1. Groundworks.
    a. All columbaria products installed by "The Columbaria Company" (TCC) are designed to be installed on reinforced insitu-concrete foundation pads which have been specified by our consultant Civil Engineer.
    b. These foundation pads are to be installed by a competent, experienced groundworks contractor (directly employed and supervised by the customer), in suitable weather conditions (i.e. avoiding excessive rainy and freezing conditions) to leave a hard, even, smooth (steel trowel floated finish) that is deemed level (in both directions) as per the Spirit Level bubble – THE COLUMBARIA COMPANY SITE FITTING TEAM CAN NOT INSTALL COLUMBARIA PRODUCTS ON FOUNDATIONS THAT ARE NOT LEVEL AND SMOOTH – IF THE SITE SLOPES IT MAY BE NECESSARY TO "STEP" THE FOUNDATIONS TO SUIT THE NATURAL LIE OF THE LAND.
    c. In most cases, the top surface of the concrete foundation pad should be approx. 25-50mm below the proposed finished surface (paving) level to allow the surface dressing of the concrete pad with a fine (10mm nominal size) ornamental gravel covering and the hiding of the intersection of the columbaria/foundation pad (where some levelling shims may need to be inserted to correct minor levelling inadequacies and prevent products (rocking). The exception possibly being a proposed grass surfacing where the concrete foundation pad should finish "flush" with the proposed finished surface level (some additional remedial soft landscaping by others may be necessary).
    d. In most cases, Columbaria products should be installed in individual "pits" or "strips" housed within the main body of the chosen paving scheme. These pits should be edged with permanent "edging" products i.e. pre-cast concrete flat top kerbs, granite "setts" or concrete block paving paviours etc. which are to be concreted in to place. These edgings should be installed as close as possible to the foundation pad of the columbaria product to achieve a minimum width gravel surround to the product. In some cases (such as in the sanctum Panorama Unit, which has a circular base on plan), the "squared" foundation pads specified by the Civil Engineer may be adjusted prior to pouring the concrete to better suit the base of the product (i.e. by constructing an octagonal/circular shaped pit of the same diameter).
    e. IF ANY PARTY HAS ANY QUERIES PERTAINING TO THE FOUNDATION PAD INSTALLATION PROCESS, PLEASE DO NOT HESITATE TO CONTACT "TCC" (01482 387466) AT YOUR EARLIEST CONVENIENCE FOR FURTHER ADVICE BEFORE PROCEEDING.
    f. It is the Customer's responsibility (and their appointed Contractors/Agents) to ensure all site clearance, earthworks, drainage, foundation, hard-landscaping and soft-landscaping works are undertaken for the project. THE COLUMBARIA COMPANY INSTALLS ITS OWN STONE COLUMBARIA PRODUCTS ONLY. Upon completion of the concrete foundation pads, please take a digital photograph of the foundation and email it to: nikki.easby@odlings.co.uk
2. Landscaping.
    a. All TCC "Gardens Of Remembrance" Design Schemes are produced using 2D and 3D Computer Aided Design (CAD) software for speed and accuracy.
    b. Proposed sites for gardens may/may not have been accurately measured/surveyed on site at the initial design phase and the base layout plans may have been generated by TCC Design Team using a combination of site taken photographs and online mapping services such as "Google Earth" etc. The Base Plan generated will be

accurate +/- 1m or so and there is a margin for error as the plan view is essential based on Satellite imagery.

c. Upon receipt of Order for the Columbaria Products needed for a particular scheme (large schemes/high value products only), TCC's "Project Manager" shall arrange a site meeting a.s.a.p. with TCC's Designer, The Customer, Customer's Site Agent/Proposed Contractor present to discuss the proposed plan/implementation process, check physically (by on-site measurement) that the design fits the area chosen, agree setting-out points and "bench marks" for proposed topography levels etc.

d. TCC's Garden Design scheme's "Hard-Landscaping" proposals are primarily based on the footpath/roads/terracing surfacing that already exist on the site, surfacing that suits the Columbaria products proposed and surfacing that is commonly laid by the majority of Civil Engineering and Landscaping Contractors nationwide such as Tarmacadam, Flag Paving, Block Paving, Ornamental Gravel and Grass. All paving specified would also be sympathetic to a Crematorium/Cemetery environment and suitable for light pedestrian use in a public environment. Each different type of paving has its own advantages and dis-advantages and these are listed below for your information.

    i. Tarmac (High Density Bituminous Macadam).
        1. Can easily be laid to form any shape (inc. circles) – advantage.
        2. Can be installed very quickly (after kerbs and MOT type one sub-base material are installed) – advantage.
        3. Can be installed in inclement weather (i.e. rain) – advantage.
        4. Leaves an even, non-slip surface with little chance of "trip hazards" and is easily cleaned – advantage.
        5. The top "wearing course" can easily be replaced if it deteriorates over the years installed – advantage.
        6. It is black/grey in appearance and compliments Columbaria/Cemetery memorials – advantage.
        7. Cost to install per m2 is relatively low – advantage.
        8. It is perceived by the public as being "utilitarian" – dis-advantage.
        9. A specialist installation team is required – dis-advantage.

    ii. Flag Paving.
        1. Is available in many colours, textures and materials – advantage.
        2. Is readily available from builder's merchants etc. – advantage.
        3. Installation is slow and weather dependent – dis-advantage.
        4. Flags can work loose and become a trip hazard. – dis-advantage.
        5. Non-uniform (i.e. not square) shaped areas involve flags being cut (which is expensive) – dis-advantage.
        6. Surface can become slippery and requires regular cleaning – disadvantage.
        7. Cost to install per m2 is very high. – dis-advantage.

    iii. Block Paving.
        1. Can be laid to form non-uniform shapes – advantage.
        2. It is laid using a "dry" process and can be walked upon immediately after laying – advantage.
        3. Block paving is available in many colours, textures and materials – advantage.

4. Cost to install per m2 is relatively high – dis-advantage.
5. Installed block paving requires regular cleaning and maintenance – dis-advantage.

