Construction Services

Design brief

**External works**
**Construction of car parks**

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Environment Directorate
Construction Services - Design Brief

External works – Construction of car parks

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1.0 Construction of car parks generally

The Contractor should provide a statement describing how the works are to be carried out (e.g. a 'Method Statement'), including details of machinery, staffing (with relevant qualifications) and a timetable for monitoring purposes.

The Contractor should provide at least 24 hours notice before starting a number of tasks, such as the following. This should provide for an inspection or quality control check to take place if required):

- The start date of the works
- The initial and completed marking out of the work area especially the line of the pipe to the outlet and the perimeter and lateral drain runs
- The start of the drainage pipe excavations
- The start of each component part of the drainage pipe runs i.e. the laying of the gravel backfill, the pipe itself, blinding layer and final material fill
- The start of each component part of the sand-gravel slits, i.e. the gravel backfill and the sand fill
- Initial surface preparation and seeding works
- Completion of the construction phase
- Completion of the maintenance phase

In addition to the Contract Administrator (CA) the Council may wish to carry out random checks on a periodic basis to assess the progress and standard of the work.

All materials must comply with the relevant material specifications. Samples of all materials should be provided to the CA as acceptance by the Contractor from his supplier. The samples will act as a comparison for future deliveries.

Any materials which do not meet the required material specification may be classed as being unsuitable and may have to be removed from the site at the Contractor’s own expense. This will encourage the Contractor to implement quality control on materials.

To comply with relevant Highway Acts etc. and ensure residents are not unduly inconvenienced, it is essential that the Contractor takes measures to prevent dirt or foreign matter from being deposited upon any highway, footpath or access way. Where this does occur, it is up to the Contractor to remove the material and clean the area, at their own expense.

Any damage whatsoever caused by the Contractor will also have to be rectified at their own expense.
2.0 Earthworks

2.1 Site clearance

Affected services must be protected or lowered as appropriate.

Work on sites where trees are present must be carried out in accordance with **BS 5837:2012 - Trees in relation to design, demolition and construction. Recommendations**

Tree root protection areas **must** be identified at the design stage and clearly marked on all plans.

No part of any development, including landscape works involving excavation or change of ground levels, should normally be within the minimum tree root protection area(s) of any retained tree(s).

Verify with the CA before commencing site clearance, identify and mark plants, trees, shrubs, hedges, areas of scrub etc to be retained and protect and preserve throughout period of works.

Trees within the construction area agreed to be felled, shall be removed and have all associated roots grubbed up. Roots of retained shrubs and trees shall not be cut, lopped or severed without approval. Cut and clear away long grass, weeds, brambles, saplings etc and grub up stumps and major root runs without unduly disturbing top soil.

Dispose of all rubbish and unwanted spoil to an approved tip.

Burning on site will not be permitted.

2.2 Rotovation

Before top soil is removed, the platforms should be rotovated to help break down the turfs.

2.3 Top Soil

Top soil should be stripped and stacked in heaps not exceeding 2000mm high. Weeds must not be allowed to seed or perennial weeds become established.

Preference is for the soil to be spread on the remaining site and if this is not possible, to be taken to an approved tip.

2.4 Cut and Fill

Regrading the external works will involve altering the levels in the subsoil using the surplus ‘cut’ from high parts to fill lower areas. Filling must be done in consecutive layers not exceeding 250mm.
Each layer must be adequately consolidated to avoid subsequent settlement.

The gradient of the car park should have a crossfall of no steeper than 1:40. The final formation must be trimmed smooth to within +/-25mm of the required design levels.

The final formation must be trimmed smooth to within +/-25mm of the required design levels before replacing the topsoil and have a minimum undrained shear strength of at least 50kN/m² or a California Bearing Ratio (CBR) of 2%.

A geotextile membrane shall be laid over the formation. Joints shall overlap by at least 300mm.

Allowance should be made for the possibility of rock in excavations.

2.5 Surface water

All excavations should be kept clear of water, and sumps should be created to avoid flooding neighbouring properties during playing field construction. These should be filled in when no longer required.

2.6 Banks

Banks formed must be gently graded, to match the existing but in any case no steeper than 1:3, in order to facilitate subsequent safe and effective maintenance. Along the top of the fill bank, a slight back fall no steeper than 1:30 and approx 5000mm wide to meet the line of the carrier drain should be formed.

2.7 Top Soil Replacement

On completion of the grading operations the topsoil is replaced to a uniform depth to produce a finished surface that marries in with the surrounding ground levels. Where there are only shallow depressions these can be infilled with imported topsoil of a similar nature to the existing material.

