



| CONSULTING Engineering Calculation Sheet  ENGINEERS Consulting Engineers    STRUCTURE, Member Design - Geotechnics Pile Cap   | 1 <sup>d</sup> hd. |
|---|--------------------|
|   | <b>1</b> Chd.      |
| Dob Title   Structure, Member Design - Geotechnics Pile Cap v2021   Drop  | <b>1</b> Chd.      |
| Structure, Member Design - Geotechnics Pile Cap   | <b>1</b> Chd.      |
| Pile Cap Dimensions           Pile group arrangement         Nine Pile Arrangement         ▼           Number of piles in pile group, Σn         (generic only)         N/A           Plle shaft diameter (circular) or width (square), D         1200mm         ▼         1200 mm           Pile group pile spacing, S         25D         ▼ 25D         ▼ 3000         3000 mm           Note that spacing, S refers to distance from c/l to c/l between piles;         S > = perimeter π.D (or simply 3.0D) for circular friction piles and 4.0D for square friction spiles and 4.0D for square friction piles and 4.0D for square fr   | 1 <sup>Chd.</sup>  |
| Number of piles in pile group, Σn   9   Number of piles in pile group, Σn   9   Number of piles in pile group, Σn (generic only)   N/A     Pile shaft diameter (circular) or width (square), D   1200mm   |                    |
| Number of piles in pile group, Σn   9   Number of piles in pile group, Σn   9   Number of piles in pile group, Σn (generic only)   N/A     Pile shaft diameter (circular) or width (square), D   1200mm   |                    |
| Number of piles in pile group, ∑n   Number of piles in pile group, ∑n (generic only)   NyA    Pile shaft diameter (circular) or width (square), D   1200mm   1200mm   1200 mm   |                    |
| Number of piles in pile group, ∑n   Number of piles in pile group, ∑n (generic only)   NyA    Pile shaft diameter (circular) or width (square), D   1200mm   1200mm   1200 mm   |                    |
| Number of piles in pile group, Σn (generic only)  |                    |
| Pile shaft diameter (circular) or width (square), D         1200mm         ▼         1200 mm           Pile group pile spacing, S         25D         ▼         25D         ▼         3000         3000         mm           Note that spacing, S         25D         ▼         3000         3000         mm           Note that spacing, S         25D         ▼         3000         3000         mm           Note that spacing, S         25D         ▼         3000         3000         mm           Note that spacing, S         25D         ▼         3000         3000         mm           Note that spacing, S         25D         ▼         3000         3000         mm           Note that spacing, S         25D         ▼         3000         3000         mm           Portion of pile cap in y, Both Spaces and s   |                    |
| Pile group pile spacing, S   2.50   ▼ 2.50   ▼ 3000 3000 mm   | N/A                |
| Pile group pile spacing, S         2.5D         ▼ 2.5D         ▼ 3000         3000         mm           Note that spacing, S refers to distance from c/I to c/I between piles;         S >= perimeter π.D (or simply 3.0D) for circular friction piles and 4.0D for square friction piles are follows:           Projection of pile cap beyond face of pile, c <sub>proj</sub> (usually 150)         150         150         mm           Width of pile cap in x, B <sub>cap</sub> B <sub>cap</sub> = D + 2.c <sub>proj</sub> N/A m         7.500         mm           Width of pile cap in x, B <sub>cap</sub> B <sub>cap</sub> = 1.0S + D + 2.c <sub>proj</sub> N/A m         N/A m         n           3P:         B <sub>cap</sub> = 1.0S + D + 2.c <sub>proj</sub> N/A m         n         n         n           4P:         B <sub>cap</sub> = 1.10S + D + 2.c <sub>proj</sub> N/A m         n         n         n         n         n           5P:         B <sub>cap</sub> = 1.10S + D + 2.c <sub>proj</sub> N/A m         n   |                    |
| Note that spacing, S refers to distance from c/l to c/l between piles;  |                    |
| $S >= perimeter \ \pi.D \ (or simply 3.0D) \ for circular friction piles and 4.0D \ for square friction should be a square friction from square friction from$  |                    |
| $\begin{array}{ c c c c c } S>=2.0D_b \   for\   end\   bearing\   piles; \\ \hline \\ Projection\   of\   pile\   cap\   beyond\   face\   of\   pile,\   c_{proj}\   (usually\   150) \\ \hline \\ Width\   of\   pile\   cap\   in\   x \\ \hline \\ Width\   of\   pile\   in\   x \\ \hline \\ Width\   of\   pile\   in\   x \\ \hline \\ Width\   of\   pile\   in\   x \\ \hline \\ Width\   of\   in\   x \\ \hline \\ Width\   of\   pile\   in\   x \\ \hline \\ Width\   of\   in\  $ |                    |
| Projection of pile cap beyond face of pile, C <sub>proj</sub> (usually 150)   150   150   mm  | on piles;          |
| Projection of pile cap beyond face of pile, cproj (usually 150)   150   150   mm  |                    |
| Width of pile cap in x, B <sub>cap</sub> B <sub>cap</sub> = D + 2.C <sub>proj</sub> N/A m           1P:         B <sub>cap</sub> = D + 2.C <sub>proj</sub> N/A m           3P:         B <sub>cap</sub> = 1.0S + D + 2.C <sub>proj</sub> N/A m           4P:         B <sub>cap</sub> = 1.0S + D + 2.C <sub>proj</sub> N/A m           5P:         B <sub>cap</sub> = 1.415S + D + 2.C <sub>proj</sub> N/A m           6P:         B <sub>cap</sub> = 1.0S + D + 2.C <sub>proj</sub> N/A m           8P:         B <sub>cap</sub> = 1.0S + D + 2.C <sub>proj</sub> N/A m           8P:         B <sub>cap</sub> = 1.734S + D + 2.C <sub>proj</sub> N/A m           8P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           10P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           11P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           12P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           13P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           14P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           15P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           15P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           15P:         B <sub>cap</sub> = 2.0S + D + 2.C <sub>proj</sub> N/A m           15P:         B <sub>cap</sub> = 1.10S + D + 2.C <sub>proj</sub> N/A m           16P:   |                    |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |                    |
| Generic: $B_{cap} = user-defined$ N/A m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ $T.500$ m         Length of pile cap in y, $L_{cap}$ <   |                    |
| Length of pile cap in y, $L_{cap}$  |                    |
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| $BP$ : $L_{cap} = 2.0S + D + 2.c_{proj}$ N/A m $9P$ : $L_{cap} = 2.0S + D + 2.c_{proj}$ 7.500 m $10P$ : $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m $11P$ : $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m   |                    |
| 9P: $L_{cap} = 2.0S + D + 2.c_{proj}$ 7.500 m         10P: $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m         11P: $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m   |                    |
| 10P: $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m 11P: $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m   | 1                  |
| 11P: $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m  | 1                  |
|   |                    |
| $L_{cap} = 3.0S + D + 2.c_{proj}$ N/A m   | +                  |
| 13P: $L_{cap} = 4.0S + D + 2.c_{proj} \qquad \text{N/A m}$  | -                  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$   |                    |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | +                  |
| Generic: $L_{cap} = user-defined$ N/A m   | 1                  |
| Concret Leap - user defined 14/A III  | 1                  |
| Banding ratio (affects truss base force and enhanced shear capacity)  | +                  |
| Banding ratio in plane of width, $b_{r,x} = L_{cap} / L_{cap(3.0D)} \ge 1.0$  | cl.3.11.4.2        |
| Banding ratio in plane of width, $b_{r,x} = L_{cap} / L_{cap(3.0D)} \ge 1.0$ Banding ratio in plane of width, $b_{r,x}$ (generic only)  | BS8110             |
| Banding ratio in plane of length, $b_{r,y} = B_{cap} / B_{cap(3.0D)} \ge 1.0$   | cl.3.11.4.2        |
| Banding ratio in plane of length, $b_{r,y} = b_{cap} / b_{cap(3.0D)} \ge 1.0$ Banding ratio in plane of length, $b_{r,y}$ (generic only)  N/A   | BS8110             |
| Note only steel reinforcement within 1.5D from pile centre considered effective;  | 230110             |
| The centre considered effective,  | +                  |

| T-          |                                       | 1                                    |                        |                              |                        |                   | 1             | Ţ                    | 1  |
|-------------|---------------------------------------|--------------------------------------|------------------------|------------------------------|------------------------|-------------------|---------------|----------------------|--|
| CON         | SULTING                               | Enginoorin                           | a Calculatio           | n Choot                      |                        | Job No.           | Sheet No.     |                      | Rev.   |
|             | INEERS                                | _                                    | _                      | ii Sheet                     |                        | :٧٧٧              |               | 4                    |  |
| ENG         | INEEKS                                | Consulting                           | Liigiileeis            |                              |                        | jXXX              |               | 4                    |  |
|             |                                       |                                      |                        |                              |                        | Member/Location   | n             |                      | •  |
| Job Title   | Structure                             | Member De                            | sian - Geot            | echnics Pile                 | Can v2021              | Drg.              |               |                      |  |
|             |                                       |                                      |                        |                              | Cap v2021              |                   | V Date 21     | /11 /2021            | Thd.   |
| Structure,  | Member De                             | esign - Geot                         | echnics Pile           | Сар                          |                        | Made by X         | X 21          | /11/2021             | ond.   |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
| Stress con  | centration (                          | affects ben                          | dina mome              | nt alnoluded (               | BS8110 cl 3 11         | 3 2) (3D Fffec    | t) 🔻          |                      |  |
| 00.000      | 1                                     | centration i                         |                        |                              | 1.0                    |                   | -             | 1.000                |  |
|             | +                                     |                                      |                        |                              |                        |                   | _             |                      |  |
|             |                                       | centration i                         |                        |                              | 1.0                    | 1.                | 1.000         | 1.000                |  |
|             | Basis: BS                             | 8110 cl.3.1                          | 11.3.2 (3D             | Effect)                      |                        |                   |               |                      |  |
|             | Factor, s <sub>c,x</sub>              | $_{\rm c} = 2/3 \; L_{\rm cap} \; /$ | / (h or D +            | $3d_x$ )                     |                        |                   | 0.300         |                      | cl.3.11.3.2                                      |
|             | applicable                            | if $L_{cap}/2 > 1$                   | 3/4(h or D)            | +9/4d <sub>x</sub>           | 3.750                  | <=                | 12.479        | m                    | BS8110   |
|             | Factor, so,                           | $= 2/3 B_{cap}$                      | / (b or D +            | 3d.,)                        |                        |                   | 0.365         |                      | cl.3.11.3.2                                      |
|             |                                       | if $B_{cap}/2 >$                     |                        |                              | 3.750                  | <=                | 10.267        |                      | BS8110   |
|             |                                       |                                      |                        |                              | 3.730                  | \ <u>-</u>        | 10.207        | 111                  | <i>D30110</i>                                    |
|             |                                       | 8110 cl.3.4                          | <del></del>            |                              |                        |                   |               |                      |  |
|             | · · · · · · · · · · · · · · · · · · · | $_{\rm c} = L_{\rm cap} / (h)$       |                        |                              |                        |                   | 0.968         |                      | cl.3.4.1.5                                       |
|             | Factor, s <sub>c,v</sub>              | $A = B_{cap} / (b$                   | or D + $L_{cap}$       | /5)                          |                        |                   | 1.563         |                      | BS8110   |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
| Thickness   | of pile cap,                          | Tear                                 |                        |                              |                        |                   | 3.800         | m                    |  |
|             |                                       |                                      | 1/21 / 4-              | <br>n/F○                     | or 1 '                 | /0.5              |               |                      | -01/   |
| ivote usua  | Ily T <sub>cap</sub> ≈ (I             |                                      |                        |                              |                        |                   |               |                      | OK   |
|             |                                       | $(MIN(L_{db,x},L$                    |                        |                              |                        |                   |               | т                    |  |
| for single  | layer base s                          | steel and an                         | gle 45° to 3           | 30° from ve                  | rtical to lin          | e of comp         | ression;      |                      |  |
| Note suffic | cient pile ca                         | p rebar anci                         | horage, T 🚙            | n ≥ tanchorn                 | ilecan -D/2-C          | nroi +cover       | 1 +cover 2    |                      |  |
|             | ·                                     |                                      |                        | $2r_3 + \phi_{link,2/3}$     |                        |                   | 0.590         | m                    | ОК   |
| 6           | 1                                     | -t1. N-t-                            |                        |                              |                        |                   | _             |                      |  |
|             |                                       |                                      |                        |                              |                        |                   | is needs to b |                      |  |
| Note suffic | cient pile rei                        | bar anchora                          | ge, T <sub>cap</sub> ≥ | $t_{anchor,pile} + c$        | cover 1 +cov           | rer₃ ≈            | 0.810         | m                    | OK   |
|             | Pile longitu                          | ıdinal steel                         | reinforceme            | ent diamete                  | $r, \phi_{D}$          |                   | 20            | mm                   |  |
| Note tensi  | on anchorac                           | ge, t <sub>anchor</sub> =            | (1/1.05).f             | v. ø/4/f m. A                | As As prov by          | $f_{bu} = (0.50)$ | G460, 0.28    | $G250$ ). $\sqrt{f}$ | A s/A s n  |
|             |                                       | anciioi                              |                        | y - 77 -7 - Du               | - 57 - 5,p10v,b7       | Du (CIC           |               |                      | <b>1</b>   |
|             | <u> </u>                              | 16                                   | , . ,                  |                              |                        |                   |               |                      |  |
|             | se section t                          |                                      |                        |                              |                        |                   | angular 🔻     |                      |  |
|             | ise depth, h                          |                                      |                        |                              |                        |                   | 6250          | mm                   | 4.7  |
| Column ba   | se width, b                           | (≤ h) (rect                          | angular) or            | N/A (circul                  | ar)                    |                   | 3300          | mm                   | 7.7  |
| Note wher   | e applicable                          | e, it is assun                       | ned that h             | is in same p                 | lane as L ca           | , and that        | the column    | base                 | N/mm²  |
|             |                                       |                                      |                        |                              |                        | r                 | nerally h ≥ b |                      |  |
| is always i | TRECTION UNIO                         | Tocated III t                        | The certare o          | Title pile ce                | тръ <sub>сар</sub> апа | L cap, GCI        |               | (not manu            | I  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             | f pile group                          |                                      |                        |                              |                        |                   | 3.000         | m                    |  |
| Centroid o  | f pile group                          | in y, $y_c = \Sigma$                 | y <sub>n</sub> /Σn     |                              |                        |                   | 3.000         | m                    |  |
| Second m    | oment of dis                          | stance of pil                        | e group in :           | $X$ , $I_1 = \Sigma X_{p-q}$ | 2                      |                   | 54            | $m^2$                |  |
|             | oment of dis                          |                                      |                        |                              |                        |                   |               | m <sup>2</sup>       |  |
| Socond m    | oment of di                           | stance of pil                        | o group in             | <u>,, +2 - 4yn-c</u>         |                        |                   |               |                      | 1  |
| second in   | oment of dis                          | stance of pli                        | e group III :          | λy, 1 <sub>12</sub> = ΣΧ     | n-c <b>· y</b> n-c     |                   | 0             | m <sup>2</sup>       |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      | 1  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      | <u> </u>   |
|             |                                       |                                      |                        |                              |                        |                   |               |                      | <del>                                     </del> |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       | -                                    |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               | <u></u>              | <u></u>  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               | 1                    |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      | <del>                                     </del> |
| 1           |                                       | -                                    |                        |                              |                        |                   |               | <b>_</b>             | ļ  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      |  |
|             |                                       |                                      |                        |                              |                        |                   |               |                      | 1  |
|             |                                       | +                                    |                        |                              |                        |                   |               | +                    | <del> </del>                                     |
|             | 1                                     |                                      |                        |                              |                        |                   |               |                      | <u> </u>   |

| CON        | ICHT TINC               |                | a Calaulatia   | n Chaat      |                  | Job No.          | Sheet No.      |                           | Rev.                               |
|------------|-------------------------|----------------|----------------|--------------|------------------|------------------|----------------|---------------------------|------------------------------------|
|            | ISULTING<br>I N E E R S | _              | _              | on Sneet     |                  | jXXX             |                | 5                         |                                    |
| ENGI       |                         | Consuming      |                | T.           |                  |                  | ,              |                           |                                    |
|            |                         |                |                |              |                  | Member/Location  |                |                           |                                    |
| Job Title  | 1                       |                |                | echnics Pile | Cap v2021        |                  | Date 21        | /// /2024                 | dhd                                |
| Structure, | Member De               | sign - Geot    | echnics Pile   | е Сар        |                  | Made by XX       | Date <b>21</b> | /11/2021                  | Gild.                              |
|            |                         |                |                |              |                  |                  |                |                           |                                    |
|            |                         |                |                |              |                  |                  |                |                           |                                    |
|            |                         |                | Coor           | dinates an   | d Geomet         | rical Prope      | erties         |                           |                                    |
| Pile n     | Coordin                 | ates (m)       |                | rdinates (1  |                  | et (m)           |                | ical Prope                | rties (m²)                         |
|            | X <sub>n</sub>          | у <sub>п</sub> | X <sub>n</sub> | . <b>y</b> n | X <sub>n-c</sub> | У <sub>п-с</sub> | $x_{n-c}^2$    | <b>y</b> n-c <sup>2</sup> | X <sub>n-c</sub> ·y <sub>n-c</sub> |
| 1          | 0.000                   | 0.000          | N/A            | N/A          | -3.00            | -3.00            | 9.00           | 9.00                      | 9.00                               |
| 2          | 3.000                   | 0.000          | N/A            | N/A          | 0.00             | -3.00            | 0.00           | 9.00                      | 0.00                               |
| 3          | 6.000                   | 0.000          | N/A            | N/A          | 3.00             | -3.00            | 9.00           | 9.00                      | -9.00                              |
| 4          | 0.000                   | 3.000          | N/A            | N/A          | -3.00            | 0.00             | 9.00           | 0.00                      | 0.00                               |
| 5          | 3.000                   | 3.000          | N/A            | N/A          | 0.00             | 0.00             | 0.00           | 0.00                      | 0.00                               |
| 6          | 6.000                   | 3.000          | N/A            | N/A          | 3.00             | 0.00             | 9.00           | 0.00                      | 0.00                               |
| 7          | 0.000                   | 6.000          | N/A            | N/A          | -3.00            | 3.00             | 9.00           | 9.00                      | -9.00                              |
| 8          | 3.000                   | 6.000          | N/A            | N/A          | 0.00             | 3.00             | 0.00           | 9.00                      | 0.00                               |
| 9          | 6.000                   | 6.000          | N/A            | N/A          | 3.00             | 3.00             | 9.00           | 9.00                      | 9.00                               |
| 10         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 11         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 12         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 13         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 14         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 15         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 16         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 17         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 18<br>19   | 0.000                   | 0.000          | N/A<br>N/A     | N/A<br>N/A   | N/A<br>N/A       | N/A<br>N/A       | N/A<br>N/A     | N/A<br>N/A                | N/A<br>N/A                         |
| 20         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A<br>N/A                         |
| 21         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A<br>N/A                | N/A<br>N/A                         |
| 22         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 23         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 24         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 25         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 26         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 27         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 28         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 29         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 30         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 31         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 32         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 33         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 34         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 35         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 36         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 37         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 38         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 39         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 40<br>41   | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 41         | 0.000                   | 0.000          | N/A<br>N/A     | N/A<br>N/A   | N/A<br>N/A       | N/A<br>N/A       | N/A<br>N/A     | N/A<br>N/A                | N/A<br>N/A                         |
| 43         | 0.000                   | 0.000          | N/A            | N/A<br>N/A   | N/A<br>N/A       | N/A              | N/A            | N/A                       | N/A<br>N/A                         |
| 44         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 45         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 46         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 47         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 48         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 49         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| 50         | 0.000                   | 0.000          | N/A            | N/A          | N/A              | N/A              | N/A            | N/A                       | N/A                                |
| Σ          | 27                      | 27             |                |              | 0                | 0                | 54             | 54                        | O                                  |

| CON           | SULTING                        | Enginooring               | r Calculatio             | n Shoot  |                                       | Job No.                          | Sheet N  | lo.      |                       | Rev.     |
|---------------|--------------------------------|---------------------------|--------------------------|--|---------------------------------------|----------------------------------|----------|----------|-----------------------|----------|
|               | NEERS                          |                           |                          | iii Sileet   |                                       | jXXX                             |          | 6        | 5                     |          |
|               |                                |                           |                          |  |                                       | Member/Location                  |          |          |                       |          |
| lob Title     | Structure                      | Memher De                 | sian - Geot              | echnics Pile                                       | Can v2021                             |                                  |          |          |                       |          |
|               | Member De                      |                           |                          |  | Cap v2021                             | Made by XX                       | Date     | 21       | /11/2021              | Chd.     |
| oci accai c,  | Tierriber be                   | Sign Georg                | cerrines i ne            | Сир  |                                       | ХХ                               |          |          | 11, 2021              |          |
| Pile Cap F    | Reinforcem                     | ent                       |                          |  |                                       |                                  |          |          |                       |          |
| -             |                                |                           |                          |  |                                       |                                  |          |          |                       |          |
| Cover to a    | ll (bottom) i                  | reinforceme               | nt, cover <sub>1</sub> ( | (usually 100                                       | ))                                    |                                  |          | 75       | mm                    |          |
| Cover to a    | ll (side) rein                 | forcement,                | cover <sub>2</sub> (usi  | ually 75)  |                                       |                                  |          | 75       | mm                    |          |
| Cover to a    | ll (top) reinf                 | forcement, o              | cover <sub>3</sub> (usu  | ally 45 inte                                       | grated base                           | slab and 7                       |          | 75       | mm                    |          |
|               |                                |                           |                          |  |                                       |                                  |          |          |                       |          |
| Base steel    | reinforceme                    | ent diamete               | r in directio            | on of width a                                      | <b>Χ,</b> φ <sub>b,χ</sub>            |                                  | 32       | <b> </b> | mm                    |          |
| Base steel    | reinforceme                    | ent pitch for             | resistance               | in direction                                       | of width x                            | , p <sub>b,x</sub>               | 2        | 250      | mm                    | Goal See |
|               | ccuracy, goa                   |                           | ,                        |  |                                       |                                  | o. of re | bars     | s below;              |          |
| Number of     | layers of ba                   | ase steel for             | resistance               | in direction                                       | n of width x                          | , n <sub>layers,base,x</sub>     |          | 4        | layer(s)              |          |
| Base steel    | area provid                    | ed per meti               | re in directi            | on of width  | x, A <sub>s,prov,b,x</sub>            | $= (\pi.\phi_{b,x}^2/4$          | 128      | 63       | mm²/m                 |          |
|               | base steel,                    |                           |                          |  |                                       |                                  |          |          | mm                    | ОК       |
| Base steel    | area provid                    | ed in direct              | ion of width             | $1 \times A_{s,prov,b,x}$                          |                                       | . L <sub>cap</sub>               |          |          | mm <sup>2</sup>       |          |
|               |                                | $n_x = A_{s,p}$           |                          |  | 120.0                                 | ~                                |          |          | numbers               |          |
|               |                                |                           |                          | 2.cover <sub>2</sub> – 3                           |                                       |                                  |          |          | mm                    |          |
|               | reinforceme                    |                           |                          |  |                                       |                                  | 32       |          | mm                    | <u> </u> |
|               | reinforceme                    |                           |                          |  |                                       | .,                               |          |          | mm                    | Goal See |
|               | ccuracy, goa                   |                           | .,                       |  |                                       |                                  |          |          |                       |          |
|               | layers of ba                   |                           |                          |  |                                       |                                  |          |          | layer(s)              |          |
|               | area provid                    |                           |                          |  | ι y, A <sub>s,prov,b,</sub>           | $y = (\pi . \phi_{b,y}^2 /$      |          |          | mm²/m                 |          |
|               | base steel,                    |                           |                          |  |                                       |                                  |          |          | mm                    | ОК       |
| Base steel    | area provid                    |                           |                          |  |                                       | <sub>,y</sub> . B <sub>cap</sub> | 1093     |          |                       |          |
|               |                                | $n_y = A_{s,p}$           |                          |  | 135.9                                 | ~                                |          |          | numbers               |          |
|               | Actual bar                     | pitch, p <sub>b,y</sub> = | $(n_y.p_{b,y}-2)$        | 2.cover <sub>2</sub> – 3                           | $.\phi_{b,y}) / n_y$                  |                                  | 2        | 219      | mm                    |          |
| 21            | -l:                            |                           |                          |  | - 1                                   |                                  |          |          |                       |          |
|               | diameter fo                    |                           |                          |  | <b>γ</b> Φlink,2/3                    | <u> </u>                         | 16       | 42       | mm                    |          |
|               | links for fire                 |                           |                          |  | (s 2)                                 | nea<br>ster                      |          | 42       |                       | NOTO     |
|               | perimeters                     |                           |                          | F 7  |                                       | First Shear<br>Perimeter         | 0.4      | I        | 2                     | NOT O    |
|               | ded by all lir<br>etween peri  |                           |                          |  |                                       | irst<br>Peri                     |          |          | mm <sup>2</sup>       |          |
|               | links for se                   |                           |                          |  | $S_1, S_2 = S_{1,1}$                  |                                  |          |          | mm                    |          |
|               |                                |                           |                          | .,-  | (> - 2)                               | Second<br>Shear<br>Perimeter     |          | V/A      |                       | NI / A   |
|               | perimeters                     |                           |                          |  | •                                     | Second<br>Shear<br>erimete       |          | V/A      | 2                     | N/A      |
|               | ded by all lir<br>etween peri  |                           |                          |  |                                       | Se<br>S<br>Per                   |          |          | mm <sup>2</sup><br>mm |          |
|               | diameter, $\phi$               |                           | iiii secona s            | Sileai periiri                                     | = $=$ $=$ $=$                         |                                  |          |          | mm                    |          |
|               | link legs pe                   |                           | . – 1/5                  |  |                                       |                                  |          | 2.0      |                       |          |
|               |                                |                           |                          |  | 211                                   |                                  |          |          |                       |          |
|               | ded by all lir<br>ks in zone 1 |                           |                          | = η <sub>link</sub> .π.φ <sub>link</sub><br>Zone 1 | 500                                   | N/A                              |          |          | mm²/m<br>mm           | N/A      |
| 10011 01 1111 | NO III ZUITE I                 | . 4114 20116 2            | -, 01,1/2                | Zone 1   | 300                                   |                                  | -        | ,00      | 111111                | N/A      |
| Side steel    | reinforceme                    | nt diameter               | . d <sub>a</sub>         |  |                                       |                                  | 16       | <b>—</b> | mm                    |          |
|               | reinforceme                    |                           | <i>ι</i> Ψs              |  |                                       |                                  |          |          | mm                    |          |
| J.GC 3(CCI    |                                | c piccii, ps              |                          |  |                                       |                                  |          |          |                       |          |
| )etailing c   | ode of pract                   | ice                       |                          |  |                                       | BS 8666:                         | 2000     | _        |                       | 1        |
|               | idius of bend                  |                           | nce in x an              | d y, r.,,,   |                                       | 150                              |          |          | mm                    |          |
|               |                                |                           | / 9/1                    | ,, · x/y   |                                       | 130                              |          | - 5 5    |                       |          |
| ffective d    | epth to base                   | e steel in di             | rection of w             | vidth x, d.  |                                       |                                  | 34       | 63       | mm                    |          |
|               |                                |                           |                          | $\phi_{link,2/3}$ - [ $\phi$                       | b <sub>h.x</sub> +(n <sub>laver</sub> | <sub>.hase x</sub> -1)( φ,       |          |          | mm                    |          |
|               | 3P to 15P:                     | $d_x = T_{can}$           | - cover 1 -              | $\phi_{link,2/3}$ - [ $\phi$                       | $b_{h,x} + (n_{lavar})$               | hase x -1)( di                   | 34       | -        | mm                    |          |
| ffective d    | epth to base                   |                           |                          |  | ZIA L IAYEIS                          | ,545C/A /( PL                    |          |          | mm                    |          |
|               |                                |                           |                          | $\phi_{link,2/3}$ - [ $\phi$                       | b <sub>h v</sub> +(n laver            | hase v -1)( φ,                   |          |          | mm                    |          |
|               | 3P to 15P:                     | $d_{v} = T_{can}$         | - cover 1 -              | $\phi_{link,2/3}$ - [ $\phi$                       | $b_{h,v} + (n_{lavers})$              | hase v -1)( φι                   | 34       |          | mm                    |          |
|               |                                | , сар                     |                          | ,2/3 L T   | ZIJ C Idyels                          | Judge, J. F.L.                   |          |          | · ·                   |          |
| stimated      | steel reinfo                   | rcement au                | antity With 1            | гор Steel ((0.5-1                                  | 1.0)T20EW@SI.                         | 1) 🔻                             |          | 23       | kg/m³                 | 4(       |
|               | with full an                   | <u>-</u>                  |                          |  |                                       |                                  |          |          | kg/m <sup>3</sup>     | 43       |
|               |                                |                           |                          |  |                                       | nm anchora                       |          |          | kg/m <sup>3</sup>     |          |
| 120EW@        | $\rho_b$ , 120@3               | , I III X alla            | 120651172                | - 111 9, 110110                                    | , with 7001                           |                                  |          |          |                       |          |