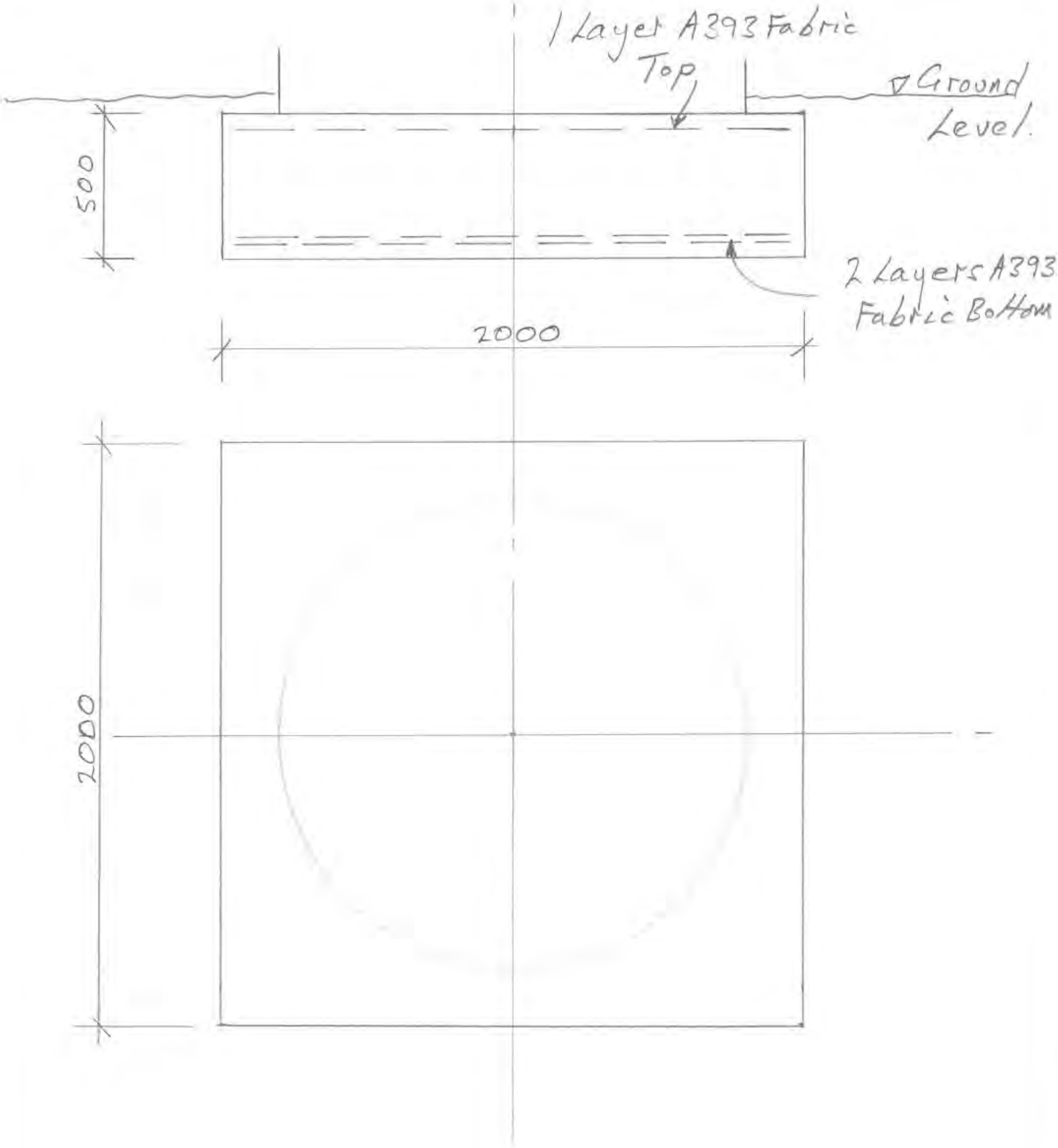
iv. Ornamental Gravel.

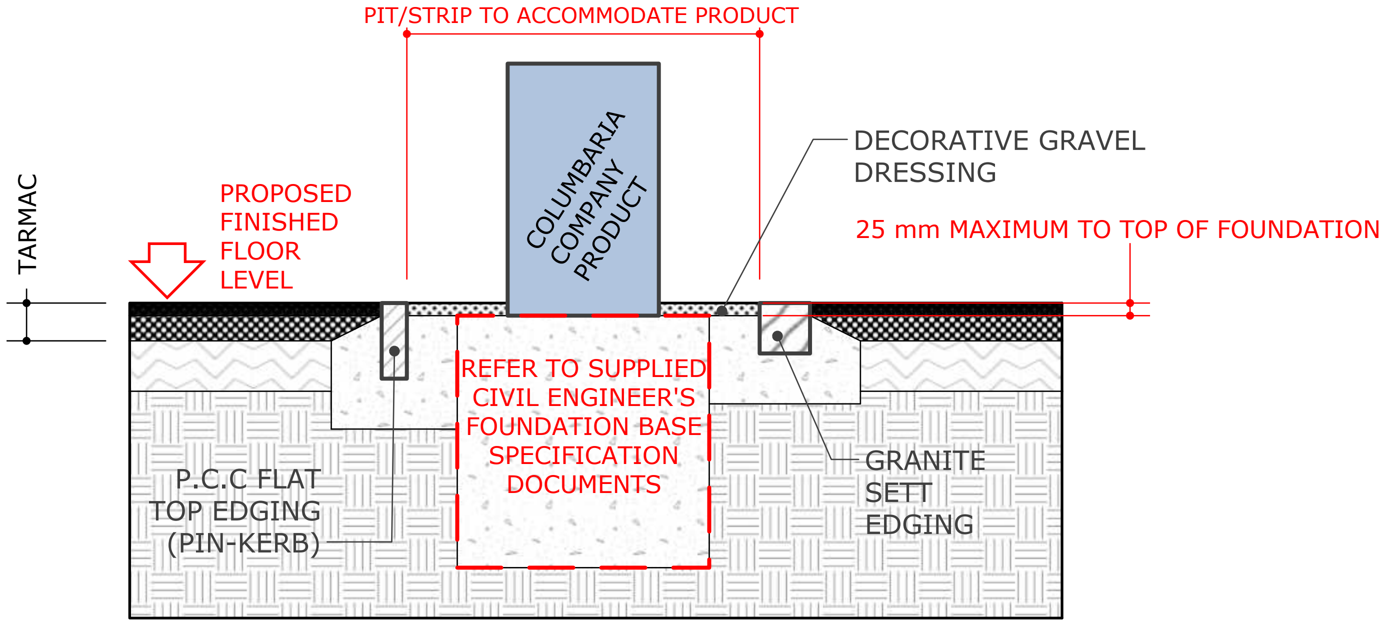
1. Can be installed to form any shape – advantage.
2. Cost to install per m2 is cheap – advantage.
3. Speed of installation is very quick – advantage.
4. Material looks natural against Columbaria products and planting – advantage.
5. Finished surface is difficult to walk on and in-accessible to wheelchairs – dis-advantage.
6. Gravel can easily “migrate” in to areas it is not wanted and needs regular raking/sweeping – dis-advantage.

v. Grass.

