



**Canterbury Bankstown
Development Control
Plan 2021**

**Engineering
Development Guide**

DRAFT December 2020





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SECTION 1–INTRODUCTION

Explanation

The Development Engineering Standards Guide supports Canterbury Bankstown Development Control Plan 2021 by providing additional requirements to protect the integrity of Canterbury Bankstown's infrastructure in situations where it is impacted upon by building and subdivision development.

Objectives

- 01** To ensure that development provides a satisfactory level of engineering infrastructure.
- 02** To minimise the impact of development on surrounding sites, roads and existing stormwater systems.
- 03** To protect and construct the interface, under Council supervision and to Council's satisfaction, between development and Council's assets including footways, roadways and drainage systems.

Requirements

Standard Plans

- 1.1** For all standard plans go to Canterbury Bankstown Council website:

Development / Planning control and policies / Council Standard Drawings

- 1.2** Any infrastructure provided based on this Guide will need to meet the relevant Australian Standards, where applicable.



SECTION 2–SUMMARY OF ENGINEERING INVOLVEMENT AND PROCESSES

Explanation

Council's Engineer will utilise this Guide and be involved in the assessment process in the following areas:

- Site civil engineering requirements;
- Protection of Council infrastructure;
- Vehicular and pedestrian access to development sites;
- Stormwater management and conveyance
- Stormwater flooding
- Land Subdivision.

Requirements

Engineering Requirements Relating to the Development Process

2.1 Engineering issues play a major role in most developments. It is usually wise for a developer to seek input from the engineering staff at Council prior to embarking on any development proposal where access to the site, drainage of stormwater from the site and site terrain are potential issues that may restrict the potential of developing the site. This section attempts to explain the necessary steps for assessing the development proposal from an engineering aspect. The following is a list of steps to follow when considering a site for development.

Stormwater System Report (SSR) Application Process

2.2 Council maintains a register of lots, which may be affected by a publicly controlled and some privately maintained drainage systems. All development proposals involving lots noted on this register must obtain advice, by way of an application to Council for a SSR, prior to lodgement of the DA to Council for assessment. The SSR is likely to include the following information:

- The nominal location and size of any Council or Sydney Water stormwater system within or near the site.
- The Council stormwater system to which the site stormwater system is to be connected.
- 100 Year ARI Georges River Flood levels and other mainstream and major stormwater flood levels, if applicable and available.
- Whether Council requires a flood study, to be provided, by the applicant, to determine the depth and extent of the 100 year ARI overland stormwater flow within the site.



An application for the SSR can be made on Council's standard form and lodged with Council's Customer Service Counter together with payment of the current fee at least three weeks prior to the information being required for lodgement of the DA. Site plans; including existing and proposed building footprint, and a site survey should be submitted with the application to enable a complete assessment.

The information and recommendations contained in the SSR must be incorporated into the Architectural, Drainage and Civil Works Plans lodged with the DA.

Council may require the location, size and relative levels of any nominated Council drainage infrastructure to be verified by a Registered Surveyor, engaged by the applicant for the development, and shown on the Concept Drainage and Civil Works Plan lodged with the DA.

The SSR does not give details of internal site stormwater systems or the existence of CDL's on the site. Locating the existence of CDL's is the responsibility of the applicant and this information must be included with the Concept Drainage and Civil Works Plan lodged with the DA.

A copy of the issued SSR and any required flood studies must be lodged with the DA. The DA plans are to incorporate any recommendations of the flood study.

Development Application (DA) Assessment Process

2.3 When the DA is ready to be lodged, the application must be accompanied by engineering documentation suitable for purposes of assessing whether the development proposal is a viable proposal from an engineering aspect. For Council's Engineer to suitably assess the proposal, Concept Drainage and Civil Works Plans must be submitted along with any SSR, flood studies and engineering reports that may be required for the development to proceed.

The level and quality of the detail presented on the concept engineering plans and reports will determine the time necessary to review and assess the application from an engineering aspect.

Concept engineering plans must be prepared by a suitably qualified Civil Engineer and presented at a scale suitable for the size and complexity of the information required for the development proposal. In general, residential type developments should be drawn at 1 to 100 scale. Concept engineering plans for larger scale developments may be presented at 1 to 200 scale. Other scales for drawing presentation are not preferred.



- 2.4** The level of detail for the concept earthworks and drainage plan acceptance is dependent on the degree of difficulty of the site to achieve the desired outcomes for site levels and drainage connection to the Council drainage system. If it can be easily determined that the site has ample slope to an existing legal drainage system within the bounds of the site then not much information is required to assess the development proposal. If the site has very little fall and no legal access to an existing drainage system then Council will require much more survey information and design detail to assess the viability of the development proposal. It is better to have more existing and design information at the assessment stage than not enough information. If Council deems there is not enough existing or design information, the concept plans will be rejected for further information and delays to the assessment process will occur.

The following is a list of information of which all or some may be required for the DA assessment process:

- Site benchmark and origin of datum; specify either AHD or assumed. AHD is required if a flood study has been carried out, or flood levels to AHD have been issued.
- Extent of flooding and relevant information from the flood study.
- Site and development layout and proposed finished floor and garage levels.
- Location and levels of drainage infrastructure on and adjacent to the development.
- Location and levels of existing road infrastructure, traffic facilities, stormwater pits, street trees, existing utilities including power poles and Telstra pits, and vehicular footway crossings in front of the site and in front of adjacent properties.
- Layout and approximate sizing of the proposed onsite and offsite drainage system including concept design surface and invert levels.
- Location of all existing and proposed drainage easements.
- Location, depth and extent of any proposed OSD system, when applicable.
- Approximate volume of OSD storage proposed and method used to estimate the OSD storage required.
- Proposed site discharge control method.
- Location and concept levels of the proposed discharge point to the Council's or private drainage system.
- Location of proposed OLFP routes for the development.
- Existing and proposed ground levels and contours extending a minimum distance 1 metre into adjoining properties.
- Location of any overland flow paths from upstream areas through the site.
- Location of trees on the site.

Any changes required by the Council engineer must be shown on amended concept engineering plans prior to final stamping of the DA plans for approval.



Work Permit (WP) Assessment Process

- 2.5** A Work Permit, commonly called a permit to carry out works, is required for any proposed construction activities occurring within Council owned or maintained land or infrastructure including Council infrastructure on privately owned Land. The WP applied for, is a requirement of Section 138 of the Roads Act 1993 for any construction activities within the road reserve or of Section 68 of the Local Government Act 1993 for any construction activities within Council land or to infrastructure maintained by Council.

The developer is to apply for the WP at Council's Customer Service Counter with the payment of the appropriate fees.

The developer should apply for the WP as soon as practicable after the DA has been approved, as the CC cannot be issued until Council has issued an approved Work Permit.

A RMS WP Approval will be required for works and a Road Occupancy License will be required for roadway occupancy, on Regional or State Roads or within 100 metres of a traffic facility including roundabouts and traffic signals. Council will not issue a Work Permit until relevant RMS licenses are submitted to Council.

On State Roads and/or where the RMS is the road authority, all WP applications for permits to carry out works on the roadway, or to occupy the roadway, shall be directed to the RMS for approval. Application can be made to the RMS Network Planning Engineer.

A Traffic Control Plan (TCP), prepared by an RMS authorised person, is to be submitted with the WP application where impact on pedestrian or vehicular traffic will be long term or significant or where road works are being carried out and traffic must be diverted, or where a trafficable kerbside lane is blocked.

Council shall supervise construction works, associated with the WP application, with the exception of works being constructed within State Road roadways under the jurisdiction of the RMS. Council will inspect works on State Road footways.

Construction Certificate (CC) Assessment Process

- 2.6** The construction certificate application is the process by which the developer is granted approval to commence construction. This requires the construction documentation to incorporate all of the conditions of consent relating to the construction of a development. Once the DA Consent is issued a developer may proceed to apply for a CC. If required by the DA consent, the CC for the development must include the following list of engineering documentation before the CC may be issued:



- An approved Work Permit from Council
- Site benchmark and origin of datum; specify either AHD or assumed. AHD is required if a flood study has been carried out, or flood levels to AHD have been issued.
- Site and development layout including proposed finished floor levels, garage levels, driveway levels, and all other necessary proposed finished ground level for earthworks.
- Approved SBAL's and VFC design shall be shown on the final Drainage and Civil Works Plan.
- Location and levels of existing pipes, pits and other drainage infrastructure on and adjacent to the development site. The developer is responsible to locate pipes and pits.
- Layout, pipe sizes, pipe grades and pipe invert levels necessary to construct the proposed drainage system, including all computations.
- Location of all existing and proposed drainage easements.
- Location, depth and extent of all OSD storage areas – where applicable.
- Actual volume of OSD storage required and calculations used to size the OSD storage required, where applicable.
- Provide cross sections for detention storage system showing surface levels, invert levels, structural details and materials used, preferably to a scale of 1:20, where applicable.
- Proposed site discharge control method; for example sharp edge orifice plate, choke pipe, weir, and materials and levels required, where applicable.
- Designed discharge point to the Council's drainage system including all levels of proposed pipelines and existing levels at the point of discharge.
- Design OLFP routes and proposed ground levels for the development.
- Existing and proposed ground levels and contours extending a minimum distance 1 meter into adjoining properties.
- Show the extent of any upstream catchment draining through the site.
- Design levels and location of any overland flow paths from upstream areas through the site.
- Hydraulic analysis of existing drainage system, where required, if redirecting stormwater drainage runoff from one catchment to another.
- Location and diameter of trees on the site and within 3 metres of the any proposed work.



Subdivision Certificate (SC) Assessment Process

- 2.7** The subdivision certificate application is the process by which the developer receives Council's final authorisation of a subdivision plan or an instrument to create easements, restrictions and/or positive covenants. Land and Property Information require the authorisation, prior to registering the subdivision or instruments. The authorisation to subdivide the development will only be issued if the development is completed in accordance with Council's policies and the conditions of the DA consent with respect to the subdivision requirements for the development.

The developer may want to discuss the particular details of the subdivision with Council prior to the granting of the final DA so the DA can be issued with the particulars in mind. The developer may apply for a SC upon completion of all development works required for the subdivision. Development works may include, but are not limited to, road and drainage work, installation of CDL's, construction of common use driveway surfaces, common use OSD systems and earthworks required for the subdivision.

Application Fees and Charges

- 2.8** Council's Application Fees and Charges are updated annually and apply to the various approvals and certificates associated with the engineering requirements.



SECTION 3–WORK PERMITS

Explanation

A Work Permit, issued by Council, is required under Section 138 of The Roads Act and Section 68 of The Local Government Act for any work to be carried out by a developer on Council's Road Reserve, within Public Land, or on Council Assets including stormwater pipes and pits. It is very important to apply for the WP as early as possible in the Construction Certificate process because the outcomes of the WP approval may affect the civil and stormwater design of the development.

Requirements

Work Permits for Work in Council's Road Reserve, within Public Land, and/ or on Council Assets.

- 3.1** Where construction of new Council infrastructure, excavation for VFC's, and/or works for utilities including stormwater, water, sewer, gas, electricity, communication cables, occurs adjacent to or within the road reserve, the work must be carried out with an approved Council issued Work Permit (Part D) and under the supervision of Council. The developer must apply to Council for a Work Permit (Part D) to be assessed and approved after payment of the appropriate fees and charges.
- 3.2** Utility installations must be constructed in accordance with the relevant utility company's authorisation and to their satisfaction. The restoration of the Council assets must be carried out in accordance with the requirements of the issued Work Permit and to Council's satisfaction.
- 3.3** For any other works in the Road Reserve, not associated with development work, a Work Permit (Part C) for Road Openings or VFC must be obtained and associated fees paid prior to commencement of any work.

Traffic Management in Council Roads

- 3.4** For any work within the Council Road Reserve and involving temporary partial road closure and/or closure of the footway, the developer must provide a Traffic Management Plan and/or a Certified Traffic Control Plan prepared in accordance with RMS guidelines "Traffic Control at Work Sites" and AS1742.3, titled "Traffic Control Devices for Works on Roads".



An application for lane closure and/or partial road closure on Regional Roads, RMS State Roads, and within 100 metres of a traffic facility, must be submitted to the RMS for issue of a Road Occupation Licence. Traffic facilities include traffic signals, roundabouts, speed humps, kerb islands and extensions, pedestrian signals, pedestrian crossings. Application can be made to the RMS Transport Management Centre, Eveleigh, NSW.

The Traffic management Plan and the Traffic Control Plan must be prepared and signed by a RMS accredited traffic consultant.

