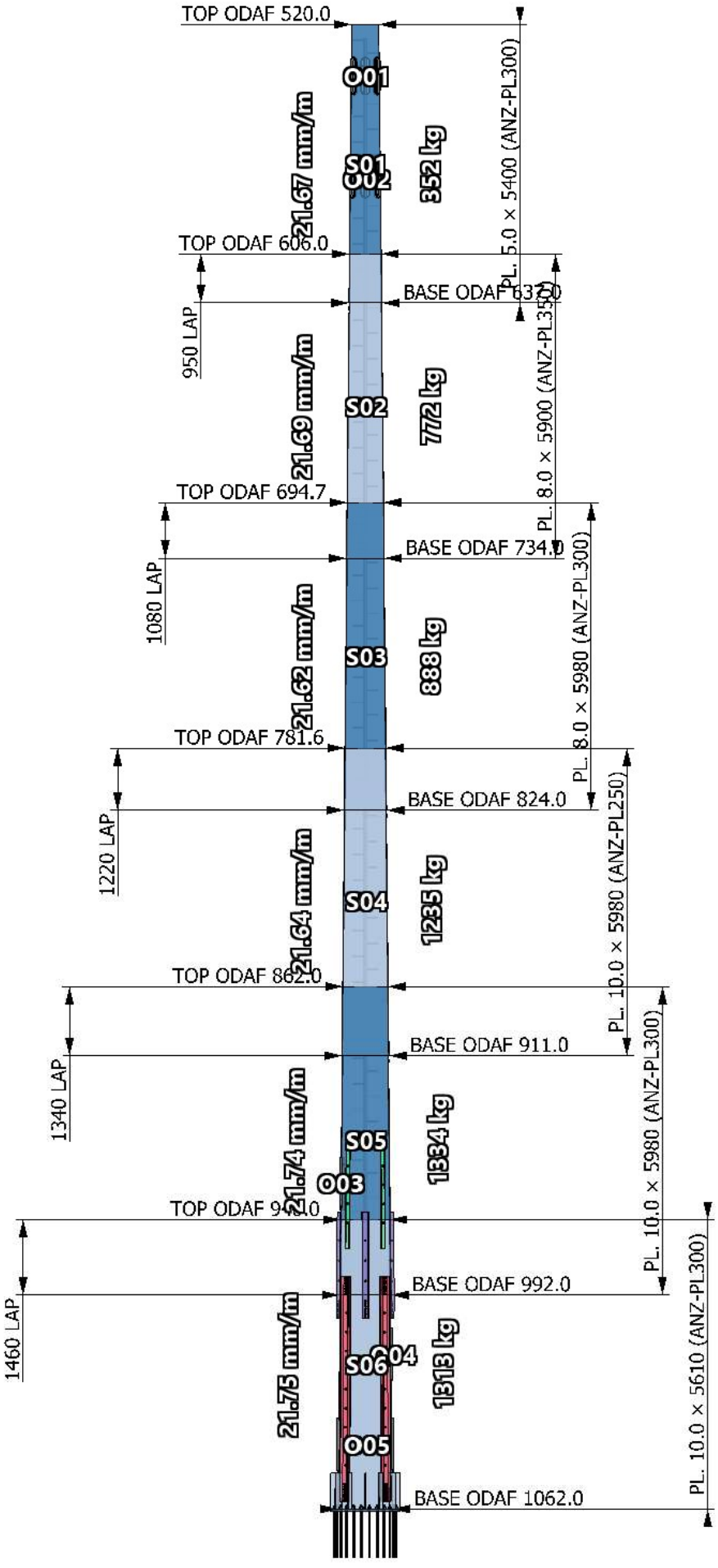
TOP ODAF 520.0
O01
S01
C02
21.67 mm/m
352 kg
PL. 5.0 × 5400 (ANZ-PL300)
TOP ODAF 606.0
BASE ODAF 632.0
950 LAP
S02
21.69 mm/m
772 kg
PL. 8.0 × 5900 (ANZ-PL350)
TOP ODAF 694.7
BASE ODAF 734.0
1080 LAP
S03
21.62 mm/m
888 kg
PL. 8.0 × 5980 (ANZ-PL300)
TOP ODAF 781.6
BASE ODAF 824.0
1220 LAP
S04
21.64 mm/m
1235 kg
PL. 10.0 × 5980 (ANZ-PL250)
TOP ODAF 862.0
BASE ODAF 911.0
1340 LAP
S05
O03
21.74 mm/m
1334 kg
PL. 10.0 × 5980 (ANZ-PL300)
TOP ODAF 921.0
BASE ODAF 992.0
1460 LAP
S06
C04
21.75 mm/m
1313 kg
O05
PL. 10.0 × 5610 (ANZ-PL300)
BASE ODAF 1062.0

