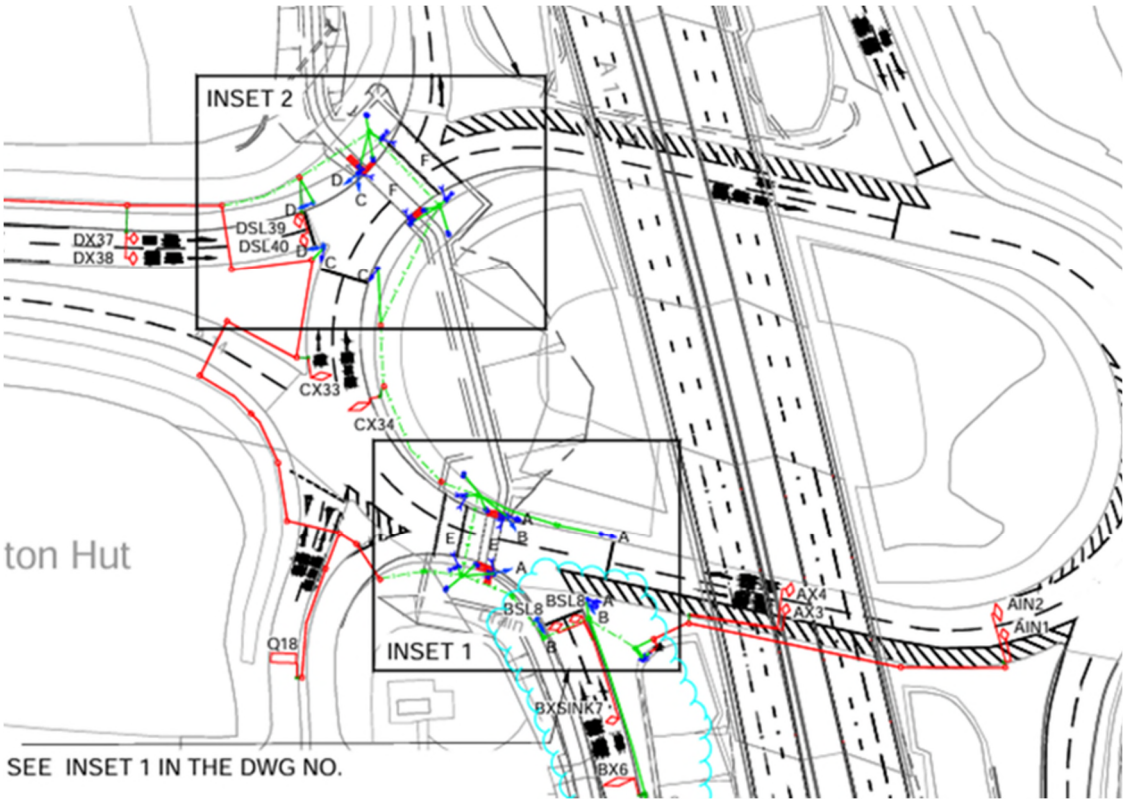


Figure 2 A1/A141 Brampton Hut

The are Pegasus and Toucan crossing on the south and northwest circulatory which require an “all red” period to cross at each stream and cause delays both for traffic and NMU, especially if the crossing demand window is missed. Because the cycle time is fixed in CLF, whenever the crossings ran this took time out of the 60 second cycle time for vehicle green, and with both crossing called a minute or so apart delayed traffic which caused the hurry calls to run regularly, which in turn caused more delays.

After multiple complaints, including from the local MP, it was decided to turn the hurry calls off. This slightly improved the situation, reduced complaints until the MOVA loops could be repaired and the junction revalidated under MOVA 8.

Following MOVA 8 revalidation congestion and delays improved, rather than taking time out of the cycle to run the pedestrian stages, the junction cycle time increased to accommodate the crossings and traffic recovered without the need for any additional intervention.

The cycle time is often shorter than the 60s used in CLF, which created more intergreens so vehicles leaving the service area had more gaps to get out, and as the circulatory was clearer, somewhere to go, rather than being blocked by queuing traffic.

But how to confirm our site observations? A bit of (cheap) modelling was required.

My initial thoughts were to produce a LinSig model of the existing junction and then reduce the capacity of the junction by taking a lane/link out on either the circulatory or slip roads, but increase the green time on the upstream approach to represent the additional green time an independent hurry call would give. However, whilst this would be suitable for modelling the fixed stage lengths within the CLF plans and hurry calls it would not be able to model the variability of MOVA to give comparable results.

I discussed this with Chris Kennett who had undertaken the MOVA validation, and he suggested using the MOVA simulation software available in MOVA tools. This seemed an ideal solution as he could compare the model with his real-time site observations and a copy of the actual site MOVA dataset.