A copy of the Traffic Management Plan, Traffic Control Plan, and any RMS Occupation Licence, if required, is to be lodged with Council prior to issue of the Work Permit.

Full closure of any road is generally not permitted unless approved as a condition of development consent and done in accordance with the requirements of the Roads Act.

Traffic Management Plan (TMP)

- 3.5** For any development where site work will interrupt or have a significant impact on road and footway activities on a regular basis, the developer must submit a Traffic Management Plan to Council.

The TMP is often included in a construction management plan and provides details of how the construction activities related to a development will integrate into the operation of the road network. The plan is to assess impacts on traffic flow, cyclists, pedestrians, local residents, businesses, parking stations, schools, hospitals, public transport, and emergency services as applicable.

Traffic Control Plan (TCP)

- 3.6** The Traffic Control Plan is a plan that is intended to ensure the safety of road users and road workers at the work site. The TCP specifies the signs, devices, and illumination, to be used to warn, instruct and guide road users in the safe negotiation of work sites on road reserves, and to provide a safe work area.

The TCP must include proposed timelines of the above matters.

Traffic Control Plans must be prepared in accordance with RMS's guidelines "Traffic Control at Work Sites" and comply with AS1742.3.

TCP's must only be prepared by persons who are qualified, authorised and have passed an RMS approved training course.



SECTION 4–CIVIL ENGINEERING REQUIREMENTS

Explanation

It is recommended that the developer and design engineer consult with Council early in the development process. Developers should incorporate any recommendations and requirements from the early consultation process before the site design is submitted to Council for a Development Application.

Developments should be designed to utilise the existing infrastructure, whenever possible, and to minimise impacts on Council's and privately owned assets.

Design and construction shall be carried out generally in accordance with these guidelines and any conditions as set out in the DA consent.

The design of development sites should utilise and consider all of the following:

- Existing Public Road and drainage infrastructure and levels, including OLFP's.
- Location of existing and proposed vehicular access with regard to avoiding existing drainage structures, traffic control devices, street infrastructure, existing utilities and street trees.
- The location and levels of existing onsite private and public drainage infrastructure.
- Adjoining property land levels and features, including fence types and building footprints.

Requirements

Preparation of Drainage & Civil Works Plans

4.1 The Civil Engineering site plan, showing proposed drainage and civil works, should be developed in two phases. One phase should be conceptual for the purposes of the DA assessment process and the second phase should be more detailed for the purposes of the CC assessment and construction documentation.

DA Plans

4.2 In general, the Concept Drainage and Civil Works Plan for DA submission require less information to be shown than the Final Drainage and Civil Works Plan for CC submission. However, the more information provided in the concept stage of the development, the more thoroughly Council can assess the design for compliance with this guideline or agree with any proposed deviation from the guidelines.



The plans must also be legible or they may be rejected causing delays to the assessment process. The following is a list of minimum required information to be shown on the plans:

- Sheet size shall be a maximum A1 or a minimum of A3 size.
- Plan scale shall be preferably 1 to 100, 1 to 200 or as otherwise noted.
- Datum, preferably to AHD.
- Bench Mark location and level.
- North arrow
- Legend
- General Notes
- Site location map
- Title Block
- Qualified Engineer's Signature
- Date of latest revision
- Existing contours, spot levels, buildings and fences.
- Existing pipe and inlet pit locations and levels
- Conceptual proposed contours, spot levels, buildings and fences.
- Conceptual pipe and inlet pit locations
- Any recommended flood levels as included in the flood study.

Construction Certificate (CC) Plans

4.3 All developments involving site construction works must be constructed in accordance with an approved CC for the development. Detailed plans and calculations, suitable for construction purposes must be prepared by a qualified practising Civil Engineer and submitted to the Principal Certifying Authority for approval with the CC. An Accredited Civil Certifier must supply a compliance certificate, under Section 6.16 of the EP&A Act, to Council, for internal site earthworks and stormwater drainage system design. This clause excludes any approval for works related to Council's infrastructure that may be located within or external to the development site.

The plans must include existing contours at suitable intervals to define site topography, and spot levels at critical points such as boundary levels, adjacent building levels, changes of grade, surface levels at the base of existing trees, levels on the surface of existing utility structures and along the base of any existing structures intended to remain on the property.



The plans must include all proposed contour levels and spot levels at critical points such as the edge of proposed buildings, the surface level of proposed utility structures, top and toe of proposed retaining walls, at all grade changes, at the surface of all propose drainage inlet structures, building finished floor and garage levels and finished surface levels of landscaping.

The following is a list of required information to be shown on the CC Plans:

- Sheet size shall be a maximum A1 or a minimum of A3 size.
- Plan scale shall be preferably 1 to 100, 1 to 200 or as otherwise noted. Odd scale plans may be rejected.
- Datum, preferably to AHD.
- Bench Mark location and level.
- North arrow
- Legend
- General Notes
- Site location map
- Title Block
- Qualified Engineer's Signature
- Date of latest revision
- Existing contours, spot levels, buildings and fences.
- Existing pipe and pit locations and levels
- Proposed contours, spot levels, buildings and fences.
- Proposed pipe and pit locations and levels
- Any recommended flood levels as included in the flood study.

Earthworks

4.4 Earthworks may include bulk excavation or filling of sites to make general grades before final site levels are constructed. Earthworks also include design-finished levels for pavements and kerbs. Proposed earthworks, including excavation, fill or retaining walls, must not obstruct any overland flow from upstream properties or divert flow onto other properties.

Cut and Fill

4.5 Cut and fill levels exceeding 500mm in depth, must be constructed under the supervision of a NATA registered Geotechnical Testing Consultant and in accordance with the latest edition of AS 2870. A NATA Registered Geotechnical Testing company must be engaged, by the developer, to provide Compaction testing and certification of the compaction results for submission to Council for acceptance.



The proposed cut and fill levels should be designed so as to not require any soil to have to be transported to or away from the site.

Retaining Walls

- 4.6** Where approved cut or fill exceeds 200mm and a stable batter of 1:3 maximum grade cannot be achieved on the site, a retaining wall shall be constructed to support the embankment.

Retaining walls must be constructed of masonry or other proprietary material intended and suitable for the purpose. Retaining wall structures must include a sub-soil drainage system, behind the wall, connected to the site drainage system. All elements of the retaining wall shall be fully contained within boundaries of the development site.

Any proposed retaining walls exceeding 600mm in height shall be designed by a practising Civil/Structural Engineer and certified to be able to withstand all of the anticipated loads. In all cases, Council may request supporting documentation, from the proprietor of the retaining wall material, to be submitted as evidence of its suitability for the purpose intended.

Flooding Assessment, Internal Site Drainage, OSD Design Requirements And Stormwater Disposal

- 4.7** Requirements for flood assessment, overland flow paths, stormwater disposal from the site, and design of internal drainage and OSD systems are detailed in the relevant later sections of this Guideline.

Erosion and Sediment Control

- 4.8** Measures shall be adopted, to prevent eroded soil or soil laden water from leaving any part of the construction site, in accordance with Development Control Plan and the latest edition of "Managing Urban Stormwater (Soils and Construction)" commonly known as "The Blue Book" by Landcom.

All measures shall be installed prior to the commencement of site surface disturbance and, where necessary, modified as the project continues. The function and integrity of the measures shall be cleaned after each storm event and maintained at all times.

Sediment and Erosion Control Plans and details for the whole construction site, prepared in accordance with the above requirements, must be lodged with the PCA for approval prior to issue of the Construction Certificate.



Site Vehicular Access

- 4.9** In general, any proposed site vehicular access must comply with Council's Vehicular Footway Crossing (VFC) Criteria. Developers must apply for a Work Permit to construct a new VFC. The Work Permit Approval will include all of the relevant criteria for geometry and construction of the VFC. The VFC location shall be located to comply with the latest edition of AS 2890.1. Site vehicular access, not complying with this requirement will require specific approval from Council's Traffic Engineer, or the Council's Traffic Committee and the RMS.

Location and Width of Site Vehicular Access

- 4.10** Vehicular access is to be sized and located to maximise the retention of on street parking. Design with regard to the following criteria will ensure this objective is met.

Wherever possible, vehicular access must be located to avoid conflict with existing infrastructure. Where the proposed vehicular access is located in conflict with an existing drainage structure and/or other utility authority structures in the street, gutter, or footway, the applicant must bear all costs associated with adjusting such structures only after the relevant authority has given approval.

If the VFC conflicts with a Council stormwater pit then another stormwater pit with equivalent or greater capacity lintel is to be reconstructed clear of the VFC. If the affected structure is a Council stormwater pit at a sag then another two stormwater pits with equivalent capacity lintel may be required to be reconstructed on either side of the VFC. The existing stormwater pit is to be retained and a double grate installed over the existing pit, in accordance with Standard Drawing S-118. Council will have the final determination of the location and size of the new pit/s.

Site Vehicular Access And Traffic Impacts on Roads

- 4.11** When designing the site layout and site access, the developer must consider impacts on existing traffic flow and volumes, and existing and future traffic control facilities such as, but not limited to, road intersections, roundabouts, wombat crossings, pedestrian crossings, traffic signals, regulatory signs, traffic calming devices, roadside parking facilities and line marking controls.



Any changes to traffic facilities are strongly discouraged. Developers should make every attempt to avoid conflict with existing traffic facilities when designing the layout of the proposed development. Any proposed changes to these facilities must be submitted to the Council's Traffic Committee for review and comment as a part of the DA process. Any construction design documents requesting change or addition of these facilities must be reviewed and approved by the traffic Committee prior to any work commencing on the change being made.

Council will require traffic studies for large traffic generating developments. Compensatory traffic control works may be required to offset impacts generated by the development.

It should be noted that the Council's Traffic Committee meets monthly and that sufficient lead-time should be allowed for the required approvals prior to any works being carried out on site.

When designing any development with access onto State Roads, application must be made to the RMS for consideration and approval regarding the location and width of the proposed vehicular access. State and Regional Roads in the Local Government Area is shown on Council's website.

VFC's and Impact on Street Trees

4.12 Street trees represent an important Council and environmental asset. Every effort should be made to protect the existing street trees.

With the exception of utilising existing VFC's for access to new developments, all new VFC's should be located 2.0m clear of any tree trunk for sight distance and reduction of potential root damage to the existing tree. For any variation, an application should be made to Council for consideration. Any approval will be based on an assessment having regard to the potential size of the street tree and the amount of excavation involved.

The Tree Preservation Officer must assess any impact to trees affected by the development proposal. Developers will be required to replace any removed trees with other suitable tree(s) as approved by Council's Tree Preservation Officer. Developers will be liable for the cost of replacement of removed trees.



SBAL's and VFC Design Levels

- 4.13** Council has developed and adopted set criteria for determining the shape of the footway area within the existing and proposed road reserves. Council's desire to have a consistent approach to the reshaping of the footway area requires that site levels at the Street Boundary Alignment SBAL must be compatible with profiles designed by Council.

The developer must make application to Council to obtain a Work Permit [Part D] for SBAL's and VFC's and pay the standard application fee at Councils Customer Service Centre prior to the issue of the CC for the development. The levels must be incorporated in the designs of the internal pavement, car park, landscaping and stormwater drainage.

VFC And Foot paving Construction

- 4.14** The VFC and foot paving must be constructed in accordance with plans, design levels and specification issued by Council's Civic Design Unit. A Work Permit [Part D] must be applied for and an application fee is applicable for Council to provide the design, construction specifications, and inspections.

All VFC and foot paving pavement surfaces must be constructed to be a slip resistant finish in accordance with Council's VFC and foot paving design and specification by Council.

- VFC finish is to be broom, stencilled, or cove finish only to ensure compliance with slip resistance requirements.
- Sealing of VFC is not permitted as the surface becomes excessively slippery.
- Only one colour may be applied to non-grey finishes if a colour finish is approved.
- The VFC layback must be in plain broom finish concrete.
- Foot paving finish is to be plain concrete broom finish unless specified otherwise by Council. Council may specify decorative paving in designated areas such as shopping centres.

Council may reconstruct any construction not complying with these requirements, at the owner or developer's expense.

Any form of paving strip across the footway, between the street boundary and kerb and gutter, for pedestrian or vehicular access other than the approved vehicular crossing will not be permitted without Council Approval. Council may remove any unauthorised construction of such work, at the owner or developer's expense.



Restoration Works Within The Footway

4.15 Council may require the following works within the road reserve to be carried out by the developer in the roadway adjacent to a new development at the developer's expense.

