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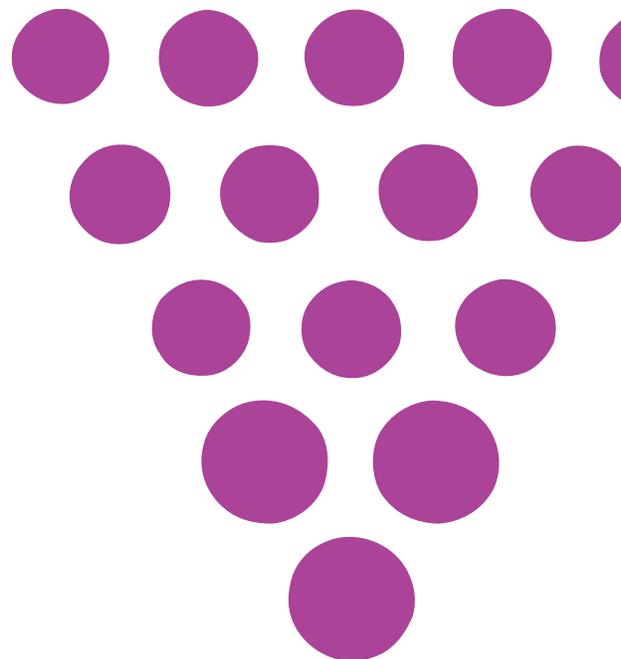
# Signals & ITS Design Guide

Standards & Criteria for Adoptable Traffic Signal Control & ITS Infrastructure

T&T Suite Ref: AD002

Version 5.2

Transport & Technology Service  
Economy, Enterprise & Environment Directorate



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## Abbreviations

ANPR	Automatic Number Plate Recognition
CDM	Construction (Design and Management) Regulations
DFM	Detector Fault Monitor
DfT	Department for Transport
EDG	Engineering Design Group
EEE	Economy, Enterprise and Environment
FAT	Factory Acceptance Test
HA	Highways Agency
ITC	Integrated Technologies Contract
ITS	Intelligent Transport Systems
LTP	Local Transport Plan
MEWP	Mobile Elevating Work Platform
MOVA	Microprocessor Optimised Vehicle Actuation
PCU	Passenger Car Units
PDU	Pedestrian Demand Unit
PROM	Programmable Read-Only Memory
SA	Speed Assessment
SAT	Site Acceptance Test
SDE	Speed Discrimination Equipment
SITS	Signals and Intelligent Transport Systems
TAL	Transport Advisory Leaflet
VA	Vehicle Actuation
VAS	Vehicle Activated Sign

## Introduction

This document forms part of a suite of design guidance documents for the Transport & Technology service. This particular guide is for those considering the installation of “**Signals & ITS Infrastructure**” equipment on the highway in Cornwall. It covers design, operation and installation and outlines the adoption standards that must be met in order to minimise the future revenue funding demands on the Council. It is not intended to specify every detail and it is not a step by step guide or ‘help’ file and so by referring to it the designer, developer, contractor or installer is not relieved of the responsibility in any way to provide a safe design compliant with current codes of practice, guidance, specifications, standards and advice.

Given the variable nature and requirements of individual sites, it is strongly recommended that any organisation, both within and external to the Authority, contemplating design and installation contact the Council’s Integrated Technologies Contract (ITC) team at the earliest stage possible as they are responsible for Cornwall Council’s SITS equipment. The role of the ITC team is primarily asset management and to enable the provision of services through commissioning; therefore the ITC team are required to sign off (Authorise) ALL scheme designs prior to any construction being undertaken.

The ITC team regularly liaise with the Strategic Transport team to thorough technical evaluation has been undertaken with any traffic signal activity that features within strategic planning strategies or applications. It is expected that the Planning Team will also consult the ITC team at an early stage regarding impact of planning applications on traffic signals including in relation to the trunk road.

Where national advice allows for flexibility, this document sets out a framework to enable designers and developers advice and consistency in SITS design on the Cornwall highway network. It also provides guidance on the design processes for SITS equipment to supplement the general information on good practice such as the “Code of Practice for Traffic Control and Information Systems for All-Purpose Roads”.

Designs must be in accordance with the Council’s approved materials list for SITS equipment and a ‘mix and match’ manufacturer will not be accepted, i.e. the signal controller and the signal heads must be of the same manufacturer and on the approved list.