----- MONOPOLE DATA -----

MATERIAL: STEEL
SHAPE: CIRCULAR
SEGMENTS: 6
SURFACE: GALVANIZED
ASSEMBLED LENGTH: 28800 mm (TIP RL @ 29140 mm)
ELASTIC MODULUS: 200000 MPa
DENSITY (ρs): 7850 kg/m³
SHAFT MASS: 5894 kg

SHAFT

ID	LENGTH	TOP OD	BASE OD	t	GRADE	TAPER	MASS	JOINT
01	5400 mm	520.0 mm	637.0 mm	5.0 mm	ANZ-PL300	21.67 mm/m	352 kg	950 mm LAP
02	5900 mm	606.0 mm	734.0 mm	8.0 mm	ANZ-PL350	21.69 mm/m	772 kg	1080 mm LAP
03	5980 mm	694.7 mm	824.0 mm	8.0 mm	ANZ-PL300	21.62 mm/m	888 kg	1220 mm LAP
04	5980 mm	781.6 mm	911.0 mm	10.0 mm	ANZ-PL250	21.64 mm/m	1235 kg	1340 mm LAP
05	5980 mm	862.0 mm	992.0 mm	10.0 mm	ANZ-PL300	21.74 mm/m	1334 kg	1460 mm LAP
06	5610 mm	940.0 mm	1062.0 mm	10.0 mm	ANZ-PL300	21.75 mm/m	1313 kg	

< STRUCTURE BASE @ RL 250 mm (PAD) = PAD PLINTH HEIGHT (500 mm) + PAD BASE HEIGHT (1500 mm) - PAD BASE EMBEDMENT (1750 mm) >

OPENINGS

ID	ELEVATION	DOORS	Hd	Wd	Rd	REINFORCEMENT	SHAPE	GRADE	Hr	Lr	tr
01	27800 mm	60°+180°+300°	700 mm	150 mm	75.0 mm	TYPE 1	-	ANZ-PL300	-	50 mm	16.0 mm
02	25800 mm	60°+180°+300°	700 mm	150 mm	75.0 mm	TYPE 1	-	ANZ-PL300	-	50 mm	16.0 mm
03	6310 mm	270°	1000 mm	225 mm	112.5 mm	TYPE 1	-	ANZ-PL300	-	100 mm	16.0 mm
04	3000 mm	90°	1000 mm	225 mm	112.5 mm	TYPE 1	-	ANZ-PL300	-	100 mm	16.0 mm
05	1250 mm	90°+270°	1000 mm	225 mm	112.5 mm	TYPE 1	-	ANZ-PL300	-	100 mm	16.0 mm

CONNECTION #01: BASE

ANCHOR BOLTS

PATTERN: SINGLE RING
DIAMETER: M36
QUANTITY: 24
RING DIAMETER: 1200 mm
EMBEDMENT: 900 mm
YIELD STRESS (fya): 420 MPa
ULTIMATE STRESS (fua): 520 MPa

BASE PLATE

SHAPE: CIRCULAR
VOID: CIRCULAR
WELD: BUTT
GRADE: ANZ-PL350
WIDTH (Wp): 1350 mm
VOID DIAMETER (Vp): 750 mm
THICKNESS (tp): 50 mm
YIELD STRESS (fyp): 340 MPa
MASS: 375 kg