- Reconstruction of any existing VFC to be retained, if previously damaged or not meeting Council's current specification.
- Reconstruction of damaged foot paving.
- Removal of redundant VFC or laybacks and reinstatement of the footway and kerb and gutter.
- Any adjustment and/or provision of new kerb and gutter, drainage facilities, road pavement, utility services, adjacent foot paving and/or footway.
- Adjustment and reconstruction of adjoining VFC and foot paving as required due to difference in grades and levels and to provide 1.0 metre transitions or clearance to existing infrastructure.
- Remove any unauthorised VFC and restore the footway to Council's satisfaction.

Improvement Works Required Within The Road Reserve

4.16 For the categories of development listed below, developers may be required to upgrade Council's infrastructure in accordance with the DA Consent. The works must be carried out at the developer's expense where these improvements do not exist, are in need of replacement due to damage or are sub-standard for its intended purpose. This clause usually does not apply to single-family residential, dual occupancy types of development and where no onsite works are proposed such as change of use. The following is a list of the types of developments and the required frontage improvements to be installed in front of those developments.

(a) Multi-unit Residential, Institutional, and Industrial Development

- Concrete Kerb and gutter over the full road frontage(s) of the site.
- Road shoulder pavement over the full road frontage(s) of the site.
- Concrete foot paving 1.2m wide adjoining the full road frontage(s) of the site.
- Reconstruction of damaged concrete foot paving, kerb and gutter and/or road pavement.
- Reconstruction of stormwater pits including replacing old and damaged grates and lintels.



(b) Commercial Developments

- Concrete Kerb and gutter over the full road frontage(s) of the site.
- Road shoulder pavement over the full road frontage(s) of the site.
- Foot paving must be provided over the full width of the footway. The foot paving must be in accordance with Council's requirements for the area.
- Developments, within the Bankstown CBD, must be built to comply with the foot paving requirements of the "CBD Paving Guidelines".
- Reconstruction of damaged concrete foot paving, kerb and gutter and/or road pavement.
- Reconstruction of stormwater pits including replacing old and damaged grates and lintels.

Works By Private Contractors

4.17 The opportunity exists for the applicant to have the necessary works in Council's footway to be carried out by a suitably qualified private contractor, under Council's supervision, subject to the approval of the Work Permit by Council. Developers should make early applications to Council for the issue of Work Permits. A contractor must provide proof of Public Liability Insurance, to the value specified by Council, for any works or activities on public land.

Internal Driveway Profile

4.18 The vehicular driveway profile within the development site shall be designed to prevent vehicles from scraping and must satisfy the following requirements:

- The maximum allowable grade is to comply with AS 2890.1 & AS 2890.2.
- Transition grades will be required for changes in grade in excess of 12.5%.
- Maximum allowable limits and vertical transitions must comply with Council's Standard Drawing No. S-005.
- Council's Standard Car Clearance Profile on Drawing No. S-006 shall be used to determine acceptable grades to prevent scraping on residential development. The 99% profile in AS 2890 is to be used for commercial, and industrial developments and all developments where more than 25 parking spaces are provided.

Driveway Pavement Surface Requirements

4.19 The developer must construct the driveway pavement surface of a durable, slip resistant, all weather material such as concrete or pavers intended for the use as a driveway surface.



The minimum pavement thickness design for the driveway within the development must be in accordance with Council's Standard Drawings, whichever is required by the development consent. A Structural Engineer shall be engaged to design any driveway shared by more than two dwellings. The following driveway requirements also apply:

- Concrete finish is to be broom, stencilled, or cove trowel finish to achieve a slip resistant surface finish.
- Sealing of coloured concrete is not recommended as the surface may become slippery when wet.
- Driveways with a grade in excess of 15% are to be constructed with an enhanced skid resistant surface treatment such as grooving.
- If pavers are proposed as a driveway surface the pavers must be laid on a sand covered concrete base.

Car-Wash Bays

4.20 Where residential developments are required to provide a car wash bay as a condition of development consent, the following requirements apply:

- The car wash bay pavement must be bunded and isolated from the stormwater drainage system so the car wash runoff discharges into the Sydney Water sewer system.
- The car wash bay must be covered or located in the basement and protected so that stormwater does not collect in the wash bay and discharge into the sewer system.
- The car-wash bay space may also be used as a visitor parking space.

Certification Of Driveway Design And Construction

4.21 The developer must provide a design prepared by a qualified Engineer for all driveways, parking bays and service areas that are to be subjected to vehicular movement. The type and thickness of pavement must be designed to accommodate the anticipated wheel loads, over the sub grade concerned, in accordance with current relevant Australian Standards.

The developer must provide certification by a qualified Engineer that all driveways, parking bays and service areas for villas, high density, commercial and industrial developments, have been constructed in accordance with the approved plans and specifications. Such certification will be required prior to the issue of the Occupation Certificate or occupation of the site.



SECTION 5—SITE STORMWATER DRAINAGE

Explanation

The requirements of this section apply to all new site stormwater drainage systems within subdivisions, development sites for buildings, structures requiring drainage improvements, building additions and site works. A suitably qualified Civil Engineer must be engaged to design and certify the stormwater drainage plans for all developments. Where special circumstances occur, the requirements of this section may be varied at the discretion of Council or its engineers. In some cases, where a commercial type development is situated in and resembles a residential environment, the stormwater drainage system may be designed to meet the residential requirements.

The following standards are to be implemented to manage stormwater runoff and prevent damage to buildings and property and reduce hazardous flows.

Requirements

Council Stormwater System Availability

- 5.1** It is the developer's responsibility to investigate the availability of Council's stormwater drainage system, in accordance with the provisions of this guideline, prior to submitting a Development Application. Where the stormwater drainage system is unavailable or the Council stormwater drainage system must be extended to the development site, it is the developer's responsibility to undertake all acquisitions and construction required to extend the Council system to the site. The minimum pipe size Council will maintain is 375mm diameter Reinforced Concrete. Council does not undertake to provide or assist in providing stormwater drainage infrastructure to facilitate proposed developments.

Redirecting Stormwater Runoff to Another Catchment

- 5.2** Sub-Catchment redirection of stormwater results in stormwater being directed to a drainage system that may not have been designed to receive it. This redirection of stormwater may increase flows to part of that system and increase chances of flooding of an OLFP upstream of where the stormwater would normally flow. Where additional properties are affected by the redirected flows, Council may require a drainage study to assess the impact of the redirected catchment to the part of the drainage system that will receive increased flows.



This may generally be along the receiving street gutter, existing stormwater drainage system and the adjoining properties to the low point in the subject street then to the OLFP through to the next street drainage system downstream. If the engineer requires a drainage study then the following criteria should be assessed before the redirected stormwater will be permitted:

- The additional flows should not increase the water surface levels in the OLFP to a point where dwellings are adversely affected by the increased flows.
- Existing dwellings adjoining the OLFP should have habitable floor levels at least 300mm above the computed 100 year flood level. No freeboard is required for non-habitable buildings such as sheds and garages.
- Velocity depth product [Vxd] should remain unchanged or as in accordance with Section 9.5.1.

Stormwater Disposal Requirements:

Stormwater Connection To The Kerb and Gutter

5.3 Any drainage connection to Council's kerb and gutter requires the developer to apply to Council for a **Work Permit** to carry out work within the road reserve. The permit must be issued under section 138 of the Roads Act prior to the issue of any other CC. All costs associated with the application and construction for the work shall be borne by the developer.

The minimum pipeline connection to the street kerb and gutter must be made via a suitably sized galvanised steel rectangular or circular outlet. A 100mm diameter heavy-duty sewer grade pipe may be substituted as the minimum drainage outlet in areas where it is unlikely to be damaged by heavy vehicular movements over the footpath area. Typically, sewer grade pipe may be used in single-family residential and dual occupancy situations where the design flow doesn't warrant a larger pipe size.

The 100mm Sewer grade pipe may be installed for drainage of a Single Dwelling or for drainage of a Dual Occupancy where two separate outlets, one for each dwelling, are proposed for discharge to the kerb and gutter. The 100mm diameter sewer grade pipe must be connected to the kerb by using a 150mm x 50mm galvanised RHS kerb outlet and a proprietary uPVC adaptor inserted into the back of the RHS. The minimum cover over any kerb outlet is to be 40mm. If multiple pipes are installed to meet the capacity requirements of the site discharge, the pipes are to be separated by a minimum distance of 300mm at the kerb face and the kerb is to be reinstated to Council's satisfaction in accordance with Council's Standard Drawing S-107.



The angle of the kerb outlet from the drainage pipes should be installed between 45° and 90° to the gutter flow.

The existing kerb height must be checked to ensure it is high enough to accept the proposed pipe dimension. The kerb must be a minimum of 150_{mm} high to accept a 100_{mm} high RHS. If the kerb is less than 150_{mm} high then an adaptor of suitable height is to be manufactured and installed to connect the outlet to the kerb and gutter.

Maximum Stormwater Discharge To The Kerb and Gutter

- 5.4** The maximum direct discharge from the site to the kerb and gutter must be limited to 30 litres per second, at any one discharge point, for the 10 year ARI storm. It may be required that multiple RHS's be installed to meet the capacity requirements of the discharge from the site. If this is the case they must be installed in accordance with Council's Standard Drawing S-107. If the site discharge is greater than 30 l/s, a connection to Council's underground pipe system may be required. OSD may be provided, or increased to limit the discharge to permissible flows. All underground direct connections to Council pipelines are to be constructed in accordance with Council Standard Drawing S-107 and inspected by Council prior to backfilling.

Connection To Council's Piped Drainage System

- 5.5** Where a development has legal access to Council's piped drainage system a connection to the system will be permitted, only after the design is approved by Council under the Work Permit Process, by means of directly connecting to an existing pit or construction of a new pit over the existing pipeline.

Pits constructed over existing pipelines and in line with the kerb and gutter must be constructed as gully pits with minimum 450mm x 900mm grated inlet in the gutter. A lintel may be required to be installed where the gutter flows are considered to be high enough to warrant the installation of an additional lintel. Junction pits may be constructed in other locations along the footway. Proprietary cast iron lids or grates are permitted in the footway area. No concrete lid will be permitted.

All pits must be designed and constructed in accordance with Council's Standard Drawings S-103 to S-106, whichever applies to the proposed situation, and as required by Council.

Council will permit a direct connection to its pipeline for discharge pipes up to 150mm diameter and where a direct connection to a Council pit is not feasible. A 225mm diameter pipelines can be directly connected to a 600mm diameter or greater Council pipeline.



Connections are to be made in accordance with Council's Standard drawing S-107. A cleaning eye or pit must be constructed within the development lot at the nearest convenient location adjacent to the connection of the Council pipeline.

An existing Council drainage pipeline may be extended, along the kerb alignment, to the development site to enable a connection to be made. The minimum pipe size of the extended Council pipeline is to be 375mm diameter.

Connection to Stormwater Channels

- 5.6** Site stormwater runoff may be discharged into a Council or Sydney Water stormwater drainage channels subject to approval from the relevant authorities. Any approval is subject to issue of a Controlled Activity Permit under the Water Management Act. The developer must apply to the relevant state department for this approval.

Any proposed site stormwater drainage connection to Council or Sydney Water's channel must be made into an existing pipe connection if one is available near the development site. If one is not available, adjacent to the development site, then the connection must be made via a single connection point to the channel adjacent to the site.

For Council channels the pipe connection is to be at 45° to the channel. The pipe invert is to be a minimum of 150mm above the channel invert at the connection. For Sydney Water channels, an application must be made to Sydney Water for permission to connect.

For lined channels, the proposed connection to the channel must be made using a reinforced concrete pipe or FRC pipe from the channel to the boundary of the development site. The developer must reinstate the lining of the channel, at the connection point, to Council or Sydney Water's satisfaction.

For unlined channels the channel is to be protected against erosion at the point of discharge into the channel. The protection must be in the form of a sandstone or durable rock apron to Council's satisfaction. Pipes should be RCP or FRC only. Connections to an unlined channel will also require approval under the Rivers and Foreshores Improvement Act.



Piping Stormwater Drainage Through Council Parks And Reserves

- 5.7** Council may consider an application by a developer to lay pipes within public land such as Public Reserves and parkland. Any proposal to drain stormwater to or through a public reserve must first obtain approval from Council's Recreation and Open Space Unit prior to submitting the DA to the Council for assessment.

The decision, as to whether such a proposal is allowable, will also depend on the classification of the land, whether any plan of management, that may apply to the land, permits the laying of such pipes and the intended future use of the Reserve.

To prevent multiple pipelines from passing through the public land, the pipeline must be sized to allow for adjoining properties, in future, to connect to it. The minimum pipe size for the pipe must be 375mm diameter and constructed of RC or FRC pipe.

