

The background of the page is a close-up photograph of a traffic signal lens. The lens is circular and contains several rows of green LED lights. The lights are arranged in a pattern that suggests a signal light showing a green light. The background is dark, and the lens is illuminated from within, creating a bright green glow. There are some grey and white squares overlaid on the left side of the image, possibly representing a design or layout element.

Traffic signal design

Section 4 – Plan requirements

The traffic signal design guidelines have been developed to assist in designing traffic control signals.

The guidelines are to comprise 16 sections and 5 appendices. These are initially being released individually and in no specific order. The sections which are to be released are as follows:

Part	Title
Section 1	Investigation
Section 2	Warrants
Section 3	Design Process
Section 4	Plan Requirements
Section 5	Geometry
Section 6	Pavement Marking
Section 7	Phasing and Signal Group Display Sequence
Section 8	Lanterns
Section 9	Posts
Section 10	Signs
Section 11	Detectors
Section 12	Controller
Section 13	Provision for Future Facilities
Section 14	Signalised Mid-block Marked Footcrossings
Section 15	Special Situations
Section 16	References
Appendix A	Design Plan Checklist
Appendix B	Traffic Signal Symbols
Appendix C	Location and Function of Lanterns
Appendix D	Location and Dimensions of Components
Appendix E	Left Turn on Red

To determine which sections are currently available go to:

www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/trafficsignaldesign_dll.html

The information contained in the various parts is intended to be used as a guide to good practice. Discretion and judgement should be exercised in the light of the many factors that may influence the design of traffic signals at any particular site. The guidelines make reference, where relevant, to current Australian Standards and are intended to supplement and otherwise assist in their interpretation and application.

Traffic Signal Design

Section 4

PLAN REQUIREMENTS





Roads and Traffic Authority

www.nsw.rta.gov.au

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Amendment record

Please note that the following updates have been made to this document.

Version Number	Page	Description	Issued
1.0		Original issue	February 2008
1.1	4-4	Amended design layout requirements related to lines and signs	August 2008
1.2	Various	Drawings VD018 series updated to TS-TN series	August 2009

4.1 INTRODUCTION

Figure 4.1 shows the progressive steps in the development of a full set of traffic signal plans (see Section 4.4). The site plan and the preliminary design plan represent the concept drawings (or various stages of the same concept drawing). These plans are described in Section 3 [Design Process](#).