Initially, the MOVA simulation was able to deal with the traffic flow, without any congestion or hurry call demand and so traffic flows on all arms were increased proportionally (based on flows from the TMA logs) to level where hurry calls would be demanded. These increased levels of flow were used for all simulations.

Over 20 different simulations were run to compare all the different options. It should be noted that all scenarios used the same traffic flows and hurry calls and/or all red extensions are called by excessive vehicle demand rather than exit blocking or lane obstructions. These scenarios are listed below.

Ref'	Simulation Name	Description
0	Benchmark	Base case, realistic linking with altered traffic flows. Unvalidated to simulation flows. No Hurry Calls
0-	Benchmark, No Linking	As per Benchmark, linking removed
0v	Benchmark, Validated	As per Benchmark, validated to simulated traffic flows.
1a	All Approaches, full Hurry Call	As per Benchmark, plus: All circulatory and entry approach lanes fitted with queue detection at 150m on entry lanes, with 10s call delay, 3s cancel delay. On circulatory lanes, queue detection is at 40m or 100m. Queue detectors trigger Priority Links with highest PFACIL set, 20s Hold, 20s Extension and truncation allowed.
1b	All Approaches Extension Only	As per 1a, truncation not permitted
1c	All Approaches Truncation Only	As per 1a, Extension and Hold disabled
2a	Circulatories only, full Hurry Call	As per 1a, HC restricted to Circulatory Lanes only
2b	Circulatories, Extension Only	As per 1b, HC restricted to Circulatory Lanes only
2c	Circulatories, Truncation Only	As per 1c, HC restricted to Circulatory Lanes only
3a	Entry Approaches, full Hurry Call	As per 1a, HC restricted to Entry Lanes only
3b	Entries, Extension Only	As per 1b, HC restricted to Entry Lanes only
3c	Entries, Truncation Only	As per 1c, HC restricted to Entry Lanes only
4	All-Red Extension	As per Benchmark (no Hurry Calls), with facility for all-red extension on south-west node, to assist uncontrolled traffic emerging from Services. Queue detector in uncontrolled lane with 20s Call and 5s

		Cancel triggers all-red extension from typically 8s up to 15 seconds on every stage move (except after pedestrian stage).

1a+	All Approaches, full Hurry Call plus All-Red extension	Combination of 1a and 4
1b+	All Approaches Extension Only plus All-Red extension	Combination of 1b and 4
1c+	All Approaches Truncation Only plus All-Red extension	Combination of 1c and 4
2a+	Circulatories only, full Hurry Call plus All-Red extension	Combination of 2a and 4
2b+	Circulatories, Extension Only plus All-Red extension	Combination of 2b and 4
2c+	Circulatories, Truncation Only plus All-Red extension	Combination of 2c and 4
3a+	Entry Approaches, full Hurry Call plus All-Red extension	Combination of 3a and 4
3b+	Entries, Extension Only plus All-Red extension	Combination of 3b and 4
3c+	Entries, Truncation Only plus All-Red extension	Combination of 3c and 4

0f	Benchmark, Fixed Time	As per Benchmark, but with MOVA disabled, running simple FIXED TIME values. Pedestrian facilities are disabled to prevent loss of coordination. The results are provided but are not included in comparisons. The simulated pedestrian facilities run rarely under MOVA control but are highly disruptive and complicate the linking. Simulation FIXED TIME is limited and would result in pedestrian stages running every cycle, plus loss of coordination. As such, FIXED TIME without pedestrian facilities (as presented) is significantly advantaged and unrealistically positive. FIXED TIME with pedestrian facilities would be severely disadvantaged and unrealistically negative.

Figure 3 MOVA Simulations

The screen grab below shows the MOVA emulation model for Scenario 1a, with queue detection at 150m on both slip road entries and roundabout queue detection at 40m for the circulatory links. In this model there are no “all red” extensions for the unsignalled service entry



Figure 4 Scenario 1a snapshot

Running the emulation (1a) shows, after about 30 minutes the first hurry call on the northern entry slip is demanded. This causes congestion on the conflicting roundabout circulatory, triggering the roundabout circulatory hurry call. The signals alternate between hurry calls for a couple of cycles before settling back to MOVA control.

Later this same pattern is repeated on the southern arm with competing entry and circulatory hurry calls with also trigger the hurry calls on the northern entry and circulatory.