| CON<br>ENGI       |   |   |                                 |   |   | l .                                  | Ī                                | 1  | ſ         |
|-------------------|---|---|---------------------------------|---|---|--------------------------------------|----------------------------------|--|-----------|
|                   | SULTING   | Engineerin                              | a Calculatio                    | n Sheet   |   | Job No.                              | Sheet No.                        |  | Rev.      |
| ENGI              |   |   |                                 | ii Siicct   |   | jXXX                                 | -                                | 7  |           |
| 1                 |   | Consuming                               | Liigiiieeis                     |   |   |                                      |                                  | ,  |           |
|                   |   |   |                                 |   |   | Member/Location                      |                                  |  |           |
| Job Title         | Structure,  | Member De                               | sign - Geot                     | echnics Pile  | Cap v2021                               | Drg.                                 | 1                                |  |           |
| Structure.        | Member De   |   |                                 |   | •                                       | Made by XX                           | Date 21                          | /11/2021 <sup>0</sup>                            | hd.       |
| 0 0 0 0 0 0 0 0   |   | .0.9 0000                               |                                 |   |   | 7,7                                  |                                  | ,,   |           |
| Pilo Can (        | SLS Loadin  |   |                                 |   |   |                                      |                                  |  |           |
| Pile Cap S        | LS LUAUIII  | 9<br>T                                  |                                 |   |   |                                      |                                  |  |           |
| CI C              |   |   | !                               |   | L F                                     |                                      | 06570                            | 1.51   |           |
|                   | al (downwai   |   |                                 |   |   |                                      | 96570                            |  | Goal Seek |
|                   | F <sub>col,v</sub> is posi  |   |                                 |   |   | suspended                            |                                  |  | ıb;       |
|                   | e of F <sub>col,v</sub> loa   |   |                                 |   | 3.000                                   | m                                    | 3.000                            |  |           |
|                   | e of F <sub>col,v</sub> loa   |   |                                 |   | 3.000                                   | m                                    | 3.000                            | m  |           |
|                   | y of F <sub>col,v</sub> fro   |   |                                 |   |   |                                      | 0.000                            | m  |           |
| Eccentricit       | y of F <sub>col,v</sub> fro   | om centroid                             | in y, $e_2 = y$                 | Fcol,v - Yc   |   |                                      | 0.000                            | m  |           |
|                   | ntal load fro   |   |                                 |   |   |                                      | 0                                | kN   |           |
| SLS horizo        | ntal load fro   | om column                               | in y, F <sub>col.h2</sub>       |   |   |                                      | 0                                | kN   |           |
|                   | ent from col  |   | ,                               | defined to a  | add to posit                            | ive e₁ eccei                         | 0                                | kNm  |           |
|                   | ent from col  |   |                                 |   |   |                                      |                                  | kNm  |           |
|                   | defined to a  |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      | a positive                       | . 01   |           |
|                   | alue to mat   |   |                                 | zsponung 6  | ccentilicity;                           |                                      | F136                             | LAN  |           |
|                   | eight, F <sub>cap</sub> ≈   |   |                                 |   |   |                                      | 5130                             |  |           |
|                   | cap SLS ver   |   |                                 |   |   |                                      | 101700                           |  |           |
| Note that         | water uplift  | force at pile                           | e and pile c                    | ap base hav   | ∕e been ign                             | ored in the                          | calculation                      | of F pilecap,v ;                                 | <u>'</u>  |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
| Note comp         | oression is p   | ositive, ten                            | sion negati                     | ve;   |   |                                      |                                  |  |           |
| Equation s        | et to emplo   | y, symmetr                              | rical or unsy                   | mmetrical   | ?                                       | Symmetrical                          | ▼                                |  |           |
| For pile gr       | oups symm   | etrical abou                            | t at least o                    | ne (of the t  | wo) axis:-                              |                                      |                                  |  |           |
| , 5               |   | $F_{col,v}.e_1)/($                      |                                 | Note $D = ($  |   | <sup>2</sup> ):                      |                                  |  |           |
|                   | Note $B = 0$  | $F_{col,v}.e_2)/($                      | $\Sigma V = \frac{2}{2}$        | Note $F = 0$  | F 151 T                                 | $(\Sigma x - 2)$                     |                                  |  |           |
|                   | Note C = (  | $(M_1)/(\Sigma X_{n-1})$                | <sup>2</sup> ),                 | Note $F = (I$   | r coi,ni r cap,<br>F T                  | $\frac{1}{2} \frac{2 \times n-c}{2}$ |                                  |  |           |
| For pilo ar       | ounc uncum  | motrical ab                             | out both a                      | ,oo,  |   |                                      |                                  |  |           |
| roi pile gi       | Note A = ( Note B = ( Note C = ( Note D = ( Note E = ( Note F = ( Note F = ( Note E = ( | r - 5                                   | 2 F                             | (ES   | )// 5                                   | 2 5 2                                | / 5                              | 121  |           |
|                   | Note $A = ($  | $F_{col,v}.e_1.\Sigma$                  | $\frac{y_{n-c} - F_{col,v}}{2}$ | $.e_2.\Sigma X_{n-c}.$                                | <u>y<sub>n-c</sub>)/(ΣΧ<sub>n</sub></u> | -c 2 Y n-c                           | $-(\Sigma X_{n-c}.Y_{n-c})$      | ·c) - );   |           |
|                   | Note $B = ($  | $F_{col,v}.e_2.\Sigma$                  | $X_{n-c}^{-} - F_{col,v}$       | $.e_1.\Sigma x_{n-c}.$                                | $\frac{y_{n-c}}{2}$ /( $\Sigma x_n$     | -c <sup>-</sup> . Σ'y <sub>n-c</sub> | $-(\Sigma X_{n-c}.y_{n-c})$      | . <sub>c</sub> )                                 |           |
|                   | Note $C = ($  | $M_1 \cdot \Sigma y_{n-c^2}$            | $-M_2 \cdot \Sigma X_{n-c}$     | $y_{n-c}$ //( $\Sigma x$                              | $\frac{1}{n-c^2}$ . $\Sigma y_{n-c^2}$  | $-(\Sigma X_{n-c}.y_r)$              | <sub>n-c</sub> )²);              |  |           |
|                   | Note $D = ($  | $M_2 \cdot \Sigma x_{n-c}^2$            | $-M_1.\Sigma x_{n-c}$           | $y_{n-c}$ )/( $\Sigma x$                              | <sub>n-c</sub> ².Σy <sub>n-c</sub> ²    | $-(\Sigma x_{n-c}.y_{n-c})$          | <sub>1-c</sub> ) <sup>2</sup> ); |  |           |
|                   | Note $E = ($  | $F_{col,h1}.T_{cap}.$                   | $\Sigma y_{n-c}^2 - F_c$        | $_{ol,h2}$ . ${\cal T}_{cap}$ . ${\cal \Sigma}_{cap}$ | x <sub>n-c</sub> .y <sub>n-c</sub> )/(  | $\Sigma x_{n-c}^2 \cdot \Sigma y$    | $_{n-c}^{2}-(\Sigma X_{n-c})$    | <sub>c</sub> .y <sub>n-c</sub> ) <sup>2</sup> ); |           |
|                   | Note $F = ($  | F <sub>col,h2</sub> .T <sub>cap</sub> . | $\Sigma x_{n-c}^2 - F_c$        | ol, $h1$ . $T_{cap}$ . $\Sigma$                       | x <sub>n-c</sub> .y <sub>n-c</sub> )/(  | $\Sigma x_{n-c}^{2} \cdot \Sigma y$  | $_{n-c}^{2}$ –( $\Sigma X_{n-c}$ | $_{c}.y_{n-c})^{2});$                            |           |
| Note F pile,v     | $_{\prime,n} = F_{pilecap,}$  | $_{v}/\Sigma n + A.x$                   | $r_{n-c} + B.y_{n-c}$           | $c + C.x_{n-c}$                                       | $+ D.y_{n-c} + $                        | $E.x_{n-c} + F.y$                    | 'n-c;                            |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
| Pile Cap l        | JLS Loadin  | g                                       |                                 |   |   |                                      |                                  |  |           |
| -                 |   | Ī                                       |                                 |   |   |                                      |                                  |  |           |
| ULS vertic        | al (downwa  | rd) load froi                           | m column a                      | nd base sla   | b. F <sub>aal vivila</sub> =            | : K.F.                               | 140027                           | kN   |           |
|                   | $F_{col,v,uls}$ is positive in the second contract of the second co |   |                                 |   | - 7 · Coi,v,uis                         | COI,V                                |                                  |  |           |
| Note that I       | COI,V,UIS 13 P  |   | iiivara),                       |   |   |                                      |                                  |  |           |
|                   |   | -                                       |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
| <u> </u>          | 1   |   |                                 |   |   |                                      |                                  |  | ļ         |
|                   |   |   |                                 | 1   | İ                                       | Ĺ                                    |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
|                   |   |   |                                 |   |   |                                      |                                  |  |           |
| kg/m <sup>2</sup> |   |   |                                 |   |   |                                      |                                  |  |           |
| kg/m <sup>2</sup> | [Base stee  | I + top stee                            | el]                             |   |   |                                      |                                  |  |           |
| _                 |   | I + top stee                            |                                 |   |   |                                      |                                  |  |           |

| CON        | ICI II TINIC                    |                                       | 6 1 1 1                               | Cl. I              |                    | Job No.                                       | Sheet No.          |                | Rev. |
|------------|---------------------------------|---------------------------------------|---------------------------------------|--------------------|--------------------|---|--------------------|----------------|------|
|            |                                 | Engineering<br>Consulting             |                                       | n Sheet            |                    | jXXX  |                    | 3              |      |
| ENGI       | NEEKS                           | Consum                                | Liigineers                            |                    |                    |   | (                  | )              |      |
|            |                                 |                                       |                                       |                    |                    | Member/Location                               |                    |                |      |
| Job Title  |                                 | Member De                             |                                       |                    | Cap v2021          |   |                    |                | d    |
| Structure, | Member De                       | esign - Geot                          | echnics Pile                          | Сар                | ı                  | Made by XX                                    | Date <b>21</b>     | /11/2021       | Ohd. |
|            |                                 |                                       |                                       |                    |                    |   |                    |                |      |
|            |                                 |                                       |                                       |                    |                    |   |                    |                |      |
|            |                                 |                                       | Avial F                               | orce (kN)          | Due To             |   |                    |                |      |
| Pile n     | Σn                              | F <sub>col v</sub> .e <sub>1</sub> ar | nd F <sub>col,v</sub> .e <sub>2</sub> |                    | nd M <sub>2</sub>  | ol,h1.T <sub>cap</sub> ar                     | nd FootbarT.       | $F_{pile,v,n}$ |      |
|            | $F_{\text{pilecap,v}}/\Sigma r$ |                                       | B.y <sub>n-c</sub>                    | C.x <sub>n-c</sub> | D.y <sub>n-c</sub> | <b>E.x</b> <sub>n-c</sub>                     | F.y <sub>n-c</sub> | - pile,v,ii    |      |
| 1          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 2          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 3          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 4          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 5          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 6          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 7          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 8          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 9          | 11300                           | 0                                     | 0                                     | 0                  | 0                  | 0   | 0                  | 11300          |      |
| 10         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 11<br>12   | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A<br>N/A         | N/A<br>N/A                                    | N/A<br>N/A         | N/A<br>N/A     |      |
| 13         | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A<br>N/A         | N/A<br>N/A                                    | N/A<br>N/A         | N/A<br>N/A     |      |
| 14         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A<br>N/A     |      |
| 15         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 16         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 17         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 18         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 19         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 20         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 21         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 22         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 23         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 24         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 25         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 26         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 27<br>28   | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A<br>N/A         | N/A<br>N/A                                    | N/A<br>N/A         | N/A<br>N/A     |      |
| 26<br>29   | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A                | N/A   | N/A<br>N/A         | N/A<br>N/A     |      |
| 30         | N/A<br>N/A                      | N/A                                   | N/A                                   | N/A<br>N/A         | N/A                | N/A   | N/A<br>N/A         | N/A<br>N/A     |      |
| 31         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 32         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 33         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 34         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 35         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 36         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 37         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 38         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 39         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 40         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 41         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 42         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 43<br>44   | N/A                             | N/A<br>N/A                            | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 44<br>45   | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A<br>N/A         | N/A<br>N/A                                    | N/A<br>N/A         | N/A<br>N/A     |      |
| 45         | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A                | N/A   | N/A<br>N/A         | N/A<br>N/A     |      |
| 47         | N/A<br>N/A                      | N/A<br>N/A                            | N/A<br>N/A                            | N/A<br>N/A         | N/A                | N/A   | N/A<br>N/A         | N/A<br>N/A     |      |
| 48         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 49         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
| 50         | N/A                             | N/A                                   | N/A                                   | N/A                | N/A                | N/A   | N/A                | N/A            |      |
|            | <u> </u>                        | <u> </u>                              |                                       |                    | ,                  | <u>, , , , , , , , , , , , , , , , , , , </u> |                    | •              | 1    |

|               |                |                              |                                |                |                          | Job No.         | Sheet No.         |                           | Rev.        |
|---------------|----------------|------------------------------|--------------------------------|----------------|--------------------------|-----------------|-------------------|---------------------------|-------------|
|               |                | Engineerin                   | _                              | n Sheet        |                          |                 |                   |                           |             |
| ENGI          | NEERS          | Consulting                   | ⊏ngineers                      |                |                          | jXXX            |                   | 9                         |             |
|               |                |                              |                                |                |                          | Member/Location | ı                 |                           |             |
| ob Title      | Structure,     | Member De                    | sign - Geot                    | echnics Pile   | Cap v202:                | Drg.            |                   |                           |             |
| Structure,    |                | esign - Geot                 |                                |                | •                        |                 | ( Date 21         | /11/2021                  | hd.         |
|               |                |                              |                                | •              |                          |                 |                   | -                         |             |
| ile Cap S     | Spanning 1     | Theory                       |                                |                |                          |                 |                   |                           |             |
| Continuo      | us Spans (     | Rigid Piles                  | , Flexible I                   | Pile Cap) T    | heory                    |                 |                   |                           |             |
| Span / dan    | th ratio in    | width v (co.                 | ****************************** | 220) C ( d     |                          |                 | 0.07              |                           |             |
|               |                | width x (cor<br>length y (co |                                |                |                          |                 | 0.87<br>0.87      |                           |             |
|               |                | uous spans,                  |                                |                | <b>'</b>                 |                 | 0.67              |                           |             |
|               |                | ory in width                 |                                |                | ıss / Deep               | Ream Th         | eory              |                           | Too Dee     |
|               |                | ory in width                 |                                |                | ıss / Deep<br>ıss / Deep |                 |                   |                           | Too Dee     |
|               |                | neory is app                 |                                |                |                          |                 |                   |                           | TOO Dec     |
|               |                |                              |                                |                |                          |                 |                   | (CIRIA Guid               | le 2 cl 1 3 |
| iote truss    | / deep bea     | THEORIES                     | аге аррпсац                    | DIE IOI 1.0    | <u> </u>                 | us sparr / u    | Eptil 3 2.0       | CINIA Guiu                | e z ci.1.3  |
| nverted (     | L<br>Cantileve | ·<br>· Spans (Ri             | aid Pile Ca                    | n Flevible     | Diles) Th                | eorv            |                   |                           |             |
|               |                |                              |                                | p, i icxibic   | 11103) 111               |                 |                   |                           |             |
| nan / den     | th ratio in    | ⊥<br>width x (inv            | erted cantil                   | ever snans'    | Ι<br>Ν ΜΔΧ (γ            | ) / d           | 0.87              | Adopted                   |             |
|               |                | width x (inv                 |                                |                |                          |                 | 0.87              | Not Adopted               |             |
|               |                | length y (in                 |                                |                |                          |                 | 0.87              | Adopted                   |             |
|               |                | length y (in                 |                                |                |                          | ,               | 0.87              | Not Adopted               |             |
|               |                | ed cantileve                 |                                |                |                          | · /             |                   | 140t Adopted              |             |
|               |                |                              |                                |                |                          |                 |                   | ⊥<br>ending and s         | hear        |
|               |                | ory in width                 |                                |                | ss / Deep                |                 |                   | and 3                     | OK          |
|               |                | ory in Width                 |                                |                | ıss / Deep<br>ıss / Deep |                 |                   |                           | OK          |
|               |                | neory is app                 | -                              |                |                          |                 | COLÀ              |                           | OK          |
|               |                | am theories                  |                                |                |                          |                 | nth < 1 0:        |                           |             |
| iole liuss    | / ueep bea     |                              | аге аррпсац<br>                | 101 0.5        | ≥ cantileve              | spair / ue      | :piπ ≤ 1.0,       |                           |             |
| \damtad [     | Dila Can S     | │<br>panning Th              | 0000                           |                |                          |                 |                   |                           |             |
| laoptea i     | Pile Cap 5     | panning in                   | leory                          |                |                          |                 |                   |                           |             |
| Enan / don    | th ratio do    | <br>finition ador            | tocloverted C                  | antilovar Chan | (Digid Dila Ca           | n Florible Dil  | 26)               |                           | OK          |
| · · · · ·     |                | s with 5 or i                |                                |                |                          | •               |                   |                           | OK          |
|               |                |                              |                                |                |                          | •               |                   |                           |             |
|               | -              | be applicab<br>tion of loads |                                |                |                          |                 |                   |                           |             |
|               |                | the validity                 |                                |                |                          |                 |                   |                           |             |
|               |                | pe carried ou                |                                |                |                          |                 |                   |                           |             |
|               |                | ertical pile s               |                                | пастері        | те сар итст              | 11633 13 301    | Ticletitiy Stil   | 1                         |             |
|               |                | ory in width                 |                                | Teu            | ıss / Deep               | Ream Th         | eorv.             |                           | ОК          |
|               |                |                              |                                |                | ıss / Deep<br>ıss / Deep |                 |                   |                           | OK<br>OK    |
| ile cap sp    |                | ory in lengtl                | 1 <b>y</b>                     | 110            | ss / Deep                |                 | COLÀ              |                           | OK          |
| Pile Group    | n Lavout       |                              |                                |                |                          |                 |                   |                           |             |
| iic Group     | Layout         |                              |                                |                |                          |                 |                   |                           |             |
|               |                |                              | ila Cuarr                      |                |                          |                 | (n <sub>v</sub> ) |                           |             |
|               | 7.655          | ŀ                            | Pile Group                     | p Layout       |                          |                 |                   |                           |             |
|               | 7.000          |                              |                                |                |                          |                 | ∦ I               |                           | $\vdash$    |
|               | 6.000 ③        |                              | 6                              |                |                          | 9               | H I               | v                         | $\vdash$    |
| Ξ             | 5.000          |                              |                                |                |                          |                 | ∦ <u>↓</u>        | <b>→</b> ′ <sub>▲</sub> x | $\Box$      |
|               |                |                              |                                |                |                          |                 | (1)               | <u>T.</u>                 | $n_y$       |
|               | 4.000          |                              |                                |                |                          |                 |                   | that + b =                |             |
| COORDINATE, X | 3.000 ②        |                              | 6                              |                |                          | 8               | п                 | that the<br>linate datum  |             |
|               | 2.000          |                              |                                |                |                          |                 | III               | en as centre              |             |
|               | 1.000          |                              |                                |                |                          |                 | pile 1            | ; Note enter              | - <u> </u>  |
| O             |                |                              |                                |                |                          |                 | piles             | from 1 up to              | Σn; —       |
|               | 0.000          |                              | @                              |                |                          | <b>(2)</b>      | III .             | $X_{n-c} = X_n - X$       | c           |
|               | 0.000          | 1.000                        | 2.000 3.00                     |                |                          | 5.000 7.00      | )()               | _                         |             |
|               |                |                              | COORE                          | DINATE, Y (M   | )                        |                 | NTS               |                           |             |
|               |                |                              |                                |                |                          |                 |                   | <del>-</del>              |             |
|               |                |                              |                                |                |                          |                 |                   |                           |             |
|               |                |                              |                                |                |                          |                 |                   |                           |             |
|               |                |                              |                                |                |                          |                 |                   |                           |             |

| CON               | SHLTING       | Engineerin                            | g Calculatio      | n Sheet      |                          | Job No.                     | Sheet No.             |          | Rev.     |
|-------------------|---------------|---------------------------------------|-------------------|--------------|--------------------------|-----------------------------|-----------------------|----------|----------|
|                   | NEERS         |                                       |                   | II Sheet     |                          | jXXX                        | -                     | 10       |          |
| LIVOI             |               |                                       |                   |              |                          | -                           | -                     |          |          |
|                   |               |                                       |                   |              |                          | Member/Location             |                       |          |          |
| Job Title         |               |                                       |                   |              | le Cap v2021             |                             |                       |          |          |
| Structure,        | Member De     | sign - Geo                            | technics Pile     | Сар          |                          | Made by XX                  | Date <b>21</b>        | /11/2021 | Ohd.     |
|                   |               |                                       |                   |              |                          |                             |                       |          |          |
| Pile Cap D        | Design The    | ory                                   |                   |              |                          |                             |                       |          |          |
|                   |               |                                       |                   |              |                          |                             |                       |          |          |
|                   |               |                                       |                   |              |                          |                             |                       |          |          |
|                   |               |                                       |                   |              |                          |                             |                       |          |          |
| $H \square$       |               | Comp                                  | ression in di     | agonal       |                          |                             |                       |          |          |
| $\sqcup \sqcup =$ |               | Tensio                                | n in base         |              |                          |                             |                       |          |          |
| -                 |               |                                       |                   |              |                          |                             |                       |          |          |
| $\vdash$          |               |                                       |                   |              |                          |                             |                       |          |          |
| Dila san d        | lasian thas   | / <b>-</b>                            | <b>*</b>          |              | la alvala                | al Almana                   |                       |          |          |
|                   | esign theo    |                                       |                   | nding th     |                          | d Always                    |                       | ,        |          |
|                   |               | - 1                                   |                   |              | eory) Include            |                             | icable —              | ,        |          |
|                   |               |                                       | w beam sh         |              | shear (Include           | d Only If Appli             | capie -               | ,        |          |
|                   |               |                                       |                   |              | for the exti             | -                           | in certain n          | ile cans |          |
|                   |               |                                       |                   |              | dent to inclu            |                             |                       |          |          |
|                   |               |                                       |                   |              | ire also very            |                             |                       | LC3      |          |
| WITCHE LITER      | C CAISE & SIG | grinicant III                         | Introduction pile | S WIIICH A   | uso very                 | CIUSE LU LIII               | Column,               |          |          |
| Inclusion         | of effect o   | f b. h dim                            | ensions on        | truce ha     | se force                 | Not In                      | cluded $lacktriangle$ | ,        |          |
|                   |               |                                       | hod 1 - Cantilev  |              |                          | NOCIII                      | cidded •              | ,        |          |
|                   |               |                                       |                   |              | bending mo               | ments are                   | affected <sup>,</sup> |          |          |
|                   |               |                                       | ment (Mod         |              |                          |                             | Average               |          |          |
| rictiou 1         | l             |                                       |                   |              | <br>se bending n         | nomer Includ                |                       |          |          |
|                   | l             |                                       |                   |              | F.E. analysis            |                             | 1.00                  | )        |          |
|                   | 1             |                                       |                   |              | F.E. analysis            |                             | 1.00                  |          |          |
| Note in Me        |               |                                       |                   |              | te bending m             |                             |                       |          |          |
|                   |               |                                       |                   |              | ess the dime             |                             |                       |          |          |
| `                 |               |                                       |                   |              | s significant            |                             |                       |          |          |
|                   |               | · · · · · · · · · · · · · · · · · · · |                   |              | under consi              | •                           | ,                     |          |          |
|                   |               |                                       |                   |              | ents (Modif              |                             | Peak                  |          |          |
|                   | l             |                                       | nd adopted        |              | 1.0                      | _                           | Ldb,x ▼               | ,        |          |
| Note Meth         | od 2 only ap  | pplicable fo                          | r centrally lo    | paded pile   | caps withou              | t column m                  | oments as             | shown    |          |
|                   |               |                                       |                   |              | theory which             |                             |                       |          |          |
|                   |               |                                       |                   |              | the ratio of             |                             |                       |          |          |
| a corner-si       | upported an   | nd simply-s                           | upported (b       | ut uniform   | nly loaded) re           | ectangular p                | plate;                |          |          |
|                   | 1             |                                       | Supported (       |              |                          | verage $\blacktriangledown$ | Average               |          |          |
|                   | Aspect rati   | o, actual a                           | nd adopted        |              | 1.0                      | Ldb,y = 1.0I                | Ldb,x ▼               |          |          |
|                   |               |                                       |                   |              |                          |                             |                       |          |          |
| Inclusion         | of effect o   | of b, h dim                           | ensions on        | shear sp     | an                       | Includ                      | ed ▼                  | ,        |          |
| Note that i       | it may be ur  | nconservati                           | ive to calcul     | ate the sh   | ear span, a <sub>v</sub> | to the face                 | e of the col          | umn      |          |
| (as oppose        | ed to the cer | ntroid of th                          | e column) u       | nless the    | dimension of             | f the colum                 | n in the dir          | ection   |          |
| orthogonal        | to the plan   | e under co                            | nsideration       | is significa | ant with resp            | ect to the p                | oile cap dim          | nension  |          |
| also in the       | direction or  | rthogonal t                           | o the plane       | under con    | sideration. T            | his option a                | affects the           | shallow  |          |
|                   |               |                                       |                   |              | enhanced pu              |                             |                       |          |          |
|                   |               |                                       |                   |              | culation of th           |                             |                       |          |          |
|                   |               |                                       |                   |              | near capacity            | in x and y                  | calculation           | s;       |          |
|                   |               |                                       | n shear spa       |              |                          |                             | cluded <b>v</b>       | ·        | Note     |
|                   |               | _                                     | t first shea      |              |                          | Includ                      |                       | <u> </u> |          |
|                   |               |                                       |                   |              | ter check ma             |                             |                       |          |          |
|                   |               |                                       |                   |              | beyond the               |                             |                       | <u>;</u> |          |
|                   |               |                                       |                   |              | <b>hear p</b> Include    |                             |                       |          |          |
|                   | •             |                                       |                   |              | hear perimet             |                             | •                     |          | Criteria |
|                   |               |                                       |                   |              | piles is less            | <u>`</u>                    |                       |          | Not Met  |
|                   |               |                                       |                   |              | $(x_{n-c})/d_x$ ar       |                             |                       | ses;     |          |
|                   |               |                                       | deep beam         |              |                          | IA Guide 2 cl.2             |                       | <u> </u> |          |
| Check lon         | gitudinal s   | <b>snear wi</b> ld                    | necked Only If S  | hallow Beam  | Theory Included          | d and Applicab              | ole 🔻                 | <u> </u> |          |