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Cornwall Council operates an Intelligent Transport Management System (Cloud Amber); **ALL** signals and ITS designs and installations must be UTMC compliant with a preference for UG405 on board direct connections. ALL licences relevant to that SITS equipment shall also be allowed for in the design, construction and adoption process, with handover given to the ITC service team on completion.

# 1 General Principles

The overarching transport strategy of the council is contained within the LTP. Specific spending is outlined within the LTP implementation plan and particular intentions can be found within the supporting documents of the LTP which includes the Intelligent Transport Strategy currently being authored. This guide will be updated in respect of the Intelligent Transport Strategy to provide information about installation of new equipment. The designer should in particular consider the requirements of all transport modes as per the LTP and supporting documents.

The completed design must be checked and approved as shown in Figure 1 (page 24) before work on the procurement and installation of the scheme commences. For an example of an acceptable design see Figure 2 (page 25). Figure 1 depicts the overall design process to be followed, the information which should be kept on the scheme design file, the interaction required between the overall scheme designers and ITC team.

In order to comply with registered quality assurance procedures, health and safety legislation and the CDM it is necessary for design checks to be carried out at various stages in the design process and for any documentation pertinent to the subsequent operation, maintenance and removal of the equipment to be made available to those responsible for these activities. A design file of basic information and certification must be produced as part of CDM. Information within the drawing and the controller specification will enable a Stage 2 design check of the scheme to take place. Only when the scheme design has been approved can work start on site. The Stage 3 design check will be carried out at the time of commissioning.

Cornwall Council operates an Intelligent Transport Management System (Cloud Amber); **ALL** signals and ITS designs and installations must be UTMC compliant with a preference for UG405 on board direct connections. ALL licences relevant to that SITS equipment shall also be allowed for in the design, construction and adoption process, with handover given to the ITC service team on completion.

## 2 Signals/ITS Co-ordinator Role

Before any work commences a Signals Co-ordinator must be identified. Evidence must be forwarded to show this named person is competent to deal with traffic signals and ITS. The Signals Co-ordinator must be registered to the appropriate sector scheme and CSCS accredited. The SITS team must approve this person as the Signals Co-ordinator before any work on site commences.

The Signals Co-ordinator role must;

- a) include advising and assisting the client with his or her traffic signal duties
- b) notifying HSE regarding the traffic signals work if applicable
- c) co-ordinate health and safety aspects of design work on the signals/ITS and co-operate with others involved with the project
- d) facilitate good communication between client, designers and contractors
- e) liaise with the principal contractor regarding ongoing design
- f) identify, collect and pass on pre-construction information regarding
- g) prepare and update health and safety file as necessary

The Signals Co-ordinator role will include;

- a) day to day management of any traffic signal/ITS issues such as queries with highway/civils contractor
- b) liaison and negotiation between all parties involved with signal installation including local authority, signals installer, maintainer and configurator
- c) resolution of all faults and issues
- d) updating of policies, procedures and the design file as per the CDM regulations

It is not acceptable for the following to act as the Signals Co-ordinator;

- a) a competent person then commission them to undertake a specific role only such as simply install the signals equipment
- b) a competent general site manager with little or no traffic signals experience
- c) a MOVA consultant or specialist configurator completing the FAT test, SAT test or MOVA validation
- d) a Cornwall Council Section 278 inspector

A developer or promoter may wish to employ an engineer from Cornwall Council as the Signals Co-ordinator. This should be discussed with the ITC team at the earliest opportunity.

All Signals/ITS installations must take place in accordance with Cornwall Council's Termed Contract including Cornwall's controller specification a copy of which can be supplied on request.

### 3 Summary of Staged Actions

This section describes the actions Cornwall Council requires to facilitate approval of a design. This section is based on Figure 1 Design process for signal schemes which should be noted when reading this part of the guide.

A design brief is required for each scheme which should consist of a statement of the objectives of the scheme with the reasons for them. This brief must include a list of all the facilities required and any particular design requirements necessary as a result of local factors.

At an early stage the Council's design team (currently EDG) and the ITC team should be consulted to establish how the installation is to be controlled and if this will place restrictions on the design, particularly on the cycle time.