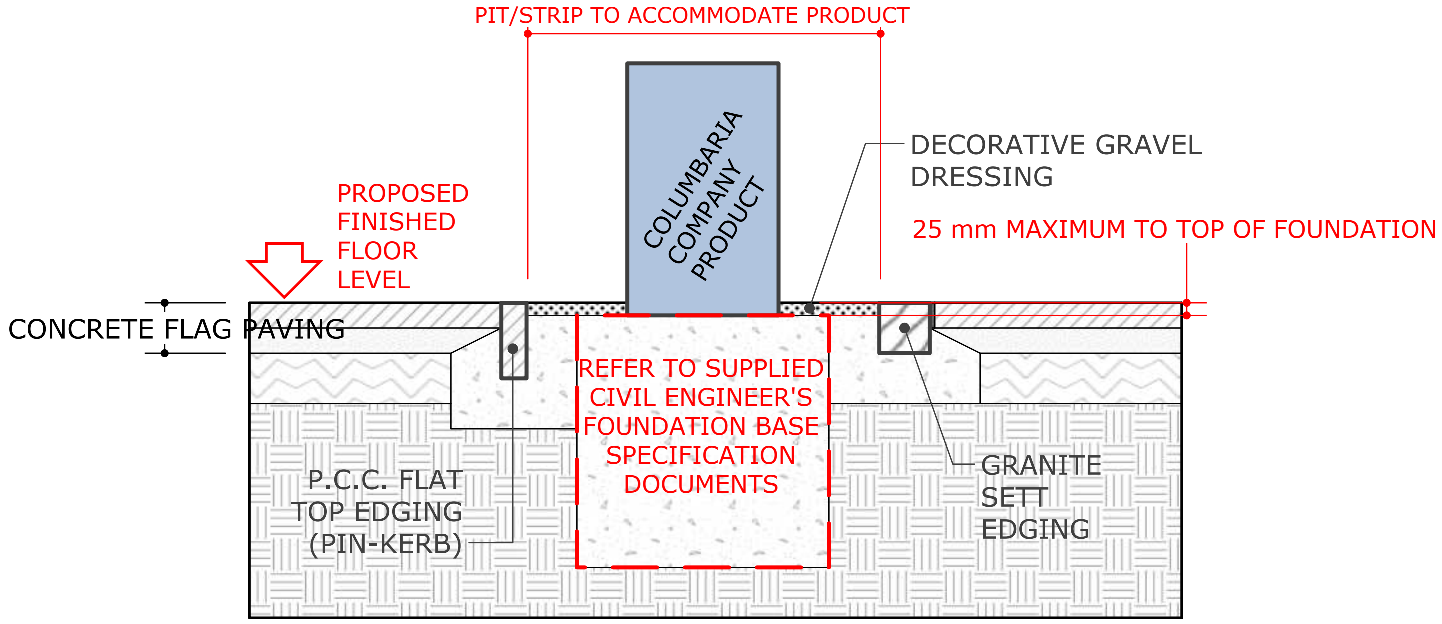
1. Can be installed to form any shape – advantage.
2. Cost to install per m2 is very cheap – advantage.
3. Speed of installation is very quick – advantage.
4. Material looks natural against Columbaria products and planting – advantage.
5. Finished surface is difficult to walk on after inclement weather and is in-accessible to wheelchairs – dis-advantage.
6. Grass needs intensive maintenance – dis-advantage.

STEPHEN MOFFAT ASSOCIATES *Chartered Civil & Structural Engineers* Melton Court, Gibson Lane, Melton North Ferriby HU14 3HH Tel:- 01482 638667 Fax:-01482 638500 E-Mail:-*sma@structuralengineers.uk.com*	Job No. 11/3352 Job Title Round 32 Niche Columbarium Foundation Base Specification Client The Columbaria Company	Sheet No. 07 Rev. August 2011