Results

Case	0	0-	0v	1a	1a+	1b	1b+	1c	1c+	2a	2a+
Total Delay (mins)	5504	7783	3852	4730	6641	6012	6668	4395	6802	5715	6611
Average Delay (secs)	154	226	107	130	184	168	189	117	186	156	188
X-Det Counts	8561	8077	8561	8559	8450	8457	8308	8675	8464	8553	8279
Excess Demand	150	263	91	137	223	167	250	85	215	167	385
Case	**2b**	**2b+**	**2c**	**2c+**	**3a**	**3a+**	**3b**	**3b+**	**3c**	**3c+**	**4**
Total Delay (mins)	5678	7410	4377	6792	7390	8492	7715	7513	6581	8192	6838
Average Delay (secs)	155	208	121	194	225	274	238	227	194	255	202
X-Det Counts	8530	8383	8557	8272	7814	7483	7696	7978	8111	7712	8161
Excess Demand	159	294	93	395	375	529	405	361	274	444	326

0v As per Benchmark, validated to simulated traffic flows. Only comparable with the Benchmark.

1c All Approaches Truncation Only. Extension and Hold disabled.

2c As per 1c, HC restricted to Circulatory Lanes only

3a+ Entry Approaches, full Hurry Call plus All-Red extension

Various graphs and bar charts were produced. A couple of the more interesting ones are shown below.