An early on site visit and meeting is required to undertake the preliminary Stage 1 Design/Safety check and identify possible problems that would have a bearing on the design of the scheme. Particular safety features and the need for any non-standard information should be noted at this point.

Stage 2 should involve detailed consultation with the Council's design team and the ITC team and at least 3 weeks should be given for each team to assess the information. When approval is given and the project moves to construction phase it is vital that the Signals Co-ordinator is then nominated and approved. The Signals Co-ordinator should then meet with the ITC team to go through the signals installation side of the project.

The Cornwall Council signals installation process shown in Figure 2 must be followed. This must be agreed at a meeting between the Signals Co-ordinator and the ITC team before any construction can take place.

Prior to construction it must be noted that the developer or promoter is responsible for obtaining any traffic orders required and for the design and management of civil engineering works required for the scheme.

Following construction the completed installation must be checked and approved by ITC team before it is commissioned to conduct a site inspection to check that any problems identified in Stages 1 and 2 have been overcome and no other problems have occurred.

The ITC team must be present at the SAT along with the Council's term maintenance contractor to confirm the site is acceptable for adoption. If the installation does not meet the requirements as listed on the Council's SAT commissioning forms the ITC team will not adopt the site.

Post construction a stage 3 safety audit must also take place which may suggest further modifications that will have to take place under S278 of the Highways Act.

## 4 Junction Design

### 4.1 Signal Controllers

All controllers in Cornwall must be installed on a root with low level access doors and pre-formed base seal must be used. The controller will need to be sited so that its position will allow unimpeded use of the footway by pedestrians and those using wheelchairs or pushing prams – the minimum width is 1.2m clearance. In addition, the controller location should;

- a) allow an engineer to be able to view the junction and the signals from the controller
- b) allow the outer case door and panels to be opened to their full extent
- c) not cause undue obstruction on the footway when the door is fully open but there should be sufficient clearance for an operative to work
- d) not obstruct other street furniture and should not mask waiting pedestrians from approaching vehicles

Wherever possible, controllers should be provided with a hard standing area for maintenance vehicles. If there is limited space near the controller for a maintenance layby, a suitable alternative must be provided. When the controller is installed on unmade ground a concrete pad or paving slabs should be provided in front of the outer case doors to assist maintenance.

### 4.2 Pedestrian Facilities

Where pedestrian facilities are being provided at junctions they must be designed to meet all current codes of practice, guidance, specifications, standards and advice. Audible and tactile devices must be provided for the visually impaired in addition to the Red and Green Man indication. In sensitive residential areas it may be necessary to inhibit the audible by time switch at night. Tactile units need to be installed in all push buttons at the crossing.

Where there is a central refuge on a crossing there should ideally be two push buttons on the refuge, both fitted with tactile units. Only tactile devices shall be used, since audible signals could be misinterpreted and would be unsafe when parallel pedestrian phases are provided; or when a full pedestrian stage is provided and the appearances of the various pedestrian phases are staggered to take account of clearing traffic.

Where parallel pedestrian crossings are displaced from the junction, a stop line and associated traffic signals should normally be provided for the protection of pedestrians. Detailed site requirements may need discussion with the ITC team. With a staggered pedestrian facility the minimum distance between crossings (i.e. the distance between the inside line of studs on each side of the island) should be 4m to reduce the problems of “see-through”.

Audible devices should be installed where there is a full pedestrian stage at which all the pedestrian indications appear at the same time on the same stage and there are no additional pedestrian phases.

In addition, where audible and tactile devices are provided for parallel crossings without the protection of a stop line all red extending detectors will be required to inhibit the pedestrian signal while vehicles are still approaching the crossing.

All tactile paving and dropped kerbs are to be constructed in accordance with all current codes of practice, guidance, specifications, standards and advice. It should be noted that tactile surfacing is not recommended within pedestrian refuges or separation islands where the signal staging is intended to allow pedestrians to cross the whole width of the carriageway in one movement.

Where there is a staggered pedestrian facility the island should be a minimum of 3m wide.

### **4.3 Signal Heads**

Primary and Secondary signals, along with plate signs on poles must be designed and positioned in accordance with all current codes of practice, guidance, specifications, standards and advice.

Regarding box signs, designers should ensure a traffic order exists or is proposed for any box sign associated with the signals.