Surface grading involves smoothing out the surface by moving soil from slightly higher parts to lower areas by means of a blade grader. There must be a minimum ‘firmed’ depth of 150mm of topsoil to give adequate cover on completion of the project.

Maximum depth of top soil shall be no greater than 250mm.

3.0 Drainage

3.1 Drainage generally

The Car Park should have a suitable drainage scheme that will:
• Ensure that all surface water shall be removed from the site at the rate of porosity specified for the surface to ensure that no surface flooding will occur during heavy storms.
• Not allow excess water to remain present in the construction which might result in a reduction of the load-bearing capacity of the formation or in any frost damage to the construction.
• Protect the installation from the effects of ground or surface water from the surrounding areas.

All drainage works should be undertaken in accordance with latest codes of good practice for techniques, equipment and materials for drainage works and the relevant clauses of ‘Drainage and Service Ducts’ series requirements of the Department for Transport, Highways Agency - Manual of Contract Documents for Highway Works Volume 1 - Specification for Highway Works

3.2 Carrier Drains

Carrier drains should be 160mm diameter perforated corrugated drainage tube in accordance with BS 4962 - Specification for plastics pipes and fittings for use as subsoil field drains (incorporating amendment No.1) and backfilled to the same specification as lateral drains. Stone fill to be brought to the surface.

All carrier drains should be laid no flatter than 1:200. If the sub base is permeable then hi-performance polypropylene (HP) stormwater cells should be inserted along the line of the carrier drain, to reduce run-off and slow the flow at the outfall. However, these should not be used on fill ground: here the carrier drain should be continuous between catch pits

3.3 Drainage Trenches

Drainage trenches shall be a minimum of 450mm deep from formation by 300mm wide and contain 80-100mm perforated-plastic drainage pipe in accordance with BS 4962- Specification for plastics pipes and fittings for use as subsoil field drains (incorporating amendment No.1). All trenches should be backfilled with clean porous material to ensure the high percolation rates necessary for effective drainage. Predominantly single-sized, hard, angular gravel or broken stone within the range 6–10mm must be used as backfill.

Excavated material to be spread around the site and covered with top soil.

To ensure an even grade, pipe-laying machinery should be laser guided. All drainage pipes shall be laid to a minimum fall of 0.5%. Allowance should be made for the possibility of rock in trench excavations.
3.4 Gulleys

Road gulleys shall be provided where necessary and connected with 100mm diameter solid wall Unplasticized Poly-Vinyl Chloride (PVC-U) pipe connecting them bedded on 100mm granular base. Gulley to be 750mm deep, 380mm internal diameter vitrified clay or polypropylene pot, encased in 10 N/mm² concrete with a minimum cover of 150mm all round. Grating to be 400mm x 350mm Grade B straight bar gully grating and frame to BS EN 124:1994 - Gully tops and manhole tops for vehicular and pedestrian areas. Design requirements, type testing, marking, quality control bedded in sand cement mortar 1:3 on two courses of brickwork.

3.5 Catch Pits

Catch pits shall be constructed from pre-cast concrete rectangular rings with clear internal dimensions of 750 x 600mm and should be sited on all corners of the platform, and not further apart than 30m. During construction 150mm inlet/outlet pipes in solid wall Unplasticized Poly-Vinyl Chloride (PVC-U) pipe conforming to BS EN 1401-1:2009 - Plastic piping systems for non-pressure underground drainage and sewerage. Unplasticized poly vinyl chloride (PVC-U). Specifications for pipes, fittings and the system and BS EN 13598-1:2010 Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly vinyl chloride (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for ancillary fittings including shallow inspection chambers should be firmly fixed in concrete.

A 1000mm length of rigid plastic pipe should be used to connect the corrugated main and lateral drainage pipes into and out of the catch pit. An approved connection and sealant must be used where the pipes join. The outlet pipe, connecting to the outfall structure, should be as above but with a minimum length of 2000mm.

Concrete base slab shall be provided to 300mm below invert of outlet pipe. Covers and frames to be set level and flush with surrounds

Manhole covers should comply with BS EN 124:1994 - Gully tops and manhole tops for vehicular and pedestrian areas. Design requirements, type testing, marking, quality control and state size, for example 600mm x 450mm.

Where steps are to be used within inspection pits then these should comply with BS EN 13101:2002 - Steps for underground man entry chambers. Requirements, marking, testing and evaluation of conformity.