GUSSETS

QUANTITY: 12
SHAPE: RECTANGULAR
GRADE: ANZ-PL300
WIDTH (Wg): 144 mm
HEIGHT (Hg): 700 mm
THICKNESS (tg): 12.0 mm
YIELD STRESS (fyg): 310 MPa
MASS: 115 kg

BEARING

TYPE: GROUT
GROUT STRESS (f'cb): 40 MPa
ELASTIC MODULUS (Eb): 29725 MPa (ACI 318-14 Section 19.2.2)
THICKNESS (tb): 40 mm

STRENGTHENING

ID	TYPE	SECTION	GRADE	LOCATION	ORIENTATION	GEN	TOP	BASE	MASS
01	FLAT BAR	100 x 16 FLAT	ANZ-300	EXTERNAL	45°	3	7300 mm	5050 mm	113 kg
02	CHANNEL	125 PFC	ANZ-300	EXTERNAL	0°	2	5750 mm	3700 mm	98 kg
03	CHANNEL	200 PFC	ANZ-300	EXTERNAL	45°	1	4500 mm	150 mm	399 kg

----- SITE DATA -----

LOCATION

LATITUDE: -33.834392
LONGITUDE: 151.256418
ELEVATION: 86.00 m

DESIGN

REFERENCE: AS/NZS 1170-2021
IMPORTANCE LEVEL: 2
LIFE: 50 YEARS

WIND

REGION: A2
ULTIMATE ARI: 500 YEARS

REGIONAL WIND SPEED (VR)

- Calculated as per AS/NZS 1170.2-2021 Section 3.2.

ULTIMATE: 45 m/s
SERVICEABILITY: 27 m/s

DIRECTION MULTIPLIER (Md)

- Calculated for Region A2 as per AS/NZS 1170.2-2021 Section 3.3.

WIND	Md
N	1.0
NE	1.0
E	1.0
SE	1.0
S	1.0
SW	1.0
W	1.0
NW	1.0

CLIMATE CHANGE MULTIPLIER (Mc) = 1.0

- Calculated for Region A2 as per AS/NZS 1170.2-2021 Table 3.3.

TERRAIN/HEIGHT MULTIPLIER (Mz,cat)

- Calculated using averaging as per AS/NZS 1170.2-2021 Section 4.2.3 and varies with height.

NORTH WIND: Mz,cat = 0.83 → 1.155 (TC 3.0 → TC 1.48)

ZONE 1: TC 3 to 813.75 m
ZONE 2: TC 1 to 1860.00 m

NORTH EAST WIND: Mz,cat = 0.83 → 1.0991 (TC 3.0 → TC 2.21)

ZONE 1: TC 3 to 581.25 m
ZONE 2: TC 1 to 697.50 m
ZONE 3: TC 3 to 1046.25 m
ZONE 4: TC 1 to 1162.50 m
ZONE 5: TC 3 to 1395.00 m
ZONE 6: TC 1 to 1860.00 m

EAST WIND: Mz,cat = 0.8724 → 1.183 (TC 2.48 → TC 1.0)

ZONE 1: TC 3 to 348.75 m
ZONE 2: TC 1 to 1860.00 m

SOUTH EAST WIND: Mz,cat = 0.8398 → 1.183 (TC 2.88 → TC 1.0)

ZONE 1: TC 3 to 465.00 m
ZONE 2: TC 1 to 1860.00 m

SOUTH WIND: Mz,cat = 0.8491 → 1.183 (TC 2.76 → TC 1.0)

ZONE 1: TC 2.5 to 116.25 m
ZONE 2: TC 3 to 465.00 m
ZONE 3: TC 1 to 1860.00 m

SOUTH WEST WIND: Mz,cat = 1.004 (TC 3.0)

ZONE 1: TC 3 to 1860.00 m

WEST WIND: Mz,cat = 1.004 (TC 3.0)

ZONE 1: TC 3 to 1860.00 m

NORTH WEST WIND: Mz,cat = 1.004 (TC 3.0)

ZONE 1: TC 3 to 1860.00 m

SHIELDING MULTIPLIER (Ms)

- Shielding Multipler (Ms) = 1.0 for structures exceeding 25.00 m as per AS/NZS 1170.2-2021 Section 4.3.1.