Louvres, long hoods or long cut-away hoods should be specified as necessary to avoid ‘see through’ problems particularly where there may be internal stop lines in

a junction or the site is close to a railway, waterway (of which there are many in Cornwall) or airport such as Newquay, Truro or Land's End.

Advice on the circumstances which warrant the use of vertical and horizontal louvers can be obtained from the ITC team. In no circumstances should louvers be used on red aspects.

#### **4.4 Signal Heads at Non-standard Heights**

Mast arms and 6m poles will only be installed in line with all current codes of practice, guidance, specifications, standards and advice and may require DfT approval.

Mast arm signals or alternatively 6m poles with dual signal heads should only be provided where there is a visibility problem for example on wide multi-lane approaches, on adverse gradients or where the 'canyon effect' may occur. This is where due to high vehicles signal head visibility may be obscured for drivers in lane two.

It is now necessary for signal maintenance companies to use Mobile Elevating Work Platforms (MEWP) along with suitable traffic management measures when installing or maintaining equipment on any signal pole greater than 4.0m high. This has considerable cost implications on maintenance. Without compromising the most appropriate method of signalling, and with safety in mind, it is important to take maintenance costs into consideration during the design stage and consult with the ITC Team. Double heads on tall poles have significantly reduced maintenance costs, similarly new technology with reduced whole life costs may be recommended such as the newer style rotating mast arms.

#### **4.5 Anti-skid**

All new installations shall have at least 50m of skid resistant surfacing applied on all approaches. Where pedestrian facilities are provided the anti-skid should be extended to the first row of studs. On a gradient or on roads with a speed limit greater than 30 mph it may be necessary to increase this length.

If the signal controlled junction incorporates pedestrian facilities on any of its arms high friction material should be continued past the stop lines to the first row of studs. If the approach has high approach speeds, reduced visibility or a downhill gradient, the high friction material should be extended through to the second line of studs.

## 4.6 Detectors

Detectors must be supplied, designed and installed in compliance with all current codes of practice, guidance, specifications, standards and advice. The only exclusion should be the arrangement of detector packs at a MOVA site, where they should be placed with one phase per pack using blank phases where necessary to minimise cross talk.

The X loops and stopline loops will be used by the controller as combined detectors for both MOVA and Vehicle Actuation. Speed Discrimination and Assessment equipment may be required where MOVA is not implemented, e.g. pedestrian crossings.

Consideration should be given to speed reducing measures or changing the speed limit. Regarding modernisation of existing installations the same general rules apply although due to the absence of information on speeds it may not be possible to make an accurate assessment. In such a circumstance it will therefore be necessary to obtain up to date speed-readings to confirm the precise requirements.

A fully ducted system must be provided when required and carriageway loop boxes must be used on all loops. This is to maximise the life of the loop cable, minimise the risk of damage from kerb works and minimise future maintenance costs. See standard drawing 12/129 - Carriageway Loop Box. In addition all feeder and loop cable joints must be heat shrink type.

## 5 Technical Design/Drawings

The drawing must show the proposed signal layout, method of control, detection and ducting system. A detailed 1:200 scale insert showing all relevant local details is required together with all existing and proposed plant and equipment. A 1:500 scale insert of outline detail showing detectors/loops on all approaches should also be included.

Drawings should include;

- a) a north point
- b) method of control
- c) controller position
- d) pole positions, all numbered starting nearest to the controller in a clockwise direction
- e) location of a photoelectric cell
- f) ducting with relevant quantities (orange highway authority duct)
- g) draw pits and pole pits with any associated notes
- h) feeder cables from draw pits to poles
- i) electricity supply pillar and proposed connection point from WPD (black electricity duct)
- j) BT connection point to the controller (grey comms duct)
- k) zig-zag markings on pedestrian crossings where applicable.

Phase letters should be highlighted in the method of control and on the junction layout.

Pole equipment should be shown to include all necessary signal information such as push button units, secondary signals, box signs and filter arrows.

Detection loops should be illustrated in a table to include distance, name and type of loop.

The drawing must also show if pedestrian aspects are pole or side-mounted and all necessary road markings such as stop lines and studs.

Barrier rails must be included along with street names, street lights and traffic sign locations and numbers. Amendment notes must be shown along with version control.

An example of an acceptable proposed scheme drawing for Cornwall Council is shown in figure 2.