|                                  |                                |                                       |                                       |                   |                                    | Job No.                | Sheet No.      |                       | Rev.                  |
|----------------------------------|--------------------------------|---------------------------------------|---------------------------------------|-------------------|------------------------------------|------------------------|----------------|-----------------------|-----------------------|
|                                  | SULTING                        | _                                     | _                                     | n Sheet           |                                    |                        |                | _                     |                       |
| ENGI                             | NEERS                          | Consulting                            | Engineers                             |                   |                                    | jXXX                   | 1              | 1                     |                       |
|                                  |                                |                                       |                                       |                   |                                    | Member/Location        |                |                       |                       |
| Job Title                        | Structure,                     | Member De                             | sign - Geot                           | echnics Pile      | Cap v2021                          |                        |                |                       |                       |
| Structure,                       | Member De                      | sign - Geot                           | echnics Pile                          | Сар               |                                    | Made by XX             | Date <b>21</b> | /11/2021 <sup>0</sup> | hd.                   |
|                                  |                                |                                       |                                       |                   |                                    |                        |                |                       |                       |
| Executive                        | Summary                        |                                       |                                       |                   |                                    |                        |                |                       |                       |
| Dila Can                         | Dila Can                       | D:La                                  | Dila Cafa                             | Conomoto          | C:                                 | C:                     | Danth          | D                     | В                     |
| Pile Cap<br>Shape                | Pile Cap<br>Reference          | Pile                                  |                                       | Concrete<br>Grade | Size<br>S <sub>x</sub>             | Size<br>S <sub>v</sub> | Depth<br>D     | R <sub>x</sub><br>(B) | R <sub>y</sub><br>(B) |
| Silape                           | Reference                      | (mm)                                  | (kN)                                  | Grade             | (mm)                               | (mm)                   | (mm)           | (5)                   | (6)                   |
| PC9P                             | PC9P1200                       |                                       | 11300                                 | C45               | 7500                               | 7500                   | 3800           | 4x30T32               | 4x34T32               |
|                                  |                                |                                       |                                       |                   |                                    |                        |                |                       |                       |
| T <sub>x</sub>                   | T <sub>y</sub>                 | Min Col                               | Min Col                               | Binder            | Binder                             | Shear                  | Shear          | Overall               | Overall               |
| <b>(T)</b>                       | (T)                            | Size, C <sub>x</sub>                  | Size, C <sub>y</sub>                  |                   | Number                             | Hooks                  | Hooks          | Tonnage               | Tonnage               |
|                                  |                                | (mm)                                  | (mm)                                  |                   |                                    | (Zone 1)               | (Zone 2)       | kg/m³                 | kg/m²                 |
| 15T20                            | 8T20                           | 3300                                  | 6250                                  | T16-225           | 17                                 | T16-500EW              | T16-500EW      | 123                   | 468                   |
| D C                              | tion i                         |                                       |                                       |                   |                                    |                        | ·              |                       |                       |
| Perform op                       | timisation                     |                                       |                                       |                   |                                    |                        | Optimise!      | Tidy Up!              |                       |
|                                  | Optimisatio                    | n algorith~                           | <u> </u>                              |                   |                                    | GRG Nonlinea           | r 🔻            |                       |                       |
|                                  | · ·                            | of pile cap,                          |                                       |                   | 1.200                              | to                     | 7.200          | m                     |                       |
|                                  | Base steel                     |                                       |                                       |                   | 1.200                              | to                     |                | mm                    |                       |
|                                  | Base steel                     | -,                                    |                                       |                   | 150                                | to                     |                | mm                    |                       |
|                                  | Pitch of link                  |                                       |                                       |                   | 300                                | to                     |                | mm                    |                       |
|                                  | Pitch of link                  | ks in zone 2                          | 2, S <sub>I,2</sub>                   |                   | 300                                | to                     | 600            | mm                    |                       |
|                                  |                                |                                       |                                       |                   |                                    |                        |                |                       |                       |
|                                  | anning theo                    | -                                     |                                       |                   |                                    | <b>Beam The</b>        | _              |                       |                       |
| Pile cap sp                      | anning theo                    | ry in length                          | ı y                                   | Tru               | iss / Deep                         | Beam The               | ory            |                       |                       |
|                                  |                                |                                       |                                       |                   |                                    |                        |                |                       |                       |
|                                  | on capacity                    |                                       |                                       |                   | cable                              | 96%                    | OK             |                       |                       |
|                                  | ompression<br>ending mom       |                                       |                                       | •                 |                                    | 51%<br>48%             | OK<br>OK       |                       |                       |
|                                  | ending mom                     | •                                     |                                       |                   |                                    | 69%                    | OK             |                       |                       |
|                                  | e reinforcen                   |                                       |                                       | 7 /               |                                    | 38%                    | OK             |                       |                       |
|                                  | hear at colu                   |                                       | ice                                   |                   |                                    | 42%                    | OK             |                       |                       |
|                                  | hear at first                  |                                       |                                       |                   | lom.Links                          | 57%                    | ОК             |                       |                       |
| Punching s                       | hear at seco                   | ond shear p                           | erimeter                              |                   | N/A                                | N/A                    | N/A            |                       |                       |
| Ultimate sl                      | near stress                    |                                       |                                       |                   |                                    | N/A                    | N/A            |                       |                       |
|                                  | ear resistanc                  | •                                     |                                       | N/A               | N/A                                |                        | N/A            |                       |                       |
|                                  | near force (                   | · · · · · · · · · · · · · · · · · · · |                                       |                   |                                    | 48%                    | OK             |                       |                       |
| _                                | ar resistanc                   |                                       |                                       | lom.Links         | lom.Links                          |                        | OK             |                       |                       |
|                                  | al shear wit                   |                                       | • •                                   |                   |                                    | N/A                    | N/A            |                       |                       |
|                                  | al shear with<br>al shear with |                                       | -                                     | <u> </u>          |                                    | N/A<br>N/A             | N/A<br>N/A     |                       |                       |
|                                  | of shear link                  |                                       |                                       |                   |                                    |                        | OK             |                       |                       |
|                                  | equirements                    |                                       | g., IIIIKS III                        | ze required       |                                    |                        | K              |                       |                       |
|                                  | meters ched                    |                                       |                                       |                   |                                    |                        | ОК             |                       | <u> </u>              |
|                                  | ecommende                      |                                       | pile cap                              |                   |                                    |                        | K              |                       |                       |
| Spanning a                       | and design t                   | heory chec                            | ks                                    |                   |                                    | 0                      | K              |                       |                       |
| •                                | n depth zon                    |                                       |                                       |                   |                                    |                        | K              |                       |                       |
| Min breadt                       | h for deep b                   | peam bendi                            | ng                                    |                   |                                    | 0                      | K              |                       |                       |
|                                  |                                |                                       |                                       |                   |                                    |                        |                |                       |                       |
| Overall uti                      | lisation sum                   | mary                                  |                                       |                   |                                    |                        | 96%            |                       |                       |
| 0/ D=                            | in <b>f</b> or                 |                                       |                                       |                   |                                    | 0.24                   | 0.20           | 0/                    |                       |
|                                  | inforcement                    |                                       |                                       | ib., /110 - 1     | <br>  EOL = / 3\                   | 0.34                   | 0.38           | % lsa/m³              |                       |
|                                  | pile cap ste                   |                                       | · · · · · · · · · · · · · · · · · · · |                   |                                    | robar <sup>1</sup> :   | 123            | kg/m <sup>3</sup>     |                       |
| <u>[Note that</u><br>Material co | •                              |                                       | <i>can be ol</i><br>concrete, c       |                   | n /8.5 x %<br>units/m <sup>3</sup> | rebar];<br>steel, s    | 4600           | units/tonne           | د                     |
|                                  | concrete m                     |                                       |                                       |                   |                                    | 3.001, 3               | 872            | units/m <sup>3</sup>  | -                     |
|                                  | 30.10.000 111                  |                                       | 2. (030.                              | quuiii            | -,                                 |                        |                | ariicə/ 111           |                       |
|                                  |                                |                                       |                                       |                   |                                    |                        |                |                       |                       |

| CON   | ICHI TING  | En electrical  | - C-l-ul-ti-   | Clarat   |   | Job No.  | Sheet No.  |  | Rev.               |
|---|--|--|--|--|---|--|--|--|--------------------|
|   | NSULTING<br>INEERS   |  |  | n Sneet  |   | jXXX   | 1  | 2  |                    |
| ENGI  | INEERS   |  |  | 1  |   |  | 1  |  |                    |
|   |  |  |  |  |   | Member/Location  |  |  |                    |
| Job Title   |  |  | esign - Geot   |  | Cap v2021   |  | T= :   |  | al                 |
| Structure,  | Member De  | sign - Geot  | echnics Pile   | Сар  |   | Made by XX   | Date <b>21</b>   | /11/2021   | Chd.               |
| Pile Can I  | Base Reinfo  | rcement  | Design (Tr   | uss Theory   | <u>, , , , , , , , , , , , , , , , , , , </u>   |  |  |  |                    |
| i ne cup i  | Juse Reime   | // CCITICITE   | Jesigii (11  | 11101 y  | · )   |  |  |  |                    |
| ULS vertic  | al (downwar  | d) load fro  | m column a   | nd base sla  | b, F <sub>col,v,uls</sub>   |  | 140027   | kN   |                    |
| Note that I   | F <sub>col,v,uls</sub> is po   | sitive (dov  | vnward);   |  |   |  |  |  |                    |
|   |  |  |  |  |   |  |  |  |                    |
|   | force in plan  |  |  |  |   |  | 40435  |  |                    |
| ULS base f  | force in plan  | e of length  |  |  |   |  | 40435  | kN   |                    |
|   |  |  | F base   |  |   | F base   |  |  |                    |
|   | 1P:  |  | N/A  | -  |   | N/A  |  | kN   |                    |
|   | 2P:  |  | N/A  |  |   | $_{uls}.S/(4d_y)$  |  | kN   | Mosley             |
|   | 3P:  |  | .S/(4.5d <sub>x</sub> )  |  |   | .S/(4.5d <sub>y</sub> )  |  | kN   | Mosley             |
|   | 4P:  |  | $uls.S/(4d_x)$   |  |   | $_{uls}.S/(4d_y)$  |  | kN   | Mosley             |
|   | 5P:  |  | $uls . S/(5d_x)$   |  |   | $_{uls}.S/(5d_y)$  |  | kN   | 1asterserie        |
|   | 6P:  |  | $uls.S/(4d_x)$   |  |   | $\frac{1}{(3d_y)}$   |  | kN   | 1asterserie        |
|   | 7P:  |  | $uls.S/(4d_x)$   |  |   | $S/(3.5d_y)$   |  | kN   | <i>lasterserie</i> |
|   | 8P:  |  | $u_{ls}.S/(3d_x)$  |  |   | $\frac{S/(3d_y)}{S}$   |  | kN   | 1asterserie        |
|   | 9P:  |  | $\frac{1}{1}$ (3d $_{x}$ )   |  |   | $\frac{1}{1}$ $\frac{1}$ |  | kN   | <i>Nasterserie</i> |
|   | 10P:   |  | $L_{x,i}/(4d_x)$   |  |   | $L_{y,i}/(4d_y)$   |  | kN   | xtrapolatio        |
|   | 11P:   |  | $L_{x,i}/(4d_x)$   |  |   | $L_{y,i}/(4d_y)$   |  | kN   | xtrapolatio        |
|   | 12P:   |  | $L_{x,i}/(4d_x)$   |  |   | $L_{y,i}/(4d_y)$   |  | kN   | xtrapolatio        |
|   | 13P:   |  | $L_{x,i}/(4d_x)$   |  |   | $L_{y,i}/(4d_y)$<br>$L_{y,i}/(4d_y)$   |  | kN<br>kN   | xtrapolatio        |
|   | 14P:<br>15P:   |  | $\frac{L_{x,i}/(4d_x)}{L_{x,i}/(4d_x)}$  |  |   | $L_{y,i}/(4d_y)$<br>$L_{y,i}/(4d_y)$   |  | kN   | xtrapolatio        |
|   | Generic:   |  | ser-defined  |  |   | ser-defined  |  | kN   | xtrapolatio        |
| Note that   | $F_{base,uls}$ is po   |  |  | N/A  | us  | Ser-derified   | NYA  | KIN  |                    |
| TVOCC CHAC I  | base,uls 13 pc   | isitive (teri  |  |  |   |  |  |  |                    |
| III S hace f  | force in plan  | e of width   | ner metre  | []<br>F/I  |   |  | 5391   | kN/m   |                    |
|   | force in plan  |  |  |  |   |  |  | kN/m   |                    |
|   | force in plan  |  |  |  |   |  |  | kN/m   | cl.3.11.4.2        |
|   | force in plan  |  |  |  |   |  | 5391   |  | 0.5.11.4.2         |
| OLS base i  |  | e or length  | per metre,   | Dr,y · I base,uls,   | у/ Осар   |  | 3391   | KIN/III  | RCQ110             |
| Area of sta   |  |  |  | 1  |   |  |  | ,  | BS8110             |
| AICG OI SIL   |  | in v nor ma  | otro Δ. –  | (h F   | // ) / (0   | ) 95f )  | 12227  | •  | BS8110             |
| Area of ste   | el required  | in x per mo  | etre, $A_{s,t,x} = \frac{1}{2}$  | (b <sub>r,x</sub> .F <sub>base,uls</sub>   | <sub>s,x</sub> /L <sub>cap</sub> ) / (0   | ).95f <sub>y</sub> )   |  | mm²/m  | BS8110             |
| Area of ste   | eel required   | in y per me  | etre, $A_{s,t,y} =$  | (b <sub>r,y</sub> .F <sub>base,uls</sub>   | $_{s,y}/B_{cap}) / (0$  | 0.95f <sub>y</sub> )   | 12337  | •  | BS8110             |
| Area of ste<br>Note that i  | eel required<br>F <sub>col,v,uls</sub> does  | in y per me<br>s not accou   | etre, A <sub>s,t,y</sub> =<br>ant for prima  | (b <sub>r,y</sub> .F <sub>base,uls</sub><br>ary moment   | <sub>s,y</sub> /B <sub>cap</sub> ) / ((<br>s nor secon  | 0.95f <sub>y</sub> )<br>ndary mome   | 12337<br>ents due to   | mm²/m<br>mm²/m                                       | BS8110             |
| Area of ste<br>Note that i<br>eccentricit   | eel required F <sub>col,v,uls</sub> does ty of vertical  | in y per me<br>s not accou   | etre, A <sub>s,t,y</sub> =<br>ant for prima  | (b <sub>r,y</sub> .F <sub>base,uls</sub><br>ary moment   | <sub>s,y</sub> /B <sub>cap</sub> ) / ((<br>s nor secon  | 0.95f <sub>y</sub> )<br>ndary mome   | 12337<br>ents due to   | mm²/m<br>mm²/m                                       | BS8110             |
| Area of ste<br>Note that i<br>eccentricit   | eel required F <sub>col,v,uls</sub> does ty of vertical  | in y per me<br>s not accou   | etre, A <sub>s,t,y</sub> =<br>ant for prima  | (b <sub>r,y</sub> .F <sub>base,uls</sub><br>ary moment   | <sub>s,y</sub> /B <sub>cap</sub> ) / ((<br>s nor secon  | 0.95f <sub>y</sub> )<br>ndary mome   | 12337<br>ents due to   | mm²/m<br>mm²/m                                       | BS8110             |
| Area of ste<br>Note that i<br>eccentricit<br>area steel;  | eel required  F <sub>col,v,uls</sub> does  y of vertical  ;  | in y per me<br>s not accou<br>loading an   | etre, A <sub>s,t,y</sub> =<br>ant for prima<br>ad horizontal   | (b <sub>r,y</sub> .F <sub>base,ul</sub> .<br>ary moment.<br>I loading, th  | <sub>s,y</sub> /B <sub>cap</sub> ) / ((<br>s nor secon<br>us not acco   | 0.95f <sub>y</sub> )<br>ndary mome<br>ounted for v   | 12337 ents due to vithin the bo  | mm²/m<br>mm²/m                                       | BS8110             |
| Area of ste<br>Note that i<br>eccentricit<br>area steel;<br>Area of ter   | eel required  F col,v,uls does  y of vertical  ;  nsile steel re   | in y per me<br>s not accou<br>loading an<br>einforcemen  | etre, A <sub>s,t,y</sub> = ant for prima ad horizontal ant provided  | (b <sub>r,y</sub> .F <sub>base,ul</sub> .<br>ary moment.<br>I loading, th  | <sub>s,y</sub> /B <sub>cap</sub> ) / ((<br>s nor secon<br>us not acco   | 0.95f <sub>y</sub> )<br>ndary mome<br>ounted for v   | 12337 ents due to vithin the bo  | mm²/m<br>mm²/m                                       | BS8110             |
| Area of ste<br>Note that in<br>eccentricity<br>area steel,<br>Area of ter<br>Base tensi   | eel required  F <sub>col,v,uls</sub> does  y of vertical  ;  nsile steel re  ion capacity  | in y per mo<br>s not accou<br>loading an<br>einforcemer<br>in x utilisat   | etre, A <sub>s,t,y</sub> =  Int for prima  Ind horizontal  Int provided  Ition = A <sub>s,t,x</sub>  | in x per me  (b <sub>r,y</sub> .F <sub>base,uls</sub> ary moment  I loading, th  | s,y/B <sub>cap</sub> ) / (0<br>s nor secon<br>tus not acco  | D.95f <sub>y</sub> )<br>ndary mome<br>punted for v   | 12337<br>ents due to<br>vithin the ba<br>12863<br>96%  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       |                    |
| Area of ste<br>Note that is<br>eccentricity<br>area steel;<br>Area of ter<br>Base tensi<br>Area of ter  | eel required  F col,v,uls does  ty of vertical  ;  nsile steel re ion capacity  nsile steel re   | in y per me s not accour loading an einforcemer in x utilisate einforcemer   | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare depends on the provided on the pro | in x per me  / A <sub>s,prov,b,x</sub> in y per me   | s,y/B <sub>cap</sub> ) / (0<br>s nor secon<br>tus not acco  | D.95f <sub>y</sub> )<br>ndary mome<br>punted for v   | 12337<br>ents due to<br>vithin the ba<br>12863<br>96%  | mm²/m<br>mm²/m                                       |                    |
| Area of ste<br>Note that is<br>eccentricity<br>area steel;<br>Area of ter<br>Base tensi<br>Area of ter  | eel required  F <sub>col,v,uls</sub> does  y of vertical  ;  nsile steel re  ion capacity  | in y per me s not accour loading an einforcemer in x utilisate einforcemer   | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare depends on the provided on the pro | in x per me  / A <sub>s,prov,b,x</sub> in y per me   | s,y/B <sub>cap</sub> ) / (0<br>s nor secon<br>tus not acco  | D.95f <sub>y</sub> )<br>ndary mome<br>punted for v   | 12337 ents due to vithin the bo 12863 96% 14577  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       | ОК                 |
| Area of ste<br>Note that is<br>eccentricit<br>area steel;<br>Area of ter<br>Base tensi<br>Area of ter<br>Base tensi   | eel required  F col,v,uls does  ty of vertical  ;  nsile steel re ion capacity  nsile steel re   | in y per me<br>s not accou<br>loading an<br>einforcemer<br>in x utilisat<br>einforcemer<br>in y utilisat   | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare dependent provided in the provided | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub>  | tre, A <sub>s,prov,b</sub>  | D.95f <sub>y</sub> )  odary mome  ounted for v   | 12337 ents due to vithin the bo 12863 96% 14577  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       | ОК                 |
| Area of ste<br>Note that is<br>eccentricit<br>area steel;<br>Area of ter<br>Base tensi<br>Area of ter<br>Base tensi   | eel required  F col,v,uls does  ty of vertical  ;  nsile steel re ion capacity nsile steel re ion capacity   | in y per me<br>s not accou<br>loading an<br>einforcemer<br>in x utilisat<br>einforcemer<br>in y utilisat   | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare dependent provided in the provided | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub>  | tre, A <sub>s,prov,b</sub>  | D.95f <sub>y</sub> )  odary mome  ounted for v   | 12337 ents due to vithin the bo 12863 96% 14577  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       | ОК                 |
| Area of stermarea steel; Area of termarea | eel required  F col,v,uls does  y of vertical  ;  nsile steel re ion capacity nsile steel re ion capacity  Diagonal Co   | in y per me s not accou loading an einforcemer in x utilisate inforcemer in y utilisate per pressio  | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare department provided in the provide | in x per me  / A <sub>s,prov,b,x</sub> in y per me / A <sub>s,prov,b,x</sub> in y per me / Design (T   | tre, A <sub>s,prov,b</sub>  | D.95f <sub>y</sub> )  odary mome  ounted for v   | 12337 ents due to vithin the bo 12863 96% 14577  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       | ОК                 |
| Area of ste<br>Note that is<br>eccentricity<br>area steel;<br>Area of ter<br>Base tensi<br>Area of ter<br>Base tensi<br>Base tensi  | eel required  F col,v,uls does  ty of vertical  ;  nsile steel re ion capacity nsile steel re ion capacity   | in y per me s not accou loading an einforcemer in x utilisate inforcemer in y utilisate ompressio  | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare department provided in the provide | in x per me  / A <sub>s,prov,b,x</sub> in y per me / A <sub>s,prov,b,x</sub> in y per me / Design (T   | tre, A <sub>s,prov,b</sub> russ Theo  | o.95f <sub>y</sub> ) odary mome ounted for v   | 12337 ents due to vithin the ba 12863 96% 14577 85%  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       | ОК                 |
| Area of sterm of the control of the | eel required  F col,v,uls does  y of vertical  ;  nsile steel re ion capacity nsile steel re ion capacity  Diagonal Co   | in y per me s not accou loading an einforcemer in x utilisate einforcemer in y utilisate ompressio   | etre, $A_{s,t,y} = \frac{1}{2}$ Int for primary Int provided int provided int provided int provided interprovided inte | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub> * Design (T  | tre, A <sub>s,prov,b</sub> tre, A <sub>s,prov,b</sub> tre, A <sub>s,prov,b</sub>  | o.95f <sub>y</sub> ) odary mome ounted for v   | 12337 ents due to vithin the bo 12863 96% 14577 85%  | mm²/m<br>mm²/m<br>ase<br>mm²/m                       | ОК                 |
| Area of sterm of the control of the | eel required  F col,v,uls does  ty of vertical  ;  nsile steel re ion capacity nsile steel re ion capacity  Diagonal Co  | in y per me s not accou loading an einforcemer in x utilisate einforcemer in y utilisate ompressio   | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare deposition in the provided in the  | in x per me  (A <sub>s,prov,b,x</sub> in y per me  (A <sub>s,prov,b,y</sub> Design (T  | tre, A <sub>s,prov,b</sub> tres Theo  d  N/A  | D.95f <sub>y</sub> ) ndary mome punted for v   | 12337 ents due to vithin the ba 12863 96% 14577 85%  25910 d N/A                                   | mm²/m<br>mm²/m<br>ase<br>mm²/m<br>mm²/m              | ОК                 |
| Area of stee Note that is eccentricit area steel; Area of ter Base tensi Area of ter Base tensi Pile Cap I  ULS diagon  | eel required  F col,v,uls does  y of vertical  ;  nsile steel re ion capacity nsile steel re ion capacity  Diagonal Co  nal force, Fdi   | in y per me s not accouloading an leinforcemer in x utilisate inforcemer in y utilisate propersion leinforcemer leinforcem | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare deposition in the provided in the  | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub> in Question (T   | $_{\rm s,y}/{\rm B}_{\rm cap})$ / (0 s nor second   | ndary mome ounted for v  y  ry)  1.803S  | 12337 ents due to vithin the ba 12863 96% 14577 85%  25910 d N/A N/A                               | mm²/m<br>mm²/m<br>ase<br>mm²/m<br>mm²/m              | ОК                 |
| Area of stee Note that is eccentricit area steel; Area of ter Base tensi Area of ter Base tensi Pile Cap I ULS diagor   | reel required  F col,v,uls does  y of vertical  ;  nsile steel region capacity  nsile steel region capacity  Diagonal Co  nal force, Fdi  1P/6P/11P: 2P/7P/12P:  | in y per me s not accour loading an einforcement in x utilisate einforcement in y utilisate einforcement einforcemen | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare deposition in the provided in the  | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub> in Y Design (T  L  1.118S  1.0S  | $_{\rm s,y}/{\rm B}_{\rm cap})$ / (0 s nor second sus not according to the second sus second  | o.95f <sub>y</sub> ) indary mome ounted for v  | 12337 ents due to vithin the bo  12863 96% 14577 85%  25910 d N/A N/A N/A                          | mm²/m mm²/m ase mm²/m mm²/m kN mm mm                 | ОК                 |
| Area of stee Note that is eccentricit area steel; Area of ter Base tensi Area of ter Base tensi Pile Cap I ULS diagor   | reel required  F col,v,uls does  ty of vertical  insile steel reliance to capacity  nsile steel reliance to capacity  Diagonal Co  nal force, Fdi  1P/6P/11P: 2P/7P/12P: 3P/8P/13P:                                    | in y per me s not accour loading an einforcemer in x utilisate einforcemer in y utilisate einforcemer einfor | etre, $A_{s,t,y} = \frac{1}{2}$ Int for primary Int provided interprovided i | in x per me  As,prov,b,x in y per me  As,prov,b,y  Design (T  1.118S  1.05  1.414S   | tre, A <sub>s,prov,b</sub> tre, A <sub>s,prov,b</sub> tre, A <sub>s,prov,b</sub> tre, A <sub>s,prov,b</sub>   | ndary mome ounted for v  y  ry)  1.803S  1.803S  2.0S  | 12337 ents due to vithin the ba 12863 96% 14577 85%  25910 d N/A N/A N/A N/A                       | mm²/m mm²/m ase mm²/m mm²/m mm²/m mm²/m              | ОК                 |
| Area of sterm of the steel, area steel, area of terms area of terms area of terms area of terms. Area of terms are area.  | reel required  F col,v,uls does  y of vertical  insile steel reliance capacity  nsile steel reliance capacity  Diagonal Co  nal force, Fdi  1P/6P/11P: 2P/7P/12P: 3P/8P/13P: 4P/9P/14P:                                | in y per me s not accou loading an einforcemer in x utilisate einforcemer in y utilisate einforcemer einforceme | etre, $A_{s,t,y} = \frac{1}{2}$ Int for primary Int provided interprovided i | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub> in Question (T   | $_{\rm s,y}/{\rm B_{cap}})$ / (0 s nor second tre, ${\rm A_{s,prov,b}}$ ) tre, ${\rm A_{s,prov,b}}$ tre, ${\rm A_{s,prov,b}}$ ${\rm A_{s,pr$ | 2.55f <sub>y</sub> ) indary mome ounted for v  in the property of the pro  | 12337 ents due to vithin the base 12863 96% 14577 85%  25910 d N/A N/A N/A N/A N/A                 | mm²/m mm²/m ase mm²/m mm²/m mm²/m mm²/m mm mm mm     | ОК                 |
| Area of ste Note that is eccentricit area steel; Area of ter Base tensi Area of ter Base tensi ULS diagor   | reel required  F col,v,uls does  y of vertical  ;  nsile steel resion capacity nsile steel resion capacity  Diagonal Co  nal force, Fdi  1P/6P/11P: 2P/7P/12P: 3P/8P/13P: 4P/9P/14P: P/10P/15P:                        | in y per me s not accour loading and loading and loading and leinforcement in x utilisate inforcement in y utilisate lompression loading loadi | etre, $A_{s,t,y} = \frac{1}{2}$ ant for primare definition of the provided in the  | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub> in Y Design (T  1.118S  1.0S  1.414S  1.5S                                       | $_{\rm s,y}/{\rm B_{cap}})$ / (0 s nor second s   | 2.95f <sub>y</sub> ) indary mome ounted for v  in the following state of the fo  | 12337 ents due to vithin the ba  12863 96% 14577 85%  25910 d N/A N/A N/A N/A N/A N/A              | mm²/m mm²/m ase mm²/m mm²/m mm²/m kN mm mm mm mm     | ОК                 |
| Area of stee Note that is eccentricity area of ter Base tensis Area of ter Base tensis Area of ter Base tensis ULS diagon   | reel required  F col,v,uls does  y of vertical  ;  nsile steel region capacity  nsile steel region capacity  Diagonal Co  nal force, Fdi  1P/6P/11P: 2P/7P/12P: 3P/8P/13P: 4P/9P/14P: P/10P/15P: Generic:              | in y per me s not accour loading an einforcemer in x utilisate einforcemer in y utilisate einforcemen ein | etre, $A_{s,t,y} = \frac{1}{2}$ Int for primary Int provided interprovided i | in x per me  / A <sub>s,prov,b,x</sub> in y per me  / A <sub>s,prov,b,y</sub> / A <sub>s,prov,b,y</sub> / Design (T  1.118S  1.0S  1.414S  1.5S  pile from the | $_{\rm s,y}/{\rm B_{cap}})$ / (0 s nor second s   | 2.95f <sub>y</sub> ) indary mome ounted for v  in the following state of the fo  | 12337 ents due to vithin the ba  12863 96% 14577 85%  25910 d N/A N/A N/A N/A N/A N/A              | mm²/m mm²/m asse mm²/m mm²/m mm²/m kN mm mm mm mm mm | ОК                 |
| Area of stee Note that is eccentricity area steel; Area of ter Base tensi Area of ter Base tensi  Pile Cap I  ULS diagon  Shote that is Diagonal comments   | reel required  F col,v,uls does  y of vertical  insile steel relion capacity  nsile steel relion capacity  Diagonal Co  nal force, Fdi  1P/6P/11P: 2P/7P/12P: 3P/8P/13P: 4P/9P/14P: P/10P/15P: Generic: L d is the dis | in y per me s not accour loading an loading an leinforcemer in x utilisate inforcemer in y utilisate inforcemer in y utilisate lompression loading and loading and loading loa | etre, $A_{s,t,y} = \frac{1}{2}$ and for primare definition in the provided in the  | in x per me  A s,prov,b,x  in y per me  A s,prov,b,y  Design (T  1.118S  1.0S  1.414S  1.5S  Dile from the cu. (π.D²/4)  | $_{\rm s,y}/{\rm B_{cap}})$ / (0 s nor second tre, ${\rm A_{s,prov,b}}$ ) tre, ${\rm A_{s,prov,b}}$ tre, ${\rm A_{s,prov,b}}$ ${\rm A_{s,pr$ | 2.95f <sub>y</sub> ) indary mome ounted for v  in the following state of the fo  | 12337 ents due to vithin the base 12863 96% 14577 85%  25910 d N/A N/A N/A N/A N/A N/A N/A n load; | mm²/m mm²/m asse mm²/m mm²/m mm²/m kN mm mm mm mm mm | ОК                 |