NORTH WIND: Ms = 1.0

NORTH EAST WIND: Ms = 1.0

EAST WIND: Ms = 1.0

SOUTH EAST WIND: Ms = 1.0

SOUTH WIND: Ms = 1.0

SOUTH WEST WIND: Ms = 1.0

WEST WIND: Ms = 1.0

NORTH WEST WIND: Ms = 1.0

TOPOGRAPHIC MULTIPLIER (Mt)

- Calculated as per AS/NZS 1170.2-2021 Section 4.4 and varies with height.

- Topography calculations based on "DEFAULT" dataset (this can be edited in Settings).

WIND	CRITICAL	TOPOGRAPHY	H	Lu	x	Mh	Mt
N	NNW	Hill	86.00 m	241.33 m	-20.02 m	1.2665 → 1.1964	1.2665 → 1.1964
NE	ENE	Hill	87.00 m	351.76 m	-80.01 m	1.1653 → 1.1328	1.1653 → 1.1328
E	E	Escarpment	86.00 m	222.67 m	20.00 m	1.2989 → 1.2155	1.2989 → 1.2155
SE	ESE	Hill	85.50 m	241.67 m	20.01 m	1.2646 → 1.1951	1.2646 → 1.1951
S	SSW	Hill	88.00 m	266.25 m	80.02 m	1.2076 → 1.1568	1.2076 → 1.1568
SW	SSW	Hill	88.00 m	266.25 m	80.02 m	1.2076 → 1.1568	1.2076 → 1.1568
W	WNW	Hill	22.00 m	166.67 m	-20.01 m	1.096 → 1.0633	1.096 → 1.0633
NW	NNW	Hill	86.00 m	241.33 m	-20.02 m	1.2665 → 1.1964	1.2665 → 1.1964

ICE

ELEVATION CLASS: N/A
WIND SPEED (VR): 34 m/s

----- SHAFT DRAG ----------

- Monopole Shaft Drag Factor (Cd) has been calculated as per AS/NZS 1170-2021 Table C.3, accounting for variations in wind speed and monopole width with height and the presence of access systems and linear loads.

----- ACCESS SYSTEM -----

TYPE: LADDER
STRINGER: TUBE
TOP HEIGHT: 28530 mm
BASE HEIGHT: 5741 mm
AZIMUTH: 0°
STRINGER DEPTH: 50 mm
STRINGER THICKNESS: 5.0 mm
STRINGER FACE OFFSET: 179 mm
PEG SPACING: 500 mm
PEG LENGTH: 215 mm
TOTAL MASS: 177 kg

----- HEADFRAMES & PLATFORMS -----

HEADFRAME #01

℄ RL: 31.00 m
TYPE: TURRET (h = 3720 mm / b = 520 mm)
EPA: 1.00 m²
MASS: 350.00 kg
LIVE LOAD: 0.00 kPa
FLOOR AREA: 0.00 m²

DESIGN LOADS

WIND	Wu	Ws
N	2.32 kN	0.84 kN
NE	1.88 kN	0.68 kN
E	2.51 kN	0.90 kN
SE	2.43 kN	0.87 kN
S	2.28 kN	0.82 kN
SW	1.64 kN	0.59 kN
W	1.38 kN	0.50 kN
NW	1.75 kN	0.63 kN

HEADFRAME #02

℄ RL: 27.50 m
TYPE: TRIANGULAR (h = 1000 mm / b = 3200 mm)
EPA: 2.50 m²
MASS: 650.00 kg
LIVE LOAD: 0.25 kPa
FLOOR AREA: 4.50 m²

DESIGN LOADS

WIND	Wu	Ws
N	5.56 kN	2.00 kN
NE	4.46 kN	1.61 kN
E	6.21 kN	2.24 kN
SE	6.00 kN	2.16 kN
S	5.61 kN	2.02 kN
SW	3.97 kN	1.43 kN
W	3.35 kN	1.20 kN
NW	4.26 kN	1.53 kN