## 6 Topography Above & Below Ground

For schemes that entail no significant alteration to road kerb lines, base ordnance survey data may provide sufficient topographical information but care should be exercised to ensure that the details are both current and accurate.

Limited surveys to check certain critical dimensions and to check the location of any physical objects such as statutory undertaker's plant, manhole and drain covers, drainage, cables, lamp columns, road signs, trees etc may be all that is required.

When undertaking swept paths, the width of carriageway should be taken from the outer edge of the cycle feeder lane and not from the kerb edge. For all proposed installations vehicle speeds should be provided so that suitable detection can be determined including SA / SDE.

For major changes early consultation with statutory undertakers, who may be affected, is recommended. These consultations may lead to a requirement to commission trial excavations to locate precisely existing plant in relation to the revised kerb alignments. Statutory undertakers' drawings should be provided for all proposed designs.

## 7 Configuration, MOVA & Bus Priority

The configuration (2500 forms) will be produced by the ITC team at the cost of the developer/promoter. This will include completion of the FAT and provision of an SD card/Heart to be installed in the controller. Any subsequent FATs from changes made following the safety audits will also be at the cost of the developer. The Council currently employs a specialist configurator and a MOVA consultant who work alongside each other.

MOVA control will be a requirement at all signalised junctions within Cornwall. At specific sites the Council may insist on a pedestrian crossing to require MOVA control. The designer should seek advice from the ITC team. TRL MOVA Application Guides should be used when designing a MOVA installation.

The Council has a contract for the provision of a Real Time Bus Information system including bus priority at junctions. If there are bus routes passing through the scheme with a minimum of four buses per hour on any one approach then Bus Priority should be considered. To provide maximum efficiency, if the junction has bus lanes on any approach, then the timings will need to be matched to the set back of the bus lane.

Cornwall Council operates an Intelligent Transport Management System (Cloud Amber) all equipment must be UTMC compliant and enabled compatible to work with the ITMS system. It is the Council's preference for UG405 on board direct connections where applicable.

## 8 Modelling

Junction capacity modelling of existing traffic signal controlled junctions should take into account observed saturation flows and models should be calibrated and validated accordingly. This is due to saturation flows at junctions in Cornwall being typically lower than the averages derived using RR67.

For proposed signalised junctions Cornwall Council would not anticipate saturation flows for ahead lanes exceeding 1800 PCU/hr and for turning lanes exceeding 1600 PCU/hr and therefore models should adhere to these thresholds. On-site validation of existing junctions is encouraged. Early discussions should be held with the Council's design team to discuss appropriate parameters for junction capacity modelling so that potentially abortive work is minimised.

For signalised junctions the preferred modelling software is Linsig, Transit or Traned; for non-signalised junctions the preferred software is Arcady or Picady and for micro-simulation modelling the preferred software is s-Paramics. Linsig is recommended for use as it is capable of modelling accurately different forms of flared approach, allows for parked vehicles, bus lanes and can take into account the number of right turn PCUs stored in front of the stop line. Linsig can predict the capacity of this movement with or without a right turn indicative signal. Any permitted stage sequence can be run with the Linsig traffic model and all constraints of controller data will apply. Junctions must be modelled under MOVA operation.

The modelled stage structure selected must deal not only with the junction in its normal operating condition but also cater for contingency and non-optimum working. Local linking to adjacent signals should always be considered in the design, particularly for pedestrian crossings but local factors will influence this decision. The link timings should be provided.

At junctions with pedestrian crossing facilities, cycle times should only exceptionally be longer than 90 seconds. Cycle times greater than 120 seconds are only acceptable in certain special cases such as at junctions on high speed roads, MOVA sites and where a phase receives the green light twice in a cycle.

## 9 Controller Remote Monitoring

Cornwall Council currently operates a remote monitoring system that is located within the Council's protected server area and uses an ADSL connection. This system is a core component that allows traffic signal faults to be instantly forwarded to the on-call engineer's handset instantaneously.

Any controller installed in Cornwall must have a monitoring unit with secure digital serial link to this system. An ADSL monitoring unit is specified at all of our new sites and a completely secure encrypted router is required so that Cornwall Council's protected server area is protected. The ADSL monitoring unit must be installed complete with a configuration, tested and downloaded prior to commissioning of the site. This is important as it allows any initial faults with a new site to be reported instantly.

The unit must be compatible with the Council's monitoring system and be on the approved list of materials.