| CON         |                  |                      |                            |                      |   | Job No.                     | Sheet No.       |                   | Rev. |
|-------------|------------------|----------------------|----------------------------|----------------------|---|-----------------------------|-----------------|-------------------|------|
|             | SULTING<br>NEERS |                      |                            | n Sheet              |   |                             |                 | .3                |      |
| ENGI        | NEEKS            | Consulting           | Linginicers                |                      |   | jXXX                        | 1               | .3                |      |
|             |                  |                      |                            |                      |   | Member/Location             |                 |                   |      |
| Job Title   |                  |                      |                            |                      | Cap v2021   |                             | T =             |                   | J    |
| Structure,  | Member De        | sign - Geot          | echnics Pile               | Сар                  | ı   | Made by XX                  | Date <b>21</b>  | /11/2021          | Chd. |
| D.1 6 B     | <b>D</b> : 6     |                      |                            |                      |   |                             |                 |                   |      |
| Pile Cap B  | Base Reinfo      | rcement i            | esign (Sn                  | allow and            | реер веа  | m Ineory)<br>               |                 |                   |      |
| III S mome  | nt at colum      | n hase in n          | lane of widt               | h M                  |   |                             | 66359           | kNm               |      |
|             | nt at colum      |                      |                            |                      |   |                             |                 | kNm               |      |
| 0 2000      |                  | 5455 p               | _                          | I <sub>x</sub>       |   |                             | l <sub>y</sub>  | 10.00             |      |
|             | 1P:              |                      | N/A                        |                      |   | N/A                         |                 | kNm               |      |
|             | 2P:              |                      | N/A                        |                      | M <sub>v</sub> =                                  | {M1 only}                   |                 | kNm               |      |
|             | 3P:              | $M_X = \{M\}$        | !, M2, M3}                 | -                    | ,   | 1, M2, M3}                  |                 | kNm               |      |
|             | 4P:              | $M_{\times} = \{M\}$ | !, M2, M3}                 | N/A                  |   | 1, M2, M3}                  |                 | kNm               |      |
|             | 5P:              | $M_{\times} = \{M\}$ | !, M2, M3}                 | N/A                  |   | 1, M2, M3}                  |                 | kNm               |      |
|             | 6P:              |                      | ., M2, M3}                 |                      | ,   | 1, M2, M3}                  |                 | kNm               |      |
|             | 7P:              |                      | !, M2, M3}                 | -                    | ,   | 1, M2, M3}                  |                 | kNm               |      |
| ,           | 8P:              |                      | !, M2, M3}                 | -                    | ,   | 1, M2, M3}                  |                 | kNm               |      |
| ,           | 9P:              |                      | !, M2, M3}                 |                      | ,   | 1, M2, M3}                  |                 | kNm               |      |
| •           | 10P:             |                      | !, M2, M3}                 |                      | ,   | 1, M2, M3}                  |                 | kNm               |      |
| •           | 11P:             |                      | !, M2, M3}                 |                      | ,   | 1, M2, M3}                  |                 | kNm               |      |
| ,           | 12P:             |                      | !, M2, M3}                 |                      | ,   | 1, M2, M3}                  |                 | kNm               |      |
| า           | 13P:             |                      | !, M2, M3}                 |                      | ,   | 1, M2, M3}                  |                 | kNm               |      |
| 7           | 14P:             |                      | !, M2, M3}                 | -                    | ,   | 1, M2, M3}                  |                 | kNm               |      |
| 7           | 15P:             | $M_{\times} = \{M\}$ | !, M2, M3}                 | N/A                  | $M_{v} = \{M\}$                                   | 1, M2, M3}                  | N/A             | kNm               |      |
| 7           | Generic:         | us                   | er-defined                 | N/A                  |   | ser-defined                 |                 | kNm               |      |
| Note mome   | ent calculat     | ions based           | on either: -               |                      |   |                             |                 |                   |      |
| Method 1    | Cantilever       | Span Mome            | ent (Modifie               | d)                   | $M_X = f_{mx}$                                    | K. ΣF <sub>pile,v,i</sub> . | $(x_{i-c}-b/2)$ |                   |      |
|             |                  |                      | -                          |                      | $M_y = f_{my}$                                    |                             |                 |                   |      |
| Method 2    | Timoshenk        | o S/S Coeff          | icients (Mo                | dified)              | $M_{x} = K.F_{p}$                                 |                             |                 |                   |      |
|             |                  | -                    | ,                          |                      | $M_y = K.F_p$                                     |                             |                 |                   |      |
| Method 3    | GPSS GSA         | C/S Coeffic          | ients                      |                      | $M_x = K.F_p$                                     | ilecap.v.β.L <sub>c</sub>   | ap              |                   |      |
|             |                  | -                    |                            |                      | $M_y = K.F_p$                                     |                             |                 |                   |      |
|             |                  |                      |                            |                      | , ,   |                             |                 |                   |      |
| ULS mome    | nt at colum      | n base in p          | lane of widt               | h per metr           | e, M <sub>x</sub> /L <sub>cap</sub>               |                             | 8848            | kNm/m             |      |
| ULS mome    | nt at colum      | n base in p          | lane of leng               | th per met           | re, M <sub>v</sub> /B <sub>cap</sub>              |                             |                 | kNm/m             |      |
|             | nt at colum      |                      |                            |                      | , ··· r   | ap                          | 8848            | kNm/m             |      |
|             | nt at colum      |                      |                            |                      |   |                             |                 | kNm/m             |      |
|             |                  |                      |                            |                      |   | Cap                         |                 | ,                 |      |
| Concrete n  | noment cap       | acity in x p         | er metre, M                | $I_{u.x} = 0.1561$   | f <sub>cu</sub> .1000.d <sub>v</sub> <sup>2</sup> |                             | 84186           | kNm/m             |      |
|             | noment cap       |                      |                            |                      |   |                             |                 | kNm/m             |      |
|             | ress in x, [N    |                      |                            |                      |   |                             |                 | N/mm <sup>2</sup> |      |
|             | ress in y, [N    |                      |                            |                      |   |                             |                 | N/mm <sup>2</sup> |      |
|             | ress ratio in    |                      |                            |                      | , -   |                             | 0.016           |                   | ОК   |
|             | ress ratio in    |                      |                            |                      |   |                             | 0.000           |                   | ОК   |
|             | in x, $z_x = d$  |                      |                            |                      | 95d <sub>x</sub>                                  |                             | 3290            | mm                |      |
|             | in y, $z_y = d$  |                      |                            |                      |   |                             | 3290            |                   |      |
| Area of ste | el required      | in x per me          | etre, A <sub>s,m,x</sub> = | $= (s_{c,x}.M_x/L_c$ | <sub>ap</sub> ) / [(0.95                          | $f_{v}$ ). $z_{x}$ ]        | 6154            | mm²/m             |      |
|             | el required      |                      |                            |                      |   |                             |                 | mm²/m             |      |
|             |                  |                      | ,                          | ,                    |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             |                 |                   |      |
|             |                  |                      |                            |                      |   |                             | <u> </u>        |                   | •    |

|             |                              |                           |                |                           |                            | Job No.                     | Sheet No.          |                                       | Rev.               |
|-------------|------------------------------|---------------------------|----------------|---------------------------|----------------------------|-----------------------------|--------------------|---------------------------------------|--------------------|
|             | SULTING                      | _                         | _              | n Sheet                   |                            |                             |                    |                                       |                    |
| ENGI        | NEERS                        | Consulting                | Engineers      |                           |                            | jXXX                        | 1                  | 4                                     |                    |
|             |                              |                           |                |                           |                            | Member/Location             |                    |                                       |                    |
| Job Title   | Structure,                   | Member De                 | sign - Geot    | echnics Pile              | Cap v2021                  | Drg.                        |                    |                                       |                    |
| Structure,  | Member De                    | sign - Geot               | echnics Pile   | . Сар                     |                            | Made by XX                  | Date <b>21</b>     | /11/2021                              | L <sup>C</sup> hd. |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             | eel required                 |                           |                |                           |                            |                             |                    | mm²/m                                 | Reynolds           |
|             | eel required                 |                           |                |                           |                            |                             | 0                  | mm²/m                                 | T.148              |
|             | <sub>k,db</sub> to be dis    |                           |                |                           |                            |                             | 650                |                                       | cl.21.4.1          |
|             | one used by                  |                           |                |                           |                            | 93%                         |                    |                                       | OK                 |
|             | <sub>v,db</sub> to be dis    |                           |                |                           |                            |                             | 650                |                                       | cl.21.4.1          |
| Depth of z  | one used by                  | / A <sub>s,m,y,db</sub> ( |                |                           | 0)                         | 93%                         |                    | mm                                    | OK                 |
|             | 4.5                          |                           | +              | lb,x                      |                            |                             | ib,y               |                                       |                    |
|             | 1P:                          |                           | N/A            |                           |                            | N/A                         | <u> </u>           | mm                                    |                    |
|             | 2P:                          |                           | N/A            |                           |                            | 1.05                        | -                  | mm                                    |                    |
|             | 3P:                          |                           | 1.05           |                           |                            | 1.05                        | -                  | mm                                    | +                  |
|             | 4P:                          |                           | 1.05           | -                         |                            | 1.05                        | -                  | mm                                    | 1                  |
|             | 5P:<br>6P:                   |                           | 1.415S<br>1.0S |                           |                            | 1.415S<br>2.0S              | -                  | mm                                    |                    |
|             | 7P:                          |                           | 1.0S<br>1.734S |                           |                            | 2.05                        | -                  | mm                                    | 1                  |
|             | 8P:                          |                           | 2.05           | -                         |                            | 2.05                        | -                  | mm                                    |                    |
|             | 9P:                          |                           |                | 6000                      |                            |                             | 6000               | mm                                    |                    |
|             | 10P:                         |                           | 2.05           |                           |                            | 3.05                        |                    | mm                                    | 1                  |
|             | 11P:                         |                           | 2.05           | -                         |                            | 3.05                        | -                  | mm                                    |                    |
|             | 12P:                         |                           | 2.05           | -                         |                            | 3.05                        | -                  | mm                                    |                    |
|             | 13P:                         |                           | 2.05           |                           |                            | 4.05                        | <u> </u>           | mm                                    |                    |
|             | 14P:                         |                           | 2.05           |                           |                            | 5.05                        | -                  | mm                                    |                    |
|             | 15P:                         |                           | 2.05           |                           |                            | 4.05                        | <u> </u>           | mm                                    |                    |
|             | Generic:                     | us                        | ser-defined    |                           | us                         | ser-defined                 |                    | mm                                    |                    |
|             |                              |                           |                | ,                         |                            |                             | ,                  |                                       |                    |
| Area of ter | nsile steel re               | einforcemer               | nt provided    | in x per me               | tre, A <sub>s.prov.b</sub> | .X                          | 12863              | mm²/m                                 |                    |
| Sagging be  | ending mor                   | nent (shallo              | w beam the     | ory) in x ut              | ilisation = A              | $A_{s,m,x} / A_{s,pro}$     |                    | · · · · · · · · · · · · · · · · · · · | ОК                 |
|             | ending mor                   |                           |                |                           |                            |                             |                    |                                       | ОК                 |
|             | nsile steel re               |                           |                |                           |                            |                             |                    | mm <sup>2</sup> /m                    |                    |
| Sagging be  | ending mor                   | nent (shallo              | w beam the     | eory) in y ut             | ilisation = A              | $A_{s,m,y} / A_{s,pro}$     | 0%                 |                                       | OK                 |
| Sagging be  | ending mom                   | ent (deep l               | peam theor     | y) in y utilis            | $ation = A_{s,r}$          | n,y,db / A <sub>s,pro</sub> | 0%                 |                                       | OK                 |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
| Base Reir   | forcement                    | t Percenta                | ge             |                           |                            |                             |                    |                                       |                    |
| 0/ 14: 1    |                              |                           | 0.0004         | 1000 = 0                  |                            | 0010 1000                   |                    |                                       |                    |
|             | e reinforcer                 |                           |                | 1000.1 <sub>cap</sub> G   | 250; >= 0. <sub>0</sub>    | 0013.1000.                  |                    |                                       |                    |
|             | e reinforcer                 |                           |                | 1000 T C                  | 250. > 0.4                 | 0012 1000                   | 38%                |                                       | ОК                 |
|             | e reinforcer<br>e reinforcer |                           |                | LUUU. I <sub>cap</sub> G. | 250; <i>&gt;</i> = 0.0     | 0013.1000.                  | 0.38<br><b>34%</b> | %                                     | ОК                 |
| % MIII Das  | e reilliorcei                |                           | ilisation      |                           |                            |                             | 34%                |                                       | UK                 |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       | +                  |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       | 1                  |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       |                    |
|             |                              |                           |                |                           |                            |                             |                    |                                       | <u> </u>           |

| CONSULTING                                     | Engineerin               | a Calculatio                            | n Chaot   |  | Job No.                     | Sheet No.       |                   | Rev.      |
|--|--------------------------|---|---|--|-----------------------------|-----------------|-------------------|-----------|
| ENGINEERS                                      |                          |   | iii Sileet  |  | jXXX                        | 1               | .5                |           |
|  |                          |   |   |  | Member/Location             |                 |                   |           |
| ob Title Structure,                            | Member De                | sian - Coot                             | ochnics Pilo  | Cap v2021                                |                             |                 |                   |           |
| Structure, Member De                           |                          |   |   | : Cap v2021                              |                             | Date <b>21</b>  | /11/2021          | Chd.      |
| Perdecare, Fieliber De                         | Jaigii acot              | CCITIICS I IIC                          | . Сар   |  |                             | 21              | / 11/ 202.        |           |
| Pile Cap Punching S                            | hear Reinf               | orcement                                | Design  |  |                             |                 |                   | cl.3.11.4 |
|  |                          |   |   |  |                             |                 |                   | BS8110    |
| JLS vertical (downwa                           | rd) load from            | m column a                              | nd base sla   | b, F <sub>col,v,uls</sub>                |                             | 140027          | kN                | 1         |
| Note that F col,v,uls is p                     |                          |   |   |  |                             |                 |                   |           |
| Area of column base s                          | section, A <sub>c1</sub> | = b.h (recta                            | angular) or   | $\pi D^2/4$ (circ                        | ular)                       | 20625000        | mm <sup>2</sup>   |           |
| Effective depth to bas                         | e steel, d =             | $(d_x + d_y) /$                         | 2   |  |                             | 3463            | mm                |           |
| Area of tensile steel re                       |                          | t provided                              | per metre,  | (A <sub>s,prov,b,x</sub> .L <sub>o</sub> | cap + A <sub>s,prov,t</sub> |                 | mm²/m             |           |
| $p_{\rm w} = 100A_{\rm s,prov,b}/(1000$        |                          |   | 1/2   | 1/4                                      |                             | 0.40            |                   |           |
| First shear perimeter,                         | $v_{\rm c} = (0.79/$     | ′1.25)(ρ <sub>w</sub> f <sub>cu</sub> , | /25)1/3(400)  | $(d)^{1/4}$ ; $\rho_{\rm w}$ < 3         | 0.67                        |                 | N/mm <sup>2</sup> | T.3.8     |
| Second shear perimet                           | er, $v_c = (0.7)$        | <b>79/1.25)(</b> ρ <sub>ν</sub>         | <sub>v</sub> f <sub>cu</sub> /25) <sup>1/3</sup> (4 | ·00/d) <sup>1/4</sup> ; ρ <sub>ν</sub>   | N/A                         | N/A             | N/mm <sup>2</sup> | BS8110    |
|  |                          |   |   |  |                             |                 |                   |           |
| Column Base Face F                             | 'erimeter                |   |   |  |                             |                 |                   |           |
| Theory force at column                         | hass face                | \/ ADC/I                                | - \   |  |                             | 140027          | LAL               |           |
| Shear force at column                          |                          |   |   | ianoradi                                 |                             | 140027          |                   |           |
| Effective shear force,<br>Column base face per |                          | $v$ . $v_1$ (mom                        | ent enects  | ignorea)                                 |                             | 140027<br>19100 |                   | +         |
| Column base race per                           | imeter, u <sub>1</sub>   |   | Pocta   | <br>ngular                               | Circ                        | ular            | mm                |           |
| Internal column:                               |                          |   | 2.(b+h)   |  | $\pi.D$                     | 1               | mm                | +         |
|  | n hasa fasa              | norimotor                               |   |  |                             |                 | N/mm <sup>2</sup> | +         |
| Shear stress at colum<br>Ultimate shear stress |                          | perimeter,                              | v <sub>1</sub> - v <sub>eff,1</sub> /               | u <sub>1</sub> u (< 0.6                  | I a sivi                    | 42%             | 11/111111         | ОК        |
| oldinate shear stress                          | utilisation              |   |   |  |                             | <b>-12</b> /0   |                   |           |
| First Shear Perimet                            |                          |   |   |  |                             |                 |                   |           |
| inst Shear Fermiet                             |                          |   |   |  |                             |                 |                   | +         |
| Shear force 20% D in:                          | side face of             | pile from o                             | olumn base  | face, $V_2 =$                            | Fast vivila - Fn            | 123642          | kN                | +         |
|  | F                        |   |   | V/A                                      |                             | V/A             | 10.1              |           |
| 1P/6P/11P:                                     |                          |   | 0.M(F <sub>P</sub> )                                | N/A                                      | 1.M(F <sub>P</sub> )        |                 | kN                |           |
| 2P/7P/12P:                                     |                          |   | 1.M(F <sub>P</sub> )                                |  | $0.M(F_P)$                  |                 | kN                | +         |
| 3P/8P/13P:                                     |                          |   | $0.M(F_P)$  |  | $1.M(F_P)$                  |                 | kN                | +         |
| 4P/9P/14P:                                     |                          |   | $1.M(F_P)$  |  | $0.M(F_P)$                  |                 | kN                | †         |
| 5P/10P/15P:                                    |                          |   | $0.M(F_P)$  |  | $1.M(F_P)$                  |                 | kN                | +         |
| Generic:                                       | ( , ,                    | ,                                       | ( , ,   | <b>-</b>                                 | ser-defined                 |                 | kN                |           |
| Note $M(F_P)$ above ref                        | ers to K . M             | IN (F <sub>pile,v,i</sub> )             | ;   |  |                             | ,               |                   |           |
| Effective shear force,                         |                          |   |   | ignored)                                 |                             | 123642          | kN                |           |
| Column base first she                          |                          |   |   |  |                             | 21120           | mm                |           |
| Internal column:                               |                          |   |   | Recta                                    | ngular or C                 |                 |                   | 1         |
| 1P:  |                          |   |   |  | N/A                         | N/A             | mm                |           |
| 2P:  |                          |   |   |  | N/A                         | N/A             | mm                | <u></u>   |
| 3P:  | [1.0S-D+2.               | (0.2D)] + 2                             | $2.[(0.5^2 + 1.5^2)]$                               | $(0^2)^{0.5}S-D$                         | +2.(0.2D)]                  | N/A             | mm                |           |
| 4P:  |                          |   |   |  | +2.(0.2D)]                  |                 | mm                |           |
| 5P:  |                          |   | 4.  | .[1.415S-D                               | +2.(0.2D)]                  | N/A             | mm                |           |
| 6P:  | 2                        | 2.[1.0S-D+                              | 2.(0.2D)] +   | 2.[2.0S-D                                | +2.(0.2D)]                  | N/A             | mm                |           |
| 7P:  |                          |   |   | 6.[1.0S-D                                | +2.(0.2D)]                  | N/A             | mm                |           |
| 8P:  |                          |   |   |  | +2.(0.2D)]                  | -               | mm                |           |
| 9P:  |                          |   |   |  | +2.(0.2D)]                  |                 | mm                |           |
| 10P:   |                          |   |   |  | +2.(0.2D)]                  |                 | mm                |           |
| 11P:   |                          |   |   |  | +2.(0.2D)]                  |                 | mm                |           |
| 12P:   |                          |   |   |  | +2.(0.2D)]                  |                 | mm                |           |
| 13P:   |                          |   |   |  | +2.(0.2D)]                  |                 | mm                |           |
| 14P:   | 2                        | 2.[2.0S-D+                              | 2.(0.2D)] +   |  | +2.(0.2D)]                  |                 | mm                |           |
| 15P:   |                          |   |   | _  | +2.(0.2D)]                  |                 | mm                |           |
| Generic:                                       |                          |   |   |  | ser-defined                 | N/A             | mm                |           |
| Note first shear perim                         |                          |   |   |  | ce of pile;                 |                 |                   |           |
| Shear stress at colum                          |                          |   |   |  |                             |                 | N/mm <sup>2</sup> |           |
| Shear capacity enhar                           |                          |   |   |  |                             |                 |                   |           |
| 1.5d of the "support"                          | as clause 3.             | 7.7.4 BS81                              | 10 employe  | ed, that of o                            | clause 3.7.7                | 7.6 BS8110      | not applica       | able;)    |
|  |                          |   |   |  |                             |                 |                   |           |
|  |                          |   |   |  |                             |                 |                   |           |