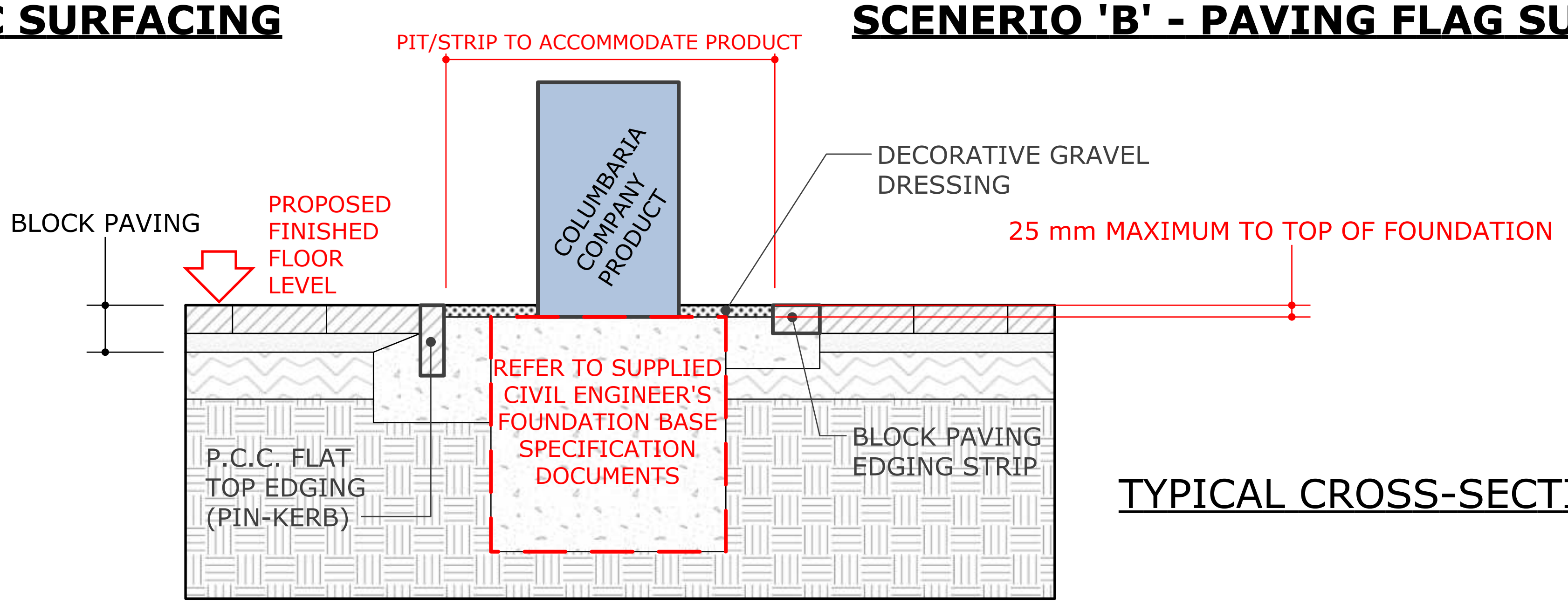


SCENERIO 'A' - TARMAC SURFACING



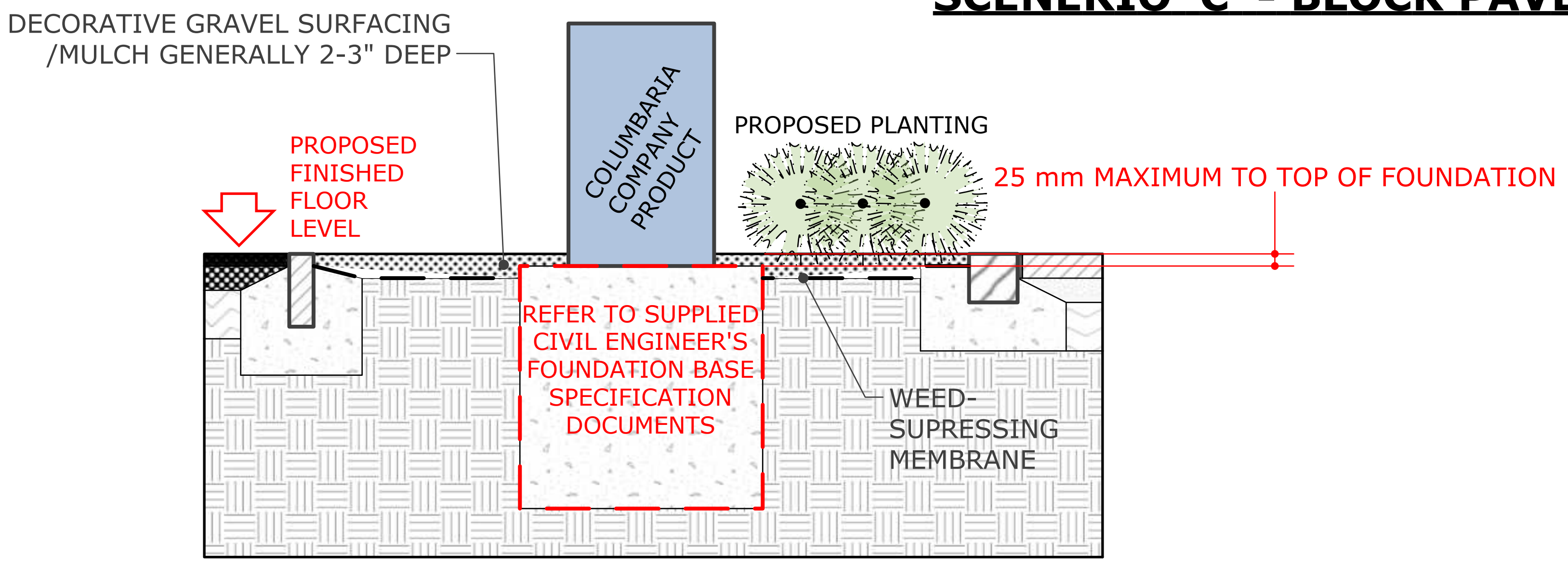
SCENERIO 'B' - PAVING FLAG SURFACING

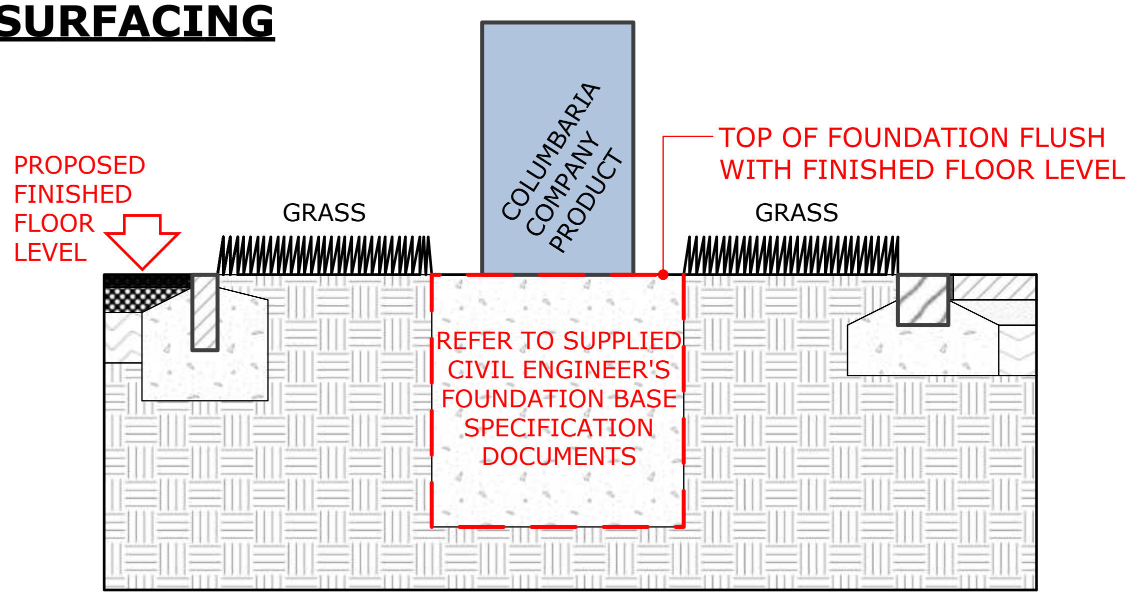
- LANDSCAPE/GROUNDWORK CONTRACTORS TO INSTALL CONCRETE FOUNDATIONS SO THAT THE FINISHED CONCRETE LEVEL IS SUITABLE FOR THE PROPOSED PAVEMENT SURFACE FINISH DETAIL.
- FOUNDATION CONCRETE IS TO BE SET LEVEL (USING A SPIRIT LEVEL) AND FINISHED WITH A STEEL FLOAT TO LEAVE A SMOOTH EVEN SURFACE FOR COLUMBARIA PRODUCT INSTALLATION BY THE COLUMBARIA COMPANY.
- THE CONTRACTOR IS TO REFER TO THE CIVIL ENGINEERS SPECIFACATION DOCUMENTS FOR ALL TECHNICAL MATTERS PERTAINING TO THE PRODUCT FOUNDATION.



