THIRD ANGLE PROJECTION

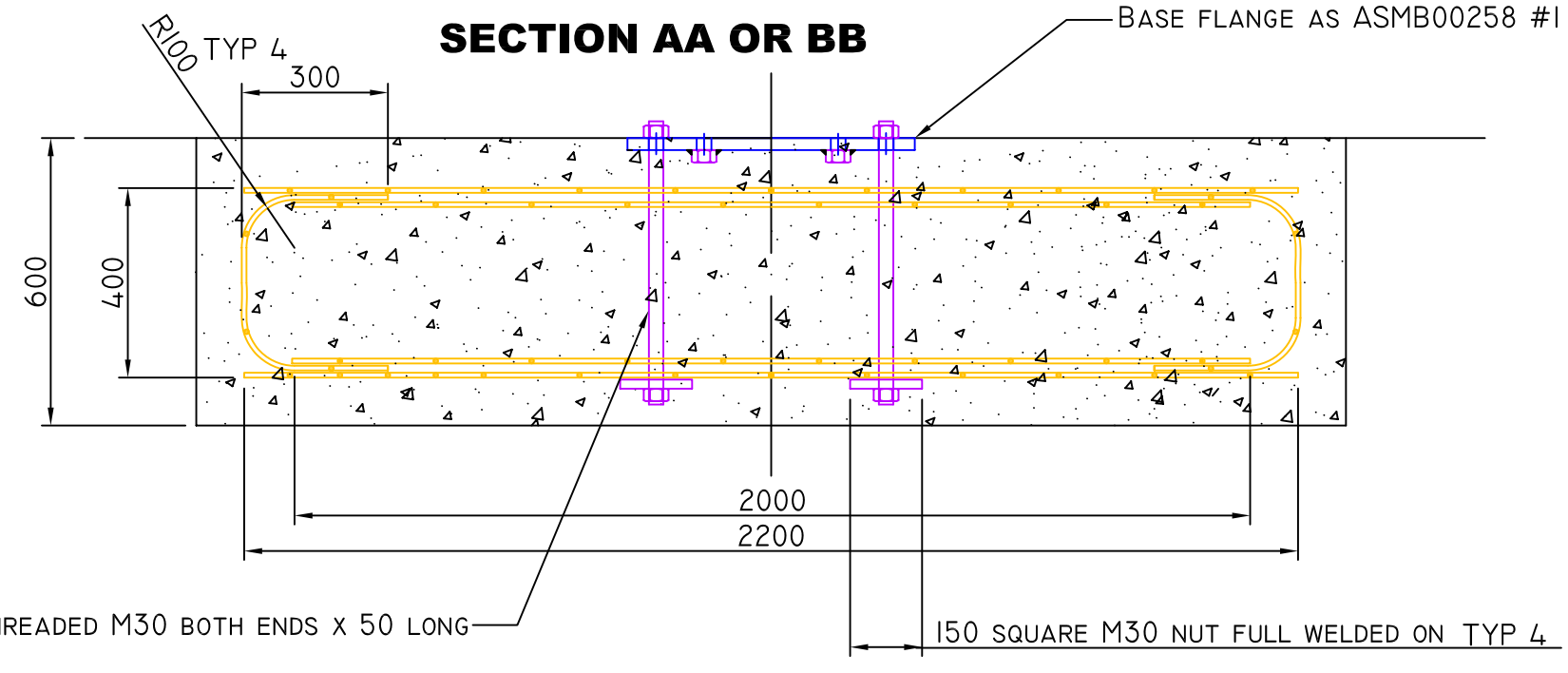
6 kW WIND TURBINE 10m MAST FOUNDATION
Drawing AMP061 Issue A dated 14 Nov 08
General Assembly Scale 1 : 15