| CON   | SULTING  | Engineering   | . Calculatio   | n Sheet  |  | Job No.   | Sheet No.  |  | Rev.        |
|---|--|---|--|--|--|---|--|--|-------------|
|   |  | Consulting  |  | ii Siicce  |  | jXXX  | 1  | .6   |             |
|   |  |   |  |  |  | Member/Location   |  |  |             |
| lob Titlo   | Ctructuro  | Mombor Do   | sian Coot  | ochnica D  | ilo Can v202                           |   |  |  |             |
| Job Title   |  |   |  |  | ile Cap v202                           | Made by XX  | Date 31  | /11/2021 <sup>0</sup>  | hd.         |
| Structure,  | Member De  | sign - Geot   | ecimics Pile   | Сар  |  |   | ZI   | /11/2021   |             |
|   |  |   |  |  |  |   |  |  |             |
|   |  |   |  |  |  |   |  |  |             |
| Distance 2  | L<br>0% D inside   | face of pile  | from colur   | nn base f  | <br>face, a <sub>v</sub> (≥ 0          | .375d)  | 253  | mm   | 6.2.3(8) E0 |
|   | 1P:  |   |  |  |  | N/A   |  | mm   | Not Incl.   |
|   | 2P:  |   |  |  |  | N/A   | -  | mm   |             |
|   | 3P:  | AV  | E [(1.0S-D-  | b)/2+0.2   | 2D, (4/3S-D-                           | -   | -  | mm   |             |
|   | 4P:  |   |  |  | 2D, (1.0S-D-                           |   | N/A  | mm   |             |
|   | 5P:  | AVE [(1   | .415S-D-b)   | /2+0.2D,   | (1.415S-D-                             | h)/2+0.2D]  | N/A  | mm   |             |
|   | 6P:  | AV  | E [(1.0S-D-  | -b)/2+0.2  | 2D, (2.0S-D-                           | h)/2+0.2D]  | N/A  | mm   |             |
|   | 7P:  | AVE [   | (1.734S-D-   | -b)/2+0.2  | 2D, (2.0S-D-                           | h)/2+0.2D]  | N/A  | mm   |             |
|   | 8P:  | AV  | E [(2.0S-D-  | -b)/2+0.2  | 2D, (2.0S-D-                           | h)/2+0.2D]  | N/A  | mm   |             |
|   | 9P:  | AV  | E [(2.0S-D-  | -b)/2+0.2  | 2D, (2.0S-D-                           | h)/2+0.2D]  | 253  | mm   |             |
|   | 10P:   |   |  |  | 2D, (1.0S-D-                           |   |  | mm   |             |
|   | 11P:   |   |  | -  | 2D, (2.0S-D-                           |   |  | mm   |             |
|   | 12P:   |   |  | -  | 2D, (1.0S-D-                           |   |  | mm   |             |
|   | 13P:   |   |  |  | 2D, (2.0S-D-                           |   |  | mm   |             |
|   | 14P:   |   |  |  | 2D, (1.0S-D-                           |   |  | mm   |             |
|   | 15P:   | AV  | E [(2.05-D-  | - <i>D)</i> /2+0.2   | 2D, (2.0S-D-                           |   |  | mm   |             |
| Note h and  | Generic:   | ro roplaced   | hy D for cir   | cular colu   | ımns, here D                           | ser-defined<br>referring to   |  | mm<br>n dimonsion  |             |
|   |  |   | -  |  | perimeter is t                         |   |  |  | ,           |
|   |  |   |  |  | ar capacity e                          |   |  |  | /a=1:)      |
|   | ancement, a  |   | 253  | mm   | <= <=                                  | 1.5d =  | 5195   | mm   | Adopted     |
|   |  | city, 1.5dv <sub>c</sub> /a   |  |  | -                                      | x 20.57   |  | N/mm <sup>2</sup>  |             |
|   |  | city, 1.5dv <sub>o</sub> /a   |  | <sup>0.5</sup> & 5N/r  | mm²)                                   | x 8.11  |  | N/mm <sup>2</sup>  | Note        |
|   | he enhance   |   |  |  |  | / 2 O I   |  |  | 5 .         |
|   |  | a sirear cap  | acity is iiiii   | iteu to o.   | oi cu & Siv                            | $/mm & K_1$   | $0.5 r_{cu}$   | 2 λ <sub>1</sub> 0.5t <sub>cu</sub> °  | -;          |
|   |  |   | deity is iiiii   | rica to o.   | 81 <sub>cu</sub> & 51V,                | /mm & K <sub>1</sub>  | 0.5F <sub>cu</sub>   .   | $2\lambda_1 0.5 f_{cu}$  | ,           |
|   | Case v <sub>2</sub> <  | 1.5d <sub>Vc</sub> /a <sub>v</sub>  |  |  |  | /mm & K <sub>1</sub>  | VALID  |  |             |
|   | Case v <sub>2</sub> <  | 1.5dv <sub>c</sub> /a <sub>v</sub>  | l / design liı   | nks requii   |  | /mm & K <sub>1</sub>  | <b>VALID</b> 66946   | $2\lambda_1 0.5 f_{cu}$ mm <sup>2</sup>  | NOT OK      |
|   | Case v <sub>2</sub> <  | 1.5d <sub>Vc</sub> /a <sub>v</sub>  | l / design liı   | nks requii   |  |   | VALID  |  |             |
|   | Case v <sub>2</sub> <  | $1.5 dv_c/a_v$ No nomina $v_c/a_v < v_2$  | / design lii<br><b>&lt; 1.6(1.5</b> 0  | nks requii<br>Iv <sub>c</sub> /a <sub>v</sub> )  | re( 6333                               | <   | VALID<br>66946<br>N/A  | mm <sup>2</sup>  |             |
|   | Case v <sub>2</sub> <  | $1.5 dv_c/a_v$ No nomina $v_c/a_v < v_2$  | l / design liı   | nks requii<br>Iv <sub>c</sub> /a <sub>v</sub> )  |  |   | <b>VALID</b> 66946   |  |             |
|   | Case v <sub>2</sub> <  | $1.5 dv_c/a_v$ No nominal $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$   | / design lin $< 1.6(1.50)$ $\geq \frac{(v - v_c)v}{0.95f_{y_c}}$   | nks requii   | re 6333<br>N/A                         | >=  | VALID<br>66946<br>N/A  | mm <sup>2</sup>  | NOT OK      |
|   | Case v <sub>2</sub> <  | 1.5 $dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$  | / design lin $< 1.6(1.5c)$ $\geq \frac{(v-v_c)v}{0.95f_{yy}}$ $> v \sin \alpha$  | nks requii   | N/A N/S Note                           | <   | VALID 66946 N/A N/A  N/A  ove refers t   | mm <sup>2</sup>  | NOT OK      |
|   | Case v <sub>2</sub> <  | 1.5 $dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5 $dv_c/a_v$ )   | / design lin<br>$< 1.6(1.50)$ $\geq \frac{(v - v_c)v}{0.95f_{yy}}$ $\leq v_2 < 2.0$  | nks requii   | N/A N/S Note                           | >=  | VALID<br>66946<br>N/A  | mm <sup>2</sup>  | NOT OK      |
|   | Case v <sub>2</sub> <  | 1.5 $dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5 $dv_c/a_v$ )   | / design lin<br>$< 1.6(1.50)$ $\geq \frac{(v - v_c)v}{0.95f_{yy}}$ $\leq v_2 < 2.0$  | nks requii   | N/A N/S Note                           | >=  | VALID 66946 N/A N/A  N/A  ove refers t N/A   | mm <sup>2</sup>  | NOT OK      |
|   | Case v <sub>2</sub> <  | 1.5 $dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5 $dv_c/a_v$ )   | / design lin $< 1.6(1.5c)$ $\geq \frac{(v-v_c)v}{0.95f_{yy}}$ $> v \sin \alpha$  | nks requii   | N/A 0.95f <sub>yv</sub> Note           | $\Rightarrow$   | VALID 66946 N/A N/A  N/A  ove refers t   | mm <sup>2</sup> mm <sup>2</sup> o 1.5dv c/a  | NOT OK      |
|   | Case 1.5d  | $1.5 	ext{d} 	ext{v}_{c}/	ext{a}_{v}$ No nominal $	ext{v}_{c}/	ext{a}_{v} < 	ext{v}_{2}$ $\Sigma A_{sv} 	ext{sin} lpha$ Note $\Sigma A_{s}$ $1.5 	ext{d} 	ext{v}_{c}/	ext{a}_{v}$ $\Sigma A_{sv} 	ext{sin} lpha$ Note $\Sigma A_{s}$  | $  / \text{ design lin}   $ $< 1.6(1.50)$ $\geq \frac{(v - v_c)v}{0.95 f_{yy}}$ $  > < v_2 < 2.0$ $\geq \frac{5(0.7v - 0.95)}{0.95}$ $  >   > < v_c < 2.0$   | nks required by $v_c/a_v$ $ud_v$ $0.4ud/0$ $(1.5dv_c/v_c)ud_v$   | N/A  N/A  N/A  N/A                     | $\Rightarrow$   | VALID 66946 N/A N/A N/A  N/A N/A   | mm <sup>2</sup> o 1.5dv c/a  mm <sup>2</sup>   | NOT OK      |
|   | Case 1.5d  | $1.5 dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ $1.5 dv_c/a_v)$  | $  / \text{ design lin}   $ $< 1.6(1.50)$ $\geq \frac{(v - v_c)v}{0.95 f_{yy}}$ $  > < v_2 < 2.0$ $\geq \frac{5(0.7v - 0.95)}{0.95}$ $  >   > < v_c < 2.0$   | nks required by $v_c/a_v$ $ud_v$ $0.4ud/0$ $0.5dv_c/v_c)ud_v$  | N/A  N/A  N/A  N/A                     | >= >= >= >= >= >=   | VALID 66946 N/A N/A N/A  N/A N/A   | mm <sup>2</sup> o 1.5dv c/a  mm <sup>2</sup>   | NOT OK      |
|   | Case 1.5d  Case 1.6(  Case v <sub>2</sub> >  | $1.5 dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ $1.5 dv_c/a_v$ ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5 $dv_c$  | /  design line   /  | nks requiii $v_c/a_v$ ) $ud$ $v$ $0.4ud/0$ $(1.5dv_c/v_e)ud$ $\overline{f_{yv}}$ $0.4ud/0$   | N/A  N/A  N/A  N/A                     | >= >= >= >= >= >=   | VALID 66946 N/A N/A N/A N/A N/A N/A N/A  | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link  | Case 1.5d  Case 1.6(  Case $v_2 > 0$   | 1.5 $dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5 $dv_c/a_v$ ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5 $dv_c$  | $  / \text{ design lin}   < 1.6(1.50)   < 1.6(1.50)   < 1.95 f_{yv}   < 0.95 f_{yv}   < 0.95 f_{yv}   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0.95   < 0$ | nks requiii $v_c/a_v$ ) $ud$ $v$ $0.4ud/0$ $(1.5dv_c/v_e)ud$ $\overline{f_{yv}}$ $0.4ud/0$   | N/A  N/A  N/A  N/A                     | >= >= >= >= >= >=   | VALID 66946 N/A N/A N/A N/A N/A N/A N/A  | mm <sup>2</sup> o 1.5dv c/a  mm <sup>2</sup>   | NOT OK      |
| Shear link  | Case 1.5d  Case 1.6(  Case v <sub>2</sub> > diameter for for first sh  | Note $\Sigma A_{\rm sv} \sin \alpha$ Poste $\Sigma A_{\rm sv} \sin \alpha$ Note $\Sigma A_{\rm sv} \sin \alpha$ Note $\Sigma A_{\rm sv} \sin \alpha$ Poste $\Sigma A_{\rm sv} \sin \alpha$ Poste $\Sigma A_{\rm sv} \sin \alpha$ Represented the second of the seco   | / design line  | nks requiii $v_c/a_v$ ) $v$ $0.4ud/0$ $0.5dv_c/v_c$ $v_c$ ) $0.4ud/0$ $0.4ud/0$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | >= >= >= >= >= >=   | VALID 66946 N/A N/A N/A N/A N/A N/A N/A  | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link No. of links   | Case 1.5d  Case 1.6(  Case v <sub>2</sub> >   diameter for first shometers with  | 1.5 $dv_c/a_v$ No nomina $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5 $dv_c/a_v$ ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5 $dv_c$ or first shear ear perimetrin first shear  | /  design lin   $  < 1.6(1.5d)  $ $  < 1$            | nks requiii $v_c/a_v$ ) $v$ $0.4ud/0$ $0.5dv_c/v_c$ $v_c$ ) $0.4ud/0$ $0.4ud/0$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | $\Rightarrow$ that $v_c$ above that $v_c$ above $\Rightarrow$   | VALID 66946 N/A N/A N/A N/A N/A N/A N/A 16 42  | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link No. of links No. of peri   | Case $v_2 <$ Case 1.5d  Case 1.6(  Case $v_2 >$ diameter for a for first showeters with $v_2 > v_2 > v_2 > v_2 > v_3 >$                      | 1.5dv <sub>c</sub> /a <sub>v</sub> No nominal $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5dv <sub>c</sub> /a <sub>v</sub> ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5dv <sub>c</sub> or first shear ear perimethin first shear ear ear perimethin first shear ear ear perimethin first shear ear ear ear ear ear ear ear ear ear   | $  / \text{ design lin}  $ $  < 1.6(1.50)  $ $  < 1.6(1.50)  $ $  < 1.6(1.50)  $ $  < 1.6(1.50)  $ $  < 0.95f_y  $ $  < v_z < 2.00  $ $  < 0.7v - 0.95  $ $  < v_z < 2.00  $ $  < 0.7v - 0.95  $ $  < v_z < 2.00  $ $  < 0.7v - 0.95  $ $  < v_z < 2.00  $ $  < 0.7v - 0.95  $ $  < v_z < 2.00  $ $  < v_z < $ | nks requiii $v_c/a_v$ ) $v$ $0.4ud/0$ $0.5dv_c/v_c$ $v_c$ ) $v_c$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | $\Rightarrow = $ $\Rightarrow that v_c abo$   | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A   | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link No. of link No. of peri No. of link  | Case $v_2 <$ Case 1.5d  Case 1.6(  Case $v_2 >$ diameter for a for first showever with $v_2 > v_3 > v_4 > v_5 > v_5 > v_6 > $                      | Note $\Sigma A_{sv} \sin \alpha$   | /  design line   < 1.6(1.5 design line   < 1.6(1.5 design line   < 1.6(1.5 design line   < 1.5 d   | nks requiii $v_c/a_v$ ) $v$ $0.4ud/0$ $0.5dv_c/v_c$ $v_c$ ) $v_c$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | $\Rightarrow = $ $\Rightarrow that v_c abo$ $\Rightarrow = $ $\Rightarrow that v_c abo$ $\Rightarrow 0 \qquad 0$  | VALID 66946 N/A N/A N/A N/A N/A N/A 16 42 1 0 0  | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link No. of link No. of peri No. of link No. of link No. of link  | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case v <sub>2</sub> >  diameter for first shipmeters with specific properties of the control of the c | Note $\Sigma A_s$ | /  design lin   $  < 1.6(1.5d)  $ $  < 1$            | nks requiii $v_c/a_v$ ) $v$ $0.4ud/0$ $0.5dv_c/v_c$ $v_c$ ) $v_c$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | >= that v <sub>c</sub> above the v <sub>c</sub> above the v <sub>c</sub> above that v <sub>c</sub> above the v <sub>c</sub> a  | VALID 66946 N/A N/A N/A N/A N/A N/A N/A 16 42 1 0 0 0  | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link No. of link  | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case v <sub>2</sub> >  diameter for so for first show the solution of the show the sh | 1.5dv <sub>c</sub> /a <sub>v</sub> No nominal $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5dv <sub>c</sub> /a <sub>v</sub> ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5dv <sub>c</sub> or first shear ear perimethin first shear ear ear perimethin first shear ear ear perimethin first shear ear ear ear ear ear ear ear ear ear   | /  design line   < 1.6(1.50)   < 1.6(1.50)   < 1.6(1.50)   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50   < 1.50               | nks requiii $v_c/a_v$ ) $v$ $0.4ud/0$ $0.5dv_c/v_c$ $v_c$ ) $v_c$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | $\Rightarrow = $ $\Rightarrow that v_c abo$ | VALID 66946 N/A N/A N/A N/A N/A N/A N/A 16 42 1 0 0 0 0  | mm <sup>2</sup> 0 1.5dv c/a  mm <sup>2</sup> 0 1.5dv c/a                             | NOT OK      |
| Shear link No. of links  | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case v <sub>2</sub> >  diameter for so for first shorters with so, n <sub>1,2,0/-5/-10,0</sub> , n <sub>1,2,-1/-6/-11</sub> , n <sub>1,2,-2/-7/-12</sub> , n <sub>1,2,-3/-8/-13</sub> , n <sub>1,2,-3/-8/-13</sub> , n <sub>1,2,-3/-8/-13</sub> , n <sub>1,2,-4/-9/-12</sub>  | 1.5 $dv_c/a_v$ No nominal $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5 $dv_c/a_v$ ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5 $dv_c$ or first shear ear perimetrin first shear ear ear perimetrin first shear ear ear perimetrin first shear ear ear ear ear ear ear ear ear ear   | / design line  | 0.4ud/0 (1.5dv <sub>c</sub> /  0.4ud/0 (1.5dv <sub>c</sub> /  0.4ud/0  f <sub>yv</sub> 0.4ud/0  r, h <sub>link,2/3</sub>   | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | $>=$ $that v_c abo$ $>=$ $that v_c abo$  | VALID  66946  N/A  N/A  N/A  N/A  N/A  N/A  16  42  1  0  0  0  0  0   | mm <sup>2</sup> 0 1.5dv <sub>c</sub> /a  mm <sup>2</sup> 0 1.5dv <sub>c</sub> /a  mm | NOT OK      |
| Shear link No. of links  | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case 1.6(  Case v <sub>2</sub> >  diameter for first ship in the  | 1.5dv <sub>c</sub> /a <sub>v</sub> No nominal $v_c/a_v < v_2$ $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 1.5dv <sub>c</sub> /a <sub>v</sub> ) $\Sigma A_{sv} \sin \alpha$ Note $\Sigma A_s$ 2.0(1.5dv <sub>c</sub> or first shear ear perimetrian first shear ear ear ear ear ear ear ear ear ear  | /  design line   < 1.6(1.5d)   < 1.6(1.5d)   < 1.6(1.5d)   < 1.6(1.5d)   < 1.5d   < 1.            | nks requiii $v_c/a_v$ $ud$ $ud/0$ $0.4ud/0$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | >= that v <sub>c</sub> above the   | VALID  66946  N/A  N/A  N/A  N/A  N/A  N/A  16  42  1  0  0  0  n the first s  | mm²  o 1.5dv c/a  mm²  o 1.5dv c/a  mm  chear perim                                  | NOT OK      |
| Shear link No. of link (No. of link) Note links (of zone 1.     | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case 1.6(  Case v <sub>2</sub> >  diameter for first ship in the  | Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Provide $\Sigma A_{sv}$ sin $\alpha$   | /  design line   < 1.6(1.5d)   < 1.6(1.5d)   < 1.6(1.5d)   < 1.6(1.5d)   < 1.5d   < 1.            | nks requiii $v_c/a_v$ $ud$ $ud/0$ $0.4ud/0$  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | >= that v <sub>c</sub> above the   | VALID  66946  N/A  N/A  N/A  N/A  N/A  N/A  16  42  1  0  0  0  n the first s  | mm²  o 1.5dv c/a  mm²  o 1.5dv c/a  mm  chear perim                                  | NOT OK      |
| Shear link No. of links (of zone 1. rebars, i.e.                                  | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case 1.6(  Case v <sub>2</sub> >  diameter for significant shape of the | Note $\Sigma A_{sv}$ sin $\alpha$ Positive $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Positive $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Positive $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv}$ sin $\alpha$ Positive $\Sigma A_{sv}$ sin $\alpha$ Note $\Sigma A_{sv$   | / design line  | nks required in the second of  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | $\Rightarrow = $ $\Rightarrow that v_c about that v_c about the conditions of the con$  | VALID  66946  N/A  N/A  N/A  N/A  N/A  N/A  16  42  1  0  0  0  n the first stat least 1 in the stat 1 in the stat 1 in the stat 1 in the stat 2 in the stat 1 in the stat 2 in the stat 1 in the stat 1 in the stat 1 in the stat 1 in the stat 2 in the stat 1 in the stat 2 in the stat 1 in the stat 2 in the stat | mm²  o 1.5dv c/a  mm²  o 1.5dv c/a  mm  chear perim                                  | NOT OK      |
| Shear link No. of links (of zone 1) rebars, i.e. Effective a                                   | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case 1.6(  Case v <sub>2</sub> >  diameter for first show the short of  | Note $\Sigma A_s$ | / design line  | nks required $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v$ | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | >= that v <sub>c</sub> above the v <sub>c</sub> above the v <sub>c</sub> above that v <sub>c</sub> above the v <sub>c</sub> above t  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A   | mm²  o 1.5dv c/a  mm²  o 1.5dv c/a  mm  shear perim layer of tens  mm²               | NOT OK      |
| Shear link No. of link: Vote links (of zone 1. rebars, i.e. Effective a Note only | Case v <sub>2</sub> <  Case 1.5d  Case 1.6(  Case 1.6(  Case v <sub>2</sub> >  diameter for first shorters with specific s | Note $\Sigma A_s$ | / design line     $< 1.6(1.5d)$   $< 1.6(1.$       | nks required $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ and $v_c/a_v$ are $v_c/a_v$ are $v_c/a_v$ and $v$ | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A | >= that v <sub>c</sub> above the v <sub>c</sub> above the v <sub>c</sub> above that v <sub>c</sub> above the v <sub>c</sub> above t  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A   | mm²  o 1.5dv c/a  mm²  o 1.5dv c/a  mm  shear perim layer of tens  mm²               | NOT OK      |

| CON                | SULTING           | Engineerin              | a Calculatio            | n Sheet              |                       | Job No.                                  | Sheet No.      |                   | Rev.  |
|--------------------|-------------------|-------------------------|-------------------------|----------------------|-----------------------|--|----------------|-------------------|-------|
|                    | NEERS             |                         |                         | II SHEEL             |                       | jXXX                                     | 1              | .7                |       |
| ENGI               |                   | Consumg                 | Liigiiiceis             |                      |                       | JAAA                                     |                | . /               |       |
|                    |                   |                         |                         |                      |                       | Member/Location                          |                |                   |       |
| Job Title          | Structure,        | Member De               | sign - Geot             | echnics Pile         | Cap v2021             | Drg.                                     |                |                   |       |
| Structure,         | Member De         |                         |                         |                      | -                     |  | Date <b>21</b> | /11/2021          | hd.   |
| ŕ                  |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
| Second S           | hear Perim        | L                       |                         |                      |                       |  |                |                   |       |
| Second 5           | lear Fermi        |                         |                         |                      |                       |  |                |                   |       |
| Shear force        | 20% D inc         | ide face of             | nile from c             | olumn haca           | face V <sub>-</sub> - | F <sub>col,v,uls</sub> - F <sub>N,</sub> | N/A            | LN                |       |
| Silear forc        | 20 /0 10 1113     |                         |                         |                      |                       |  |                | KIN               |       |
|                    | 10/60/110         | F,                      |                         |                      | V/A                   | $1.M(F_P)$                               | V/A            | Land              |       |
|                    | 1P/6P/11P:        |                         |                         | N/A                  |                       |  |                | kN                |       |
| <b>-</b>           | 2P/7P/12P:        |                         |                         |                      | N/A                   | $2.M(F_P)$                               |                | kN                |       |
|                    | 3P/8P/13P:        |                         | -                       | N/A                  |                       | 3.M(F <sub>P</sub> )                     |                | kN                |       |
|                    | <i>1P/9P/14P:</i> | N/A                     |                         | N/A                  |                       | 2.M(F <sub>P</sub> )                     |                | kN                |       |
| 51                 | P/10P/15P:        | N/A                     | N/A                     | 2.M(F <sub>P</sub> ) |                       | $3.M(F_P)$                               |                | kN                |       |
|                    | Generic:          |                         |                         |                      | us                    | ser-defined                              | N/A            | kN                |       |
|                    | ) above ref       |                         |                         |                      |                       |  |                |                   |       |
| Effective s        | hear force,       | $V_{eff,3} = 1.00$      | ) . V <sub>3</sub> (mom | ent effects          | ignored)              |  | N/A            | kN                |       |
| Column ba          | se second s       | hear perim              | eter, u <sub>3</sub>    |                      |                       |  | N/A            | mm                |       |
| Internal co        | lumn:             |                         |                         |                      | Recta                 | ngular or Ci                             | ircular        |                   |       |
|                    | 1P:               |                         |                         |                      |                       | N/A                                      | N/A            | mm                |       |
|                    | 2P:               |                         |                         |                      |                       | N/A                                      | N/A            | mm                |       |
|                    | 3P:               |                         |                         |                      |                       | N/A                                      |                | mm                |       |
|                    | 4P:               |                         |                         |                      |                       | N/A                                      |                | mm                |       |
|                    | 5P:               |                         |                         |                      |                       | N/A                                      |                | mm                |       |
|                    | 6P:               |                         |                         |                      |                       | N/A                                      |                | mm                |       |
|                    | 7P:               |                         |                         |                      |                       | N/A                                      |                | mm                |       |
|                    | 8P:               |                         |                         |                      |                       | N/A                                      |                | mm                |       |
|                    | 9P:               |                         |                         |                      |                       | N/A                                      | -              |                   |       |
|                    |                   | r/1 0 <sup>2</sup> 10 r | 2 \ 0.5 C D \           | 2 (0 20)1 .          | 2 [2 00 0             | +2.(0.2D)]                               |                | mm                |       |
|                    |                   |                         |                         |                      |                       |  |                | mm                |       |
|                    |                   |                         |                         |                      |                       | +2.(0.2D)]                               |                | mm                |       |
|                    | 12P:              |                         |                         |                      |                       | +2.(0.2D)]                               |                | mm                |       |
|                    | 13P:              |                         |                         |                      |                       | +2.(0.2D)]                               |                | mm                |       |
|                    | 14P:              |                         |                         |                      |                       | +2.(0.2D)]                               |                | mm                |       |
|                    | 15P:              | 2                       | 2.[2.0S-D+.             | 2.(0.2D)] +          | 1                     | +2.(0.2D)]                               |                | mm                |       |
|                    | Generic:          |                         |                         |                      |                       | ser-defined                              | •              | mm                |       |
|                    |                   |                         |                         |                      |                       | side face of                             |                |                   |       |
|                    | ss at colum       |                         |                         |                      |                       |  |                | N/mm <sup>2</sup> |       |
|                    |                   |                         |                         |                      |                       | omparing a                               |                |                   |       |
| 1.5d of the        | "support"         | as clause 3.            | 7.7.4 BS81              | 10 employe           | ed, that of o         | clause 3.7.7                             | 7.6 BS8110     | not applica       | ble;) |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |
| 2.4.5.63           |                   |                         |                         |                      |                       |  |                |                   |       |
| 3. <i>4</i> .5.9); |                   |                         |                         |                      |                       |  |                |                   |       |
|                    |                   |                         |                         |                      |                       |  |                |                   |       |