Council is likely to seek compensation for granting of easements and laying of the pipelines through publicly owned land. All cost incurred for the granting of easements, design of the pipeline and laying of the pipeline in publicly owned land must be borne by the developer.

Stormwater Discharge to Bushland

- 5.8** Where stormwater is to drain to Council owned bushland, pipe outlet energy dissipaters are to be provided to reduce energy and to spread or direct the flow, as the location requires. For velocities up to 1 m/s the dissipater shall be constructed of sandstone or harder rock riprap of nominal size 200-400mm placed on geotextile filter fabric to achieve a compact rock blanket, with a downstream length of 6 metres. Where flow velocities are higher than 1m/s, or where a significant drop occurs at the structure the outlet is to be designed by a qualified Civil Engineer.

Where stormwater is to drain to bushland not owned by Council the applicant must apply to and obtain written approval from the relevant authority that owns and controls the bushland prior to lodging any DA for development requiring stormwater drainage works.

Common Drainage Line

- 5.9** For sites where the drainage of stormwater involves the construction of a stormwater drainage system across land owned by others, an easement to drain water must be created over the downstream properties, in favour of the lot(s) being developed.



The minimum pipe size contained within a Drainage Easement for a single dwelling, including half of a Dual Occupancy development, shall be 100mm and connected to the kerb and gutter via an approved connection method.

The minimum pipe size contained within a Drainage Easement for any other form of development shall be 150mm and connected to the Council system via an approved connection method.

Rigid wall pipes (RCP or FRC) may be required in trafficable areas or as deemed necessary by the engineer.



SECTION 6—SITE STORMWATER SYSTEM DESIGN

Explanation

Stormwater runoff from all areas within the property shall be collected, in a system of gutters, downpipes, pits and pipelines located within the site, and drained to a Council receiving stormwater system.

All site stormwater drainage systems, including OLFP's, are to be designed generally in accordance with the requirements detailed in this document, the most current and relevant editions of Australian Rainfall and Runoff as shown on Council's website.

Requirements

Determining Stormwater Flow Rates (Hydrology)

- 6.1** The Rational Method, in association with the Kinematic Wave Equation, is an acceptable method for determining flow rates where the site catchment is less than 2 hectares, has fairly uniform characteristics and the level of accuracy is not critical. A maximum time of concentration $t_c = 20$ min and a minimum coefficient of $C_{100} = .84$, for all sub-catchments, must be used when determining flow rates.

The roughness factors should be used when determining times of concentration for use in the Kinematic Wave equation as shown below:

Table 1 – Roughness Factor

SURFACE TYPES	ROUGHNESS COEFFICIENT (n) for sheet flow only
Concrete or Asphalt	0.01 - 0.013
Bare Sand	0.01 - 0.016
Gravelled Surface	0.012 - 0.03
Bare Clay - Loam Soil (eroded)	0.012 - 0.033
Sparse Vegetation	0.053 - 0.13
Short Prairie Grass	0.10 - 0.20
Lawns	0.17 - 0.48

Where the site catchments are greater than 2 hectares, and / or an accurate level of flow rate prediction is necessary, peak flow rates must be determined using a recognised runoff routing computer model such as ILSAX OR DRAINS. Council may need additional assessment time if other hydrology programs are used.



Stormwater System ARI Design Criteria

6.2 The following design ARI's should be applied to the relevant components of the stormwater drainage system:

STORMWATER DESIGN ELEMENT	DESIGN AVERAGE RECURRENCE INTERVAL (Years)
Site Piped Drainage (Residential)	10
Eave Gutters and Downpipes (Residential)	10
Site Piped Drainage (Commercial & Industrial)	20
Eave Gutters and Downpipes (Commercial & Industrial)	20
Box Gutters and Downpipes	100
Common Drainage Line (Residential) *	10
Common Drainage Line (Com & Ind)*	20
Inter-allotment Drainage no OLFP	100
Outlet to Natural Watercourse **	5

* Where an OLFP for flows in excess of the pipe capacity has been provided.

** See OSD Section

Council may vary the required ARI in instances where personal safety or the potential for property damage warrants such a variation.

Stormwater Drainage Pipe Design

6.3 Stormwater drainage pipes must be designed and sized to be sufficient to cater for stormwater run-off from the site and naturally draining to it.

A Hydraulic Grade Line (HGL) Analysis may be required, at Council's discretion, for the piped stormwater drainage design in the following cases:

- Inter-allotment drainage lines servicing more than two properties.
- Low-level property drainage systems connecting into a Council pit or street stormwater drainage system.
- Where the proposed pipe discharge exceeds 100 l/s.
- Where the catchment is being redirected
- In situations where determination of hydraulic control is critical as determined by Council's Development Engineer.



In cases where the HGL is critical to the successful implementation into the design of the development, the calculations will be required to be submitted with the DA.

In general, friction losses in pipes must be calculated using the Darcy Weisbach Equation. The design Coefficients of Roughness must be in accordance with the following table:

PIPE MATERIAL	COLEBROOK WHITE "K"
uPVC Pipe	0.03
RC or FRC Pipe	0.30

For stormwater drainage systems, where HGL analysis is required, energy losses at pits, slope junctions, bends, transitions structures, inlets and outlets, shall be incorporated into the design of the drainage system. The Hydraulic Engineer must select "K" values, to determine energy losses, using "Missouri Charts", Hare equations, US Army Corp of Engineers mitre bend charts or other recognised method. "Drains", or other recognised computer programs, may be used to determine the HGL.

The following requirements shall apply for site stormwater pipelines:

- Minimum stormwater pipe sizes, materials and cover requirements must be in accordance with the latest edition of AS 3500 and manufacturers recommendations.
- Pipes shall be specified for likely construction loads and where cover during construction may be less than finished cover.
- Anchor blocks at 3.0m maximum spacing are to be provided for pipes with a gradient greater than 20%.

Stormwater Drainage Pipes Under Buildings

- 6.4** Site stormwater drainage pipes proposed under residential buildings, will be discouraged by Council with the exception of circumstances where the site constraints require alternate solutions to drainage layout. These alternate solutions must be considered at the DA stage and approved by Council on their merits. Short-circuiting the pipe layout, to save costs, is not considered grounds for a merit-based approval.

For other developments, stormwater drainage pipes may be placed under building slabs and will be approved subject to compliance with the requirements of AS 3500 and subject to pressure testing. The pipelines must be designed in accordance with the following criteria:



- Structural foundation design must account for the stormwater drainage pipes in the details. The proposed flooring system and foundation design must be suitable for any proposed stormwater pipes beneath the building. Details of penetrations and expansion material must be included in the foundation design.
- Stormwater pipes beneath the building are to be fully water tight and protected against mechanical movement and damage from the foundation system.
- Stormwater pipes must be sewer grade or better.
- Pipes must exit from under the building under ground or within carefully designed garden beds between the front building line and the front boundary.
- Any minor filling required in the front yard does not obstruct or divert the natural flow of stormwater from the adjoining upstream properties.

Gravity fall should be provided across the Council footway area, where possible. The developer may propose minor filling of the footway area, to achieve pipe cover, with Council approved changes to footway levels.

Onsite Stormwater Drainage Pits

6.5 Inlet pits and grates are to be installed in locations such that:

- All runoff from roofed and paved areas should be collected to prevent excessive flows from accumulating and discharging across the footpath or downstream properties.
- Storm water runoff does not enter garages or buildings.
- Excessive overland flow from upstream catchment and adjoining property is collected or safely diverted around buildings through the site.
- Long-term surface ponding of stormwater does not occur.
- Excessive depths of flow do not affect pedestrian safety or movements.

Junction pits or Inspection Openings (IO's) must be provided at the following locations or where appropriate to provide access for pipe maintenance purposes.

- At multiple pipe junctions
- At change of pipe gradient
- At change of pipe diameter
- At change in pipe direction for all developments other than single family and dual occupancy types of developments
- Bolt down, sealed, cast iron IO's or bolt down, sealed cast iron lid, pits should be located within commercial or industrial buildings where an external line runs under the slab of the building.
- Maximum spacing of 60 meters for maintenance access.



All internal pit dimensions must take into account the pipe dimensions and angle of the pipe entering and exiting the pit. The pit wall dimensions shall be 150 mm larger on each side than the outside diameter of the pipe in the wall. All pit lids must be constructed as square or rectangular, for the purposes of convention, to differentiate from Sydney Water sewer pit lids.

All Council pits and site stormwater drainage inlet pits proposed for trafficable areas shall be constructed generally in accordance with Council's Standard Drawings unless noted otherwise and approved on the plans. Pits in non-trafficable areas may be constructed of a material suitable for the intended purpose and flow proposed for the pit. The pits must be installed in accordance with the manufacturer's recommendations.

The following minimum internal pit dimensions must be constructed as per the requirements of AS 3500. Pit wall dimensions shall not be smaller than the pipeline entering it or as specified in the table below, whichever is the larger.

Depth to Invert of Outlet (mm)	Minimum Internal Dimensions		
	Rectangular		Circular
	Width (mm)	Length (mm)	Diameter (mm)
≤ 600	450	450	600
> 600 & ≤ 900	600	600	900
> 900 & ≤ 1200	600	900	1000
> 1200	900	900	1000

Step rungs must be provided in pits deeper than 1.2 meters.

Pit floors must be benched or shaped so that water will not pond in them. The lowest part of the floor should match the outlet pipe invert. This does not apply to debris, sump or soakage pits.

Stormwater Quality and Pollution Controls

- 6.6** To meet stormwater quality objectives set out in Council's Catchment Stormwater Management Plans, new developments will need to install permanent stormwater pollution controls.

The minimum pollution control requirements for all development other than single-family and dual occupancy, residential housing are given in Council's Standard Drawings.



A developer should refer to the following publications to determine the appropriate stormwater pollution control system for the proposed development:

- The EPA's manual on Managing Urban Stormwater (Treatment Techniques)
- Stormwater Treatment Devices User Guide (NSW Supply) - Government Contract No.019, July 1999, Department of Public Works and Services
- The relevant Australian Standards for pollution control devices

The following is a list of stormwater quality control requirements in addition to temporary sediment and erosion control design requirements for construction works:

- **Silt arrestors and trash screens** must be placed at the last storm water drainage pit before discharging into Council's drainage system, except for single or dual occupancy type residential development. The silt arrestor and trash screen must be designed generally in accordance with Council's Standard Drawing S-106. Trash screens must be constructed of a suitable galvanized steel mesh. The size of the openings must be such that the screen will trap the design litter and in accordance with AS3500.
- **Oil arrestors** must be installed in the drainage system for industrial and large commercial developments where required by Council and the DA Consent.
- **Car wash bays** may be required on residential developments that comprise 6 or more dwellings, in accordance with the DA Consent. The car wash bay pavement must be bunded and isolated from the storm water drainage system so the car wash runoff discharges into the Sydney Water sewer system. The car wash bay must be covered or located in the basement and protected so that storm water does not collect in the wash bay and discharge into the sewer system. This space may be also used as a visitor parking space.
- **Stormwater Discharges into Bushland and Natural Waterways** must have greater controls on stormwater quality and individual pollution controls shall be constructed as required and specified by the DA Consent.

Subsoil Drainage Pipes

- 6.7 Where subsoil drainage is required, the pipes are to be located wholly within the site and connected to the onsite stormwater drainage system. If no system exists then direct connection to kerb and gutter shall be in accordance with these guidelines. Details of the connection to the system or kerb are required to be shown on the CC engineering plans.



Requirements For Filling Of Sites To Drain To Streets

- 6.8** Council may consider filling of sites, up to a maximum depth of 0.5m, where it will not impact on the privacy of the adjoining property or result in obstruction of surface stormwater runoff from adjoining properties or footway. Any proposals for deeper fill for reasons other than drainage may be considered on their individual merits.

The design for the fill must include any necessary retaining walls showing heights, locations and materials for construction.

Filling of the footway may be permitted by Council to allow site overland flow to drain to the street kerb. For filling of the footway to be approved, the level of the fill must be shown on the DA Application concept engineering plans, together with necessary adjustments to public utility pits and plant. Council must only be the approval body, under the Work Permit process, for filling of the footway.