----- APPURTENANCE GROUPS -----

APPURTENANCE GROUP #01: 3 × RFS AP909016-CT0

LOCATION: HEADFRAME 01
STATUS: EXISTING
MASS: 45.00 kg
OFFSET: 0 mm

G01-01: RFS AP909016-CT0

SECTOR: 1
MOUNT: 1
℄ RL AGL: 31.00 m
AZIMUTH: 35°
SHIELDING: 1.00

G01-02: RFS AP909016-CT0

SECTOR: 2
MOUNT: 1
℄ RL AGL: 31.00 m
AZIMUTH: 170°
SHIELDING: 1.00

G01-03: RFS AP909016-CT0

SECTOR: 3
MOUNT: 1
℄ RL AGL: 31.00 m
AZIMUTH: 310°
SHIELDING: 1.00

DESIGN LOADS

WIND	EPA
N	3.03 m²
NE	2.81 m²
E	2.69 m²
SE	2.92 m²
S	3.03 m²
SW	2.80 m²
W	2.69 m²
NW	2.93 m²

APPURTENANCE GROUP #02: 12 × CommScope RV4PX308R

LOCATION: HEADFRAME 02
STATUS: PROPOSED
MASS: 360.00 kg
OFFSET: 0 mm

G02-01: CommScope RV4PX308R

SECTOR: 1
MOUNT: 1
℄ RL AGL: 27.50 m
AZIMUTH: 35°
SHIELDING: 0.75

G02-02: CommScope RV4PX308R

SECTOR: 1
MOUNT: 2
℄ RL AGL: 27.50 m
AZIMUTH: 35°
SHIELDING: 0.75

G02-03: CommScope RV4PX308R

SECTOR: 1
MOUNT: 3
℄ RL AGL: 27.50 m
AZIMUTH: 35°
SHIELDING: 0.75

G02-04: CommScope RV4PX308R

SECTOR: 1
MOUNT: 4
℄ RL AGL: 27.50 m
AZIMUTH: 35°
SHIELDING: 0.75

G02-05: CommScope RV4PX308R

SECTOR: 2
MOUNT: 1
℄ RL AGL: 27.50 m
AZIMUTH: 170°
SHIELDING: 0.75

G02-06: CommScope RV4PX308R

SECTOR: 2
MOUNT: 2
℄ RL AGL: 27.50 m
AZIMUTH: 170°
SHIELDING: 0.75

G02-07: CommScope RV4PX308R

SECTOR: 2
MOUNT: 3
℄ RL AGL: 27.50 m
AZIMUTH: 170°
SHIELDING: 0.75

G02-08: CommScope RV4PX308R

SECTOR: 2
MOUNT: 4
℄ RL AGL: 27.50 m
AZIMUTH: 170°
SHIELDING: 0.75

G02-09: CommScope RV4PX308R

SECTOR: 3
MOUNT: 1
℄ RL AGL: 27.50 m
AZIMUTH: 310°
SHIELDING: 0.75

G02-10: CommScope RV4PX308R

SECTOR: 3
MOUNT: 2
℄ RL AGL: 27.50 m
AZIMUTH: 310°
SHIELDING: 0.75

G02-11: CommScope RV4PX308R

SECTOR: 3
MOUNT: 3
℄ RL AGL: 27.50 m
AZIMUTH: 310°
SHIELDING: 0.75

G02-12: CommScope RV4PX308R

SECTOR: 3
MOUNT: 4
℄ RL AGL: 27.50 m
AZIMUTH: 310°
SHIELDING: 0.75

DESIGN LOADS

WIND	EPA
N	6.45 m²
NE	5.22 m²
E	4.63 m²
SE	5.86 m²
S	6.45 m²
SW	5.22 m²

W 4.63 m²
NW 5.86 m²

APPURTENANCE GROUP #03: 1 × Φ1200 Shroud Dish

LOCATION: SHAFT
STATUS: EXISTING
MASS: 77.00 kg
OFFSET: 872 mm @ 90°

G03-01: Dish Φ1200 Shroud Dish

SECTOR: 2
MOUNT: 1
℄ RL AGL: 25.00 m
AZIMUTH: 110°
SHIELDING: 1.00

DESIGN LOADS

WIND EPA

N 0.86 m²
NE 1.03 m²
E 1.43 m²
SE 1.41 m²
S 0.93 m²
SW 0.89 m²
W 1.11 m²
NW 1.11 m²