The Council will not adopt the junction/pedestrian crossing until the site has been tested on the remote monitoring system and functioning correctly.

## 10 Electricity Supply Pillars

The electrical supply pillar should be;

- a) ideally located next to the controller, but can be up to a maximum of 3m
- b) be positioned so that engineers working on the pillar can do so without danger to themselves, particularly passing vehicles
- c) sited at the back of the footpath, close against a wall or fence where generally it will be safe from vehicular collision

The electrical supply pillar must not;

- a) obstruct private property, doorways, accesses or shop windows
- b) obstruct the footway or cause a hazard to pedestrians
- c) obstruct access to other street furniture

Any electrical supply pillars must be on the approved materials list and installed to the current CC standard.

## 11 Construction Phase

When the process in Figure 1 has been progressed construction work should take place in accordance with all current codes of practice, guidance, specifications, standards and advice. This should include for the covering of signal heads, pushbuttons and barriers preventing the use of crossing points under construction or modification.

The use of temporary/portable signals may be required during the construction process to maintain an existing pedestrian facility or to allow for vehicle movements during the works. Portable crossings must be provided where the existing provision has been removed. Current diagram 'light signals not in use' signs will be required to avoid any confusion along with 'permanent change to road layout ahead' 'new traffic signals ahead', 'signal priorities changed' or 'signal timings changed' messages on each approach as appropriate.

## 12 Standalone Pedestrian Crossings

Standalone crossings are to be installed in accordance with all current codes of practice, guidance, specifications, standards and advice and where a facility is proposed or being modernised, near-sided signals are the recommended facility. All crossings should be provided with both audible and tactile facilities.

At standalone crossings, multi-lane approaches are not recommended and where possible should be designed out, if necessary by provision of a central refuge. If that is not possible, tall poles or mast arms may have to be considered to assist visibility in the offside lane. At sites where there are two or more lanes on an approach an offside secondary signal should be included and the offside primary signal aspect should be offset to allow clear visibility of the secondary signal.

New sites should be justified under the Authority's pedestrian crossing facility strategy (created by EDG, copy available on request). Designers should be aware of the various options available for PDUs - narrow angle field of view units, high level repeaters, combined or separate units - and treat each site on its merits. Primary hoods may be used on secondary signals at crossings as it improves the visibility both on the approach and from the stop line.

All forms of stand-alone crossings must have zig-zag road markings. Pre-timed max with extra period on the vehicle phase should not to be used on installations

that have kerbside call-cancel detectors and can only be used when the ITC team have been consulted. Linking is to be provided to nearby crossings or junctions to provide synchronisation between the signals and all link cables should be connected with ducts and access boxes provided for all feeder cables.

Pedestrian progression achieved by a call-ahead facility may be implemented but shall be assessed on an individual site basis and must be approved by the ITC team.

The use of Pelican crossings in Cornwall has now ceased and the standard is to install nearside Puffin crossings. Designers should make allowance for converting sites paying particular attention to tactile paving and position of nearside signal poles. Where there is insufficient clearance from the signal pole to the back of the footway a farsided Puffin may be installed with on-crossing detection.

Cornwall Council operates an Intelligent Transport Management System (Cloud Amber) all equipment must be UTMC compliant and enabled compatible to work with the ITMS system. It is the Council's preference for UG405 on board direct connections where applicable.

## 13 VAS, Rising Bollards & Other ITS Equipment

Where a development requires installation of ITS hardware other than traffic signals such as VAS and rising bollards, it is treated as special hardware therefore contact must be made with the ITC team at the earliest opportunity.

All ITS equipment must be installed in conjunction with the Cornwall Council term contract. This contract is let in line with approved contract guidelines and European Law, (including through the Official Journal of the European Communities) and is also approved by the relevant executive committee of Cornwall Council.

The engineers employed through this contract are specifically trained and authorised to deal with equipment that has been installed through approved legal processes of the Council which also enables Cornwall Council as Highway Authority to maintain a 2hr 'report to fix' call out system to attend to faults and emergency's relating to electrical equipment on the highway. We can therefore keep equipment in safe and working order so that hardware does not fall in to public disrepute through neglect.