Requirements for Basement Pump Out Drainage Systems

- 6.9** Pump out systems will be permitted for approved basement garages, car parks and non-habitable areas of a development, when all other conventional methods or alternative methods have been examined and stormwater runoff cannot adequately be disposed of, by gravity, to a Council system. Approval, by Council, of a pump out stormwater drainage system is subject to the following criteria:

- The contributing catchment area to the pump out system must be limited to the basement access ramps and subsoil drainage only. No more than 50m² of access ramp, in the case of single dwelling or dual occupancies, or 100m² in the case of other development, will be allowed to drain to the sump and pump out system. Surface stormwater runoff from the remainder of site must be diverted away from the basement area and the drainage systems are to be isolated from each other hydraulically. The areas may be varied at the discretion of Council.
- The basement car parking area shall be graded to fall to the sump and pump system.
- Dual submersible type pump units, with capacity to pump subsoil drainage and any stormwater falling on or draining to the access ramp, must be installed. The engineer must size the sump and pump system to have a pump out capacity for the 100 year ARI design storm of duration five (5) minutes.
- The storage sump and twin pumps must be located in the basement of the car park, under cover, and installed with a grated cover for visual inspection and must be designed so that a minimum volume of water is retained in the sump to cover the pump when the pump float is in the “off” position.



- It must also be shown that the basement will not rise to more than 200mm in depth of stormwater in the event of a power outage or pump failure. The designer must assume a rainfall of 200mm in a 24-hour period over the catchment draining to the basement or non-habitable area sump and pump.
- The pump-out system must be independent of any gravity drainage lines except at the site boundary inspection pit where a junction pit may be constructed, from which a connection will be permitted to the gravity stormwater system provided they are isolated hydraulically.
- Storage areas and areas used for purposes other than car parking or access aisles are to be constructed a minimum of 200mm above the level of the surrounding area to achieve additional freeboard above the water level.
- Engineering details and manufacturers specifications for the sump, pump and switching system must be submitted for approval prior to issue of the construction certificate.

Requirements For OLFP's

6.10 A suitably qualified engineer experienced in hydraulic analysis must be engaged to prepare a hydraulic analysis of the overland flows within existing and proposed OLFP in accordance with the following guidelines.

- The engineer must determine the 100-year ARI water surface level and boundaries of the OLFP.
- For development sites where existing Council stormwater drainage systems occur, the piped stormwater drainage system and OLFP combined, shall be designed to carry stormwater runoff from a 100 year A.R.I. design storm for the contributing catchment. The OLFP may be distributed over adjoining properties where this naturally occurs.
- The minimum capacity of the OLFP shall be 50% of the 100 year A.R.I. design stormwater flow from the contributing catchment unless alternative ratios can be demonstrated as acceptable.
- The Velocity Depth product (VxD) must generally be kept below $0.4\text{m}^2/\text{sec}$ for flows in an OLFP where there is high pedestrian use and/or vehicular use, however, higher values of (VxD) may be considered in accordance with AR&R, based on their merits. A Hydraulic Engineer must assess the situation and consult with Council on the potential for hazard within the OLFP. The Hydraulic Engineer may propose, with Council concurrence, a higher design value of VxD , in certain circumstances on private property, where the higher value is deemed acceptable.
- Council may consider a rise up to 100mm in upstream or downstream, water surface level from the previous developed condition provided there is no significant adverse affect on adjoining properties with respect to existing levels of houses, garages, outbuildings, in-ground pools and other water-sensitive installations.



The minimum freeboard between proposed water surface level and existing house floor level must be maintained in accordance with this guideline.

Requirements For Calculating Flow Rates For OLFP's

6.11 Council will provide flow rates where a Catchment Study has been completed. Where this is not available, the runoff from the upstream catchment must be computed by a time-area hydrograph method such as ILSAX, DRAINS, RAFTS, MIKESTORM, or other Council accepted method for catchment area in excess of 10 hectares. For a catchment area up to 10 hectares, the Rational Method may be used to calculate the runoff from the upstream catchment. If the Rational Method is used, the design runoff shall be taken as the calculated runoff multiplied by a factor of 1.2. The analysis shall ensure that the catchment area is subdivided into sub catchments that are generally no larger than 20% of the total catchment. Starting at the site, the first hectare sub-catchment upstream of the site shall be modelled in detail.

When determining design flows a blockage factor of 50% shall be applied to the upstream side of road culverts where the stormwater drainage system is a lined or natural open channel through or adjacent to a development site.

A Blockage factor is to be applied, in accordance with the following table, to the hydraulic geometry of all inlet pits in an upstream catchment, when determining the overland flow through a development.

PIT LOCATION	INLET TYPE	BLOCKAGE FACTOR
Sag	Side Entry	20%
Sag	Grated	50%
Sag	Combination	0%
On Grade	Combination	20%
On Grade	Grated	50%

Requirements For Calculating Hydraulics For OLFP's

6.12 In determining the capacity of the OLFP the Manning's equation may be used where the upstream catchment is less than 2 hectares. Computer based models such as HEC-RAS, EXTRAN-SWMM or other approved models may be used for catchments greater than 2 hectares.

All submitted OLFP modelling data may be retained and used, by Council, to assist in further developing future Council stormwater drainage systems and OLFP strategies.



Standard Restriction On The Use Of Land For OLFP

6.12 A developer may be required to register a Restriction On The Use of Land with Land and Property Information (LPI), on the title of the subject property, to advise the owners of the property of their obligation to maintain unobstructed overland flow through the property.

The standard terms of the **Restriction On The Use Of Land** for an **OLFP** to be created under the Conveyancing Act is as follows:

- *An unobstructed flow path for overland stormwater runoff from upstream catchments shall not be allowed to fall into disrepair by the owner of the property burdened within the boundaries shown as "x" on the plan.*
- *Trees or shrubs shall not be planted within the boundaries shown as "x" on the plan.*
- *Changes to approved levels and/or the construction of walls and landscaping shall not occur within the boundaries shown as "x" on the plan unless approved, in writing, by Council."*
- *Any special fencing requirements, as required by Council across the overland flow path, shall not be allowed to fall into disrepair and shall not block the free passage of overland flow of stormwater runoff.*



SECTION 7—ON-SITE DETENTION SYSTEMS

Explanation

On Site Detention (OSD) is required where an increase in stormwater runoff, from a new development site, has an adverse affect to the receiving stormwater system. Provision of OSD is intended to reduce the potential for local flooding and damage to existing properties by limiting runoff from new developments, to pre-developed levels. A suitably qualified Civil Engineer shall be engaged to prepare calculations and designs in accordance with these requirements. Notwithstanding the following criteria, Council may consider the need for OSD on a case-by-case basis where justified by sound engineering principles.

Requirements

Peak And Pre-development Stormwater Discharges

- 7.1** OSD must be designed and constructed to control stormwater runoff from development sites such that, for 5 to 100 year ARI events, peak stormwater discharges from the site do not exceed pre-development stormwater discharges.

Location Of OSD System

- 7.2** OSD is to be located away from any natural watercourses and OLFP's from catchments external to the site, and are not to be inundated by a natural watercourse or externally sourced OLFP in any events up to and including the 100-year ARI event. Developers and designers shall use principles of good aesthetics and landscaping and consider long-term viability and maintenance when locating the OSD system.

Storage Volume Of OSD System

- 7.3** OSD storage volume shall be provided such that the total OSD discharge and bypass flow from the site does not exceed the maximum permissible site discharge determined using one of the Council approved calculation methods.

Design Requirements Of OSD System

Minimum Flow To OSD System

- 7.4** A minimum of 70% of the site piped stormwater system and 70% of the site's overland flow must drain through the OSD system. Stormwater from the catchment upstream of the Development shall be collected separately and conveyed around the site



without detention. Council may vary this requirement where site constraints do not warrant it and objection is supported by sound engineering principles.

If only part of the site is drained through the OSD system, the maximum allowable discharge shall be reduced so that the discharge from the OSD system plus the discharge from the remainder of the site does not exceed that from the site prior to development.

Emergency Overflow Spillway

7.5 An emergency overflow spillway, free of obstructions such as buildings, must be provided in a location not having an impact on adjoining properties. Where runoff from such a spillway would flow over private property external to the site, a piped overflow system with 100 year ARI capacity shall be provided within a suitable drainage easement, except where an alternative drainage system for dual occupancies has been approved.

Freeboard To Finished Floor Levels

7.6 Finished floor levels of existing and new buildings are to be set so they are a minimum of 0.3m above the OSD storage's maximum design water surface level and the spillway water level.

Garage floor levels are to be set so they are a minimum of 0.1m above the OSD storage's maximum design water surface level.

Ponding Depths

7.7 In the interests of safety and amenity, ponding water in OSD must not exceed depths as follows:

Use	Desirable Maximum Depth	Absolute Maximum
Pedestrian Ways	0.05m	0.05m
Parking/Paved Areas	0.15m	0.2m
Landscaping-Residential	0.3m	0.3m
Fenced Storage	1.0m	1.5m
Underground with lockable access	No limit	No Limit



Above Ground OSD In Landscaped Areas

7.8 OSD storages provided in common landscaping areas should have required storage volumes increased by a factor of 1.2 to allow for construction irregularities and vegetative growth. The surface of the landscaped area where OSD storage is proposed must be limited to grass only or other materials, approved by Council, on their merits. In addition, where the maximum depth will exceed 0.3m, a minimum setback of 1.0m from boundary lines shall be provided where landscaping is required adjacent to the boundary. The location of the OSD shall be consistent with the Landscape Plan and located clear of areas containing mulched garden beds. Watertight masonry walls and a maximum depth of 0.3m must retain any OSD storage proposed above the surrounding ground level. Above ground OSD must not be located in private open space areas of residential development sites.

Design Parameters For OSD

7.9 Rainfall Intensities must be in accordance with the table shown in this guideline. Design calculations for determining OSD storage volumes and permissible site discharges are to be in accordance with one of the calculation methods detailed in this guideline.

Design flow rates from all development sites requiring (OSD) shall be computed by a time-area hydrograph method such as ILSAX, DRAINS or other industry-accepted method. The simplified method, given below, may be used for single dwellings and dual occupancies where required.

Simplified Method

7.10 The following design parameters shall apply:

- Permitted site discharge = 0.026 L/s for each square metre of impervious area
- Permitted OSD discharge = (Permitted site discharge – site runoff unrouted through OSD)
- Storage volume = 0.025 cubic metre for each square metre of impervious area

Time-Area Hydrographs Method

7.11 The storage required is a volume that will restrict total flows from the development site to match the site runoff prior to development, for a given ARI. The volume/discharge relationship determined shall be for all ARI's for the range of 5 to 100 years ARI. The effects of all storms from 10, 20, 30 and 45 minutes are to be examined.



For sites affected by floodway from Council's and / or Sydney Water drainage systems, the portion of the site area affected by the floodway may be excluded from the total site area for the purpose of determining detention storage and permissible site discharge requirements.

When accounting for existing storages, the peak discharge prior to development is to be determined including the characteristics of that storage.

The use of triangular hydrograph methods, such as RARE, are not permitted.

Runoff times of concentration for pervious areas should be calculated using the Kinematic Wave Equation in accordance with AR&R or the "Friend" equation. A minimum time of concentration of 5 minutes is acceptable for paved or impervious areas where suitable.

OSD Controls And Structures

Stormwater Discharge Control Methods

7.12 Acceptable methods for discharge control from OSD systems are the use of orifice plates installed over the outlet pipe, broad crested weir or choke pipe installed in the outlet pipe.

As it is normally impractical to use a single outlet of fixed diameter to restrict flows for the range of events from 5 years to 100 years ARI, the discharge control pit should be designed to have a two-stage outlet. The first stage outlet should limit discharge to pre-development 5-year ARI flow (Q_{p5}) and the second stage outlet should be designed to restrict flows for larger events up to and including Q_{p100} .

This can be achieved using a dual chamber pit with the required diameter choke pipe or orifice plate between the two and the top of the dividing wall forming a weir. This design may also act as an emergency overflow in the event the first stage outlet becomes blocked by debris.

The design of the detention storage shall take into consideration of any backwater effects, drowned orifice and dead storage.

The formulae, for the relevant discharge control methods, are listed below.



Discharge Control Pits (DCP's)

7.13 DCP's are to be designed and constructed to minimise or prevent future modification or removal by unauthorised persons and should have the following characteristics:

- Self cleansing as possible
- Located in a suitable position from an aesthetics point of view.
- Readily accessible for inspection and cleaning.
- Minimum potential for overflow onto private property.
- Reduced confined space hazard
- Tamper resistant
- Minimum inside dimensions of pits are to be 900 x 600mm for pits up to 1200mm depth and 900 x 900mm for pits greater than 1200mm depth.
- Large enough to fit required trash screens
- Pit covers should be capable of being opened, by one person, in accordance with OH&S requirements.
- Step irons are required for pits greater than 1200mm depth. The step irons shall be placed in a wall clear of the flow if possible.
- Subsoil drainage may be required around control pits in aboveground storages, to prevent the ground becoming saturated during prolonged wet weather.