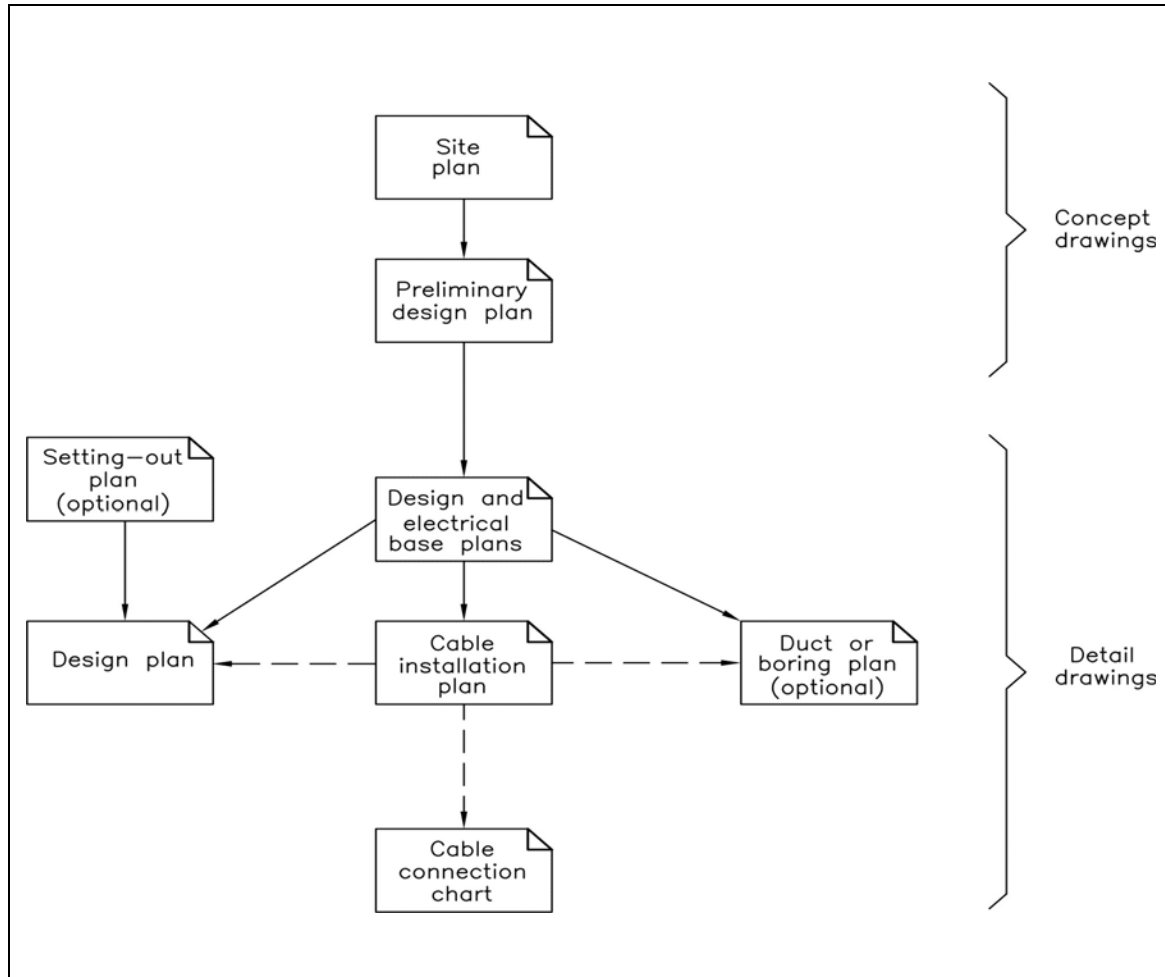


Figure 4.1 Steps in the development of traffic signal plans

The concept drawings are the basis of the detail drawings which consist of a design plan, setting-out plan (if required) and electrical plans; cable installation plan, duct or boring plan (optional), cable connection chart. The design plan, cable installation plan, and duct or boring plan information is placed on separate copies of the same base plan (see [Section 4.4](#)).

4.2 BASE PLAN

The base plan is simply a plan showing certain key features from which detail design plans are developed.

The base plan should consist of all key information shown on the site plan. Each leg of the intersection should be squared off at no less than 30 metres from the stop line and the following components included:

- title block and border
- final location of posts, detectors, controller and source of power supply
- proposed kerb ramps
- street names and road number on the roadway adjacent to the kerb on the departure side of the intersection
- destination "To ..." and "From ..." at the extremities of the intersection legs on the major road
- north point, correctly oriented to the base plan

If plans are drawn manually the design layout must be prepared in two stages. The first stage is to prepare the base plan containing the information listed above. When the base plan is complete, a transparency should be made and set aside to enable the preparation of a cable installation plan and/or duct plan at a later date. The second stage is to complete the design plan by adding the remaining information to the base plan, listed in Section 4.3.

If plans are drawn using a computer aided drafting package, then the information required on the base plan must be drawn on separate layers to allow these to be extracted for the cable installation plan and/or duct plan at a later date.

4.2.1 Title Block

A typical format for the title block is shown on drawing Nos VD002-20 and VD002-22. The title block should contain the following information:

- Roads and Traffic Authority NSW
- region or zone
- local government area
- classified state road numbers
- road names
- suburb or town
- traffic signal file number
- plan registration number
- sheet number
- issue
- registration number or sheet number of the superseded plan (if appropriate)
- scale
- UBD map reference for Sydney, Newcastle, Wollongong and Central Coast areas
- survey details
- first initial and surnames of the officers responsible for designing, drawing, checking and approving the plan and the dates these actions were done
- reference plans
- amendment details

The plan registration number is in the format xxxx.yyy.VV.zzzz where "xxxx" is the four digit classified state road number, "yyy" is the three digit local government area, VV is the code for a traffic signal plan and "zzzz" is the four digit traffic control signal (TCS) number (e.g. 0522.401.VV.1364).

TCS numbers are allocated by the Adaptive Engineering Manager. All requests for TCS numbers must be made in writing (mail or facsimile) and must list the region or zone, road names, town or suburb and UBD map reference if in Sydney, Newcastle, Wollongong or Central Coast areas. This information is used to identify the site so that it can be entered into the TCS database.

The three essential reference documents are the specification for the installation and reconstruction of traffic light signals (SI/TCS/8), the standard for signal group displays drawing No. TS-TN-019, and the standard for detector specification schedules drawing No. TS-TN-020. Any other references should be added as needed. For example, a design based single diamond overlap phasing would need a reference to drawing No. TS-TN-026.