TYPICAL CROSS-SECTIONS - SCALE 1:15

SCENERIO 'C' - BLOCK PAVED SURFACING





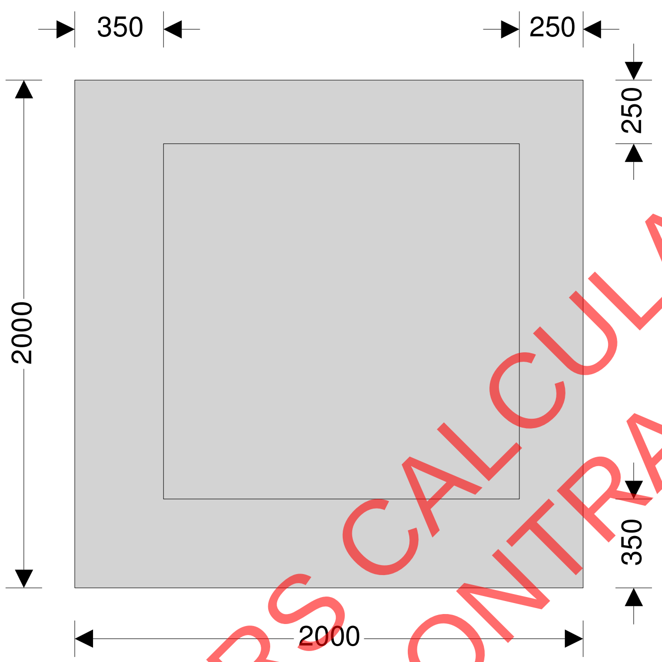
SCENERIO 'D' - GRAVEL SURFACING

SCENERIO 'E' - GRASS SURFACING

www.columbaria.co.uk

PAD FOOTING ANALYSIS AND DESIGN (BS8110-1:1997)

TEDDS calculation version 2.0.03.00



Pad footing details

Length of pad footing $L = \mathbf{2000}$ mm

Width of pad footing $B = \mathbf{2000}$ mm

Area of pad footing $A = L \times B = \mathbf{4.000}$ m^2

Depth of pad footing $h = \mathbf{500}$ mm

Depth of soil over pad footing $h_{soil} = \mathbf{200}$ mm

Density of concrete $\rho_{conc} = \mathbf{23.6}$ kN/m^3

Column details

Column base length $l_A = \mathbf{1400}$ mm

Column base width $b_A = \mathbf{1400}$ mm

Column eccentricity in x $e_{PxA} = \mathbf{50}$ mm

Column eccentricity in y $e_{PyA} = \mathbf{50}$ mm

Soil details

Density of soil $\rho_{soil} = \mathbf{20.0}$ kN/m^3

Design shear strength $\phi' = \mathbf{25.0}$ deg

Design base friction $\delta = \mathbf{19.3}$ deg

Allowable bearing pressure $P_{bearing} = \mathbf{60}$ kN/m^2

Axial loading on column

Dead axial load on column $P_{GA} = \mathbf{40.0}$ kN

Imposed axial load on column $P_{QA} = \mathbf{10.0}$ kN

Wind axial load on column $P_{WA} = \mathbf{0.0}$ kN

Total axial load on column $P_A = \mathbf{50.0}$ kN

Foundation loads

Dead surcharge load $F_{Gsur} = \mathbf{5.000}$ kN/m^2

Imposed surcharge load F_{Qsur} = **10.000** kN/m²

Pad footing self weight $F_{swt} = h \times \rho_{conc}$ = **11.800** kN/m²

Soil self weight $F_{soil} = h_{soil} \times \rho_{soil}$ = **4.000** kN/m²

Total foundation load $F = A \times (F_{Gsur} + F_{Qsur} + F_{swt} + F_{soil})$ = **123.2** kN

Horizontal loading on column base

Dead horizontal load in x direction H_{GxA} = **0.0** kN

Imposed horizontal load in x direction H_{QxA} = **0.0** kN

Wind horizontal load in x direction H_{WxA} = **2.0** kN

Total horizontal load in x direction H_{xA} = **2.0** kN

Dead horizontal load in y direction H_{GyA} = **0.0** kN

Imposed horizontal load in y direction H_{QyA} = **0.0** kN

Wind horizontal load in y direction H_{WyA} = **2.0** kN

Total horizontal load in y direction H_{yA} = **2.0** kN

Moment on column base

Dead moment on column in x direction M_{GxA} = **0.000** kNm

Imposed moment on column in x direction M_{QxA} = **0.000** kNm

Wind moment on column in x direction M_{WxA} = **2.000** kNm

Total moment on column in x direction M_{xA} = **2.000** kNm

Dead moment on column in y direction M_{GyA} = **0.000** kNm

Imposed moment on column in y direction M_{QyA} = **0.000** kNm

Wind moment on column in y direction M_{WyA} = **2.000** kNm

Total moment on column in y direction M_{yA} = **2.000** kNm

Check stability against sliding

Resistance to sliding due to base friction

$H_{friction} = \max([P_{GA} + (F_{Gsur} + F_{swt} + F_{soil}) \times A], 0 \text{ kN}) \times \tan(\delta)$ = **43.1** kN