| CON                        | SULTING                       | Engineering                     | c Calculatio                          | n Sheet                           |                       |          | Job No    | ).         | Sheet              | No.    |  | Rev.   |
|----------------------------|-------------------------------|---------------------------------|---------------------------------------|-----------------------------------|-----------------------|----------|-----------|------------|--------------------|--------|--|--|
|                            | NEERS                         |                                 |                                       | ii Silece                         |                       |          | jXX       | Χ          |                    | 1      | .8   |  |
| -                          | 1                             | _                               |                                       |                                   | 1                     |          | Member/Lo |            |                    |        |  |  |
| 7 - I- T'41 -              | Characterine                  | Marahar Da                      | ainn Caab                             | b: D                              | ila Car               | 2021     | Drg.      | CallOII    |                    |        |  |  |
| Job Title                  |                               | Member De                       |                                       |                                   | пе Сар                | ) V2U21  | Made by   | <b>Y</b> Y | Date               |        | /11 /2021  | hd   |
| Structure,                 | Member De                     | sign - Geot                     | ecnnics Pile                          | Сар                               |                       |          | Wade by   | XX         | Date               | 21     | /11/2021 <sup>0</sup>                            | Ind.   |
|                            |                               |                                 |                                       |                                   |                       |          |           |            |                    |        |  |  |
|                            |                               |                                 |                                       |                                   |                       |          |           |            |                    |        |  |  |
| Distance 2                 | ⊥<br>0% D inside              | e face of pile                  | e from colur                          | nn base                           | <br>face. a           | , (≥ 0.  | 375d)     |            |                    | N/A    | mm   | 6.2.3(8) E0                                    |
|                            | 1P:                           |                                 |                                       |                                   |                       | V ( -    | 1         | N/A        |                    |        | mm   | Not Incl.                                      |
|                            | 2P:                           |                                 |                                       |                                   |                       |          |           |            | N/A                |        | mm   |  |
|                            | 3P:                           |                                 |                                       |                                   |                       |          |           | N/A        | N/A                |        | mm   |  |
|                            | 4P:                           |                                 |                                       |                                   |                       |          |           | N/A        | N/A                |        | mm   |  |
|                            | 5P:                           |                                 |                                       |                                   |                       |          |           | N/A        | N/A                |        | mm   |  |
|                            | 6P:                           |                                 |                                       |                                   |                       |          |           | N/A        | N/A                |        | mm   |  |
|                            | 7P:                           |                                 |                                       |                                   |                       |          | +         | N/A        | -                  |        | mm   |  |
|                            | 8P:                           |                                 |                                       |                                   |                       |          |           |            | N/A                |        | mm   |  |
|                            | 9P:                           |                                 |                                       |                                   |                       |          | 1         |            | N/A                |        | mm   |  |
|                            | 10P:                          |                                 | E [(2.0S-D-                           |                                   |                       |          | •         |            | -                  |        | mm   |  |
|                            | 11P:                          |                                 | E [(2.0S-D-                           |                                   |                       |          | -         |            |                    |        | mm   |  |
|                            | 12P:                          |                                 | E [(2.0S-D-                           |                                   |                       |          |           |            |                    |        | mm   |  |
|                            | 13P:                          |                                 | E [(2.0S-D-                           |                                   |                       |          |           |            |                    |        | mm   |  |
|                            | 14P:<br>15P:                  |                                 | E [(2.0S-D-                           | -                                 |                       |          | -         |            |                    |        | mm   |  |
|                            | Generic:                      | AV                              | E [(2.0S-D-                           | · <i>U)</i> /2+0.2                | 2 <i>D</i> , (4.      |          | ser-defi  |            |                    |        | mm   |  |
| Note h and                 | h above ar                    | re renlaced                     | hy D for cir                          | cular coli                        | ımns                  |          |           |            |                    | olumi  |  | <u> </u>                                       |
|                            | ervatively, t                 |                                 |                                       |                                   |                       |          |           |            |                    |        |  | ',<br>   |
|                            | a <sub>v</sub> is limite      |                                 |                                       |                                   |                       |          |           |            |                    |        |  | //a , =1;)                                     |
|                            | ancement, a                   |                                 | N/A                                   | mm                                |                       | <=       | 1.5d      |            | N/                 |        | mm   | N/A  |
|                            | shear capac                   |                                 |                                       |                                   |                       |          | x N/A     |            |                    |        | N/mm <sup>2</sup>                                | ,  |
| Enhanced                   | shear capac                   | ity, 1.5dv <sub>c</sub> /       | a <sub>v</sub> (< 0.8f <sub>cu</sub>  | <sup>0.5</sup> & 5N/              | mm²)                  |          | x N/A     |            |                    |        | N/mm <sup>2</sup>                                | Note   |
|                            | the enhance                   |                                 |                                       |                                   |                       | & 5N/    | /mm² 8    | $k k_1$    | 0.5f <sub>cu</sub> | 0.5    | 2 λ <sub>1</sub> 0.5f <sub>cu</sub> <sup>0</sup> | .5 <b>,</b>                                    |
|                            |                               |                                 |                                       |                                   |                       |          |           |            |                    |        |  |  |
|                            | Case $v_3$ <                  |                                 |                                       |                                   |                       |          |           |            | N/                 |        | _  |  |
|                            |                               | No nomina                       |                                       |                                   | re                    | N/A      | >=        | =          | N/                 |        | mm <sup>2</sup>                                  | N/A  |
|                            | Case 1.5d                     | $v_c/a_v < v_3$                 | < 1.6(1.50                            | lν <sub>c</sub> /a <sub>ν</sub> ) |                       |          |           |            | N/                 | Ά      |  |  |
|                            |                               | F.4 -i                          | $(v-v_c)v$                            | ıd                                |                       | N / A    |           |            | NI.                | , A    | 2  |  |
|                            |                               | $\angle A_{\rm sv} \sin \alpha$ | $\geq \frac{(v - v_c)v}{0.95 f_{yy}}$ | , .                               |                       | N/A      | >=        | -          | N/                 | А      | mm <sup>2</sup>                                  |  |
|                            |                               | Note $\Sigma A$                 | <sub>sv</sub> sinα >                  | 0.4 <i>ud</i> /0                  | 05€                   | Note     | that v    | aho        | nve rei            | ferc t | <br>o 1.5dv <sub>c</sub> /a                      | <u>,                                      </u> |
|                            | Case 1.6(                     | $1.5 dv_c/a_v$                  |                                       |                                   |                       | Note     |           | abc        | N/                 |        | 0 1.30V <sub>c</sub> /a                          | V /  |
|                            | Cu3C 1.0(                     |                                 |                                       |                                   | <u>αν,</u>            |          |           |            | 147                |        |  |  |
|                            |                               | $\Sigma A_{}\sin\alpha$         | $\geq \frac{5(0.7v - 0.95)}{0.95}$    | · v <sub>e</sub> )ud              |                       | N/A      | >=        | :          | N/                 | Ά      | mm <sup>2</sup>                                  |  |
|                            |                               | - sv                            | 0.95                                  | $f_{yv}$                          |                       | ,        |           |            | ,                  |        |  |  |
|                            |                               | Note $\Sigma A$                 | <sub>w</sub> sinα >                   | 0.4ud/0                           | ).95f <sub>vv</sub> . | Note     | that v    | abo        | ove rei            | fers t | o 1.5dv <sub>c</sub> /a                          | v <i>i</i>                                     |
|                            | Case v <sub>3</sub> >         | 2.0(1.5dv                       |                                       |                                   | 7,71                  |          |           |            | N/                 |        |  |  |
|                            |                               |                                 |                                       |                                   |                       |          |           |            |                    |        |  |  |
| Shear link                 | diameter fo                   | r second sh                     | ear perime                            | ter, $\phi_{link,2}$              | /3                    |          |           |            |                    | N/A    | mm   |  |
| No. of link                | s for second                  | l shear perir                   | meter, n <sub>I,3</sub>               |                                   |                       |          |           |            |                    | N/A    |  |  |
| No. of peri                | meters with                   | in second s                     | hear perim                            | eter, n <sub>p,3</sub>            | (>= 2                 | )        |           |            |                    | N/A    |  |  |
|                            | s, n <sub>I,3,0/-5/-10/</sub> |                                 | N/A                                   | N,                                | _                     | N/A      | <b>+</b>  | N/A        |                    | N/A    |  |  |
|                            | s, n <sub>I,3,-1/-6/-11</sub> |                                 | N/A                                   | N,                                | _                     | N/A      |           | N/A        |                    | N/A    |  |  |
|                            | s, n <sub>I,3,-2/-7/-12</sub> |                                 | N/A                                   | N,                                | _                     | N/A      | -         | N/A        |                    | N/A    |  |  |
|                            | s, n <sub>I,3,-3/-8/-13</sub> |                                 | N/A                                   | -                                 | /A                    | N/A      | -         | N/A        |                    | N/A    |  |  |
|                            | s, n <sub>1,3,-4/-9/-14</sub> |                                 | N/A                                   | N,                                |                       | N/A      |           | N/A        | n +h -             | N/A    | d ab   | ulmonte::                                      |
|                            | are to be di                  |                                 |                                       |                                   | -                     |          |           |            |                    |        |  |  |
| ,                          | .5d) with a p                 |                                 | s ur ≤ 1.50                           | ı. LIΠKS Sı                       | iouia E               | e anch   | iorea ro  | und        | at iea             | St 1 l | ayer or ten:                                     | 51011  |
| rebars, i.e<br>Effective a | . DULLUITI FEL                | Jais,                           |                                       |                                   |                       |          |           |            |                    |        |  |  |
| Luccuve d                  |                               |                                 | s for second                          | d shear n                         | orimat                | or ۱۱ کو | 5Δ        |            |                    | N / N  | mm <sup>2</sup>                                  |  |
|                            | rea provide                   | d by all link                   |                                       |                                   |                       |          |           |            | racks /            |        | mm <sup>2</sup>                                  | BS8110 cl                                      |
| Note only                  | rea provide<br>links within   | d by all link<br>the central    | 0.75a <sub>v</sub> effe               |                                   |                       |          |           |            |                    | EC2    |  |  |
| Note only                  | rea provide                   | d by all link<br>the central    | 0.75a <sub>v</sub> effe               |                                   |                       |          |           |            |                    |        |  | BS8110 cl.                                     |

| CON                  | ICI II TINC                                       |                          | a Calaulatia                           | n Chaat  |                       | Job No.                   | Sheet No.  |                    | Rev.                  |
|----------------------|---|--------------------------|--|--|-----------------------|---------------------------|------------|--------------------|-----------------------|
|                      | SULTING<br>NEERS                                  | _                        | _                                      | n Sneet  |                       | jXXX                      | 1          | L9                 |                       |
|                      |   |                          | <u> </u>                               |  |                       | Member/Location           |            |                    |                       |
| loh Titlo            | Ctructuro   | Mombor Do                | <br>:sign - Geot                       | ochnice Dilo   | Cap v2021             |                           |            |                    |                       |
| Job Title            | Member De   |                          |  |  | Cap v2021             | Made by XX                | Date 21    | /11/2021           | ∎ <b>C</b> hd.        |
| Structure,           | Member De   | sign - Geor              | ecillics File                          | Сар  |                       | · ^^                      | 21         |                    |                       |
| Pile Cap S           | Shear Reint                                       | forcement                | Design (S                              | hallow Bea   | am Theory             | ' <b>)</b>                |            |                    | cl.3.11.4.4<br>BS8110 |
| ULS shear            | force for be                                      | ending in pla            | ne of width                            | n, V <sub>x</sub>                                    |                       |                           | N/A        | kN                 |                       |
| ULS shear            | force for be                                      | ending in pla            | ane of lengt                           | :h, V <sub>y</sub>                                   |                       |                           | N/A        | kN                 |                       |
|                      |   |                          | V                                      | x  |                       | V                         | y          |                    |                       |
|                      | 1P:   |                          | N/A                                    | N/A  |                       | N/A                       | N/A        | kN                 |                       |
|                      | 2P:   |                          | N/A                                    | N/A  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 3P:   |                          | $K. \Sigma F_{pile,v,i}$               |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 4P:   |                          | $K. \Sigma F_{pile,v,i}$               | N/A  |                       | $K. \Sigma F_{pile,v,i}$  | N/A        | kN                 |                       |
|                      | 5P:   |                          | $K. \Sigma F_{pile,v,i}$               |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 6P:   |                          | $K. \Sigma F_{pile,v,i}$               | N/A  |                       | $K. \Sigma F_{pile,v,i}$  | N/A        | kN                 |                       |
|                      | 7P:   |                          | $K. \Sigma F_{pile,v,i}$               |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 8P:   |                          | $K. \Sigma F_{pile,v,i}$               |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 | 1                     |
|                      | 9P:   |                          | K. ΣF <sub>pile,v,i</sub>              |  |                       | K. ΣF <sub>pile,v,i</sub> |            | kN                 |                       |
|                      | 10P:  |                          | K. ΣF <sub>pile,v,i</sub>              |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 11P:  |                          | K. ΣF <sub>pile,v,i</sub>              |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 12P:  |                          | $K. \Sigma F_{pile,v,i}$               |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 13P:  |                          | K. ΣF <sub>pile,v,i</sub>              |  |                       | $K. \Sigma F_{pile,v,i}$  |            | kN                 |                       |
|                      | 14P:  |                          | K. ΣF <sub>pile,v,i</sub>              |  |                       | K. ΣF <sub>pile,v,i</sub> |            | kN                 |                       |
|                      | 15P:  |                          | K. ΣF <sub>pile,v,i</sub>              | i e  |                       | $K. \Sigma F_{pile,v,i}$  | i e        | kN                 |                       |
|                      | Generic:  | us                       | ser-defined                            | N/A  | us                    | ser-defined               | N/A        | kN                 |                       |
|                      | C   | 6 . 111                  |  | \  |                       |                           | 21.70      | 1.517              |                       |
|                      | force in pla                                      |                          |  |  |                       |                           |            | kN/m               |                       |
|                      | force in pla                                      |                          |  |  |                       |                           |            | kN/m               |                       |
|                      | force in pla                                      |                          |  |  |                       |                           |            | kN/m               |                       |
| ULS snear            | force in pla                                      | ne or lengti             | n per metre                            | , S <sub>c,y</sub> .V <sub>y</sub> /B <sub>cal</sub> | )<br>                 |                           | N/A        | kN/m               |                       |
| III-inanaka al       |   |                          | (a. ) / /l. )                          | //1000 J )   | ( , 0 06 0.5          | 0 FN/2                    | NI / A     | N. / 2             |                       |
|                      | near stress                                       |                          |  | /(1000.a <sub>x</sub> )                              | (< 0.81 <sub>cu</sub> |                           |            | N/mm <sup>2</sup>  | NI / A                |
|                      |   |                          |  | \(\1000 4 \  | ( o of 0.5            | 9. EN/mm <sup>2</sup>     | N/A        | N/mm <sup>2</sup>  | N/A                   |
|                      | near stress<br>near stress                        |                          |  | //(1000.a <sub>y</sub> )                             | (< 0.61 <sub>cu</sub> |                           | N/A<br>N/A |                    | N/A                   |
| Jillillate Si        | lear stress                                       | iii y utilisati          | OH                                     |  |                       |                           | N/A        |                    | N/A                   |
| Design she           | l<br>ear stress in                                | v v. –(s                 | \/ /I \//1                             | 1000 Y )   |                       |                           | N/A        | N/mm <sup>2</sup>  |                       |
|                      | ear stress in                                     |                          |  |  |                       |                           |            | N/mm <sup>2</sup>  |                       |
|                      | acity enhar                                       |                          |  |  | nort" and c           | omnaring a                |            |                    | <u> </u>              |
|                      | support" as                                       |                          |  | -  |                       |                           |            |                    |                       |
|                      | nsile steel re                                    |                          |  |  |                       |                           | 1          | mm²/m              |                       |
|                      | A <sub>s,prov,b,x</sub> /(10                      |                          | Provided                               | x per me   | <b>σ, τς,ριον,</b> υ  | ,x                        | 0.37       | · · ·              |                       |
| Coefficient          | , (400/d <sub>x</sub> )                           | $\frac{1/4}{>0.67}$ nc   | links. (400                            | $1/(d_{11})^{1/4} > 1$                               | .00 with lin          | ks                        | 0.67       | +                  | T.3.8                 |
|                      | <del>/ (400/αχ/</del><br>9/1.25)(ρ <sub>w,x</sub> |                          |  |  |                       |                           |            | N/mm <sup>2</sup>  | BS8110                |
|                      | nsile steel re                                    |                          |  |  |                       |                           |            | mm <sup>2</sup> /m |                       |
|                      | $A_{s,prov,b,y}/(10$                              |                          | - p. caca                              | , , , , , , , , , , ,                                | , · ·s,prov,D         | ,,,                       | 0.42       | · · ·              |                       |
| Coefficient          | $(400/d_y)^{1}$                                   | 1/4 >0.67 nc             | links. (400                            | $0/d_{y}$ ) $1/4 > 1$                                | .00 with lin          | ks                        | 0.67       |                    | T.3.8                 |
| $V_{\rm CV} = (0.7)$ | 9/1.25)(ρ <sub>w,y</sub>                          | $f_{\rm cu}/25)^{1/3}(4$ | 00/d <sub>v</sub> ) <sup>1/4</sup> : 0 | , - y) - 1.<br>w v<3: f<4                            | 10; (400/d            | ) <sup>1/4</sup> >(0.67 d | 0.37       | N/mm <sup>2</sup>  | BS8110                |
| c,y (0.7             | - , - · ) (PW,y                                   | cu/ / ( 1                | ,y, , p                                | vv,y = 1 'Cu \                                       | -, (                  | , (3.0)                   |            | ,                  | 1                     |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    |                       |
| 3.4.5.9);            |   |                          |  |  |                       |                           |            |                    |                       |
| - //                 |   |                          |  |  |                       |                           |            |                    |                       |
|                      |   |                          |  |  |                       |                           |            |                    | 1                     |
|                      | Ĺ   | I                        | I                                      | I  | l                     | I .                       |            | 1                  |                       |