Amendment details should be added to the design layout plan for all issues other than Sheet I Issue A (i.e. the original issue). Amendments are often initiated by a Traffic Engineering Officer via a "Job Instruction". The amendment details needed are issue, job instruction number, brief description of amendments, initials of officer doing the amendments, initials of officer checking the amendments and the date.

4.3 DESIGN PLAN

The design plan consists of the base plan information and the following components:

- design layout
- movement diagrams
- detector specification schedule
- special signal group display sequence chart
- signal group/phase chart
- sequence table
- locality sketch
- post chart
- inset for setting out details (if required)
- inset for future facilities (if required)
- notes
- date in service

Further details of each component are discussed in the following sub-sections. Drawing Nos VD002-20 and VD002-22 show typical design plans for a signalised mid-block pedestrian crossing and a signalised intersection respectively.

See also Appendix A [Design Plan Checklist](#) for a design plan checklist.

4.3.1 Design Layout

The layout of the traffic signals should show all the information listed for the base plan as well as the following:

- controller position
- post or mast arm location
- post or mast arm numbering
- signal faces and aspect size; labelling; type of visors (except Type A) and louvres if required
- location of all detectors (vehicle, pedestrian, and special)
- width of vehicle detector loops
- detector numbering
- detector labelling and lane identification
- stop lines, marked foot crossings, pedestrian crossings, bicycle crossings, types and lengths of all longitudinal pavement marking, pavement arrows, painted medians, painted islands, chevrons and bus only lane markings in accordance with relevant RTA guidelines.
- lane and median widths
- the widths of marked foot crossings other than standard 3.6 m (intersections), and 6 m (mid-block)
- grade on each approach to a stop line (up, down or level) to the nearest one percent
- distance from the stop line to the centre of advance (passage) detectors (if used)
- dimensions to enable all pavement marking and traffic signal components to be easily located in the field ("standard" dimensions shown on drawing Nos VD001-5 and VD001-6 are not shown)
- details of signs on Type 6 posts or mast arms
- all regulatory signs which supplement the signal operation – it is essential to recognise that some regulatory signs are critical to the safe operation of the signal phasing and must match the allowed or disallowed movements, whereas other regulatory signs, whilst still worthwhile, may not necessarily, be reflected in the signal phasing
- stop line to stop line distance where next signal site is less than 1 km away – this information is valuable for coordination of traffic signals and should be include the next traffic signal site number as well as the distance between the stop lines

4.3.2 Movement diagrams and approach numbering

One movement diagram is required for each phase. Each diagram must be labelled with the phase and all diagrams grouped together in alphabetical order, preferably in the upper left-hand corner of the sheet.

Each diagram should show all the vehicle and pedestrian movements that run during that phase, the movements being oriented to match the orientation of the layout. Unconditional vehicle movements are shown as a solid line, left turn on red is shown as a dashed line and conditional vehicle movements are shown as a stopped solid line followed by a dashed line. In each case, the direction of traffic movement is indicated by an arrow head. (A number of examples are used throughout this guide.) Pedestrian movements are shown as a solid line with an arrow head at each end. It is not necessary to show kerbs, medians, islands or movements that do not run in that phase unless doing so would help to clarify an otherwise confusing diagram.

If there is an uncontrolled movement, such as a left turn slip lane, this should also be shown on the appropriate movement diagram.

Approach numbers should be added to any movements which are timed by approach timers (see drawing No. TS-TN-020). The movement diagrams should also identify alternative phases (such as in diamond overlap phasing) and future phases (see Section 13 [Provision for Future Facilities](#)) if appropriate.

Detectors with different labels on the same approach to the intersection have different functions and are therefore allocated different approach numbers. This may require the duplication of movements in the movement diagrams together with the respective approach numbers. See drawing No TS-TN-020.

4.3.3 Detector specification schedule

A detector specification schedule is needed on all plans except for simple two-phase designs and signalised mid-block pedestrian crossings. There must be one entry for each detector as described in drawing No. TS-TN-020.

4.3.4 Signal group/phase chart

A signal group/phase chart is needed on all plans, except for simple two-phase designs and signalised mid-block marked foot crossings. An entry is needed for each vehicle and pedestrian signal group.