Passive pressure coefficient $K_p = (1 + \sin(\phi')) / (1 - \sin(\phi'))$ = **2.464**

Stability against sliding in x direction

Passive resistance of soil in x direction $H_{xpas} = 0.5 \times K_p \times (h^2 + 2 \times h \times h_{soil}) \times B \times \rho_{soil}$ = **22.2** kN

Total resistance to sliding in x direction $H_{xres} = H_{friction} + H_{xpas}$ = **65.3** kN

PASS - Resistance to sliding is greater than horizontal load in x direction

Stability against sliding in y direction

Passive resistance of soil in y direction $H_{ypas} = 0.5 \times K_p \times (h^2 + 2 \times h \times h_{soil}) \times L \times \rho_{soil}$ = **22.2** kN

Total resistance to sliding in y direction $H_{yres} = H_{friction} + H_{ypas}$ = **65.3** kN

PASS - Resistance to sliding is greater than horizontal load in y direction

Check stability against overturning in x direction

Total overturning moment $M_{xOT} = M_{xA} + H_{xA} \times h$ = **3.000** kNm

Restoring moment in x direction

Foundation loading $M_{xsur} = A \times (F_{Gsur} + F_{swt} + F_{soil}) \times L / 2$ = **83.200** kNm

Axial loading on column $M_{xaxial} = (P_{GA}) \times (L / 2 - e_{PxA})$ = **38.000** kNm

Total restoring moment $M_{xres} = M_{xsur} + M_{xaxial}$ = **121.200** kNm

PASS - Restoring moment is greater than overturning moment in x direction

Check stability against overturning in y direction

Total overturning moment $M_{yOT} = M_{yA} + H_{yA} \times h$ = **3.000** kNm

Restoring moment in y direction

Foundation loading $M_{ysur} = A \times (F_{Gsur} + F_{swt} + F_{soil}) \times B / 2$ = **83.200** kNm

Axial loading on column $M_{yaxial} = (P_{GA}) \times (B / 2 - e_{PyA}) = \mathbf{38.000}$ kNm

Total restoring moment $M_{yres} = M_{ysur} + M_{yaxial} = \mathbf{121.200}$ kNm

PASS - Restoring moment is greater than overturning moment in y direction

Calculate pad base reaction

Total base reaction $T = F + P_A = \mathbf{173.2}$ kN

Eccentricity of base reaction in x $e_{Tx} = (P_A \times e_{PxA} + M_{xA} + H_{xA} \times h) / T = \mathbf{32}$ mm

Eccentricity of base reaction in y $e_{Ty} = (P_A \times e_{PyA} + M_{yA} + H_{yA} \times h) / T = \mathbf{32}$ mm

Check pad base reaction eccentricity

$abs(e_{Tx}) / L + abs(e_{Ty}) / B = \mathbf{0.032}$

Base reaction acts within combined middle third of base

Calculate pad base pressures

$q_1 = T / A - 6 \times T \times e_{Tx} / (L \times A) - 6 \times T \times e_{Ty} / (B \times A) = \mathbf{35.050}$ kN/m^2

$q_2 = T / A - 6 \times T \times e_{Tx} / (L \times A) + 6 \times T \times e_{Ty} / (B \times A) = \mathbf{43.300}$ kN/m^2

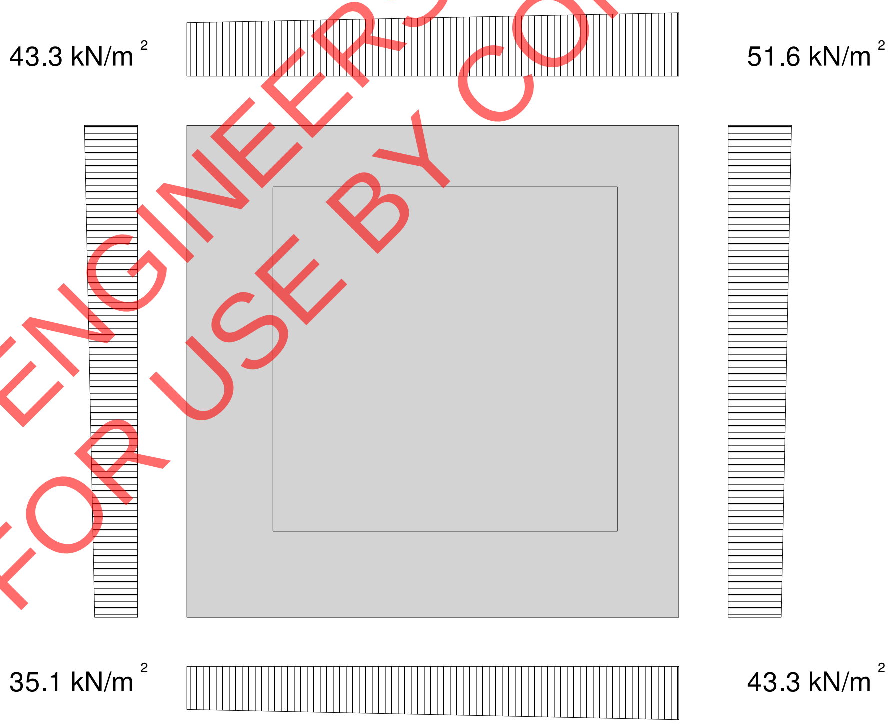
$q_3 = T / A + 6 \times T \times e_{Tx} / (L \times A) - 6 \times T \times e_{Ty} / (B \times A) = \mathbf{43.300}$ kN/m^2

$q_4 = T / A + 6 \times T \times e_{Tx} / (L \times A) + 6 \times T \times e_{Ty} / (B \times A) = \mathbf{51.550}$ kN/m^2

Minimum base pressure $q_{min} = min(q_1, q_2, q_3, q_4) = \mathbf{35.050}$ kN/m^2