| CON  | NSULTING   | Enginoorin   | a Calculatio  | n Chaot   |   | Job No.  | Sheet No.   |   | Rev.                                     |
|--|--|--|---|---|---|--|---|---|--|
|  | INEERS   | _  | _   | n Sneet   |   | jXXX   | 5   | 20  |  |
|  |  |  | , , , , , , , , , , , , , , , , , , ,   |   | I   | _  |   |   |  |
|  |  |  |   |   | 0 2021  | Member/Location  |   |   |  |
| ob Title   |  |  |   | echnics Pile  | Cap v2021   |  | Data D4   | /// /2024   | dhd                                      |
| tructure,  | , Member De  | esign - Geot   | echnics Pile  | е Сар   |   | Made by XX   | Dale <b>21</b>  | /11/2021  | ond.                                     |
|  |  |  |   |   |   |  |   |   |  |
|  |  |  |   |   |   |  |   |   |  |
| Distance 7   | _ <br>20% D inside   | face of nil  | e from colu   | mn hase fac   |   | 5d )   | N/A   | mm  | 6.2.3(8)                                 |
|  | 20% D inside   |  |   |   |   |  | N/A   |   | 6.2.3(8)                                 |
| ristarree 2  | I I I I I I I I I I I I I I I I I I I  | lace of pin  |   | v,x   |   | ,  | v,y   |   | Not Inc                                  |
|  | 1P:  |  |   | N/A   |   | N/A  |   | mm  | Not Inc                                  |
|  | 2P:  |  |   | N/A   | (1.0S-D-  | h)/2+0.2D  |   | mm  |  |
|  | 3P:  | (1.0S-D-   | b)/2+0.2D   | -   | -   | h)/2+0.2D  |   | mm  |  |
|  | 4P:  | -  | b)/2+0.2D   |   | -   | h)/2+0.2D  |   | mm  |  |
|  | 5P:  |  | b)/2+0.2D   | +   | •   |  | -   | mm  |  |
|  | 6P:  | f  | b)/2+0.2D   | -   |   | h)/2+0.2D  | -   | mm  |  |
|  | 7P:  | -  | b)/2+0.2D   |   | (2.0S-D-  | h)/2+0.2D  | N/A   | mm  |  |
|  | 8P:  |  | b)/2+0.2D   |   | <u> </u>  | h)/2+0.2D  | -   | mm  |  |
|  | 9P:  |  | b)/2+0.2D   | +   | -   | h)/2+0.2D  |   | mm  |  |
|  | 10P:   | -  | b)/2+0.2D   |   | -   | h)/2+0.2D  |   | mm  |  |
|  | 11P:   | -  | b)/2+0.2D   |   | -   | h)/2+0.2D  |   | mm  |  |
|  | 12P:   | (2.0S-D-   | b)/2+0.2D   | N/A   | (1.0S-D-  | h)/2+0.2D  | N/A   | mm  |  |
|  | 13P:   | (2.0S-D-   | b)/2+0.2D   | N/A   | (2.0S-D-  | h)/2+0.2D  | N/A   | mm  |  |
|  | 14P:   | (2.0S-D-   | b)/2+0.2D   | N/A   | (1.0S-D-  | h)/2+0.2D  | N/A   | mm  |  |
|  | 15P:   | (2.0S-D-   | b)/2+0.2D   | N/A   | (2.0S-D-  | h)/2+0.2D  | N/A   | mm  |  |
|  | Generic:   | us   | ser-defined   | N/A   | us  | er-defined   | N/A   | mm  |  |
| lote b and   | d h above ar   | re replaced  | by D for cir  | cular colum   | nns, here D   | referring to   | the colum   | n dimensioi   | n;                                       |
|  | ervatively, t  |  |   | relevant dir  | ection is tal   | ken for the  | calculation   | of a v:   |  |
|  | t a 🗸 is limite  | d to 2d ha   |   |   |   |  |   |   |  |
|  | · · · · · · · · · · · · · · · · · · ·  |  | yond which  | no shear c  | apacity enh   | ancement i   |   |   | =1;)                                     |
|  | nancement, a   | a <sub>v,x</sub> =   | N/A   | no shear c  | apacity enh<br><=   |  |   |   | =1;)<br>N/A                              |
| Shear enh  | nancement, a   | a <sub>v,x</sub> =<br>a <sub>v,y</sub> =   | N/A<br>N/A  |   | · · · ·   | ancement i   | s exhibited,<br>N/A<br>N/A  | mm<br>mm  |  |
| Shear enh<br>Enhanced  | nancement, a<br>shear capac  | a <sub>v,x</sub> =<br>a <sub>v,y</sub> =<br>city in x, 2d  | N/A<br>N/A<br><sub>x</sub> V <sub>c,x</sub> /a <sub>v,x</sub>   | mm  | · · · ·   | ancement i. $2d_{x} = $ $2d_{y} = $ $x N/A$  | s exhibited,<br>N/A<br>N/A<br><b>N/A</b>  | mm<br>mm<br>N/mm <sup>2</sup>   | N/A                                      |
| Shear enh<br>Inhanced<br>Inhanced  | nancement, a<br>shear capac<br>shear capac   | a <sub>v,x</sub> =<br>a <sub>v,y</sub> =<br>city in x, 2d<br>city in y, 2d   | N/A<br>N/A<br>xv <sub>c,x</sub> /a <sub>v,x</sub><br>yv <sub>c,y</sub> /a <sub>v,y</sub>  | mm<br>mm  | <=<br><=  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  | s exhibited<br>N/A<br>N/A<br>N/A<br>N/A   | mm<br>mm<br>M/mm <sup>2</sup><br>N/mm <sup>2</sup>  | N/A<br>N/A                               |
| Shear enh<br>Inhanced<br>Inhanced<br>Inhanced  | nancement, a<br>shear capac<br>shear capac<br>shear capac  | $a_{v,x} =$ $a_{v,y} =$ city in x, 2d city in y, 2d city in x, [(2)  | $N/A$ $N/A$ $xv_{c,x}/a_{v,x}$ $yv_{c,y}/a_{v,y}$ $v_{c,x}/a_{v,x}$   | mm<br>mm<br>L <sub>cap(3.0D)</sub> +V <sub>c</sub>  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(:</sub>  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A   | N/A N/A N/A N/A N/A N/A   | mm<br>mm<br>N/mm <sup>2</sup><br>N/mm <sup>2</sup><br>N/mm <sup>2</sup>                                 | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced  | nancement, a<br>shear capac<br>shear capac<br>shear capac<br>shear capac   | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in x, [(2   | N/A<br>N/A<br>xV <sub>c,x</sub> /a <sub>v,x</sub><br>yV <sub>c,y</sub> /a <sub>v,y</sub><br>2d <sub>x</sub> V <sub>c,x</sub> /a <sub>v,x</sub> ).<br>2d <sub>y</sub> V <sub>c,y</sub> /a <sub>v,y</sub> ).  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub>   | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(1)</sub>   | ancement i. $2d_{x} = $ $2d_{y} = $ $x N/A$ $x N/A$ $x N/A$ $x N/A$ $x N/A$  | N/A N/A N/A N/A N/A N/A N/A   | mm mm N/mm² N/mm² N/mm² N/mm²   | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced  | nancement, a<br>shear capac<br>shear capac<br>shear capac  | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in x, [(2   | N/A<br>N/A<br>xV <sub>c,x</sub> /a <sub>v,x</sub><br>yV <sub>c,y</sub> /a <sub>v,y</sub><br>2d <sub>x</sub> V <sub>c,x</sub> /a <sub>v,x</sub> ).<br>2d <sub>y</sub> V <sub>c,y</sub> /a <sub>v,y</sub> ).  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub>   | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(1)</sub>   | ancement i. $2d_{x} = $ $2d_{y} = $ $x N/A$ $x N/A$ $x N/A$ $x N/A$ $x N/A$  | N/A N/A N/A N/A N/A N/A N/A   | mm mm N/mm² N/mm² N/mm² N/mm²   | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Note that   | shear capac<br>shear capac<br>shear capac<br>shear capac<br>shear capac<br>enhanced sh   | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in x, [(2 city in y, [(2  | N/A N/A N/A xvc,x/av,x yvc,y/av,y 2dxvc,x/av,x). 2dyvc,y/av,y). ty is reduce  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(1)</sub>   | ancement i. $2d_{x} = $ $2d_{y} = $ $x N/A$ $x N/A$ $x N/A$ $x N/A$ $x N/A$  | N/A N/A N/A N/A N/A N/A N/A   | mm mm N/mm² N/mm² N/mm² N/mm²   | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Note that   | nancement, a<br>shear capac<br>shear capac<br>shear capac<br>shear capac   | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in x, [(2 city in y, [(2  | N/A N/A N/A xvc,x/av,x yvc,y/av,y 2dxvc,x/av,x). 2dyvc,y/av,y). ty is reduce  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(1)</sub>   | ancement i. $2d_{x} = $ $2d_{y} = $ $x N/A$ $x N/A$ $x N/A$ $x N/A$ $x N/A$  | N/A N/A N/A N/A N/A N/A N/A   | mm mm N/mm² N/mm² N/mm² N/mm²   | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Vote that   | shear capace shear capace shear capace shear capace enhanced shear capace esistance for the shear capace shear capace enhanced shear capace shear capace enhanced shear capace enhanced shear capace shear capace enhanced shear enhanced enhanced enhanced enhanced enhanced enhanced shear enhanced                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in x, [(2 city in y, [(2 city in y, [(2 city in bear capacid bear capacid   | N/A N/A N/A xv <sub>c,x</sub> /a <sub>v,x</sub> yv <sub>c,y</sub> /a <sub>v,y</sub> 2d <sub>x</sub> v <sub>c,x</sub> /a <sub>v,x</sub> ). 2d <sub>y</sub> v <sub>c,y</sub> /a <sub>v,y</sub> ). ty is reduce in Plane o   | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(3</sub><br>,y.(B <sub>cap</sub> -B <sub>cap</sub><br>et for effecti  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ye breadth  | s exhibited, N/A N/A N/A N/A N/A N/A (to cl.3.11                                    | mm mm N/mm² N/mm² N/mm² N/mm²   | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Note that   | shear capace shear capace shear capace shear capace enhanced shear capace esistance for the shear capace shear capace enhanced shear capace shear capace enhanced shear capace enhanced shear capace shear capace enhanced shear enhanced enhanced enhanced enhanced enhanced enhanced shear enhanced                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city  | N/A N/A N/A N/A N/A N/A N/V <sub>c,y</sub> /a <sub>v,y</sub> N <sub>c,y</sub> N <sub>c,</sub> | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(:</sub><br>,y.(B <sub>cap</sub> -B <sub>cap</sub><br>tt for effecti  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth  | N/A   | mm<br>mm<br>N/mm²<br>N/mm²<br>N/mm²<br>N/mm²<br>4.2 BS8110  | N/A<br>N/A<br>Note                       |
| shear enh<br>inhanced<br>inhanced<br>inhanced<br>inhanced<br>inhanced<br>lote that   | shear capace shear capace shear capace shear capace enhanced shear capace esistance for the shear capace shear capace enhanced shear capace shear capace enhanced shear capace enhanced shear capace shear capace enhanced shear enhanced enhanced enhanced enhanced enhanced enhanced shear enhanced                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city  | N/A N/A N/A N/A N/A N/A N/V <sub>c,y</sub> /a <sub>v,y</sub> N <sub>c,y</sub> N <sub>c,</sub> | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(:</sub><br>,y.(B <sub>cap</sub> -B <sub>cap</sub><br>tt for effecti  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth  | N/A   | mm mm N/mm² N/mm² N/mm² N/mm²   | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Note that   | shear capace shear capace shear capace enhanced shear capace capa                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(2 r Bending c < 2d <sub>x</sub> v <sub>c,x</sub> / Concrete s  | N/A  N/A  N/A  xv <sub>c,x</sub> /a <sub>v,x</sub> yv <sub>c,y</sub> /a <sub>v,y</sub> 2d <sub>x</sub> v <sub>c,x</sub> /a <sub>v,y</sub> ).  2d <sub>y</sub> v <sub>c,y</sub> /a <sub>v,y</sub> ).  ty is reduce  in Plane o  /a <sub>v,x</sub> for no  thear capaci   | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  f Width  nominal /  | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(:</sub> ,y.(B <sub>cap</sub> -B <sub>cap</sub> ),t for effection<br>design lin   | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth  | s exhibited, N/A N/A N/A N/A N/A N/A N/A N/A (to cl.3.11.                           | mm<br>mm<br>N/mm²<br>N/mm²<br>N/mm²<br>N/mm²<br>4.2 BS8110  | N/A<br>N/A<br>Note                       |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Vote that   | shear capace shear capace shear capace enhanced shear capace capa                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city  | N/A  N/A  N/A  N/A  N/A  N/A  N/A  N/A  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account f Width ity 2d <sub>x</sub> V <sub>c,x</sub> /a  | <=<br><=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(:</sub><br>,y.(B <sub>cap</sub> -B <sub>cap</sub><br>at for effecti  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth  | N/A   | mm mm N/mm² N/mm² N/mm² N/mm² N/mm² k/mm²   | N/A<br>N/A<br>Note<br>Note               |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Enhanced<br>Vote that   | shear capace shear capace shear capace enhanced shear capace capa                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city  | N/A  N/A  N/A  N/A  xv <sub>c,x</sub> /a <sub>v,x</sub> yv <sub>c,y</sub> /a <sub>v,y</sub> 2d <sub>x</sub> v <sub>c,x</sub> /a <sub>v,x</sub> ).  2d <sub>y</sub> v <sub>c,y</sub> /a <sub>v,y</sub> ).  ty is reduce  in Plane o  hear capaci  x/a <sub>v,x</sub> for dear links A <sub>sy</sub>  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account f Width ity 2d <sub>x</sub> V <sub>c,x</sub> /a lesign links   | <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(1</sub><br>,y.(B <sub>cap</sub> -B <sub>cap</sub><br>th for effecti<br>design lin<br>v,x.(1000.d <sub>x</sub><br>s<br>0.(v <sub>d,x</sub> -2d <sub>x</sub> v   | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth  | N/A   | mm mm N/mm² N/mm² N/mm² N/mm² k/mm² kN/mm   | N/A<br>N/A<br>Note<br>Note               |
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| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Inhanced<br>Note that   | shear capace shear capace shear capace shear capace shear capace enhanced shear capace enhanced shear capace sistance for the check v <sub>d,x</sub> Check v <sub>d,x</sub> Check v <sub>d,x</sub> Check v <sub>d,y</sub>  | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(city in y,  | N/A  N/A  N/A  xvc,x/av,x yvc,y/av,y  2dxvc,x/av,x).  2dyvc,y/av,y).  ty is reduce  in Plane o  hear capaci ear links As  ind design li  in Plane o  hear capaci ear links As  ind design li  in Plane o  hear capaci ear links As  ind design li  in Plane o  hear capaci ear links As   | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account f Width  nominal / ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  f Length ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100  | <= <=<br><=<br>/  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth    c, x/A <sub>v,y</sub>   (0.9    c, y/A <sub>v,y</sub>   ( | N/A   | mm N/mm² N/mm² N/mm² N/mm² A.2 BS8110  kN/m  kN/m  mm²/mm/ kN/m   | N/A N/A Note Note O) and lim             |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Inhanced<br>Note that   | shear capace shear capace shear capace shear capace shear capace enhanced shear capace enhanced shear capace sistance for the check v <sub>d,x</sub> Check v <sub>d,x</sub> Check v <sub>d,x</sub> Check v <sub>d,y</sub>  | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(city in y,  | N/A  N/A  N/A  xvc,x/av,x yvc,y/av,y  2dxvc,x/av,x).  2dyvc,y/av,y).  ty is reduce  in Plane o  hear capaci ear links As  ind design li  in Plane o  hear capaci ear links As  ind design li  in Plane o  hear capaci ear links As  ind design li  in Plane o  hear capaci ear links As   | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  f Width  ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  f Length  ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links   | <= <=<br><=<br>/  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth    c, x/A <sub>v,y</sub>   (0.9    c, y/A <sub>v,y</sub>   ( | N/A   | kN/m  kN/mm² kN/mm² kN/mm² kN/mm² kN/mm² kN/mm² kN/m  | N/A N/A Note Note O) and lim             |
| Shear enh<br>Enhanced<br>Enhanced<br>Enhanced<br>Inhanced<br>Jote that<br>Shear Re   | shear capace shear capace shear capace shear capace shear capace enhanced shear capace capace capace shear capace shear capace shear capace capace shear capace                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(city in y, [city in y, [(city in y, [city in y, [(city in y, [(city in y, [(city in y, [(city in y,  | N/A  N/A  N/A  xv <sub>c,x</sub> /a <sub>v,x</sub> yv <sub>c,y</sub> /a <sub>v,y</sub> 2d <sub>x</sub> v <sub>c,x</sub> /a <sub>v,y</sub> ).  2d <sub>y</sub> v <sub>c,y</sub> /a <sub>v,y</sub> ).  ty is reduce  in Plane o  hear capaci  ear links A <sub>sy</sub> in Plane o  hear capaci  in Plane o  hear capaci  y/a <sub>v,y</sub> for no  hear capaci  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  f Width  ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  f Length  ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c   | <=     <=   | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth    c, x/A <sub>v,y</sub>   (0.9    c, y/A <sub>v,y</sub>   ( | N/A   | mm mm N/mm² N/mm² N/mm² N/mm² A.2 BS8110  kN/m  kN/m  mm²/mm/ kN/m  kN/m                                | N/A N/A Note Note O) and lim             |
| Shear enhanced Enhanced Enhanced Note that Shear Re  | shear capace shear capace shear capace shear capace shear capace enhanced shear capace enhanced shear capace capace shear capace enhanced shear capace enhanced shear capace shear capace enhanced shear capace capace shear capac                     | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(c) in color in c | N/A  N/A  N/A  xvc,x/av,x yvc,y/av,y  2dxvc,x/av,x).  2dyvc,y/av,y).  ty is reduce  in Plane o  fav,x for no  thear capaci  ear links As  and design li  in Plane o  thear capaci  y/av,y for no  thear capaci  sty for no  thear capaci  in Plane o  thear capaci  in Plane o  thear capaci  sty for no  thear capaci  y/av,y for no  thear capaci  y/av,y for no  thear capaci  sty for no  thear capaci  y/av,y for no   | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  f Width  ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  f Length  ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c   | <=     <=   | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth    c, x/A <sub>v,y</sub>   (0.9    c, y/A <sub>v,y</sub>   ( | N/A N/A N/A N/A N/A N/A N/A N/A (to cl.3.11  N/A N/A N/A N/A N/A N/A N/A N/A N/A N/ | mm N/mm² N/mm² N/mm² N/mm² A.2 BS8110  kN/m  kN/m  mm²/mm/ kN/m  mm²/mm/ kN/m  mm²/mm/                  | N/A N/A Note Note O) and lim             |
| Shear enhanced Enhanced Enhanced Enhanced Financed Finance | shear capace shear capace shear capace shear capace shear capace enhanced shear capace enhanced shear capace sistance for the check v <sub>d,x</sub> Check v <sub>d,x</sub> Check v <sub>d,y</sub>  | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(c) in color in color in (color in color  | N/A  N/A  N/A  xvc,x/av,x  yvc,y/av,y  2dxvc,x/av,x).  2dyvc,y/av,y).  ty is reduce  in Plane o  hear capaci  ear links Asy  and design li  in Plane o  dav,y for no  chear capaci  y/av,y for no  chear capaci  y/av,y for de  ear links Asy  and design li  sy per metre  value   | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account f Width  ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear count ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear count ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear count ity 2d <sub>y</sub> V <sub>c,y</sub> /a | <= <=<br><=<br>,x.(L <sub>cap</sub> -L <sub>cap(1)</sub> , (B <sub>cap</sub> -B <sub>cap</sub> to for effection of the control | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth    c, x/A <sub>v,y</sub>   (0.9    c, y/A <sub>v,y</sub>   ( | N/A   | mm  N/mm² N/mm² N/mm² N/mm² A.2 BS8110  kN/m  kN/m  mm²/mm/ kN/m  mm²/mm/ kN/m  mm²/mm/ mm²/mm/ mm²/mm/ | N/A N/A Note Note O) and lim  m  m  N/A  |
| Shear enhanced Enhanced Enhanced Enhanced Finhanced Finh | shear capace shear capace shear capace shear capace shear capace enhanced shear capace enhanced shear capace for the check v <sub>d,y</sub> enrea provided capace enhanced shear enhan           | a <sub>v,x</sub> = a <sub>v,y</sub> = city in x, 2d city in y, 2d city in y, [(2 city in y, [(city in y, [city in y, [(city in y, [city in y, [cit | N/A  N/A  N/A  xvc,x/av,x  yvc,y/av,y  2dxvc,x/av,x).  2dyvc,y/av,y).  ty is reduce  in Plane o  hear capaci  ear links As  and design li  in Plane o  hear capaci  ear links As  and design li  in Plane o  y/av,y for no  hear capaci  sy for no  hear capaci  ear links As  and design li  sy for no  hear capaci  bear links As  and design li  ss per metre  value  beam theore  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account  f Width  ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  f Length  ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  c, 0.75A <sub>sv,pro</sub> ry) in x utili  | <=  | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth    c, x/A <sub>v,y</sub>   (0.9    c, y/A <sub>v,y</sub>   ( | N/A   | mm mm N/mm² N/mm² N/mm² N/mm² A.2 BS8110  kN/m  kN/m  mm²/mm/ kN/m  mm²/mm/ kN/m  mm²/mm/               | N/A N/A Note Note O) and lim  m  N/A N/A |
| Shear enhanced Enhanced Enhanced Shear Re  Shear Re  Effective a Tried effectoesign shear  | shear capace shear capace shear capace shear capace shear capace enhanced shear capace enhanced shear capace sistance for the check v <sub>d,x</sub> Check v <sub>d,x</sub> Check v <sub>d,y</sub>  | av,x = av,y = city in x, 2d city in y, 2d city in y, [(2 city in y, [(c) (c) (c) (c) (c) (c) (c) (c) (c) (c)  | N/A  N/A  N/A  xvc,x/av,x yvc,y/av,y  2dxvc,x/av,x).  2dyvc,y/av,y).  ty is reduce  in Plane o  fav,x for no  thear capaci  ear links As  and design li  in Plane o  fav,y for no  thear capaci  in Plane o  car links As  and design li  is per metre  value  beam theo  beam theo  beam theo  | mm  L <sub>cap(3.0D)</sub> +V <sub>c</sub> B <sub>cap(3.0D)</sub> +V <sub>c</sub> d to account f Width  ity 2d <sub>x</sub> V <sub>c,x</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  f Length  ity 2d <sub>y</sub> V <sub>c,y</sub> /a  lesign links y / S <sub>I</sub> > 100 inks shear c  c, 0.75A <sub>sv,pro</sub> ry) in x utili ry) in y utili  | <=  <=  <=  ,x.(L <sub>cap</sub> -L <sub>cap(t)</sub> ,y.(B <sub>cap</sub> -B <sub>cap</sub> to for effecti  design lin  y,x.(1000.d <sub>x</sub> apacity (0.  design lin  v,y.(1000.d <sub>y</sub> capacity (0.  s  0.(v <sub>d,y</sub> -2d <sub>y</sub> v  capacity (0.  capacity (0.  sation  sation   | ancement i.  2d <sub>x</sub> =  2d <sub>y</sub> =  x N/A  x N/A  x N/A  x N/A  ve breadth  | N/A   | mm mm N/mm² N/mm² N/mm² N/mm² A.2 BS8110  kN/m  kN/m  mm²/mm/ kN/m  mm²/mm/ kN/m  mm²/mm/               | N/A N/A Note Note O) and lim  m  m  N/A  |

| CONSU                              | LTING                | Engineering          | g Calculatio              | n Sheet  |                                       | Job No.   | Sheet No.       |                                  | Rev.           |
|------------------------------------|----------------------|----------------------|---------------------------|--|---------------------------------------|---|-----------------|----------------------------------|----------------|
| ENGINE                             |                      | _                    |                           |  |                                       | jXXX  | 2               | 1                                |                |
|                                    |                      |                      |                           |  |                                       | Member/Location                                     |                 |                                  |                |
| ab Title Ctm                       | . ctc \              | Jambar Da            | sian Cook                 | achnica Dila                                       | Can v202                              |   |                 |                                  |                |
|                                    |                      |                      |                           | echnics Pile                                       | Cap v202.                             | Made by XX  | Date 31         | /11/2021                         | Chd.           |
| structure, Men                     | ilber Des            | sigii - Geot         | ecillics Pile             | Сар  |                                       |   | Z1              | /11/2021                         | 1              |
| Pile Cap Shea                      | ır Reinf             | orcement             | Design (D                 | een Beam   | Theory)                               |   |                 | R                                | l<br>eynolds T |
| le cap shee                        |                      | or coment            | Design (D                 | CCP DCum   | 111001 47                             |   |                 |                                  | CIRIA Guid     |
| ILS shear forc                     | e for bei            | nding in pla         | ne of width               | ı, V <sub>x</sub>                                  |                                       |   | 49155           |                                  | 1              |
| JLS shear forc                     |                      |                      |                           |  |                                       |   | 49155           |                                  |                |
|                                    |                      |                      |                           |  |                                       |   |                 |                                  |                |
| JLS shear forc                     | e in plan            | ne of width          | per metre,                | s <sub>c,x</sub> .V <sub>x</sub> /L <sub>cap</sub> |                                       |   | 6554            | kN/m                             |                |
| Jltimate shear                     | force lir            | nit, 1000.T          | $r_{cap}.f_c'/10\gamma_m$ |  |                                       |   | 8867            | kN/m                             | cl.21.4.       |
| Note $f_c$ ' is the                | cylinder             | compressi            | ve strength               | and $\gamma_m =$                                   | 1.5;                                  |   |                 |                                  | Reynold        |
| Jltimate shear                     | force lir            | nit, min{10          | $000.T_{cap}.v_{u}$       | 2.1000.T <sub>cap</sub>                            | $v_{c,x}k_{s,x}/a_x$                  | }   | 13709           | kN/m                             | cl.2.4.2       |
| lote v <sub>u</sub> ultima         |                      |                      |                           |  |                                       |   | by min{0.8      | $f_{cu}^{0.5}$ ,                 | CIRIA          |
| 5.0}N/mm <sup>2</sup> },           | v <sub>c,x</sub> des | sign concre          | te shear st               | rength from  |                                       |   |                 |                                  | Guide 2        |
| and factor, $k_{s,s}$              | $_{c} = 1.01$        | for $T_{cap}/L_{ca}$ | <sub>ap</sub> < 4, else   | 0.6;   |                                       |   |                 |                                  |                |
| Jltimate shear                     | •                    | •                    |                           |  |                                       |   | 48%             |                                  | ОК             |
| JLS shear forc                     |                      |                      |                           | $s_{c,y}.V_y/B_{cap}$                              | )                                     |   |                 | kN/m                             |                |
| Jitimate shear                     |                      |                      | •                         |  |                                       |   | 8867            | kN/m                             | cl.21.4.       |
| Note $f_c$ ' is the                |                      |                      |                           |  |                                       |   |                 |                                  | Reynola        |
| Iltimate shear                     |                      |                      |                           |  |                                       |   | 19000           |                                  | cl.2.4.2       |
| Note $v_u$ ultima                  |                      |                      |                           |  |                                       |   |                 |                                  | CIRIA          |
| 5.0}N/mm <sup>2</sup> },           |                      |                      |                           |  | CP 110 T.                             | 5 and T.25  | replaced by     | V c,y                            | Guide 2        |
| and factor, $k_{s,j}$              |                      | •                    | •                         |  |                                       |   |                 |                                  |                |
| Jltimate shear                     | force (d             | leep beam            | theory) in                | y utilisation                                      |                                       |   | 34%             |                                  | ОК             |
| Name                               |                      | ·                    | h                         | 1  | L A                                   |   | 455             | <b>7</b> .                       | 1              |
| Area of tensile                    |                      |                      |                           |  |                                       | •   |                 | mm <sup>2</sup> /m               | 1              |
| Area of tensile                    | steel re             | inforcemen           | t provided                | in y per me  | tre, A <sub>s,prov,t</sub>            | D, y  | 14577           | mm²/m                            | <u> </u>       |
|                                    |                      |                      |                           |  |                                       | 0.00)   |                 |                                  | <u> </u>       |
| Distance to fac                    |                      |                      |                           |  |                                       |   | 750             |                                  | <del> </del>   |
| Distance to fac                    |                      |                      |                           |  | .,                                    |   |                 | mm                               | ļ              |
| Angle between                      |                      |                      |                           |  |                                       |   |                 | degrees                          |                |
| Angle between                      |                      |                      |                           |  |                                       |   |                 | degrees                          | TIDIA Cuit     |
| mpirical coeff                     |                      |                      |                           |  |                                       |   | 0.88            |                                  | IRIA Guid      |
| mpirical coeff                     |                      |                      |                           |  | 55 PKB, 19:                           | )<br>   |                 | N/mm <sup>2</sup>                | IRIA GUIC      |
| Cylinder splitti<br>Min breadth fo |                      |                      |                           | •••  | 651/ /[//                             | <br>  |                 | N/mm <sup>2</sup>                | ОК             |
| in breadth fo                      |                      |                      |                           |  |                                       |   | 2849            |                                  | OK             |
| iii breadtii io                    | l deep b             | earri beriur         | ing in y, D <sub>B</sub>  | ≈ MAX (U, C  | 7.03V <sub>y</sub> /[K <sub>1</sub> ] | $\frac{2\lambda_1}{ }$                              | 2049            | 1111111                          | UK             |
| Shear Resista                      | ance for             | Ronding              | in Plane o                | f Width  |                                       |   |                 |                                  |                |
| ileai Resista                      | ince ior             | Denuing              | III FIAIIE O              | . wiutii   |                                       |   |                 |                                  | +              |
| No                                 | design               | linke                |                           |  |                                       |   |                 |                                  | +              |
| 140                                |                      |                      | near capaci               | tv. V  |                                       |   | 12641           | kN/m                             |                |
|                                    |                      |                      |                           | ,  | i.<br>5a) f. 10i                      | ∪<br>00]+k₂.A <sub>s,p</sub>                        |                 | -                                | Reynola        |
|                                    |                      |                      |                           |  |                                       | $\frac{000 + k_2 \cdot A_{s,p}}{000 + 100 \lambda}$ |                 |                                  | ,              |
| De                                 | sign linl            | ks                   | , ., ([0,2]               | cap U.   | 200 x J. I t. I                       |   | z···s,prov,b,x· | - x 15111 0/C                    | 1              |
|                                    |                      |                      | n links are               | not calculat                                       | ed as thev                            | require hori  | izontal link    | :<br>;                           |                |
|                                    |                      |                      |                           |  |                                       | - 42 5 11011  |                 | ,                                | 1              |
| Shear Resista                      | nce for              | Bendina              | in Plane o                | f Length   |                                       |   |                 |                                  | 1              |
|                                    |                      |                      |                           | <u> </u>   |                                       |   |                 |                                  | 1              |
| No                                 | design               | links                |                           |  |                                       |   |                 |                                  | 1              |
|                                    |                      |                      | hear capaci               | ty, V <sub>1,y</sub>                               |                                       |   | 13807           | kN/m                             | 1              |
|                                    |                      |                      |                           |  | 5a <sub>v</sub> ).f <sub>t</sub> .100 | )0]+k <sub>2</sub> .A <sub>s,p</sub>                |                 |                                  | Reynola        |
|                                    |                      | Note $V_{1}$ , =     | = MAX[0,2]                | $\lambda_1.(T_{can}-0$                             | 35a <sub>v</sub> ).f ₊.1              | 000]+100 λ  | 2.A sprov h v   | $\frac{1}{d_{v}.\sin^{2}\theta}$ |                |
| De                                 | sign linl            |                      | 2-7                       | 1 Cap  | γ, ι –                                |   | _ 3,ρι σν,υ,γ - | , -, -, -                        |                |
|                                    |                      |                      | n links are               | not calculat                                       | ed as they                            | require hori  | izontal links   | ;;;                              | 1              |
|                                    |                      |                      |                           |  | ,                                     |   |                 |                                  |                |
| Design shear r                     | esistanc             | e (deep be           | am theory)                | in x utilisat                                      | ion                                   |   | 52%             |                                  | ОК             |
|                                    |                      |                      |                           |  |                                       |   |                 |                                  |                |
| Design shear r                     | esistanc             | e (deep be           | am theory)                | in y utilisat                                      | ion                                   |   | 47%             |                                  | OK             |

|            |                 |   |  |                       |   | Job No.               | Sheet No.      |                              | Rev.   |
|------------|-----------------|---|--|-----------------------|---|-----------------------|----------------|------------------------------|--|
|            | NSULTING        |   |  | n Sheet               |   |                       |                | 12                           |  |
| ENG        | INEERS          | Consulting                              | Engineers                              |                       |   | jXXX                  | 2              | .2                           |  |
|            |                 |   |  |                       |   | Member/Location       |                |                              |  |
| Job Title  | Structure,      | Member De                               | esign - Geot                           | echnics               | Pile Cap v202                           | 1 <sup>Drg.</sup>     |                |                              |  |
| Structure, | Member De       | esign - Geot                            | echnics Pile                           | Сар                   |   | Made by XX            | Date <b>21</b> | /11/2021                     | hd.  |
|            |                 |   |  |                       |   |                       |                |                              |  |
| Pile Cap   | Longitudina     | al Shear W                              | ithin Secti                            | ion (EC               | 2)                                      |                       |                |                              | <u>EC2</u>                                       |
| 2          |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   | $V_x$                 | $V_{y}$        |                              |  |
| Longitudir | nal shear str   |   | $_{\text{di}} = \beta V_{\text{Ed}} /$ | $(z b_i)$             |   | N/A                   |                | N/mm <sup>2</sup>            | cl.6.2.5   |
|            | Ratio, β =      |   |  | L                     |   | N/A                   | N/A            |                              | cl.6.2.5   |
|            |                 |   |  | $_{c,x}.V_x*/L_c$     | $s_{c,y}.V_y*/B_{ca}$                   |                       |                | kN/m                         | cl.6.2.5   |
|            |                 | $z = \{z_x, z_y\}$                      |  |                       |   | N/A                   | N/A            |                              | cl.6.2.5   |
|            | Width of th     | ne interface                            | , b <sub>i</sub> = 1000i               | mm                    |   | N/A                   | N/A            | mm                           | cl.6.2.5   |
|            | <u> </u>        |   |  |                       |   |                       |                | 2                            |  |
| Longitudir | nal shear str   |   |  |                       | \ 105 (                                 | N/A                   | N/A            | N/mm <sup>2</sup>            |  |
|            |                 |   |  |                       | $\alpha$ ) $\leq 0.5 \text{ v } f_{cd}$ |                       |                |                              | cl.6.2.5   |
|            |                 | = 0.00 if c                             |  |                       |   |                       |                |                              | cl.6.2.5   |
|            | + -             | coefficient,                            | <u> </u>                               |                       | Indented                                | ▼                     | N/A            |                              | cl.6.2.5   |
|            |                 | coefficient,                            | •                                      |                       | Indented                                | ▼                     | N/A            |                              | cl.6.2.5   |
|            |                 | th: a surface $\alpha$ 0,10 and $\mu$ = |  | steel, plas           | tic or specially p                      | repared woode         | en moulds:     |                              |  |
|            | Smooth: a       | slipformed or                           | extruded surf                          | face, or a            | free surface left                       | without further       | treatment      |                              |  |
|            |                 | ion: $c = 0.20$                         |  | nuahness              | at about 40 mm                          | spacing achi          | eved by        |                              |  |
|            | raking, exp     | osing of aggre                          |  |                       | giving an equiv                         |                       |                |                              |  |
|            | and $\mu = 0.7$ |   | indentations                           | complying             | g with Figure 6.9                       | . a = 0.50, and       | = 0 0          |                              |  |
|            | -               |   |  | Complying             | g with Figure 6.9                       | . C = 0,50 and        |                | 2                            |  |
|            | Design ten      | sile strengt                            |  |                       | $\alpha_{ct}=1.0, \gamma_{c}$           | 1 5                   | N/A            | N/mm <sup>2</sup>            | -1216  |
|            |                 |   | f <sub>ctk,0,05</sub> / γ              | with                  | $\alpha_{\rm ct}$ =1.0, $\gamma_0$      | C=1.5                 | NI/A           | N1 / 2                       | cl.3.1.6   |
|            |                 | $f_{\text{ctk};0,05} = 0.7$             |  | 4 -0                  | 10 1-/1 / 6 / 4                         | 0)) > C50/6           |                | N/mm <sup>2</sup>            | T.3.1  |
|            |                 |   |  | ) T <sub>ctm</sub> =2 | ,12·In(1+(f <sub>cm</sub> /1            | 0)) > 050/0           |                | N/mm <sup>2</sup>            | T.3.1  |
|            |                 | $f_{cm} = f_{ck} + 8$                   |  | ctronat               | <br>h of concrete,                      | £                     |                | N/mm <sup>2</sup>            | T.3.1  |
|            |                 |   |  |                       | f concrete, f <sub>cu</sub>             |                       |                | N/mm <sup>2</sup>            | T.3.1<br>T.3.1                                   |
|            | Normal str      | ess across l                            |  |                       | ,                                       | N/A                   |                | N/mm <sup>2</sup>            | 1.3.1  |
|            |                 |   |  |                       |   | N/A                   | N/A            | N/mm <sup>2</sup>            |  |
| ว          |                 | $\Sigma$ [factor . nent ratio, $ ho$    |  | /(D <sub>cap</sub> .L | · cap /]/                               | N/A                   | NI / A         |                              | cl.6.2.5   |
| 2          | Remiorcen       |   | nforcement                             | Λ – Λ                 | / C                                     | N/A<br>N/A            | N/A            | mm²/m/m                      | <b>.</b>   |
|            |                 |   |  |                       | ement crossing                          | •                     |                |                              | cl.6.2.5   |
|            |                 |   |  |                       | cement with a                           |                       |                |                              | C1.0.2.3   |
|            |                 |   | imary snear<br>e interface;            |                       | lerrierit witir a                       | dequate and           | noraye at t    |                              |  |
|            |                 |   | e joint, A <sub>i</sub> =              |                       |   | N/A                   | NI/A           | mm²/m/m                      |  |
|            | Design viel     | ld strength                             |  |                       | f / <sub>2</sub> /                      | $\gamma_{\rm S}=1.15$ |                |                              | cl.2.4.2.4                                       |
|            |                 | einforcemen                             |  |                       | a = 'yv / YS                            | , 15-1.13             |                | N/mm <sup>2</sup><br>degrees | cl.2.4.2.4                                       |
|            |                 | npressive st                            |  |                       |   |                       |                | N/mm <sup>2</sup>            | U.U.Z.J  |
|            | 2 congri con    | $f_{\rm cd} = \alpha_{\rm cc}$          |  | with                  | $\alpha_{cc}=1.0, \gamma_{c}$           | c=1.5                 | 11/74          | 13/111111                    | cl.3.1.6   |
|            | Strength re     | Ц                                       |  |                       | cked in shear                           | _                     | N/A            |                              | 55.1.0   |
| 2          | Sacingaria      | _                                       | _                                      |                       | icited iii Siledi                       | '                     | 11/ //         |                              | cl.6.2.2   |
| _          |                 | $\nu = 0.6$ 1-                          | 250                                    |                       |   |                       |                |                              | 3,,0,2,2   |
| Lonaitudir | nal shear str   | _                                       | _                                      | i/Vpd:                |   | N/A                   | N/A            |                              | N/A  |
| - 3.36611  |                 |   | · · Ea                                 | Rui                   |   |                       | . // . \       |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              |  |
|            |                 |   |  |                       |   |                       |                |                              | <del>                                     </del> |
|            |                 |   |  |                       |   |                       |                |                              | <del>                                     </del> |
|            |                 |   |  |                       |   |                       |                |                              | <u> </u>   |