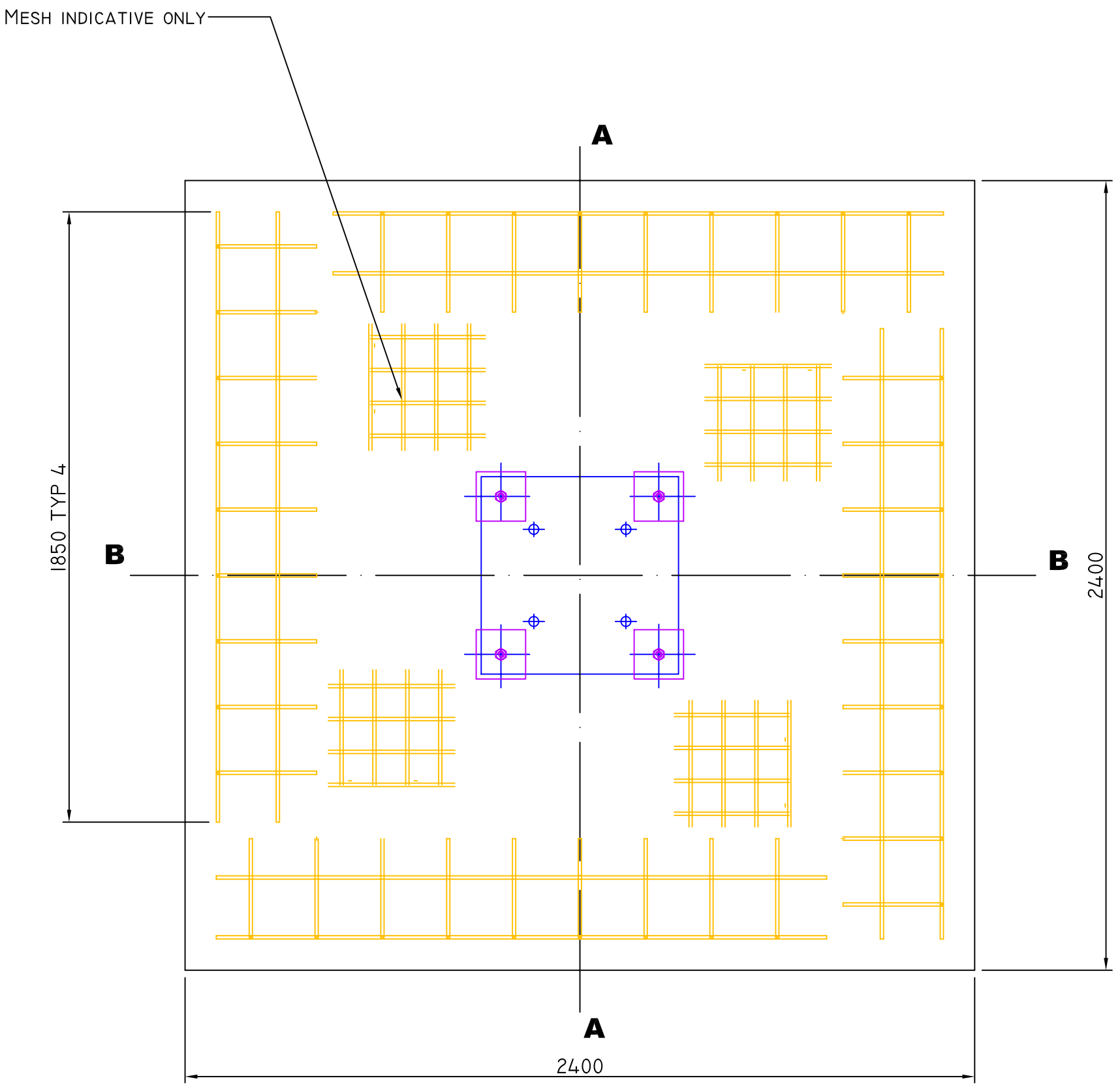
Reinforcement schedule:

Use A252 mesh throughout (200 x 200 x 8 dia wire)
to BS 4483:2005
Reinforcement cover 100 throughout
2 off 2200 square; 2 off 2000 square; 4 off bent and interleaved as shown, size before bending 1850 x 914
Total weight of mesh 97 kg approx.

NOTES:
1. Design max overturning moment at base = 82 kNm
2. Total weight concrete ex reinf. = 7.9 t approx.
   Required minimum soil bearing pressure is 50 kN/sq m.
3. Concrete specification designated RC30 or better to BS 8500-1:2002
4. Concrete may be poured into the excavated hole without shuttering if soil conditions permit. Ensure base is well compacted before pouring.
5. Nuts on base flange to be tightened after curing to 530 Nm torque.