Orifice Plates and Choke Pipes

7.14 DCP's fitted with orifice plates; choke pipes and/or broad crested weirs shall comply with the following requirements:

(a) Orifice plates are to have the following characteristics:

- Manufactured from corrosion resistant stainless steel plate with a minimum thickness of 3mm (5mm where orifice diameter exceeds 150mm), with a central circular hole machined to 0.5mm accuracy.
- Machined hole must be a sharp edge.
- Plate is permanently fixed to the pit wall over the pipe outlet and epoxy sealed to prevent the leakage of water around the edges.
- Have an orifice diameter not less than 50mm.
- The plates are to be engraved with the orifice diameter. The orifice diameters are to be certified by the manufacturers.



(b) Orifice Plate Discharge Control Formula

The maximum outflow rates can be determined from the following formula:

$$Q_{\max} = A C_d \sqrt{2gh}$$

Where:

- Q_{\max} = Stormwater discharge rate (m³/s)
- A = Area of orifice opening
- h = Depth to centreline of orifice opening
- C_d = 0.61
- g = Acceleration of gravity = 9.8m/s²

Choke pipes are to have the following characteristics:

- Opening shall be square-edged, with no bell-mouth.
- The centre of the choke pipe shall be in line with the centre of the outlet pipe.

(c) Choke Pipe Discharge Control Formula

The maximum outflow rates can be determined from the following formula:

$$Q_{\max} = A C_d \sqrt{2gh}$$

Where:

- Q_{\max} = Stormwater discharge rate (m³/s)
- A = Cross sectional area of the choke pipe
- C_d = 0.8 for pipe lengths between 1.3 and 3.1m
- g = Acceleration of gravity = 9.8m/s²
- h = Height of water level over the centre of choke pipe

For this formula, the outlet pipe must have a minimum diameter of 1.5 times the choke pipe diameter.

(d) Broad Crested Weirs are to have the following characteristics:

- Opening shall be rectangular in shape and square edged
- The weir shall not discharge directly onto the ground or footpath area. It must discharge into an outlet pit structure before draining to the Council drainage system.
- The weir must be constructed of masonry materials and constructed level.



(e) Broad Crested Weir Discharge Control Formula

The maximum outflow rates can be determined from the following formula:

$$Q_{\max} = Cwh^{1.5}$$

Where:

- Q_{\max} = Stormwater discharge rate (m³/s)
- C = Weir co-efficient = 1.67
- w = Width of weir
- h = Height of water level over the weir

Trash Screens

7.15 DCP's are to be fitted with an internal trash screen, which shall have the following characteristics:

- Manufactured from galvanised Lysaght RH3030 Maxi-mesh (or approved equivalent) with galvanised angle steel frame where necessary.
- Screen all pit inflows to the orifice or choke pipe.
- Shall be 50 times the orifice or choke pipe area.
- Located a minimum distance of 150mm from the outlet orifice or choke pipe.
- Positioned as close to vertical as possible. Pits up to 600mm deep should have screens no flatter than 45 degrees. In pits over 600mm deep or in remote positions, this should be increased to 60 degrees from the horizontal surface.
- Include handle(s) for easy removal.

Debris Sump

7.16 A sump is required in the base of the DCP to assist in avoiding turbulence near the pit floor from affecting the hydraulic performance of the orifice or choke pipe outlet, and to prevent silt and debris from blocking the orifice or choke pipe. The sump also allows a simpler installation of the orifice plate.

To ensure drainage of the control pit sump, the following are to be provided:

- The invert of the sump shall be 1.5 times the orifice or choke pipe diameter or 200mm, whichever is greater, below the centre of the outlet.
- The control pit shall be constructed on an aggregate base wrapped in geotextile fabric and drained to the outlet pipe trench.



- Sufficient weepholes in the sump floor that are to be kept unblocked by construction debris.

Underground OSD Storage Tanks

7.17 The engineer shall design the underground storages tanks to meet the following criteria:

- The storage is self-cleaning. The base of the tank must be graded toward the outlet of the tank at a minimum fall of 0.7% and is appropriately shaped.
- All stormwater must be drained from the storage tank by gravity.
- The storage tank and DCP must be fitted with grates to allow ready inspection, of the inlet and outlet, from the surface. Grates are to be provided so that no point in the tank is greater than 3 meters from an access point and at least one over each separate chamber.
- For storages over 1200mm deep, step irons are to be provided.
- The access grates and covers must be secured to prevent public access.
- A sealed storage tank should be ventilated so as to not cause the accumulation of noxious gases.

Final Certification Of OSD System

Work-As-Executed Plans

7.18 On completion of the OSD system and drainage works, the developer must supply Works-As-Executed (WAE) plans, to the Council, to verify that the works have been completed in accordance with the approved design. The WAE plans are to be prepared by a Registered Surveyor and include the following:

- The WAE information should be shown in red and on a stamped copy of the approved civil works drawings. Verification of all critical design information shown on the approved drawings would ensure a suitably detailed submission.
- Sufficient levels and dimensions to verify the On-Site Detention storage volumes.
- Location, invert levels and surface levels of all drainage pits.
- Invert levels of the internal drainage lines at each pit.
- Location and pipe diameters of each pipe as installed.
- Centreline or invert level of the orifice plates or choke pipes.
- Weir dimensions and levels as constructed.
- Finished floor and garage levels of all building structures within the completed development.



- Verify the orifice plate or choke pipe has been installed and the machined diameter of the orifice plate, diameter of the choke pipe is in accordance with the approved design.
- Verification that the trash screen is installed.
- Location and levels of any overland flow paths formed through the site.
- Levels of surface flow paths on site that direct flow to the OSD
- Note any variations or omissions made from the approved plans.

Certification Of The OSD System As Constructed

7.19 The original drainage design consultant is required to provide this certification in conjunction with the work-as-executed plans.

The objective of the OSD policy is to mitigate the effects of increased runoff from redevelopment. Provided the discharge limits and other control standards are satisfied, changes in the drainage layout for construction purposes need only be approved by the Consulting Engineer.

The certificate must be provided on completion of the drainage works and prior to issue of the occupation certificate, occupation of the site or subdivision of the development, whichever comes first. This certification may be carried out on the standard forms supplied and must include:

- Certification that the OSD system will function in accordance with the approved design, or
- Identification of any deviations from the approved design and their impact on the performance of the OSD system. If there is detrimental impact on the performance of the OSD system then the steps to mitigate the impacts must be stated in a letter by the certifying consultant. The mitigating measures must be put in place and the system certified as above.
- Or certification that the deviations from the approved design will not impair the performance of the OSD system.

If the standard form is not used for the certification then the certifying engineer must include the same statements and information as shown on the supplied certificate forms.



Registration Of OSD On Title

7.20 Sites requiring an OSD system be installed must have the existence of such OSD system permanently registered on title with Land and Property Information to ensure the owners are aware of the system's design parameters, location and their obligation to maintain it.

Council requires that the design parameters, location and maintenance requirements are registered in the form of both a Restriction On The Use Of Land and a Positive Covenant on the title of the land prior to occupation of the development, issue of an occupation certificate or issue of a subdivision certificate for the development, whichever comes first.

The developer must supply Council with evidence the Instrument setting out the terms of the Restriction On The Use Of Land and Positive Covenant have been created pursuant to Section 88B or Section 88E of the Conveyancing Act, 1919. The location of the "Onsite Stormwater Detention System" shall be shown on the Deposited Plan or included as a site plan attached to the appropriate documents, which may be obtained from the LPI.

Standard Restriction On The Use Of Land for OSD Systems

7.21 The standard terms of the **Restriction On The Use Of Land** Under (s) 88B shall benefit Canterbury Bankstown Council or under (s) 88E shall nominate Canterbury Bankstown Council the Prescribed Authority and shall read as follows:

The Proprietor of the lot burdened must not:

- a) *Erect, construct or place any building or other structure and/or,*
- b) *Make alterations to the ground surface levels, grates, pits, kerbs, tanks gutters or any other structure associated with the on-site stormwater detention system.*

within the land so burdened, without the prior written consent of Canterbury Bankstown Council.

Standard Positive Covenant for OSD Systems

7.22 The standard terms of the **Positive Covenant** Under (s) 88B shall benefit Canterbury Bankstown Council or under (s) 88E shall nominate Canterbury Bankstown Council the Prescribed Authority and shall read as follows:



1. *The registered proprietor, in respect to the On-Site Stormwater Detention System or pump-out system (which expressions include; all ancillary gutters pipes, drains, walls, safety fences, kerbs, pits, grates, tanks, chambers, basins, trash screens, orifice plates, pumps including associated electrical and mechanical features, and surfaces designed to temporarily detain stormwater, hereinafter called "the system") erected on the land so burdened, will:*
 - a) *Permit stormwater runoff to be temporarily detained by the system.*
 - b) *Keep the system clean and free from silt, rubbish and debris.*
 - c) *Maintain and repair the system so that it functions in a safe and efficient manner.*
 - d) *Replace, maintain, repair, alter and renew the whole or parts of the system within the time and in the manner, if directed in a written notice issued by Council.*
 - e) *Carry out the matters referred to in paragraphs (b), (c) and (d) at the registered proprietor's expense.*
 - f) *Not make any alterations to the system or elements thereof without prior consent in writing of Council;*
 - g) *Permit the Council or its authorised agents from time to time upon giving reasonable notice (but at any time and without notice in the case of an emergency) to enter and inspect the land for compliance with the requirements of this clause.*
 - h) *Comply with the terms of any written notice by the Council in respect to the requirements of this clause and within the time stated in the notice.*

2. *In the event the registered proprietor fails to comply with the terms of any written notice served in respect of the matters in clause 1, the Council or its authorised agents may enter with all necessary equipment and carry out any work required to ensure the safe and efficient operations of the system and recover from the registered proprietor the cost of carrying out the work, and if necessary, recover any costs of legal proceedings and entry of a covenant charge on the land under Section 88F of the Conveyancing Act 1919. In carrying out any work under this clause, the Council must take reasonable precautions to ensure the land will be disturbed as little as possible.*



SECTION 8—DEVELOPMENT ADJACENT TO COUNCIL AND/OR PRIVATE STORMWATER DRAINAGE SYSTEMS

Explanation

Developments having an impact on or affected by Council's, or other authority's, stormwater drainage system should have received a SSR, from Council, describing the drainage infrastructure and recommendations from Council regarding requirements for the development adjacent to the infrastructure.

It is the developer's responsibility to locate and verify the existing stormwater drainage system as described in the SSR or other information given by Council, and make provisions in the design and construction of the development according to those recommendations.

Existing drainage structures on a development site must be integrated into finished surface levels and features to allow for maintenance access. Existing and/or new drainage access structures must be adjusted to suit and be flush with the proposed surrounding levels within the development. If an access structure has been buried in the past then the access lid must be adjusted to suit the proposed surrounding levels. Adjusted pits are to be provided with Council approved proprietary covers with appropriate lifting fixtures. All work on access structures shall be supervised by Council and to Council's satisfaction.

Requirements

Proposed Structures Adjoining Stormwater Drainage Systems

8.1 Council prohibits the construction of most types of structures over drainage easements and stormwater pipelines. The following is a list of extremely light demountable structures Council will consider for approval:

- Paving
- Carports
- Open type awnings
- Pergolas
- Garden sheds

Construction of the above structures is always subject to the approval of Council and shall consider any impact to potential overland flow from upstream catchments. Council may consider applications for structures, other than those listed above, based on their merits and subject to full engineering assessment prior to the issue of the development consent.



Where a pipeline or easement conflicts with a development proposal Council generally requires a developer to relocate the existing pipeline and/or easement for drainage as a requirement of the development consent. The approval is subject to full engineering assessment prior to the issue of the development consent.

Footing Requirements For Structures Adjacent To Pipelines Or Easements

8.2 Where Council has approved a structure adjacent to an easement or existing pipeline, the following conditions apply:

- The footings shall be located clear of the easement, or any proposed easement,
- The footings shall be constructed below the zone of influence of the existing pipeline.
- Details of the design of piers, beams and footings shall be submitted to Council for approval with the Development Application. An inspection by Council will be required to verify depth and location of piers prior to pouring concrete.
- The depth of the structure's footings shall be equal to 300mm plus the depth to the invert of the existing pipe, or any proposed pipe. The footing depth may be reduced by the distance the proposed structure is from the edge of the pipe or as required by the Structural Engineer for the structure. The footing depth may be reduced where the footing is founded on sound bedrock.
- Where a structure is proposed adjacent to an open, unlined stormwater channel conditions will be imposed, on the development consent, in accordance with the situation encountered in each individual case.
- In very rare circumstances approval may be given to build over an easement or existing pipeline. In this situation, a suitably qualified Structural Engineer shall design pier and beam type construction, to suit the individual case. The underside of the footing beams is to be a minimum clear distance of 0.6m from the top of the pipe with all piers located in accordance with the above guide.