4.3.5 Sequence table

A sequence table is needed on all plans for two-stage mid-block pedestrian crossings. An example is shown in Figure 14.2 in [Signalised Mid-block Marked Footcrossings](#).

4.3.6 Locality sketch

A locality sketch may be included on the traffic signal design layout to assist those unfamiliar with the site or to quickly get their bearings. If the site is a well known location or an easily identified location the locality sketch may be omitted (e.g. a locality sketch is not required in the central business district (CBD) of Sydney). If a locality sketch is to be included it is traditionally drawn with the traffic signal site at the centre of a 100 mm diameter circle, although a square or rectangle of a similar area can be used if deemed more appropriate. The locality sketch should be drawn at a scale such that it covers a radius from the signal site of approximately 0.25 km in CBD areas, other than Sydney, 1 to 2 km in an urban area (depending on the density of the road network) and 5 to 10 km in a country area. It is essential that the orientation is the same as the layout.

The information does not need to be very detailed and may be restricted to:

- classified state roads and other major roads (which may be represented by a single line rather than a double line)
- street names
- rivers and coast lines
- railway lines
- prominent, well-known features such as parks, major shopping developments and schools

- location and TCS numbers of other traffic signal sites
- names of suburbs
- north point

Integrated Survey Grid (ISG) coordinates of the intersection should be shown beneath the locality sketch. This is necessary to maintain an accurate database of all traffic signal sites throughout NSW. The coordinates are used to build regional maps, determine distances between sites for coordination purposes and enable the graphical display of sub-systems.

The coordinates should be measured at the centre of the intersection to the nearest 5 m. These may be obtained from the site survey or maps showing ISG coordinates. Do not use Australian Mapping Grid (AMG) coordinates as used in the accident database and many street directories.

4.3.7 Post chart

For a new site, it is assumed that all posts on the design layout are Type 2, 4.1 m long, unless there is a note to the contrary. In the case of a reconstruction, it may also be necessary to distinguish between new and existing posts. A post chart showing post numbers, type of posts, length of posts, kerb offsets and remarks can be used for this purpose. The remarks column is used to give details of special posts, whether the posts are new or existing and the length of outreach arms for Type 9, 10, 11, 12, and 15 mast arms. However, once the signals have been installed, a job instruction should be issued to convert all "new" entries to "existing" so that the plan correctly reflects the work as executed.

4.3.8 Setting-out details

When the installation or reconstruction of traffic signals entails roadworks of any form, the construction and setting out details must be shown in one of the following ways:

- on the design layout
- as an inset on the design layout plan
- on a separate setting-out plan
- on a separate set of road construction plans

The method used will depend on the extent of the roadworks. If roadworks are minor, the details may be shown on the design layout in conjunction with explanatory notes. However, once the roadworks are complete, a job instruction should be issued to amend the layout and delete the notes so that the plan correctly reflects the work-as-executed.

If the construction is localised (such as a new corner island), the setting out details may be shown as an inset. This prevents having to alter the plan for work-as-executed at a later date. The inset can remain as a record of conditions prior to construction.

If the roadworks are too extensive or too complicated to allow either of the above methods, an extra setting-out plan sheet can be drawn to show the setting out details. This is the preferred method even for minor roadworks as the setting out details are much clearer, the setting out dimensions can be left off the design layout (hence the design layout is less cluttered), the setting-out plan contains a record of conditions prior to construction and there is no need to modify the design layout to reflect the work-as-executed.

Separate road construction plans are normally only used if the signals are part of a larger roadwork project such as road construction, or reconstruction and widening.



If either a separate setting-out plan, or roadwork plan is used for setting-out details an appropriate reference to it should be made on the design layout.

4.3.9 Inset for future facilities

If the design provides for future facilities, these must be detailed on the design layout plan using a combination of notes and/or an inset. See Section 13 [Provision for Future Facilities](#) for further details.

4.3.10 Notes

Use notes on the design layout to explain any details about the design that need clarification or cannot be conveyed via the layout, movement diagrams, insets or the various charts, tables and schedules. The notes required fall into two distinct categories:

- a). permanent notes
- b). temporary notes

The permanent notes are those that remain after the work has been carried out. These include:

- post details for any posts other than Type 2, 4.1m long (if there is no post chart)
- which posts hold the special stop signs (R1-4 & R9-201)
- which posts have audio-tactile push buttons
- which post holds the audio-tactile driver unit for an audio-tactile push button mounted on a short push-button post
- details of special equipment such as special footings, split finials, special mounting straps
- unusual shielding or aiming of signal faces
- details of non-standard signal group operation or special features
- details of any special symbols used on the layout
- reference to another sheet or road construction plans for construction details
- details of future facilities
- details of trees to be trimmed

Do not show co-ordination details unless it is considered essential for accurate setting out of signal components or associated civil works. This avoids the issue of a job instruction to amend the plan whenever the co-ordination details change. Co-ordination details are more thoroughly shown on the co-ordination sheet in the civil design drawings.