SECTION AA OR BB





FOUNDATION FOR 10m MAST TO ASMB00258 FOR AMPAIR 6kW WIND TURBINE
E-mail instruction 040908 refers

Wind loadings to IEC 61400-2
(Draft International standard, Ed2 2006)

For Class III SWT (Table 1)

Basic wind speed V_{ref} $Vref := 37.5 \cdot \frac{m}{s}$

50-year wind (Eqn 10)

V_{e50} $Ve50 := 1.4 \cdot Vref$

Coefficient C_f from Table 3 $Cf := 2$

ρ from IEC $\rho := 1.225 \cdot \frac{kg}{m^3}$

Design wind pressure pnet $pnet := \frac{Cf}{2} \cdot \rho \cdot Ve50^2$ $pnet = 3.376 \times 10^3\,Pa$

Resulting forces & moments at base:

Turbine effective frontal area in high wind Aproj $Aproj := 18000 \cdot cm^2$

$Frot := pnet \cdot Aproj$ $Frot = 6.078\,kN$

Mast height lmst 10m
C/l turbine height above mast top clht 300mm $lmst := 10 \cdot m$ $clht := 0.3 \cdot m$ $tht := lmst + clht$

Moment due to turbine Mt $Mt := Frot \cdot tht$ $Mt = 62.6\,kN \cdot m$

Mast average width wmst 170mm $wmst := 0.17 \cdot m$

Moment due to mast Mmst, assuming
wind speed proportional to height, zero on ground $Mmst := pnet \cdot wmst \cdot \frac{lmst^2}{3}$ $Mmst = 19.1\,kN \cdot m$

Total overturning moment Mov $Mov := Mmst + Mt$ $Mov = 81.7\,kN \cdot m$

Foundation design

$dpth := 0.6 \cdot m$ $density := 2300 \cdot \frac{kg}{m^3}$ $lsqu := 2.4 \cdot m$ $Wt := lsqu^2 \cdot dpth \cdot density$ $Wt = 7.949\,tonne$

$Mres := Wt \cdot g \cdot \frac{lsqu}{2}$ $Mres = 93.5\,kN \cdot m$ **OK against overturning.**

$BMmax := \frac{Mov}{2}$ Roark Table 3-3(e) $Meshload := \frac{BMmax}{dpth - 0.2 \cdot m}$ $Meshload = 102.2\,kN$

Mesh specified is 2 x A 252, each layer safe loading 57845 N per m wide, ref BS 4483

$Meshres := 57845 \cdot N \cdot 2$ $Meshres = 115.7\,kN$ **OK for mesh strength, load conc'd on central 1m**

$boltsep := 0.48 \cdot m$ $Tperbolt := \frac{Mov}{boltsep \cdot 2}$ $Tperbolt = 85.1\,kN$

SWL for M30 6.6 grade is 183 kN. Rebar is equivalent. **OK for hold down bolts**.