Additional Footing Requirements For Demountable Structures

8.3 Where an approval is given for the construction of one of the above demountable structure over a drainage easement or pipeline, the following requirements shall apply:

- The demountable structure shall be lightweight, easily demountable, and shall be removed by the owner, at their expense, if required by Council, to allow work to be carried out within the easement.
- The existing overland flow path for stormwater runoff shall be maintained if so required by the existing fall of the land and upstream catchment characteristics.



- If a concrete floor is proposed for the demountable structure it shall be a minimum 100mm thick, reinforced with F62 steel fabric with 40mm top cover, and laid on a 50mm compacted road base material.
- If other than a concrete floor is required, then the structural supports founded on concrete piers in accordance with the above requirements and isolated from any pavement by expansion joint material.
- Channels under control of Sydney Water are not included in the above, and applications in respect thereto should be referred to that authority. Documentary evidence of compliance with Sydney Water requirements must be submitted with application.

Relocating Stormwater Drainage Pipeline And/or Easement

8.4 A developer may request to relocate an existing stormwater drainage pipe conflicting with development proposals. The approval of the request is subject to the developer demonstrating the proposed stormwater drainage system will not have an adverse impact on the existing upstream or downstream stormwater drainage system and adjoining properties. The developer must provide Council with a hydraulic analysis prepared by a qualified engineer, demonstrating any impact of the proposed relocated pipe system and how that impact will be mitigated. The relocated pipe is to be designed to have the capacity specified in this guideline for a new pipeline in the same location.

OLFP's through the site, for runoff in excess of the capacity of the pipeline, must be designed and relocated in accordance with guidelines in Section 9.5.



SECTION 9—REQUIREMENTS FOR LAND SUBDIVISION

Explanation

For all land subdivisions, except strata type subdivisions, Council must be the PCA for the subdivisional works and for the Subdivision Certificate (SC) for the final plan of subdivision.

Any new land subdivision, creating one or more vacant lots, shall provide any shared drainage infrastructure, roads and access driveways in accordance with this Guide.

Requirements

Land Subdivisions Including Public Road Dedication

- 9.1** Where a subdivision of land is proposed, including dedication of public road, the engineering requirements for the design and construction of public infrastructure and works must be in accordance with Council's Aus-Spec No. 1, for design and Aus-Spec No. 2, for construction, or as otherwise specified by Council.

The developer must contact Council and apply for a CC, through the Council, for the earthworks, drainage works and road works required by the DA consent, to create the road(s) within the subdivision, for the development. The developer may apply for a SC upon completion of all development works required for the subdivision.

Land Subdivisions Not Including Public Road Dedication

- 9.2** Where subdivision of land is proposed, and there is no dedication of public infrastructure, the engineering requirements for the design and construction of the earthworks and site works must be in accordance with this engineering guideline. All shared civil site and drainage work, intended to benefit more than one lot or where the civil site and drainage work must cross one or more lots to benefit another lot, must be constructed in accordance with these guidelines and prior to issue of the subdivision certificate. Development works may include, but are not limited to, installation of CDL's, construction of common use driveway surfaces, common use OSD systems and earthworks required for the subdivision. Council will assess the SC for compliance with all of the associated requirements of the DA consent and also compliance with Council's requirements for easements, restrictions and positive covenants. Also, Council requires that BCC be empowered to be the authority to release, vary or modify the above easements, restrictions and positive covenants, where BCC is not the beneficiary. The developer may apply for a SC upon completion of all development works required for the subdivision.



Connection To Council Roads

9.3 Where subdivision road works are proposed, those works will connect onto Council owned roads requiring the issue of a Work Permit by Council. In the circumstances where roads are being dedicated or created a Work Permit is required for all of the future Council owned infrastructure.



SECTION 10—PROTECTION OF COUNCIL INFRASTRUCTURE

Explanation

A developer must protect all Council infrastructure when carrying out works and activities to a development site.

Requirements

Protection Of Public Footway

10.1 Council's footway shall be protected from damage caused by construction activities and vehicles while entering and existing a development site. Provision must be made for the safe passage of pedestrians along the footway adjoining the site at all times during construction. If hoardings are to be installed around a development site, then approval must be sought from Council to do so. The developer must apply for a Works Permit to do any work within the Council Road Reserve.

Storage Of Material In Public Footway

10.2 In areas of high pedestrian use, construction materials are generally not to be stored within Council's Road Reserve. Should removal of any construction materials or debris, or clearing of any part of the road reserve be necessary to provide safe pedestrian access along the footway or for environmental, or asset protections reasons, Council may carry out the above work at the applicant's expense.

Access Over Public Reserves

10.3 Construction access over Public Reserves and Parks is prohibited without specific written approval of Council. Due to legislative restrictions such access is generally denied.

Builders Damage

10.4 The developer is responsible for the full cost of rectification of any damage to public infrastructure and assets resulting from the development's building and site works.



Footway Damage Inspection (FDI)

- 10.5** A Work Permit for an Infrastructure Footway Damage Inspection Report (FDI) shall be applied for and fees paid, to Council, in accordance with the DA Consent and Council's latest fees and charges, prior to issue of the construction certificate.

Preventing Damage Due To Transport Of Materials And Plant

- 10.6** All bulk, demolition, earthworks and/or delivery of construction related materials and plant, associated with the development must be transported in suitably covered and designed vehicles for the intended purpose and on suitable roads intended for the transportation of heavy loads.

13.4.3 Material and Plant Transport Route

- 10.7** In general the transport route must be by the shortest possible route to the nearest "Regional Road" and with every effort made to avoid school zones on local roads and weight limited roads. The developer must nominate the transport route, for consideration by Council, prior to the commencement of any development works.

The developer may be required to provide Council with a dilapidation report in respect to the proposed transport route to and from the site. The report must be completed and submitted to Council prior to the commencement of the development works. Otherwise the developer may be held responsible for damage to a road that may have occurred prior to the development works commencing.

Damage Rectification

- 10.8** All prior damage and/or damage resulting from the development works, must be rectified prior to issue of the Final Occupation Certificate for the development. Prior damage rectification may not be required for single dwellings and dual occupancy developments where a damage inspection by Council shows existing damage to the infrastructure.



SECTION 11–CAR PARK DESIGN

Explanation

A developer must ensure the car park is designed to comply with Australian Standard 2890 Parking Facilities series, which includes:

- (a) AS 2890.1: Off-Street Car Parking;
- (b) AS 2890.2: Off-Street Commercial Vehicle Facilities;
- (c) AS 2890.3: Bicycle Parking Facilities; and
- (d) AS 2890.6: Off-street Parking for People With Disabilities.

Requirements

Minimum Parking Bay Dimensions

11.1 The following minimum dimensions are generally required for each parking space.

Parking type	L (m)	W (m)	Aisle width			
			90 ⁰	60 ⁰	45 ⁰	30 ⁰
Open parking	5.4	2.5	6.2*	4.6	3.7	3

Note 1: Width of the end parking bays with obstruction on one side is 2.8 metres.

Note 2: All dimensions in this DCP are minimum dimensions, unless specified otherwise.

Note 3: All dimensions are in metres (m), unless specified otherwise.

Note 4: *Council may consider a 6 metre absolute minimum aisle width depending upon the site constraint on a condition that 5.5 metre bay length should be maintained to produce a 17 metres wide parking module. However, Council considers 6.2 metres to be a desirable aisle width.

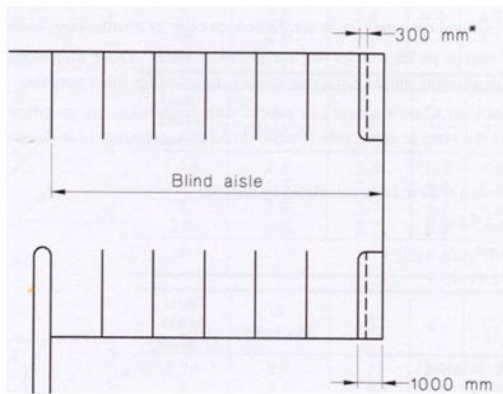
Parking bay dimensions for people with disabilities and residential garages

11.2 Parking bay dimensions for people with disabilities and residential garages are as follows:



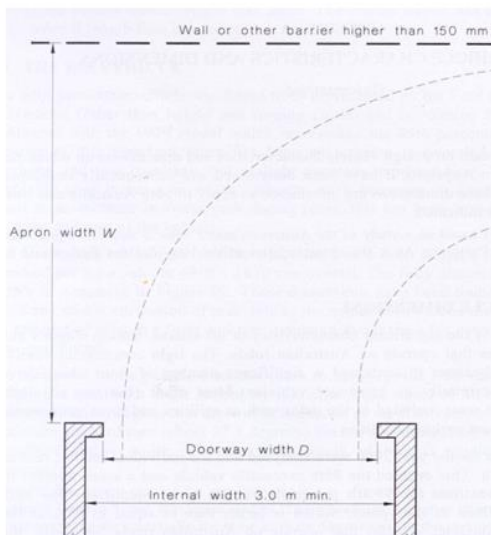
Parking type	L (m)	W (m)	Comments
Disabled (90°)	6.0	3.2	
Basement parking and single garage	5.5	3	Clear door opening of 2.4m between door jambs.
Double garage in residential development	5.5	5.4	Clear door opening of 4.8m between door jambs.

Diagram: Blind Aisle Extension



* Additional widening required if there is a wall or fence at the side of the last space. See clause 2.4 (b)(ii) of AS/NZS 2890.1:2004

Diagram: Apron widths for right angle access to single vehicle garages



Note: Vehicles larger than the B85 need to make a 3-point turn at the apron widths shown. The apron width may be reduced by 0.3m when the edge opposite the doorway is a kerb 150mm or less in height with clearance of at least 0.3 m behind the kerb

Service restriction and small car bay dimensions

Doorway width (D)	Apron width (W) (See Note)
2.4	7.0
2.7	6.3
3.0	5.6



Service restriction and small car bay dimensions

- 11.3 Service provisions such as air conditioning vents or lift shafts may reduce the length of parking bays. However, this provision must not cause adverse impact on the traffic.
- 11.4 Service restriction spaces (not less than 4.2 metres in length) should be considered where the number of parking spaces exceeds twenty five.
- 11.5 Service restriction spaces must be considered as spaces for small cars as specified in clause 11.7.
- 11.6 Development may include parking spaces for small cars measuring 4.2m x 1.7m. The minimum dimensions required for parking small car are 4.5m X 2.3m. The number of small car spaces shall be a maximum of 10% of the total car parking provision.

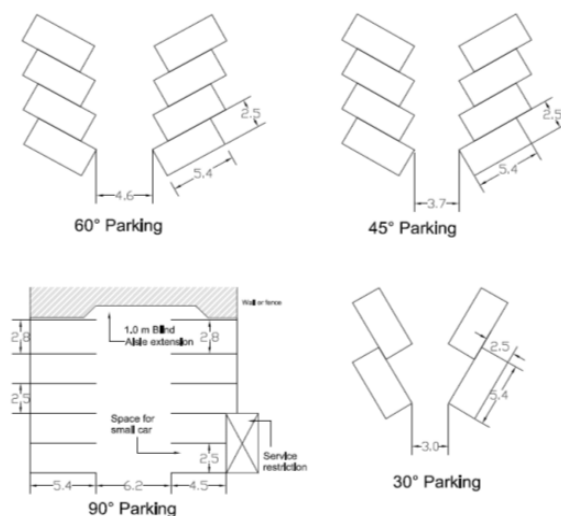
Service bay dimensions

11.7 Service bay dimensions for different vehicles are to be as follows:

Vehicles	L (m)	W (m)	Comments
Small Truck	7.0	2.7	Refer to AS/ANZ 2890.1 for manoeuvring dimension.
Large Truck	11.5	3.2	
Articulated vehicle	19.0	3.5	
City transit bus	13.0	3.2	

Parking layouts

11.8 Parking spaces and areas are to be designed according to the following diagram.

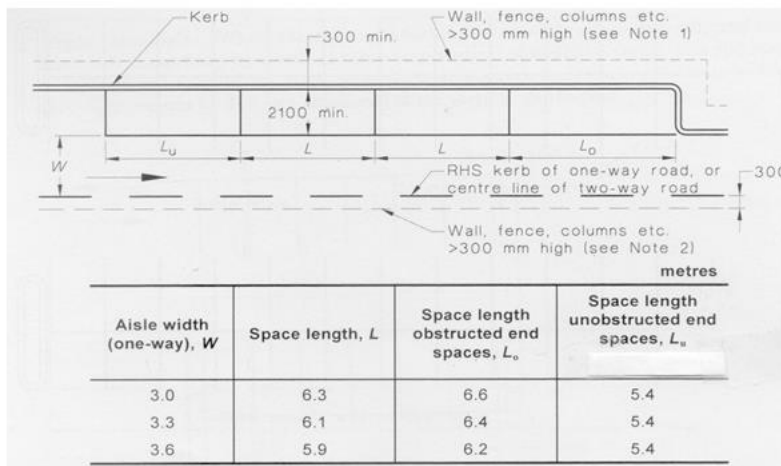




Parallel parking

11.9 Council prefers 90° parking which provides the most efficient use of space with two-way vehicle movement. Where space is limited, 60°, 45° or 30° parking may be used instead. With these arrangements, appropriate signs must be used for drivers not to enter aisles the wrong way and reversing into parking spaces.