Catch pits constructed from precast concrete sections shall comply with BS 5911-1:2002+A2:2010 - Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete pipes (including jacking pipes) and fittings with flexible joints (complementary to BS EN 1916:2002).
### 3.6 Soakaways

The depth of the soakaway should be such that it is in permeable material, and the pit filled with HP storm water cells with provision for a large vertical perforated pipe and an inspection chamber, so the water levels can be monitored. The cells should be within 150-200mm of the surface.

The top should be lined with geotextile before placement of top soil. Gaps between the cells and the sides of the pit should be filled with clean drainage stone. The pit shall not be lined with geotextile.

The soakaway should be fitted with an overflow drain of suitable diameter that will be connected to the existing surface water outfall.

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### 4.0 Sub-base

#### 4.1 Sub-base generally

The sub-base to the car park should be designed to meet the following criteria.

- To be capable of supporting – and transmitting to the existing ground – the loads of all vehicles, plant, machines and materials used in the construction, without causing deformation of the site.
- On completion the sub-base should be capable of supporting and transmitting all loads on the surface without permanent or long-term deformation of the surface.
- Ensure that water, whether rainwater or natural ground water, will drain away freely through the sub-base material, either into the natural subsoil or into the drainage system.

#### 4.2 Sub-base foundation to car park

Foundations shall be constructed using hard, clean, crushed frost-resistant aggregates, laid on geotextile material. The grading of the sub-base material must be such as to provide stability. The material laid in layers not exceeding 150mm, each layer being compacted before the next is laid. The minimum compacted thickness of sub-base stone should be 200mm. Upon completion there should be no detectable movement under the roller. The sub-base material should be compacted to the requirements of BS 5835-1:1980 - *Recommendations for testing of aggregates. Compactibility test for graded aggregates*.

The surface level tolerance should be within ±10mm of the design level, and, when checked with a 3000mm straight edge, there should be no deviation greater than 10mm.
4.3 Sub-base foundation to footpaths

Footpath Foundations shall be constructed using hard, clean, crushed frost-resistant aggregates, laid on geotextile material. The grading of the sub-base material must be such as to provide stability. The minimum compacted thickness of sub-base stone should be 100mm. Upon completion there should be no detectable movement under the roller. The sub-base material should be compacted to the requirements of BS 5835-1:1980 – as above

The surface level tolerance should be within ±10mm of the design level, and, when checked with a 3000mm straight edge, there should be no deviation greater than 10mm.

4.4 Perimeter Edging

Excavate for, supply and lay 125mm x 150mm bullnosed hydraulically pressed pre-cast concrete kerbs to outer edge of area, allowing for a 25mm upstand above wearing course. They shall be haunched in concrete in accordance with the Department of Transport Specification for Highways Works. The maximum gap between the outer kerb face and any adjacent perimeter fencing shall be 10mm. The haunching shall incorporate movement joints at appropriate spacing. Tolerance on pre-cast concrete kerbs to be within +/- 3mm to design level and +/- 3mm to line, under a 3000mm straight edge, gaps not to exceed 3mm.

4.5 Sockets

Fence post sockets to be set in place at time of kerb laying.

5.0 Base construction

5.1 Base construction generally

Design the base of the Car Park to meet the following criteria:

- It should be capable of supporting – and transmitting to the existing ground – the loads of all vehicles, plant, machines and materials to be used in the construction, without causing deformation of the site.
- On completion, the base should be capable of supporting and transmitting all loads on the surface without permanent or long-term deformation of the surface.
- Ensure that water, whether rainwater or natural ground water, will drain away freely, either into the natural subsoil or into the drainage system.

Engineered bases are the traditional form of road construction consisting of a single course or two courses of open-textured bituminous macadam to BS EN 13108 and PD 6691:2010 Guidance on the use of BS EN 13108 Bituminous mixtures. Material specifications.
5.2 Macadam base construction

A base course consisting of 60mm nominal compacted thickness (minimum compacted thickness not less than 40mm at any point) of 14mm or 20mm nominal-sized aggregate plus a binder course consisting of 30mm nominal compacted thickness (minimum compacted thickness not less than 20mm at any point) of 6mm nominal sized aggregate, both to BS EN 13108 and PD 6691:2010 - Guidance on the use of BS EN 13108 Bituminous mixtures. Material specifications shall be laid to the whole of the car park, all to design levels and design tolerances of +/- 3mm under a 3000mm straight edge.

Bitumen binder grade no softer than 300 penetration, preferably 200 penetration, is to be used. Laying in cold, wet or windy weather conditions should therefore be avoided and any double handling. The tolerance of the surface shall not exceed +/- 3mm under a 3000mm straight edge.