Maximum base pressure $q_{max} = max(q_1, q_2, q_3, q_4) = \mathbf{51.550}$ kN/m^2

PASS - Maximum base pressure is less than allowable bearing pressure



Partial safety factors for loads

Partial safety factor for dead loads $\gamma_{fG} = \mathbf{1.40}$

Partial safety factor for imposed loads $\gamma_{fQ} = \mathbf{1.60}$

Partial safety factor for wind loads $\gamma_{fW} = \mathbf{0.00}$

Ultimate axial loading on column

Ultimate axial load on column $P_{uA} = P_{GA} \times \gamma_{fG} + P_{QA} \times \gamma_{fQ} + P_{WA} \times \gamma_{fW} = \mathbf{72.0}$ kN

Ultimate foundation loads

Ultimate foundation load $F_u = A \times [(F_{Gsur} + F_{swt} + F_{soil}) \times \gamma_{fG} + F_{Qsur} \times \gamma_{fQ}] =$ **180.5** kN

Ultimate horizontal loading on column

Ultimate horizontal load in x direction $H_{xuA} = H_{GxA} \times \gamma_{fG} + H_{QxA} \times \gamma_{fQ} + H_{WxA} \times \gamma_{fW} =$ **0.0** kN

Ultimate horizontal load in y direction $H_{yuA} = H_{GyA} \times \gamma_{fG} + H_{QyA} \times \gamma_{fQ} + H_{WyA} \times \gamma_{fW} =$ **0.0** kN

Ultimate moment on column

Ultimate moment on column in x direction $M_{xuA} = M_{GxA} \times \gamma_{fG} + M_{QxA} \times \gamma_{fQ} + M_{WxA} \times \gamma_{fW} =$ **0.000** kNm

Ultimate moment on column in y direction $M_{yuA} = M_{GyA} \times \gamma_{fG} + M_{QyA} \times \gamma_{fQ} + M_{WyA} \times \gamma_{fW} =$ **0.000** kNm

Calculate ultimate pad base reaction

Ultimate base reaction $T_u = F_u + P_{uA} =$ **252.5** kN

Eccentricity of ultimate base reaction in x $e_{Txu} = (P_{uA} \times e_{PxA} + M_{xuA} + H_{xuA} \times h) / T_u =$ **14** mm

Eccentricity of ultimate base reaction in y $e_{Tyu} = (P_{uA} \times e_{PyA} + M_{yuA} + H_{yuA} \times h) / T_u =$ **14** mm

Calculate ultimate pad base pressures

$q_{1u} = T_u/A - 6 \times T_u \times e_{Txu}/(L \times A) - 6 \times T_u \times e_{Tyu}/(B \times A) =$ **57.720** kN/m²

$q_{2u} = T_u/A - 6 \times T_u \times e_{Txu}/(L \times A) + 6 \times T_u \times e_{Tyu}/(B \times A) =$ **63.120** kN/m²

$q_{3u} = T_u/A + 6 \times T_u \times e_{Txu}/(L \times A) - 6 \times T_u \times e_{Tyu}/(B \times A) =$ **63.120** kN/m²

$q_{4u} = T_u/A + 6 \times T_u \times e_{Txu}/(L \times A) + 6 \times T_u \times e_{Tyu}/(B \times A) =$ **68.520** kN/m²

Minimum ultimate base pressure $q_{minu} = \min(q_{1u}, q_{2u}, q_{3u}, q_{4u}) =$ **57.720** kN/m²

Maximum ultimate base pressure $q_{maxu} = \max(q_{1u}, q_{2u}, q_{3u}, q_{4u}) =$ **68.520** kN/m²

Calculate rate of change of base pressure in x direction

Left hand base reaction $f_{uL} = (q_{1u} + q_{2u}) \times B / 2 =$ **120.840** kN/m

Right hand base reaction $f_{uR} = (q_{3u} + q_{4u}) \times B / 2 =$ **131.640** kN/m

Length of base reaction $L_x = L =$ **2000** mm

Rate of change of base pressure $C_x = (f_{uR} - f_{uL}) / L_x =$ **5.400** kN/m/m

Calculate pad lengths in x direction

Left hand length $L_L = L / 2 + e_{PxA} =$ **1050** mm

Right hand length $L_R = L / 2 - e_{PxA} =$ **950** mm

Calculate ultimate moments in x direction

Ultimate moment in x direction $M_x = f_{uL} \times L_L^2/2 + C_x \times L_L^3/6 - F_u \times L_L^2/(2 \times L) =$ **17.910** kNm

Calculate rate of change of base pressure in y direction

Top edge base reaction $f_{uT} = (q_{2u} + q_{4u}) \times L / 2 =$ **131.640** kN/m

Bottom edge base reaction $f_{uB} = (q_{1u} + q_{3u}) \times L / 2 =$ **120.840** kN/m

Length of base reaction $L_y = B =$ **2000** mm

Rate of change of base pressure $C_y = (f_{uB} - f_{uT}) / L_y =$ **-5.400** kN/m/m

Calculate pad lengths in y direction

Top length $L_T = B / 2 - e_{PyA} =$ **950** mm

Bottom length $L_B = B / 2 + e_{PyA} =$ **1050** mm

Calculate ultimate moments in y direction

Ultimate moment in y direction $M_y = f_{uT} \times L_T^2/2 + C_y \times L_T^3/6 - F_u \times L_T^2/(2 \times B) =$ **17.910** kNm

Material details

Characteristic strength of concrete $f_{cu} =$ **30** N/mm²

Characteristic strength of reinforcement $f_y =$ **500** N/mm²

Characteristic strength of shear reinforcement $f_{yv} =$ **500** N/mm²

Nominal cover to reinforcement c_{nom} = **30** mm

Moment design in x direction

Diameter of tension reinforcement ϕ_{xB} = **10** mm

Depth of tension reinforcement $d_x = h - c_{nom} - \phi_{xB} / 2$ = **465** mm

Design formula for rectangular beams (cl 3.4.4.4)

$K_x = M_x / (B \times d_x^2 \times f_{cu})$ = **0.001**

$K_x' = 0.156$

$K_x < K_x'$ compression reinforcement is not required

Lever arm $z_x = d_x \times \min([0.5 + \sqrt{(0.25 - K_x / 0.9)}], 0.95)$ = **442** mm