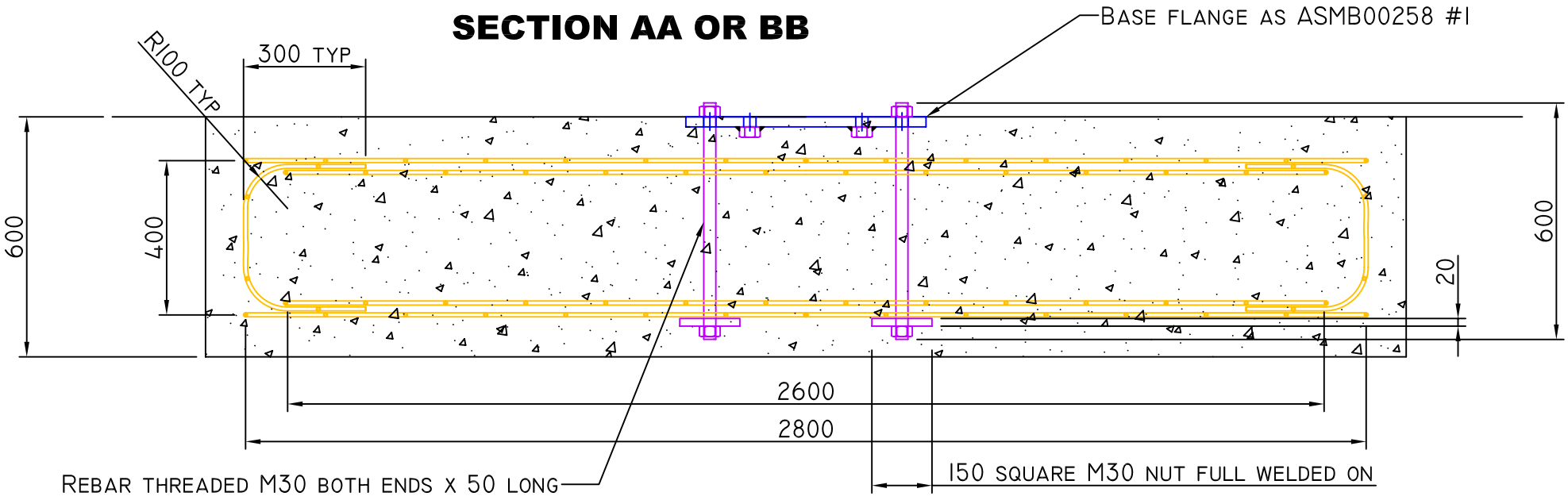
THIRD ANGLE PROJECTION

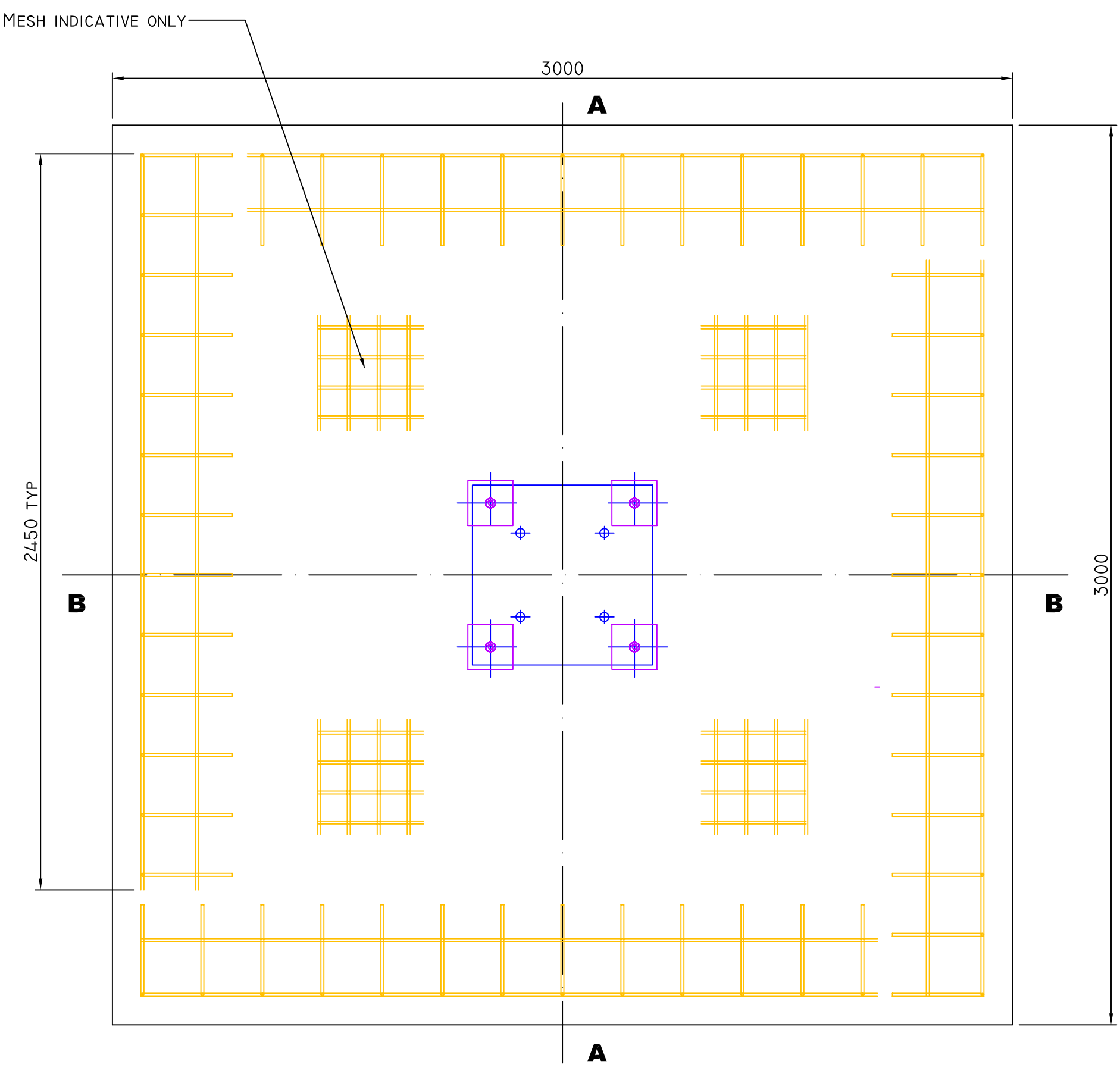
6 kW WIND TURBINE 15m MAST FOUNDATION
Drawing AMP060 Issue B dated 14 Nov 08
General Assembly Scale 1 : 15