6.0 Line Marking

Allow for the marking of parking bays and any IN and OUT arrows and text, in WHITE thermoplastic paint in. VISITORS ONLY and DISABLED bays should be clearly marked in appropriate colours.

7.0 Signage

All relevant NO ENTRY, NO EXIT and DISABLED signs should be provided.

8.0 Security Lighting

Provide Security lighting to the parking area and any footpaths leading to it. Allowance to be made for all trenching, laying and connecting to existing electrical supply. All works carried out in accordance with the latest edition of BS 7671: 2008+AI: 2011 - Requirements for Electrical Installations Wiring Regulations seventeenth edition.

9.0 Fencing

All fencing works shall be undertaken in accordance with the appropriate sections of BS 1722-1:2006 Fences. Specification for chain link fences

Fencing where required shall be 1800m high 50mm mesh x 3.55mm galvanised core and green plastic coated chain link fence fixed to wooden posts. Posts to be 100mm x 100mm x 2400mm long treated with preservative to Wood Protection Association’s Manual:- Industrial Wood Preservation Specification and Practice Commodity Specification C3 Preservative treatment of fencing timber (30yr). Posts should be set at 2400mm centres. Foundation concrete shall be C20 allowing for a minimum of 150mm cover all round. Allowance should be made for all necessary straining wires and straining posts.
10.0 Retaining Walls

The Contractor shall ensure that adequate retaining walls and/or support to excavated faces are provided, together with relevant drainage.

11.0 Reinstatement

11.1 Reinstatement generally

The Contractor shall carry out the work while soil and weather conditions are suitable and leave the site in a clean and tidy condition. All damage caused to surrounding areas and surfaces shall be reinstated in full to the satisfaction of the Employer.

All hard areas shall be reinstated using similar materials to the existing, and to the satisfaction of the Employer.

On grass areas the ground shall be prepared by ridge roller or other means, approved by the Employer.

Difficulties can arise when topsoil stored is poor quality and has not been protected from heavy rainfall.

Supervision of groundworks during the final very busy stages of a project is critical.

11.2 Seeding

- Break up compacted topsoil to full depth.
- Reduce top 100 mm of topsoil to a tilth suitable for blade grading, particle size 10 mm (maximum).
- For the reinstatement of disturbed ground allow for carrying out a thorough stone picking before seeding. Remove stones and clay balls larger than permissible maximum stone size of 50 mm in any dimension together with roots, tufts of grass, rubbish and debris.

Following rolling, the ground shall be lightly harrowed in order to produce an acceptable tilth and a mixture of Chewing Fescue Highlight 20% or equivalent and Majestic Perennial Rye Grass 80% shall be sown at a rate of 28g/m² and worked into the soil by harrowing or raking as appropriate.

Following seeding the ground shall be lightly flat rolled until the surface is firm and then watered. The Contractor shall retain responsibility for watering the ground, as required to establish the sward, until handover. Consideration needs to be given to the support of seeding by carrying out turfing at edges.
Turf edging to seeded areas

Before sowing lay turfs to **BS 3969:1998 - Recommendations for turf for general purposes**, with no perennial ryegrass and of a similar seed composition to the seeded area.

- Prepare and rake back a 750 mm wide margin around prepared seed beds
- Seed bed level to be married in with turf
- Place a Single row laid end to end and trimmed to a line
- Water on completion

Turfing on banks exceeding 30° slope

- Configuration of turfs to be Diagonal or horizontal
- Secure turfs with fixings of either:-
  - Pointed softwood pegs, 200 mm long x 25 mm square, or
  - Galvanized wire pins, bent or hairpin pattern, 200 mm long x 4 mm diameter
- Fixings to be every fourth row, slopes greater than 1 in 3 to be secured every second row
- When turf is thoroughly self anchored by its roots, remove fixings and make good any damage to grass until area is accepted

11.3 Cutting

The Contractor shall be responsible for the first two cuts when the seed has established and about 65mm long, using a sharp cutter to leave about 40mm of growth and remove arisings from site. The surface should be lightly rolled prior to cutting.

Prepared by:
**Strategic Planning and Standards Group**
Property Services
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**Cornwall Council**  
County Hall  
Treyew Road  
Truro TR1 3AY  

Telephone: 0300 1234 100  
Email: [enquiries@cornwall.gov.uk](mailto:enquiries@cornwall.gov.uk)  
[www.cornwall.gov.uk](http://www.cornwall.gov.uk)