Cornwall Council endeavours to exercise responsible asset management as defined in the Cornwall Council Highways Electrical Maintenance Plan (copy available on request) which states that the entire whole life cost of equipment must be assessed. Cornwall Council also follows the principles of the 2011 UK Roads Board Publication: 'Management of Electronic Traffic Equipment' in particular;

'Recommendation 16 – Designers should take account of the whole life cycle of the asset, including installation, maintenance and Decommissioning, during the design stage'

This publication also suggests that:

'Well-chosen materials for use in the installation process can make a significant difference to the cost and complexity of maintaining that system in the future'

And also that;

'Selection of materials and components at the design stage should take into account the ease and cost of maintenance'

Cornwall Council in its role as Highway Authority is not able to approve installation of VAS on the highway that fall outside of its termed contracts. The ITC team will happily discuss installation of Cornwall Council approved VAS equipment where it meets the criteria as laid out in the speed management plan (copy available on request).

Cornwall Council operates an Intelligent Transport Management System (Cloud Amber) all equipment must be UTMC compliant and enabled compatible to work with the ITMS system. It is the councils preference for UG405 on board direct connections where applicable.

## 14 ANPR

As part of the Council's ANPR policy, where a development may cause a significant increase in traffic flow on the highway network, the Council can insist that the developer or promoter provide ANPR cameras (and potentially a server) as appropriate. Therefore early consultation with the ITC team must be undertaken.

ANPR cameras must be provided in the following circumstances;

- a. Where the development access/egress joins an arterial route in the county
- b. 100 dwellings are included in the development (two ANPR per 100 dwellings)
- c. Where the ITC Team deem it necessary to monitor the traffic flows in the area of the new development

The equipment installed must be on the approved materials list and compatible with the Council's back office.

## 15 CCTV

As part of the Council's CCTV policy, where a development may cause a significant increase in traffic flow on the highway network, the Council can insist that the developer or promoter provide CCTV cameras as appropriate. Therefore early consultation with the ITC team must be undertaken.

CCTV will be required at junctions in the vicinity of arterial routes within the county and major towns.

The equipment installed must be on the approved materials list and compatible with the Council's back office.

## 16 Standard Drawings

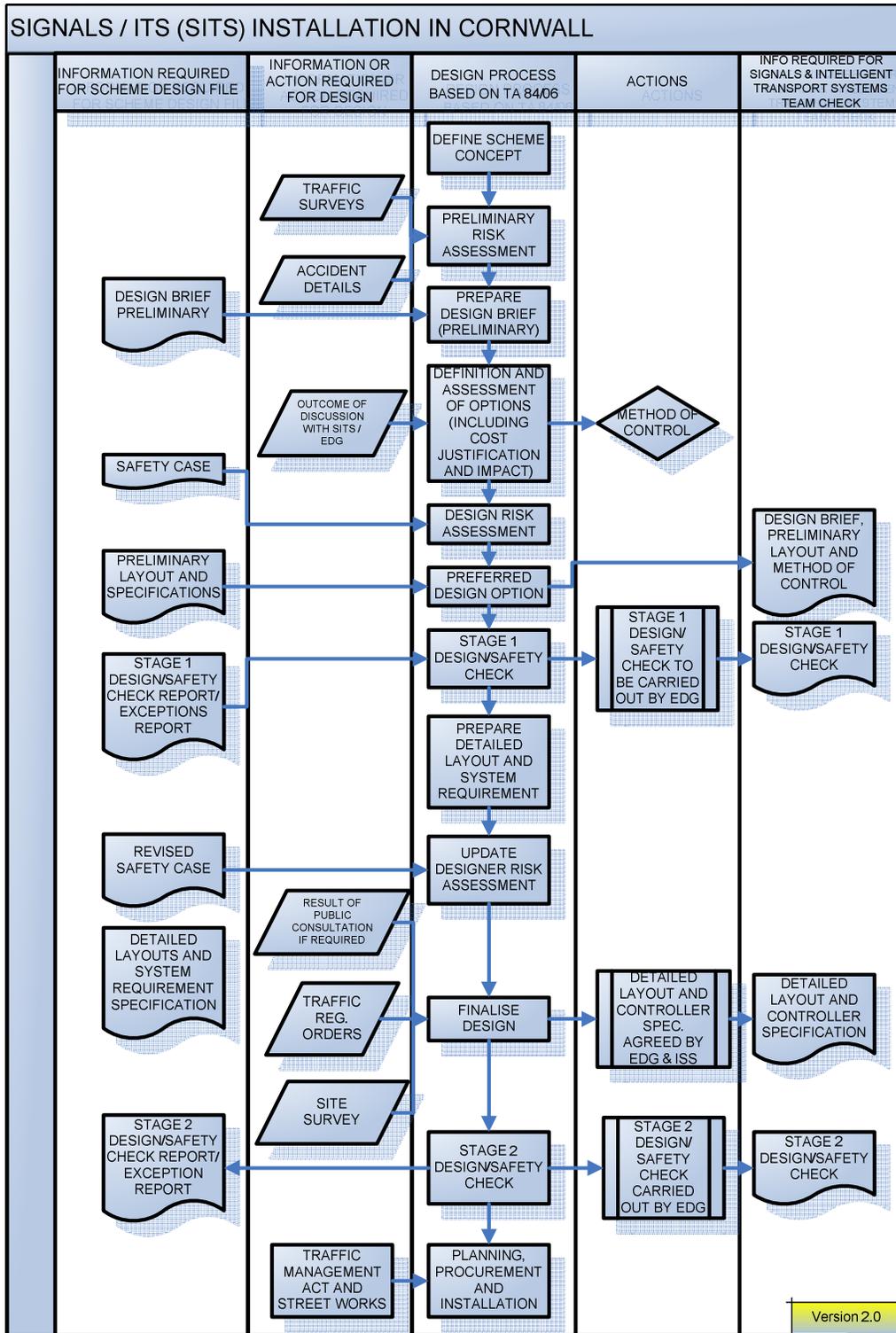
The following is a list of approved Standard Drawings that must be used when installing SITS. These drawings are available on the Cornwall Council internet;