----- LINEAR LOADS -----

LINEAR LOAD #01: NEMA 20C Cable Ladder

TOP ℄ RL: 26.80 m
BASE ℄ RL: 3.00 m
SHAPE: RECTANGULAR
WIDTH: 300 mm
DEPTH: 155 mm
MASS: 30.00 kg/m
LOCATION: EXTERNAL
FACE OFFSET: 80 mm @ 270.0°

LINEAR LOAD #02: LDF5-50A 7/8 Feed Line

TOP ℄ RL: 26.10 m
BASE ℄ RL: 3.30 m
SHAPE: ROUND
WIDTH: 26 mm
DEPTH: 26 mm
MASS: 0.49 kg/m
LOCATION: INTERNAL
FACE OFFSET: 0 mm @ 85.0°

LINEAR LOAD #03: LDF5-50A 7/8 Feed Line

TOP ℄ RL: 26.10 m
BASE ℄ RL: 3.30 m
SHAPE: ROUND
WIDTH: 26 mm
DEPTH: 26 mm
MASS: 0.49 kg/m
LOCATION: INTERNAL
FACE OFFSET: 0 mm @ 90.0°

LINEAR LOAD #04: LDF5-50A 7/8 Feed Line

TOP ℄ RL: 26.10 m
BASE ℄ RL: 3.30 m
SHAPE: ROUND
WIDTH: 26 mm
DEPTH: 26 mm
MASS: 0.49 kg/m
LOCATION: INTERNAL
FACE OFFSET: 0 mm @ 95.0°

----- ANALYSIS -----

• The maximum design actions for each load case are as follows:

LOAD CASE	MOMENT	TORSION	SHEAR	AXIAL	ROTATION	DEFLECTION	DYNAMIC
01: 1.2 G + Wu	1938.88 kN·m (SE)	7.58 kN·m (NW)	99.56 kN (SE)	105.88 kN	2.6035° (SE)	704 mm (SE)	1.0 (N)
02: 0.9 G + Wu	1931.84 kN·m (SE)	7.58 kN·m (NW)	99.56 kN (SE)	79.41 kN	2.5898° (SE)	701 mm (SE)	1.0 (N)
03: 1.2 G + 1.5 Q	3.99 kN·m (N)	0.00 kN·m (N)	9.36 kN (N)	107.57 kN	0.0046° (N)	1 mm (N)	1.0 (N)
04: G + Ws	698.17 kN·m (SE)	2.73 kN·m (NW)	35.84 kN (SE)	88.23 kN	0.9363° (SE)	253 mm (SE)	1.0 (N)
05: Wf	323.85 kN·m (NW)	1.87 kN·m (SW)	18.99 kN (NW)	4.65 kN	0.3917° (NW)	109 mm (NW)	1.0 (N)

• Elastic Critical Buckling Load (Ncr) is 1383.68 kN.

• Minimum First Mode Natural Frequency (n1) is 1.0274 Hz for Load Case 1.2 G + Wu.

• Minimum Scruton Number (Sc) is 25.16 with Critical Velocity (Vcr) = 2.67 m/s for 1.2 G + Wu.

• Maximum Equivalent Tip Load for foundation design is 67.32 kN.

----- SHAFT DESIGN (AS 4100) -----

• Monopole PASSES with a maximum utilisation of [74.69%] @ RL 8790.0 mm under South East Wind for Load Case 1.2 G + Wu.

----- CONNECTION DESIGN (AS 4100) -----

BASE

- Anchor Bolts PASS with a maximum utilisation of [60.92%] @ 45° under South East Wind for Load Case 0.9 G + Wu.
- Base Plate PASSES with a maximum utilisation of [54.20%] @ 315° under South East Wind for Load Case 1.2 G + Wu.
- Gussets PASS with a maximum utilisation of [66.90%] @ 0° under South East Wind for Load Case 1.2 G + Wu.
- Grout PASSES with a maximum utilisation of [73.33%] @ 135° under South East Wind for Load Case 1.2 G + Wu.