All permanent notes should be worded in the present tense rather than the future tense. For example, "special stop signs (R1-4 & R9-201) *are* mounted on posts 1 and 4" rather than "special stop signs (R1-4 & R9-201) *to be* mounted on posts 1 and 4". In this way, the note will be correct after installation and will not need to be amended to reflect work-as-executed.

Temporary notes are those that remain until the work is carried out and are then deleted so that the plan reflects the work-as-executed. The temporary notes should be placed beneath the permanent notes so that they can easily be deleted without having to renumber or rearrange the permanent notes. Temporary notes include details such as:

- removal of old kerb and gutter, medians, islands, etc.
- construction of new kerb and gutter, kerb ramps, pavement, medians, islands, etc.
- resurfacing of pavement
- removal of trees

Avoid vague notes such as "location of supply to be determined on site" and "final position of post to be determined on site". This practice delays the preparation of electrical plans, causes unnecessary construction problems and necessitates amendments to the plan to reflect work-as-executed.

If such notes are unavoidable they should be expanded to include the reason e.g. "final position of post to be determined on site following accurate location of utilities".

4.3.11 Date in service

The date in service must be added to the top right hand corner of the design layout when the signals first go into service. If the site is reconstructed at a later date, then the date of reconstruction is added beneath the date in service. There only needs to be one reconstruction date. If the site has been reconstructed a number of times, only the most recent reconstruction date needs to be shown.

If the plan requires a job instruction for work-as-executed, the date in service or date of reconstruction can be added at the same time that the amendments are carried out. This will result in an issue change. However, if there is no need for a job instruction for work-as-executed, the date in service or date of reconstruction may be added without an issue change.

4.4 OTHER PLANS

The design requirements and preparation of drawings set out in this manual relate mainly to the civil components of traffic signal design. However, there are a number of other plans that are also prepared that contribute to making up a "full set of traffic signal plans". The following descriptions briefly detail the content and purpose of these plans. Further information may be found in the specification SI/TCS/8, "Installation and Reconstruction of Traffic Light Signals", or by contacting the Manager, Traffic Systems Projects and Technology.

4.4.1 Cable installation plan

This plan is prepared by the traffic signal contractor, or the RTA, for each traffic signal site and details the installation of underground cable ducting for the operation of the traffic signals.

4.4.2 Cable connection chart

This plan is prepared by the traffic signal contractor, or the RTA, for each traffic signal site and details all traffic signal controller cable connections and terminations. This is not required at mid-block marked foot crossings, where a generic plan is used.

4.4.3 Duct/Boring plan

This plan is prepared when an opportunity exists to install conduits for Traffic Signals and Intelligent Transport Systems (ITS) in conjunction with planned roadworks. The plan details

the proposed positions of the under road conduits installed for future traffic signals and/or ITS infrastructure.

4.4.4 Wiring/schematic plan

This is an optional plan and is prepared when there are specific electrical facilities required for a particular traffic signal site, such as: moveable medians, pavement lights, boom gates, optic/LED signs, radio links, rotating prism signs etc.

4.4.5 Special requirement plan

This is an optional plan and is prepared when there are special requirements at the traffic signal site that need to be detailed separately, such as: footing details for the mounting of pits, posts and mast arms on parapets, bridges, walls, barriers etc.

4.5 OTHER ACTIVITIES

The following activities are very specialised and carried out by officers of the RTA. Further information may be obtained by contacting the Manager, Traffic Systems Projects and Technology for adaptive engineering or the Manager Network Operations, Transport Management Centre, for SCATS settings.

4.5.1 Adaptive engineering

This is the process of generating software programs for each particular traffic signal site and testing to detect unwanted conflicts in traffic and/or other movements (pedestrians/cyclists).

4.5.2 SCATS settings

This is an activity whereby local time settings and network plan data is installed at each traffic signal site to ensure compatibility with the overall SCATS network.

For further enquiries

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