Note: A parking aisle is a roadway or an area used by vehicles to gain access to, and to manoeuvre into and out of parking spaces. Two-way aisles are prohibited for parking angles other than 90°.



Access driveway width and design

11.10 The queuing area between the vehicular control point and the property boundary should be sufficient to allow a free influx of traffic which will not adversely affect traffic or pedestrian flow in the frontage road.

Queuing distance

11.11 Parking studies are necessary to determine minimum queuing length for developments fronting state roads.

Use	Queuing Distance
Residential and mixed use	Absolute minimum 6m; Desirable minimum 7.5m
Drive-in take away	8 spaces (each approx. 8 m long) in a marked lane for the exclusive use of drivers; plus 7 additional queue spaces at the end of the marked queue lane to be within the site.

Note: Refer to AS 2890.1 for queuing distance for other land uses.



11.12 The queuing area between the vehicular control point and the property boundary should be sufficient to allow a free influx of traffic which will not adversely affect traffic or pedestrian flow in the frontage road.

Circulation roadway and ramp gradients

11.13 Limiting requirements for grades on circulation roadways and ramps shall be as follows:

Maximum Gradient	Straight ramps longer than 20m	Straight ramps up to 20m
Public car parks	1 in 6 (16.7%)	1 in 5 (20%)
Private or residential car parks	1 in 5 (20%)	1 in 4(25%)
Domestic driveways	1 in 4 (25%)	

Note: Gradient of access driveway, grade change and grade transition is to be in accordance with AS 2890.1.

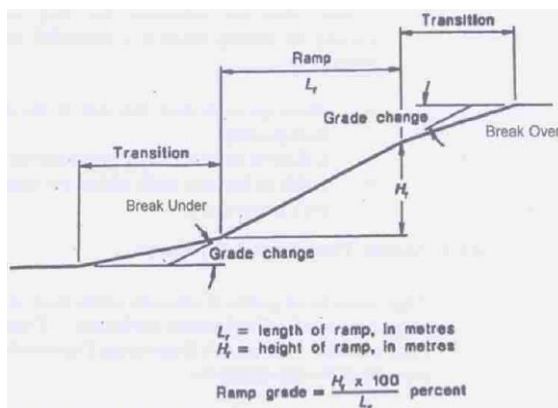
Gradient within parking module

11.14 The maximum gradients within a parking module including a motorcycle parking area shall be as follows:

- Measured parallel to the angle of parking—1 in 20 (5%).
- Measured in any other direction—1 in 16(6.25%).
- Within parking spaces for people with disabilities-see AS/ANZ 2890.6.

Internal circulation

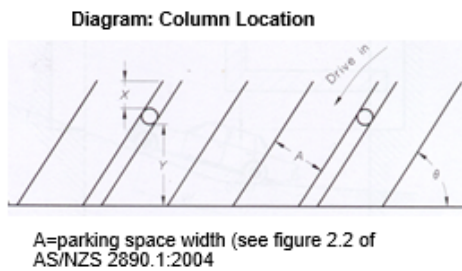
11.15 ‘Dead end’ aisles longer than 15 metres should be avoided. Internal vehicular movements should be able to take place wholly within the site. Circulation patterns which involve the use of a public street are to be avoided.





Column location and spacing

11.16 Columns should not be located at the edge of a parking aisle as they increase the difficulty of manoeuvring into a parking space. It is also desirable to avoid locating a column directly opposite a car door. The dimensions for locating columns in a short span structure are illustrated in the adjoining diagram.



Parking angle	Minimum Dimension	
	X	Y
30	375	1825
45	530	2581
60	650	3161
75	724	3526
90	750	3650

Note: The envelope around parked vehicle to be clear of columns, walls and obstructions.

Sign posting and line marking

11.17 All car parking spaces should be clearly line marked consistently as illustrated in Australian Standard 2890.1.

11.18 Where customer or visitor parking is provided, signposting should be provided to indicate the location of these spaces.

11.19 Segregated entries and exits are to be signposted to that effect.

11.20 In large car parks, means of egress should be indicated by directional signs which need to be shown on application plans.

11.21 The space should be painted blue.



APPENDIX 1–DEFINITIONS

"Annual Exceedence Probability (AEP)" is the statistical chance of having a flood of a given or larger size occurring in any given year. For example, a 1% AEP flood discharge has a 1% [1 in 100] chance of occurring or being exceeded in any one year.

"Applicant" is the person or company, also referred to in this guide as the "Developer", who is responsible for meeting all of the requirements associated with a development application on a property. The applicant must have all owners' written consent to make application for development on any particular property. The applicant is generally the person to whom all correspondence from Council will be directed.

"Australian Rainfall and Runoff (AR&R)" is the publication by Engineers Australia, which describes the industry standards for estimating rainfall and runoff for the purpose of designing stormwater drainage systems.

"Average Recurrence Interval (ARI)" is the long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with discharge as great as, or greater than, the 20-year ARI flood event will occur on average once every 20 years. A flood with a discharge as great as or greater than the 100 year ARI flood will occur on average once every 100 years.

"Carriageway" is the portion of a public road reserve intended for the use of vehicles to travel, usually measured from kerb face to kerb face. This area is also referred to as roadway. In private land, the carriageway is the driveway surface, within an access corridor, intended for the use of vehicles to travel.

"Catchment" is the source area from which stormwater runoff flows to a nominated location.

"Common Drainage Easement" is known as an Easement to Drain Water created over a nominated portion of an allotment for the purpose of legally benefiting and draining stormwater collected from upstream allotments.

"Common Drainage Line (CDL)" also referred to as IAD "Inter-Allotment Drainage" is the existing or proposed drainage pipes located within and through private property for the drainage of stormwater from upstream allotments and catchments. The drainage pipes are usually, but not always, located within a Common Drainage Easement, and are owned and maintained by the property owners who benefit from the Common Drainage Line.

"Construction Certificate (CC)" The certificate issued by a PCA which states that construction drawings have complied with the requirements of the development consent. The CC must be issued prior to any works commencing on the site.



"Council Drainage Easement or Easement to Drain Water" is an easement that has been or is to be created, through privately owned land, to benefit the Council for the purpose of maintaining or constructing stormwater infrastructure for draining stormwater through or over the land.

"Council infrastructure" refers to the physical improvements of Council's road and drainage assets.

"Development Application (DA)" is the process by which Council assesses a developer's application for the purpose of granting or not granting consent to the change of use or form of the land for which the application is requested.

"Drainage Reserve" is a parcel of land owned by Council for the purpose of draining Council's stormwater either in open channels, in underground pipes or over land.

"Dual Occupancy" has the same meaning as in Residential DCP No. 31. For the purposes of this guideline, it refers to a single building containing two dwellings-either sub-divided or not.

"Easement" is the portion of land where a beneficiary has legal entitlement to utilise for nominated use such as but not limited to draining stormwater, providing services, electricity water, gas and draining sewage. The easement width, location and terms are noted on the Deposited Plan and 88B instrument or transfer documents and registered with Land and Property Information.

"Floodway" is the area of a floodplain, generally related to large open channels, creeks or rivers, where a significant discharge of water occurs during floods. A floodway, if partially or fully blocked, would cause a significant redistribution of flood flow, and or a significant increase in flood levels.

"Foot paving" is the formalised surface, generally constructed of concrete, for the use of footway pedestrian traffic.

"Footway" is the portion of the Council road reserve between the road reserve boundary and the face of kerb or edge of road shoulder if there is no kerb.

"Footway Damage Inspection Report (FDI)" is the report, including the footway damage inspection results, required to be conducted by Council prior to any demolition and/or non-exempt development occurring on a site.

"Land and Property Information (LPI)" is the NSW government body within the Lands Department who records and maintains property title information.



“Multi Residential” development includes Residential Flat Buildings, Villas, Row Houses, Town Houses, and Terraces.

“Occupation Certificate (OC)” is the certificate, issued by a PCA, stating the development, as constructed, complies with all of the relevant conditions of the DA Consent relating to the occupation of the site, and the development site is suitable for occupation for its approved use.

“On-site Detention (OSD)” refers to the temporary storage of stormwater to reduce peak stormwater discharge rates during major storm events. OSD is intended to limit the stormwater discharge rates from a development site to at or below stormwater discharge rates of the existing site.

“Overland Flow path” (OLFP) is the natural or formed route that stormwater runoff will take when it cannot enter the below ground, stormwater system.

“Owner” is the person or corporation registered with Land and Property Information as nominated on Certificate of Title.

“Principal Certifying Authority, (PCA)” means an accredited certifier appointed by an applicant to perform certain functions as defined in DCP 35 titled ‘Development System’.

“Public Road” means any area of road reserve, form or unformed, that is opened or dedicated to the public as road.

“Road Authority” is the body, typically Council or the Roads and Maritime Services (RMS), authorised under the Roads Act 1993, with powers and responsibilities for ownership and maintenance of roads under its control. Council is the Road Authority for all local and regional roads in Canterbury Bankstown Local Government Area and the RMS is the Road Authority for all State Roads. See Appendix 2 for a list of Regional and State Roads.

“Road Reserve” is the publicly or privately owned area between allotments of land generally intended for vehicular and footway traffic providing access to and from those allotments of land. Road Reserve is usually comprised of the carriageway or roadway and the footway on both sides. The terms road reserve, road and Public Road are deemed to have the same meaning in this guideline.

“Row houses” has the same meaning as in Canterbury Bankstown Development Control Plan 2021.

“Single Dwelling” has the same meaning as in Canterbury Bankstown Development Control Plan 2021. In this document Single Dwelling also refers to “Family Housing”.



“State Road” is a roadway under the control of the RMS. Council, however, controls footways along State Roads, except the M5 Motorway. (The State Roads within the Canterbury Bankstown Local Government Area are listed in Appendix 2.

“Stormwater System” comprises all components of stormwater infrastructure, both privately and or publicly owned, including but not limited to, rivers, natural creeks, channels, pipelines, OLFP, surface inlet pits, culverts, table drains, roadways, kerb and gutters. OSD, downpipes and roof gutters.

“Stormwater System Report (SSR)” is the Council provided report, issued to a developer upon application to Council, for the information pertaining to the existing stormwater systems in the vicinity of the development site. These stormwater systems are usually owned by Council, but may also be owned by Sydney Water, other authorities, or privately owned.

“Street Boundary Alignment Levels” (SBAL’s) are the Council provided levels issued upon application to Council for the required design finished surface levels of the footway area in front of a development. They include design levels at the property boundary.

“Subdivision Certificate (SC)” is the certificate required to be issued by the Council, or in some circumstances, a PCA that states that all of the conditions of the development consent, pertaining to the subdivision of the land, have been complied with. This certificate must be issued prior to submitting plans for registration at LPI.

“Vehicular Footway Crossing” (VFC) is the concrete pavement constructed across the footway for vehicular traffic to access the property driveway.

“Villas” has the same meaning as in Residential DCP No. 1.

“Work Permit (WP)” Is the required permit that a developer must obtain, from Council, for any works to be constructed on any Council land, Council road and/or Council infrastructure. A Work Permit Part D is generally required for most developments which incorporates the Footway Damage Inspection, VFC Plans & Specification, SBAL's, Road Opening Permit, approval of stormwater connection plan to Council's systems and all associated inspections.