| CON         | SIII TING                      | Engineerin                | a Calo                 | ulatio              | n Shoot                                 |                                      | Job No.                          | Sheet No.          |   | Rev.          |
|-------------|--------------------------------|---------------------------|------------------------|---------------------|---|--------------------------------------|----------------------------------|--------------------|---|---------------|
|             |                                | Consulting                |                        |                     | II Slieet                               |                                      | :>/>/                            |                    |   |               |
| ENGI        | NEEKS                          | Consulting                | Liigiii                | CCIS                |   |                                      | jXXX                             | 2                  | .3                                      |               |
|             |                                |                           |                        |                     |   |                                      | Member/Location                  |                    |   |               |
| Job Title   | Structure                      | Member De                 | sian -                 | Gent                | echnics Pile                            | Cap v2021                            | Drg.                             |                    |   |               |
|             |                                | sign - Geot               |                        |                     |   |                                      | Made by XX                       | Date 21            | /11/2021 <sup>c</sup>                   | hd.           |
| Structure,  | мениет ре                      | sigii - Geot              | echine                 | LS PIIE             | Сар                                     |                                      |                                  | 21                 | / 11/ 2021                              |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
| Pile Cap L  | ongitudina                     | al Shear W                | ithin                  | Secti               | on (BS811                               | .0)                                  |                                  |                    |   | <u>BS8110</u> |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      | $M_{x}$                          | $M_{y}$            |   |               |
| Longitudina | al shear stre                  | ess, $v_h = K_S$          | . ΔF <sub>c</sub>      | / (b <sub>w</sub> . | .Δx)                                    |                                      | N/A                              | N/A                | N/mm <sup>2</sup>                       | cl.5.4.7.2    |
|             |                                |                           |                        |                     | e over Δx, Δ                            | .F <sub>c</sub>                      | N/A                              |                    | kN/m                                    | cl.5.4.7.1    |
|             |                                |                           |                        |                     |   | $/B_{cap}-0)/z$                      |                                  | ,                  | ,                                       |               |
|             |                                | Lever arm,                |                        |                     |   | / Cap 0// L                          | N/A                              | N/A                | m                                       |               |
|             |                                | 1                         |                        |                     |   | /21                                  |                                  |                    |   |               |
|             |                                |                           |                        |                     | $\{L_{db,x}/2, L_d\}$                   |                                      | N/A                              |                    | mm                                      |               |
|             |                                |                           |                        | betw                | een the poi                             | nt of maxin                          | num design                       | moment a           | nd                                      | cl.5.4.7.2    |
|             |                                | f zero mom                |                        |                     |   |                                      |                                  |                    |   |               |
|             | Shear stres                    | ss distributi             | on fac                 | tor, K              | $L_{\rm S} = 2.00$                      |                                      | N/A                              | N/A                |   |               |
|             | The average                    | ge design sh              | near s                 | tress :             | should then                             | be distribu                          | ted in prope                     | ortion to th       | e                                       | cl.5.4.7.2    |
|             | vertical des                   | sign shear f              | orce c                 | diagra              | m to give ti                            | he horizonta                         | al shear stre                    | ess at any i       | point                                   |               |
|             |                                |                           |                        |                     |   | ( <sub>S</sub> maybe ta              |                                  |                    |   |               |
|             |                                |                           |                        |                     |   | s and 2.00 f                         |                                  |                    | ,                                       |               |
|             |                                |                           | 101 (                  | JUITUIT             | uous Deailis                            | anu Z.UU I                           |                                  |                    | mm                                      |               |
|             | Width, b <sub>w</sub> =        | = 1000mm                  |                        |                     |   |                                      | N/A                              | N/A                | mm                                      |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
| Longitudina | al shear stre                  | ess limit for             | no no                  | omina               | l / design v                            | ertical reinfo                       | orcement, v                      | N/A                | N/mm <sup>2</sup>                       |               |
|             | Surface typ                    | oe                        |                        |                     | Washe                                   | d to Remove L                        | aitance etc                      | -                  |   | T.5.5         |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   | 1             |
|             |                                |                           | 5 — De                 | esign v             |   | zontal shear                         |                                  |                    |   |               |
|             | <b> </b>   '                   | Precast unit              |                        |                     | Surface t                               | уре                                  |                                  | e of in-situ con   |   |               |
|             |                                |                           |                        |                     |   |                                      | 25<br>N/mm <sup>2</sup>          | N/mm <sup>2</sup>  | 40 and over<br>N/mm <sup>2</sup>        |               |
|             | Without li                     | nks                       |                        | As-cas              | t or as-extrud                          | ed                                   | 0.4                              |                    | 0.65                                    |               |
|             |                                |                           |                        | Brush               | ed, screeded o                          | r rough-tampe                        | d 0.6                            | 0.65               | 0.75                                    |               |
|             |                                |                           |                        |                     | ed to remove la                         |                                      | 0.7                              | 0.75               | 0.80                                    |               |
|             | With nomi                      | nal links proje           | ecting                 |                     | d with retarde<br>t or as-extrud        |                                      | 1.2                              | 1.8                | 2.0                                     |               |
|             | into in-situ                   |                           | -cung                  |                     |   | r rough-tampe                        |                                  |                    | 2.2                                     |               |
|             |                                |                           |                        |                     | ed to remove la                         |                                      | 2.1                              | 2.2                | 2.5                                     |               |
|             | NOTE 1. Th                     | e description "se.        | cast <sup>H</sup> cons |                     | d with retarde                          | r and cleaned<br>oncrete is placed : | and vibrated leav                | ing a wordt finial | . The surface                           |               |
|             | is rougher th:                 | an would be requi         | red for fi             | nishes to           |   | ly without a furth                   |                                  |                    |   |               |
|             | <del> </del>                   | -                         |                        |                     |   | aken piace.<br>ch an open-textur     | red surface is prod              | luced direct from  | an extruding                            |               |
|             | machine.                       |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     | rough-tamped" c<br>it of exposing the : | overs those cases :<br>aggregate.    | where some form                  | of deliberate sur  | face                                    |               |
|             | NOTE 4 For                     | r structural asses        | sment pu               | arposes, i          | it may be assume                        | d that the appropr                   | riate value of $\gamma_{ m m}$ i | ncluded in the ta  | ble is 1.5.                             |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   | 4             |
| Longitudina | al shear str                   | ess limit for             | no no                  | omina               | l / design v                            | ertical reinf                        | N/A                              | N/A                |   | N/A           |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
| Required n  | ominal vert                    | ical reinford             | emen                   | t per               | unit length,                            | 0.15%b <sub>w</sub>                  | N/A                              | N/A                | mm <sup>2</sup> /m/m                    | cl.5.4.7.3    |
|             | Provided ve                    | ertical reinf             | orcem                  | ent p               | er unit leng                            | th, A                                | N/A                              |                    | mm <sup>2</sup> /m/m                    |               |
|             |                                | A <sub>sv,prov</sub> / S  |                        |                     |   | , ,                                  | ,                                | ,                  | , |               |
| Peguired n  |                                |                           |                        | t nor               | unit length                             | utilication                          | N/A                              | N/A                |   | N/A           |
|             |                                |                           |                        |                     |   |                                      |                                  |                    | UT . 1000                               | _             |
| Note UT Se  | E                              | ongituainai<br>T          | snear                  | stres               | S IIMIT FOR N                           | o nominal v                          | verticai reini                   | rorcement          | U1 <= 100°                              | %o;           |
|             |                                |                           |                        |                     |   |                                      |                                  |                    | _                                       |               |
| Required d  |                                |                           | ment                   | per u               | nit length, <i>I</i>                    | 4 <sub>h</sub>                       | N/A                              | N/A                | mm <sup>2</sup> /m/m                    |               |
|             | $A_{\rm h} = \frac{1.00}{0.9}$ | 00 <i>bv</i> <sub>h</sub> |                        |                     |   |                                      |                                  |                    |   | cl.5.4.7.4    |
|             | <sup>11</sup> h 0.9            | $95f_{y}$                 |                        |                     |   |                                      |                                  |                    |   |               |
| Required d  | esign vertic                   | al reinforce              | ment                   | per u               | nit length u                            | tilisation, A                        | N/A                              | N/A                |   | N/A           |
|             |                                |                           |                        |                     |   | o design ve                          |                                  |                    |   |               |
| 1330 37 30  |                                | g. ca amiai               |                        | - 2. 00             |   |                                      |                                  | 22                 |   | ,             |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
|             |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |
| 1           |                                |                           |                        |                     |   |                                      |                                  |                    |   |               |

| CON                  | SULTING              | Engineerin                           | n Calculatio       | n She               | oet            |                    |                          | Job N               | 0.             | Sheet I         | Vo.            |                 |                  | Rev.         |            |
|----------------------|----------------------|--------------------------------------|--------------------|---------------------|----------------|--------------------|--------------------------|---------------------|----------------|-----------------|----------------|-----------------|------------------|--------------|------------|
|                      |                      | Consulting                           | _                  | 11 5110             |                |                    |                          | jΧλ                 | ·Χ             |                 | 2              | 4               |                  |              |            |
| 21, 01               |                      |                                      |                    |                     |                | I                  |                          |                     |                |                 |                | •               |                  |              |            |
|                      | _                    |                                      |                    |                     |                |                    |                          | Member/l            | _ocation       |                 |                |                 |                  |              |            |
| Job Title            |                      | Member De                            | _                  |                     | ics Pile       | Cap v              | 2021                     | Drg.                |                | D :             |                |                 |                  |              |            |
| Structure,           | Member De            | esign - Geot                         | echnics Pile       | Сар                 |                |                    |                          | Made by             | XX             | Date            | 21             | /11/2           | 021 <sup>0</sup> | hd.          |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
| Pile Cap L           | ongitudin            | al Shear W                           | ithin Secti        | on (I               | BS540          | 00-4)              |                          |                     |                |                 |                |                 |                  | <i>BS540</i> | <u>0-4</u> |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
| Lancard Constitution | . l l                |                                      | l t-l \ /          | 17                  |                | 4                  |                          |                     | M <sub>x</sub> |                 | M <sub>y</sub> | 1.51/           |                  |              |            |
| Longituaina          |                      | ce per unit                          |                    |                     |                |                    |                          |                     | N/A            |                 |                | kN/m            |                  |              |            |
|                      |                      | total compr                          |                    |                     |                |                    | 0                        | )/- 1.              | N/A            |                 | N/A            | kN/m            |                  |              |            |
|                      | Note Ar <sub>c</sub> | $= \{(s_{c,x}.M,$                    |                    |                     | $S_{c,y}$ .M   | y "/ <b>D</b> c    | <sub>ap</sub> – <i>U</i> | )/2 <sub>y</sub> }; |                |                 | N I / A        |                 |                  |              |            |
|                      | Longth un            | 1                                    | $z = \{z_x, z_y\}$ |                     | /2             | /21                |                          |                     | N/A            |                 | N/A            |                 |                  |              |            |
|                      |                      | der consider                         |                    |                     |                |                    | navin                    | num d               | N/A            |                 |                | mm              |                  |              |            |
|                      |                      | the beam i                           |                    | een                 | ле рог         |                    | liaxiii                  | liuiii u            | esigii         | mome            | it a           |                 |                  |              |            |
|                      | -                    | o <i>f zero mom</i><br>ss distributi |                    | - 2                 | 2 00           |                    |                          |                     | N/A            |                 | NI/A           |                 |                  |              |            |
|                      |                      | udinal shear                         |                    |                     |                | oer uni            | t len                    | ath Fo              |                |                 | N/A            | , he            |                  | cl.7.4.      | 2 3        |
|                      |                      | .00 for simp                         |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  | CI.7.4.      | ۷,۷        |
|                      |                      | ver beams;                           | ,, sappoite        | a Dec               | 11113, 1       |                    |                          |                     | J DEA          | iiis aiiu       | ۷. ر           |                 |                  |              | -          |
|                      |                      | = 1000mm                             |                    |                     |                |                    |                          |                     | N/A            |                 | N/Δ            | mm              |                  |              |            |
|                      | acii, D <sub>W</sub> | 1000111111                           |                    |                     |                |                    |                          |                     | . 1/ ^         |                 | •/ ^           |                 |                  |              |            |
| Lonaitudina          | al shear for         | ce limit per                         | unit lenath        | , V <sub>1 11</sub> | mit            |                    |                          |                     | N/A            | N               | <b>/</b> A     | kN/m            |                  |              | =          |
|                      |                      |                                      |                    |                     |                |                    | 7                        |                     | 7//            |                 |                |                 |                  |              |            |
|                      |                      | l not excee                          | d the lesser       | of th               | he foll        | owing              | (a)                      |                     | N/A            |                 | N/A            | kN/m            |                  | cl.7.4.      | 2.3        |
|                      | a) $k_1 f_c$         | $_{ m u}L_{ m s}$                    |                    |                     |                |                    | (b)                      |                     | N/A            |                 |                | kN/m            |                  | cl.7.4.      |            |
|                      | b) $v_l L_s$         | $+0.7A_{e}f_{y}$                     |                    |                     |                |                    | (2)                      |                     | ,              |                 | , , .          | ,               |                  |              |            |
|                      | Table                | 31 — Ultim                           | ate longitud       | linal               | shear          | stress,            | $v_1$ , as               | nd val              | ues o          | $f k_1$ for $g$ | com            | posite          | mem              | bers         |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                | concrete        |                |                 |                  |              | 1          |
|                      | 1                    | Type of shea                         | ar plane           |                     | 20             | 0                  | 2                        | 5                   | :              | 30              | 40 o           | r more          |                  | $k_1$        |            |
|                      |                      |                                      |                    |                     | N/m            | nm <sup>2</sup>    | N/n                      | $nm^2$              | N/ı            | mm <sup>2</sup> | N              | mm <sup>2</sup> |                  |              |            |
|                      | Monolith             |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      | Surface t            |                                      |                    |                     | 0.90           |                    | 0.90<br>0.63             |                     | 1.25<br>0.75   |                 | 0.80           |                 | 0.15             |              |            |
|                      | Surface              |                                      |                    |                     | 0.30           |                    | 0.38                     |                     | 0.45           |                 | 0.50           |                 | 0.13             |              |            |
|                      |                      | or construction w                    | rith lightweight   | aggreg              |                |                    |                          | given in            |                |                 |                | uced by 2       |                  |              | 1          |
|                      |                      |                                      |                    | -                   |                |                    |                          |                     |                |                 |                |                 |                  |              | 7          |
|                      | Concrete b           | ond consta                           | nt, k <sub>1</sub> |                     |                |                    |                          |                     |                |                 | N/A            |                 |                  | T.31         | 1          |
|                      | Ultimate lo          | ngitudinal s                         | shear stress       | limit               | ν <sub>1</sub> |                    |                          |                     |                |                 | N/A            | N/mm            | 2                | T.31         | 1          |
|                      |                      | Surface typ                          | oe Mo              | onolith             | ic Const       | ruction            |                          |                     |                |                 | ▼              |                 |                  | T.31         | 1          |
|                      | Length of            | shear plane                          | $L_s = b_w$        |                     |                |                    |                          |                     | N/A            |                 |                | mm              |                  |              |            |
|                      |                      | ertical reinf                        |                    | er un               | it leng        | th, A <sub>e</sub> |                          |                     | N/A            | l               | N/A            | mm²/r           | n/m              |              |            |
|                      |                      | A <sub>sv,prov</sub> / S             |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      | orcement pr                          |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  | cl.7.4.      | 2.3        |
|                      |                      | ne shear pla                         |                    | d to r              | resist v       | vertica.           | she                      | ar, ma              | y be           | included        | d pr           | ovided          |                  |              |            |
|                      | -                    | ılly anchore                         | -                  |                     |                |                    |                          |                     |                |                 |                |                 | 2                |              |            |
|                      |                      | stic strength                        |                    |                     |                |                    |                          |                     |                |                 |                | N/mm            | 2                |              |            |
| Longitudina          | al shear for         | ce limit per                         | unit length        | utilis              | ation,         | $V_1/V_{1,l}$      | imit                     |                     | N/A            | N               | I/A            |                 |                  | N/A          | A          |
| Daniinad n           |                      | <br>                                 |                    |                     |                | 0.150              | / 1                      |                     | NI / A         |                 |                | 2,              |                  | 17.4         |            |
| -                    |                      | tical reinford                       |                    |                     |                |                    |                          |                     | N/A            |                 |                | mm²/r           | n/m              | cl.7.4.      |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     | N/A            |                 | /A             | roinfor         | omo              | N/A          | -,         |
| UT <= 100            |                      | ongitudinal<br>                      | siicai iuice       | IIIIIL              | per u          | incheni            | gui I(                   | ו טוו וכ            | 10111111       | ai veiti        | cai i          | ennoi C         | .ciiie           | 111          |            |
| 01 <= 100            | , 70,                |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              | $\dashv$   |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
|                      |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
| <u> </u>             |                      |                                      |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |
| İ                    |                      | <u> </u>                             |                    |                     |                |                    |                          |                     |                |                 |                |                 |                  |              |            |

| CONCLUTING -  | 6 1 1                                 | GI .  |   | Job No.                                  | Sheet             | No.      |                         | Rev.                      |
|---|---------------------------------------|---|---|--|-------------------|----------|-------------------------|---------------------------|
| CONSULTING Engineering ENGINEERS Consulting             | _                                     | n Sheet                                     |   | jXXX                                     | ,                 | 2        | 25                      |                           |
| ENGINEERS   | Linginicers                           | 1   |   |  |                   |          | .5                      |                           |
|   |                                       |   |   | Member/Loc                               | ation             |          |                         |                           |
| Job Title Structure, Member Do                          |                                       |   | Cap v2021                               |  | n sn s Doto       |          | /// /500                | <b>≠</b> dhd              |
| Structure, Member Design - Geo                          | technics Pile                         | е Сар                                       |   | iviade by                                | XX Date           | 21       | /11/202                 | <b>1</b> 9 <sup>nd.</sup> |
| Pile Cap Detailing Requireme                            | nts                                   |   |   |  |                   |          |                         |                           |
| rne cap betaning Requirement                            |                                       |   |   |  |                   |          |                         |                           |
| All detailing requirements met ?                        |                                       |   |   |  | Ol                | <b>〈</b> |                         |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
| Max base steel reinforcement pit                        | ch in x (<30                          | d <sub>x</sub> , <750mm                     | 1)                                      |  |                   | 248      | mm                      | ОК                        |
| Max base steel reinforcement pit                        | ch in y (<30                          | d <sub>y</sub> , <750mm                     | 1)                                      |  |                   | 219      | mm                      | ОК                        |
|   |                                       |   |   |  |                   |          |                         |                           |
|   | % Ast or less                         |   |   |  |                   |          |                         |                           |
|   | ween 0.5% a<br>% Ast or gre           |   |   |  |                   |          |                         |                           |
|   | 70 TEST OF BIO                        |   | ·  _                                    |  |                   |          |                         |                           |
| Marylanda   |                                       |   |   |  |                   | 240      |                         | -01/-                     |
| Max base steel reinforcement pit                        |                                       |   |   |  |                   |          | mm                      | OK                        |
| Max base steel reinforcement pit                        | cn in y                               |   |   |  |                   | 219      | mm                      | OK                        |
| Min base steel reinforcement pito                       | h (>100mm                             | 2)  |   |  |                   | 210      | mm                      | ОК                        |
|   | ~!! ( ~ ±00!!!!!                      | 1)  |   |  |                   | 213      | 111111                  | - OK                      |
| Base steel reinforcement diamet                         | er, փ, (>=16                          | 5mm)  |   |  |                   | 32       | mm                      | ОК                        |
|   | , 10 ( - (                            | ,   |   |  |                   |          | -                       |                           |
| Max side steel reinforcement pito                       | h (<=250m                             | im)   |   |  |                   | 225      | mm                      | ОК                        |
|   |                                       |   |   |  |                   |          |                         |                           |
| Max side steel reinforcement pito                       | ch ( $<=\phi_s^2.f_y$ /               | MIN(500mr                                   | $n,B_{cap},L_{cap})$                    | )  |                   | 225      | mm                      | ОК                        |
|   |                                       |   |   |  |                   |          |                         |                           |
| Side steel reinforcement diamete                        |                                       |   |   |  |                   | 16       | mm                      | OK                        |
|   | $F_{i,i}$                             | $2f_{a}$                                    |   |  |                   |          | -                       |                           |
| Max base steel bearing stress                           | $\frac{1}{r\varphi} \leq \frac{1}{1}$ | $\frac{2f_{\rm cu}}{+2(\varphi/a_{\rm b})}$ | 70.2                                    | <=                                       |                   | 71.7     | N/mm <sup>2</sup>       | ОК                        |
| (in direction of width x)                               |                                       |   |   | N4 /1 > 1                                | / <sub>4</sub> \  | 22-      | Labi                    |                           |
| Tensile force per bar,                                  |                                       | b <sub>r,x</sub> .F <sub>base,uls,x</sub>   | $/L_{cap}$ , $(S_{c,x})$                | M <sub>x</sub> /L <sub>cap</sub> )/<br>⊺ | (d <sub>x</sub> ) | 337      |                         |                           |
| Internal radius of ber                                  | ia, r <sub>x</sub>                    |   |   |  |                   |          | mm                      |                           |
| Size of bar, $\varphi = \phi_{b,x}$                     | h of concret                          | o f   |   |  |                   |          | mm                      |                           |
| Characteristic strengt<br>Pitch of bar, $a_b = p_{b,x}$ |                                       | .e, I <sub>cu</sub>                         |   |  |                   |          | N/mm <sup>2</sup><br>mm |                           |
| Pitch of bal, $a_b - p_{b,x}$                           |                                       |   | <del>-</del>                            |  |                   | 250      | 111111                  |                           |
| Max base steel bearing stress                           | $F_{ m bt}$                           | $\frac{2f_{\rm cu}}{+2(\varphi/a_{\rm b})}$ | 62.0                                    | <=                                       |                   | 69 8     | N/mm <sup>2</sup>       | ОК                        |
| (in direction of length y)                              | $\frac{1}{r\varphi} = \frac{1}{1}$    | $+2(\varphi/a_{\rm b})$                     | 02.0                                    | \_                                       |                   | 05.0     | 11/111111               | OIL                       |
| Tensile force per bar,                                  | $F_{bt} = MAX$ (                      | bry.Fhase uls y                             | /B <sub>can</sub> , (s <sub>c v</sub> , | $M_v/B_{can}$ )                          | /d,,)             | 297      | kN                      |                           |
| Internal radius of ber                                  | id, r <sub>v</sub>                    | i,y Dase,uis,y                              | . cap, (~C,y*                           | у, - сар <i>Л</i>                        | , y ,             |          | mm                      |                           |
| Size of bar, $\varphi = \phi_{b,y}$                     | , ,                                   |   |   |  |                   |          | mm                      |                           |
| Characteristic strengt                                  | h of concret                          | e, f <sub>cu</sub>                          |   |  |                   |          | N/mm <sup>2</sup>       |                           |
| Pitch of bar, $a_b = p_{b,y}$                           |                                       |   |   |  |                   |          | mm                      |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
| Min internal radius of bend in $x$ ,                    | $r_x (>=r_{min})$                     |   |   |  |                   | 150      | mm                      | ОК                        |
| Min internal radius of                                  |                                       |   |   |  |                   | 112      | mm                      |                           |
| Min internal radius of bend in y,                       |                                       |   |   |  |                   | 150      | mm                      | ОК                        |
| Min internal radius of                                  | bend, r <sub>min</sub>                |   |   |  |                   | 112      | mm                      |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
| Min zone for bend in x, $D/2+c_{proj}$                  |                                       |   | 750                                     | >=                                       |                   |          | mm                      | OK                        |
| Min zone for bend in y, D/2+c <sub>proj</sub>           | $>= r_y + \phi_{b,y} +$               | $+\phi_s$ +cover <sub>2</sub>               | 750                                     | >=                                       |                   | 273      | mm                      | ОК                        |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   |  |                   |          |                         | -                         |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   |  |                   |          |                         |                           |
|   |                                       |   |   | 1  |                   |          | I                       |                           |