Reinforcement schedule:
Use A393 mesh throughout (200 x 200 x 10 dia wire)
to BS 4483:2005
Reinforcement cover 100 throughout
2 off 2800 square; 2 off 2600 square; 4 off bent and interleaved as shown, size before bending 2450 x 914
Total weight of mesh 235 kg approx.

NOTES:
1. Design max overturning moment at base = 136 kNm
2. Total weight concrete ex reinf. = 12.4 t approx.
   Required minimum soil bearing pressure is 50 kN/sq m.
3. Concrete specification designated RC30 or better to BS 8500-1:2002
4. Concrete may be poured into the excavated hole without shuttering if soil conditions permit. Ensure base is well compacted before pouring.
5. Nuts on base flange to be tightened after curing to 530 Nm torque.

SECTION AA OR BB





FOUNDATION FOR 15m MAST TO ASMB00258 FOR AMPAIR 6kW WIND TURBINE
E-mail instruction 040908 refers

Wind loadings to IEC 61400-2
(Draft International standard, Ed2 2006)

For Class III SWT (Table 1)

Basic wind speed V_{ref} $Vref := 37.5 \cdot \frac{m}{s}$

50-year wind (Eqn 10)

V_{e50} $Ve50 := 1.4 \cdot Vref$

Coefficient C_f from Table 3 $Cf := 2$

ρ from IEC $\rho := 1.225 \cdot \frac{kg}{m^3}$

Design wind pressure pnet $pnet := \frac{Cf}{2} \cdot \rho \cdot Ve50^2$ $pnet = 3.376 \times 10^3\ Pa$

Resulting forces & moments at base:

Turbine effective frontal area in high wind Aproj $Aproj := 18000 \cdot cm^2$

$Frot := pnet \cdot Aproj$ $Frot = 6.078 \cdot kN$

Mast height lmst 15m
C/l turbine height above mast top clht 300mm $lmst := 15 \cdot m$ $clht := 0.3 \cdot m$ $tht := lmst + clht$

Moment due to turbine Mt $Mt := Frot \cdot tht$ $Mt = 93 \cdot kN \cdot m$

Mast average width wmst 170mm $wmst := 0.17 \cdot m$

Moment due to mast Mmst $Mmst := pnet \cdot wmst \cdot \frac{lmst^2}{3}$ $Mmst = 43 \cdot kN \cdot m$

Total overturning moment Mov $Mov := Mmst + Mt$ $Mov = 136 \cdot kN \cdot m$

Foundation design

$dpth := 0.6 \cdot m$ $density := 2300 \cdot \frac{kg}{m^3}$ $lsqu := 3 \cdot m$ $Wt := lsqu^2 \cdot dpth \cdot density$ $Wt = 12.42 \cdot tonne$

$Mres := Wt \cdot g \cdot \frac{lsqu}{2}$ $Mres = 182.7 \cdot kN \cdot m$ **OK against overturning.**

$BMmax := \frac{Mov}{2}$ Roark Table 3-3(e) $Meshload := \frac{BMmax}{dpth - 0.2 \cdot m}$ $Meshload = 170 \cdot kN$

Mesh specified is 2 x A 393, each layer safe loading 90275 N per m wide, ref BS 4483

$Meshres := 90275 \cdot N \cdot 2$ $Meshres = 180.6 \cdot kN$ **OK for mesh strength, load conc'd on central 1m**

$boltsep := 0.48 \cdot m$ $Tperbolt := \frac{Mov}{boltsep \cdot 2}$ $Tperbolt = 141.7 \cdot kN$

SWL for M30 6.6 grade is 183 kN. Rebar is equivalent. **OK for hold down bolts**.