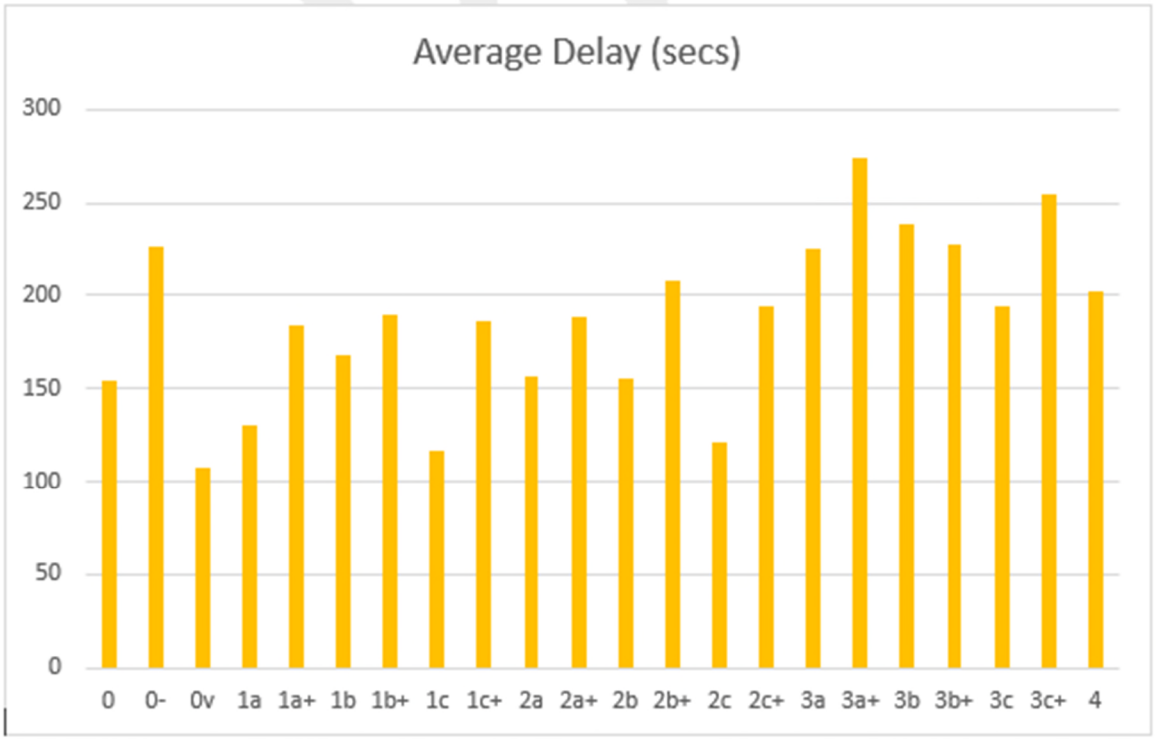


Figure 5 Average delay per vehicle for all lanes modelled

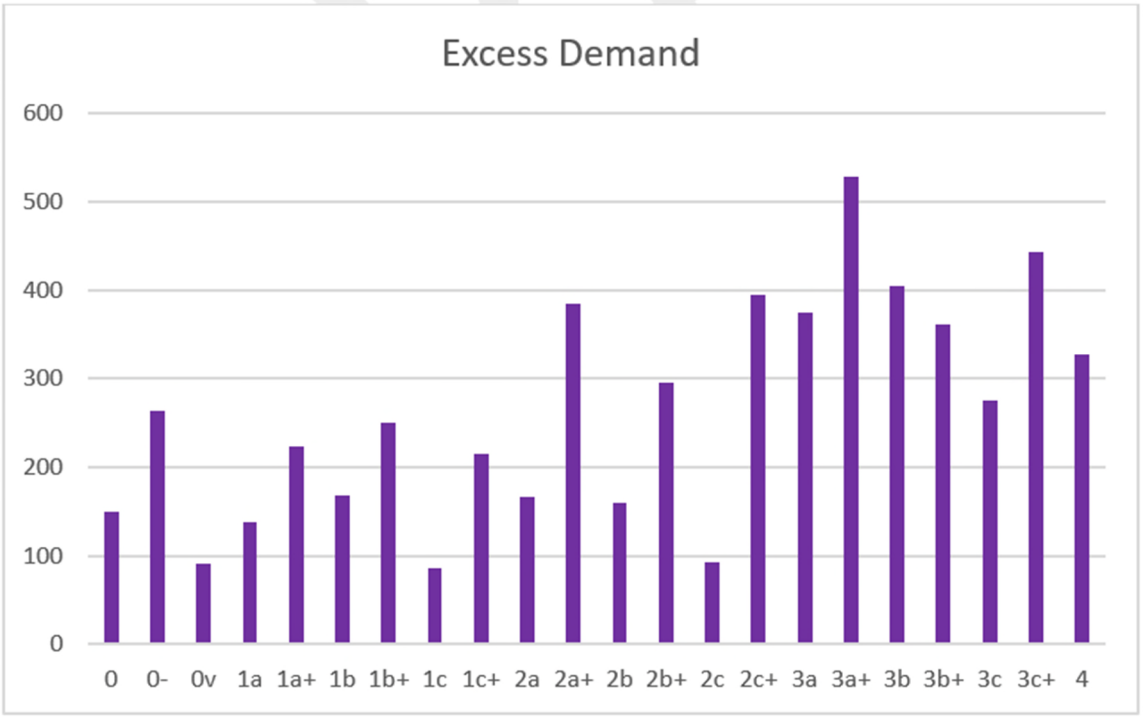


Figure 6 Total number of vehicles remaining in all lanes at end of simulated hour for each scenario.

The worst results were for scenarios that drop MOVA Mode, with entry and circulatory hurry calls, and a demand dependant extendable “all-red” period to allow the un-signalled arm out of the service area.

“Hurry Calls” (1C) does show some benefits for all approaches whilst remaining under MOVA control.

However, better results are obtained if only the circulatory is prioritised, something I had noticed years earlier with running long greens to the circulatory under SCOOT as a clearance plan.

The best results were for the MOVA validated to the benchmark flows with no external queue loops or hurry calls.

Real life site observations of the recently validated Brampton Hut site, showed vehicles, had room to enter a clear circulatory and the shorter cycle time with more intergreens was better than a long cycle with an occasional slightly longer “all-red” period

It became apparent in both the modelling and site observations of both the test site and many others within the region, that validated MOVA, using the congestion and linking facilities within, is better at dealing with congestion, without the need for any external queue loops and hurry calls and change of mode of operation.

Conclusion

My conclusions are.

For a well validated signalised MOVA roundabout you do not need external queue loops and hurry calls modes. Although these may be required on signal roundabouts not using an adaptive mode of control.

Not installing queue detection and associated ducting 160m down a slip road will save a fortune. Even a simple loop recut of queue loops on a NH slip road will be £10K in traffic management and slip road closures, before a blade even turns. This is a lot more expensive than MOVA validation of the same junction for a couple of days. Where possible I am also installing multilane above ground detection, rather than recutting loops.

It is better to leave a signal junction that is well validated and maintained, on an adaptive form of control, then run a hurry call or unvalidated clearance strategies. Congestion will respond better and get back to “normal” quicker allowing MOVAs own oversaturation and maximising capacity features to sort congestion or maybe not occur is the first place

Don’t install external queue management strategies to compensate for lack of capacity in the original design.

Queue detection at 160m+ are too far away to respond effectively and queue detection at the X (dual use) position too close and will always be triggered unless a long call period is used, defeating the point of trying to keep an exit clear.

Introducing a queue clearance strategy based on congestion on a single approach with no idea what is going on downstream is unlikely to fix the problem and to lead to more delay. More green to one approach is more red to the other.

There is an external queue management strategy that performs similar to well validated MOVA, running the circulatory on green longer than the entries. But this requires carful application and switching back to “normal” operation. Even then overall delay is still longer for the whole junction

Further Work?

Further modelling, potentially using different software, with different junction layouts.

Individual lanes removed to simulate a stopped vehicle in different locations on the circulatory or an approach slip.

Different signal control software facilities.

Identification when a site needs to be revalidated. Is the current MOVA dataset good enough? Are the changes in traffic flow significant?

Above ground detection to identify the location of a blockage and adjust validation parameters accordingly and automatically (for SCOOT)

1 IHE GUIDANCE NOTE Traffic Control and Information Systems 5.8.1 It is recommended that traffic signal junctions should be validated every five years or after significant changes to the use or alteration to the highway network.