12/8	Puffin and Toucan Crossing General Layout
12/20	Traffic Signals
12/21	Installation of British Telecom Duct into Signal Controller
12/36	Controlled Pedestrian Crossing Footway Detail
12/100	Hazard Warning Vehicle Activated Sign
12/101	School Warning Variable Speed Limit Sign
12/102	Speed Warning Vehicle Activated Sign
12/103	Combination Warning Vehicle Activated Sign
12/104	Combination Speed Warning Vehicle Activated Sign
12/105	Text Matrix Variable Message Sign
12/106	Advance Direction Car Park & Information Variable Message Sign
12/107	Advance Direction Car Park Variable Message Sign
12/108	Car Park Information Variable Message Sign
12/109	Prohibition Notice Variable Message Sign
12/110	Moveable Vehicle Activated Sign
12/111	Foundation for 1 x 140mm diameter Post for Vehicle Activated Sign
12/112	Foundation for 2 x 140mm diameter Post for Vehicle Activated Sign
12/113	Foundation for 1 x 168mm diameter Post for Variable Message Sign
12/114	Foundation for 3 x 168mm diameter Post for Variable Message Sign
12/115	Rising Bollard Installation
12/116	Rising Bollard Chamber Installation
12/117	KeySIGNALS Legend
12/118	Minimum Clearance Dimensions All Dimensions in Millimetres
12/119	Recommended Layouts and Distances
12/120	Puffin Sites - Various Lanes - For Clarity Schematic Only
12/121	No longer in use
12/122	114mm Retention Socket Low Risk Areas
12/122A	140mm Retention Socket Low Risk Areas
12/123	114mm Retention Socket High Risk Areas
12/123A	140mm Retention Socket High Risk Areas
12/124	Passive Traffic Signal Pole
12/125	WPD Standard Joint Pit Dimensions HES References
12/126	Signal Controller Installation
12/127	Controller Cabinet Base Installation
12/128	Access Chamber Installation
12/129	Carriageway Loop Box Installation
12/130	Brick Built Access Chamber Installation
12/131	Pole Box Chamber Installation
12/132	Signal Orientation Identification Signals Management Systems
12/133	Sign Orientation Identification Signals Management Systems
12/134	RTPI Sign Installation

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# 17 Appendices

**Figure 1: Design Process for Signals Schemes in Cornwall**



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**Figure 2: Example of Acceptable Drawing**



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**Figure 4: Signals Controller Configuration Process**

Should further clarification on any element of this document or guide be required please contact the Cornwall Councils Integrated Contract Team, who be able to provide additional advice and guidance.

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