Area of tension reinforcement required $As_{x\_req} = M_x / (0.87 \times f_y \times z_x)$ = **93** mm²

Minimum area of tension reinforcement $As_{x\_min} = 0.0013 \times B \times h$ = **1300** mm²

Tension reinforcement provided **21 No. 10 dia. bars bottom (100 centres)**

Area of tension reinforcement provided $As_{xB\_prov} = N_{xB} \times \pi \times \phi_{xB}^2 / 4$ = **1649** mm²

PASS - Tension reinforcement provided exceeds tension reinforcement required

Moment design in y direction

Diameter of tension reinforcement ϕ_{yB} = **10** mm

Depth of tension reinforcement $d_y = h - c_{nom} - \phi_{xB} - \phi_{yB} / 2$ = **455** mm

Design formula for rectangular beams (cl 3.4.4.4)

$K_y = M_y / (L \times d_y^2 \times f_{cu})$ = **0.001**

$K_y' = 0.156$

$K_y < K_y'$ compression reinforcement is not required

Lever arm $z_y = d_y \times \min([0.5 + \sqrt{(0.25 - K_y / 0.9)}], 0.95)$ = **432** mm

Area of tension reinforcement required $As_{y\_req} = M_y / (0.87 \times f_y \times z_y)$ = **95** mm²

Minimum area of tension reinforcement $As_{y\_min} = 0.0013 \times L \times h$ = **1300** mm²

Tension reinforcement provided **21 No. 10 dia. bars bottom (100 centres)**

Area of tension reinforcement provided $As_{yB\_prov} = N_{yB} \times \pi \times \phi_{yB}^2 / 4$ = **1649** mm²

PASS - Tension reinforcement provided exceeds tension reinforcement required

Calculate ultimate punching shear force at face of column

Ultimate pressure for punching shear $q_{puA} = q_{1u}+[(L/2+e_{PxA}-l_A/2)+(l_A)/2]\times C_x/B-[(B/2+e_{PyA}-b_A/2)+(b_A)/2]\times C_y/L$

q_{puA} = **63.390** kN/m²

Average effective depth of reinforcement $d = (d_x + d_y) / 2$ = **460** mm

Area loaded for punching shear at column $A_{pA} = (l_A)\times(b_A)$ = **1.960** m²

Length of punching shear perimeter $u_{pA} = 2\times(l_A)+2\times(b_A)$ = **5600** mm

Ultimate shear force at shear perimeter $V_{puA} = P_{uA} + (F_u / A - q_{puA}) \times A_{pA}$ = **36.191** kN

Effective shear force at shear perimeter $V_{puAeff} = V_{puA}$ = **36.191** kN

Punching shear stresses at face of column (cl 3.7.7.2)

Design shear stress $v_{puA} = V_{puAeff} / (u_{pA} \times d)$ = **0.014** N/mm²

Allowable design shear stress $v_{max} = \min(0.8\text{N/mm}^2 \times \sqrt{(f_{cu} / 1\text{ N/mm}^2)}, 5\text{ N/mm}^2)$ = **4.382** N/mm²

PASS - Design shear stress is less than allowable design shear stress

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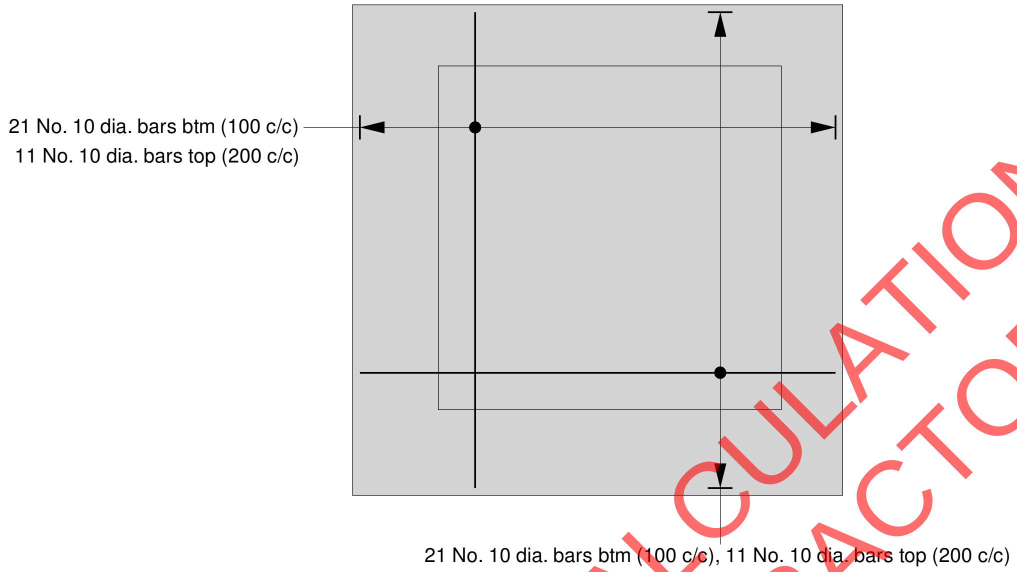

Concrete Specification

Compressive Strength	35.0N/mm2 at 28 days
Min. Cement Content	300kg/m3 OPC
Max. Aggregate size	20mm
Max. Free Water/Cement Ratio	0.55
Min. Cover to Reinforcement	50mm

Site Preparation

Remove all top soil to firm sub-base. Determine type of sub-base, i.e. CLAY, SAND or GRAVEL and use appropriate foundation type. Any soft spots are to be removed and filled with compacted Type 1 stone or foundation concrete. Contaminated ground is to be avoided if possible or removed and the trench lined with Visqueen to isolate the concrete. Sulphate Resisting Cement should be used in these conditions. Excavations in sands and gravels are to be lined with Visqueen.

Reinforcement is to be fixed in position before concrete is poured ensuring that concrete cover to steel is maintained. Use a poker vibrator to compact concrete.

Trees

If there are large trees in close proximity, Columbaria's Engineer must be consulted. An appropriate engineered foundation must be designed to protect the tree roots and foundation from possible subsidence/heave damage. Tree roots must not be severed.