----- FATIGUE DESIGN (LRFD LTS-1) -----

MEAN WIND SPEED: 5.5 m/s
DAILY STRESS CYCLES: 23000 (AASHTO LRFD LTS-1 Table 17.5.2.5)

• The default mean wind speed of 5.5 m/s is based on measurements recorded 1.00 km away (-33.8405, 151.2643) at Sydney Harbour (Wedding Cake West) (066196) between 1998-2019 and sourced from BOM.

• Infinite Life criteria not met under the following conditions:

LOAD CASE 05: Wf

RL	WIND	DETAIL	DESCRIPTION	STRESS	INFINITE LIMIT	FINITE LIFE	UTILISATION
6310.0 mm	NW	DETAIL 3.2 (A)	REINFORCED OPENING (ROOT)	117.67 MPa (K = 4.0)	110 MPa	50.8 years	[106.97%]
3000.0 mm	NW	DETAIL 3.2 (A)	REINFORCED OPENING (ROOT)	134.07 MPa (K = 4.0)	110 MPa	34.3 years	[121.88%]
1250.0 mm	NW	DETAIL 3.2 (A)	REINFORCED OPENING (ROOT)	138.51 MPa (K = 4.0)	110 MPa	31.1 years	[125.92%]
0.0 mm	NW	DETAIL 2.3	24 × M36 BOLTS	54.60 MPa	48 MPa	93.2 years	[113.75%]

----- FOUNDATION DESIGN -----

STRATA

GEOTECHNICAL STRENGTH REDUCTION FACTOR (ϕg): 0.40 (AS 2159 Section 4.3.2)
GEOTECHNICAL FACTOR OF SAFETY (FOS): 3.00 (refer site geotechnical report)

ID	TYPE	CLASS	DEPTH	UNIT WEIGHT	BEARING	COF
01	CLAY	V. SOFT	1.00 m	18.0 kN/m³	50 kPa	0.4
02	SANDY CLAY	FIRM	2.50 m	17.5 kN/m³	100 kPa	0.4
03	SAND	MEDIUM	5.00 m	16.0 kN/m³	250 kPa	0.45

• Base of foundation sits within Strata Layer #02.

PAD FOUNDATION

ORIENTATION: 0.0°
PLINTH: CIRCULAR
PLINTH WIDTH: 1500 mm
PLINTH HEIGHT: 500 mm
BASE WIDTH: 6000 mm
BASE BREADTH: 6000 mm
BASE HEIGHT: 1500 mm
BASE EMBEDMENT: 1750 mm
X OFFSET: 0 mm
Y OFFSET: 0 mm

• Foundation FAILS under the following conditions:

LOAD CASE 01: 1.2 G + Wu

WIND	BASE Mx*	BASE My*	BASE Vx*	BASE Vy*	ex	ey	qa,max*	AREA	BEARING	SLIDING	OVERTURNING
SE	1510.50 kN·m	-1513.07 kN·m	-70.40 kN	70.40 kN	-818 mm	817 mm	117 kPa	89.88%	[117.00%]	[23.80%]	[27.28%]

LOAD CASE 02: 0.9 G + Wu

WIND	BASE Mx*	BASE My*	BASE Vx*	BASE Vy*	ex	ey	qa,max*	AREA	BEARING	SLIDING	OVERTURNING
SE	1505.85 kN·m	-1507.77 kN·m	-70.40 kN	70.40 kN	-1087 mm	1086 mm	117 kPa	75.50%	[117.00%]	[31.73%]	[36.25%]

MINIMUM REINFORCEMENT (AS 3600)

CONCRETE STRESS (f'c): 32 MPa
REINFORCEMENT GRADE: ANZ-500N
YIELD STRESS (fsy): 500 MPa

• Minimum required reinforcement (As) is 1429 mm²/m as per AS 3600 Section 16.3.1.

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