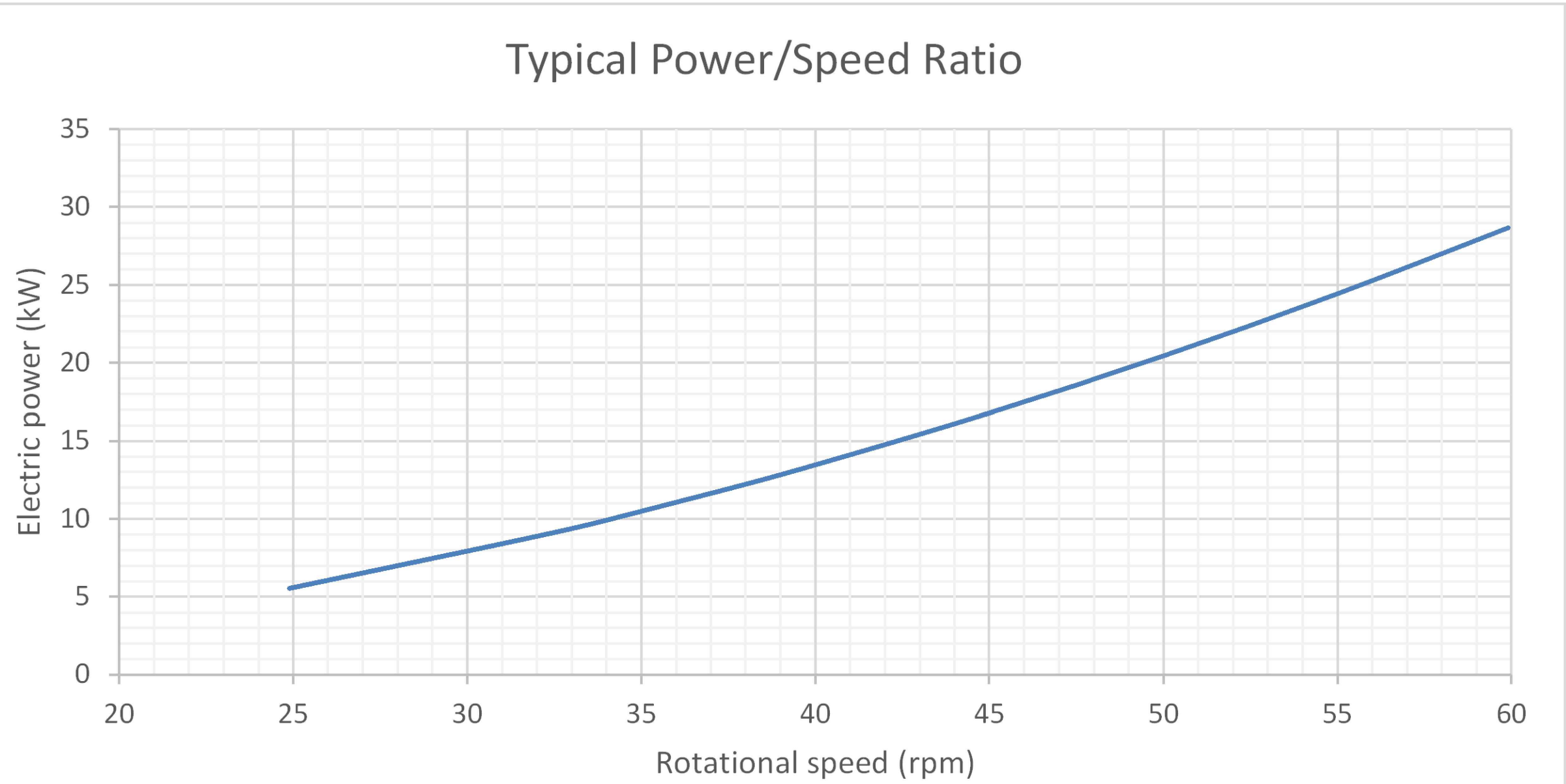
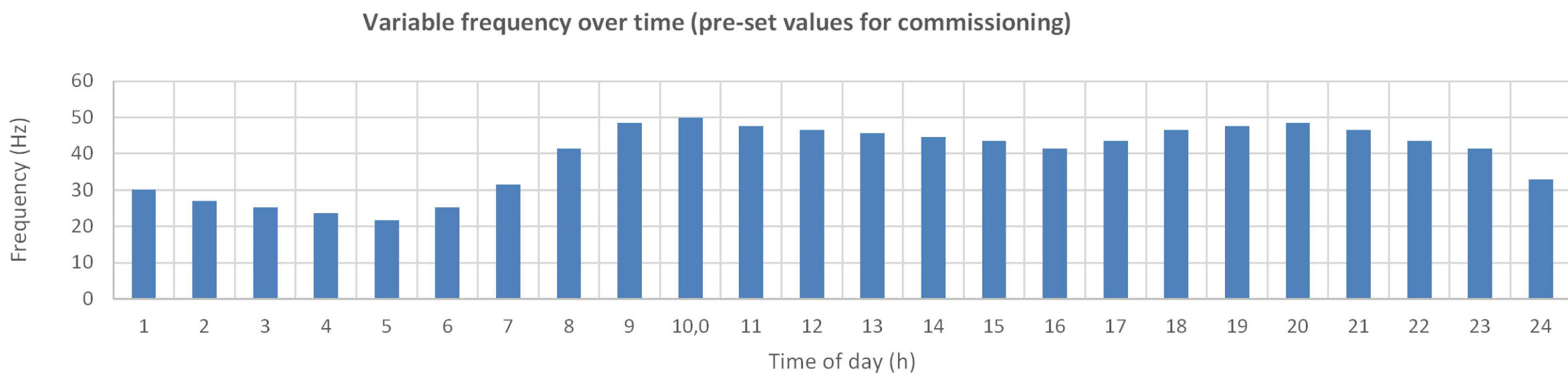
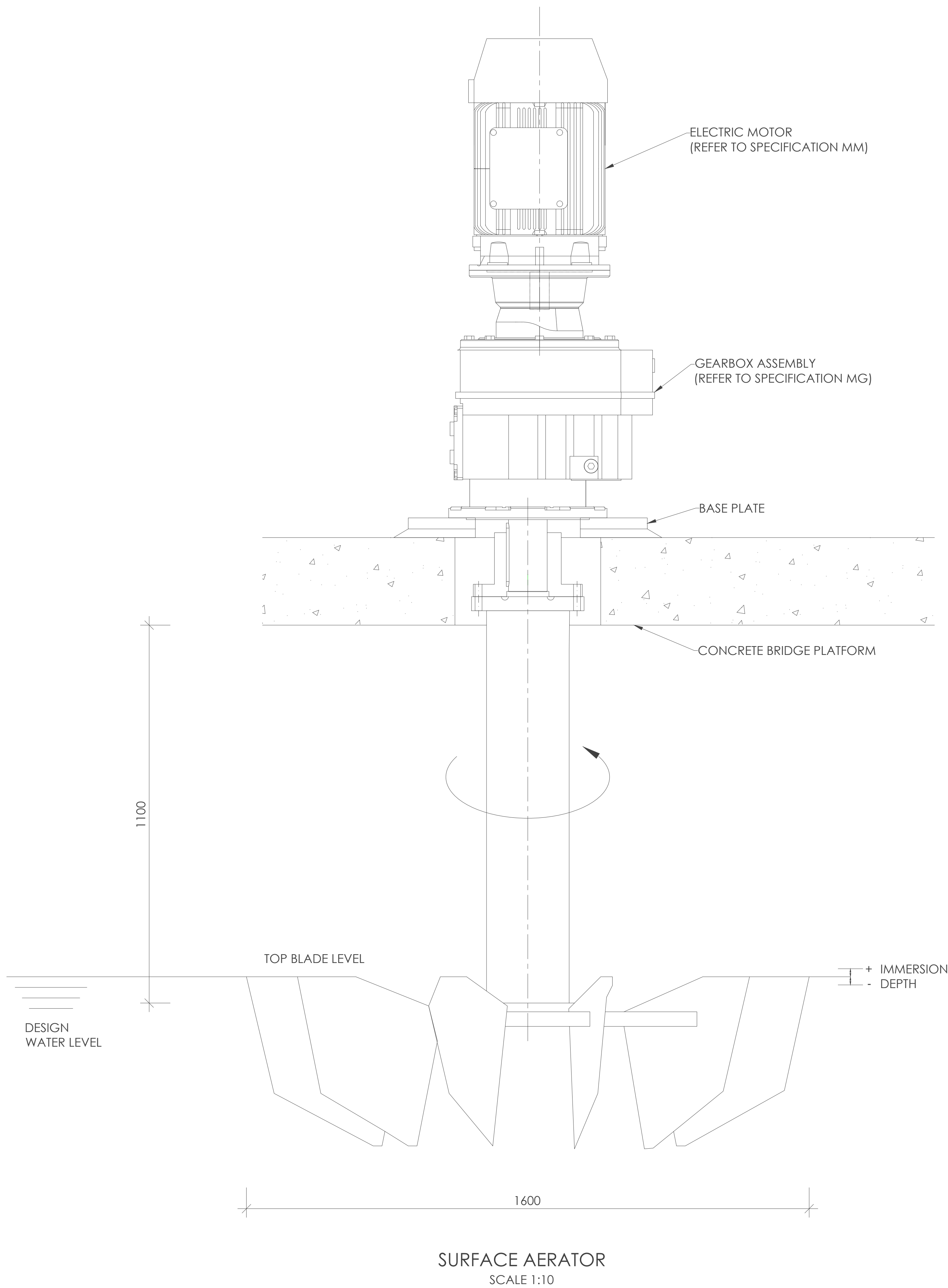


Model diurnal load variation for Variable Speed Drive adjustment, with peak load indicated in bold																										
Power/motor (kW)	11	9	8	7	6	8	12	20	27	28,5	26	25	24	23	22	20	22	25	26	27	25	22	20	13		
Speed (gear) (rpm)	36	32	30	28	26	30	38	49	58	59,7	57	56	54	53	52	49	52	56	57	58	56	52	49	39		
Frequency (Hz)	30	27	25	24	22	25	31	41	49	50,0	48	47	46	45	44	41	44	47	48	49	47	44	41	33		
Time (h)	1	2	3	4	5	6	7	8	9	10,0	11	12	13	14	15	16	17	18	19	20	21	22	23	24		



Standard Oxygen Transfer Rate = (AOR * Cs ₂₀) / α * θ ^(T - 20) * H _{cor} * β * (Cs - Ct)				
Average biological process oxygen demand		1905	1430	kg O2/day
Water temperature in process	T	12	20	°C
Oxygen concentration in aerobic zone mixed liquor	Ct	2,0	2,0	mg/l
Hydraulic retention time	t	24	24	h
Altitude above sea-level	H	1609	1609	m
Alpha factor (0,8 - 1,0)	α	0,65	0,65	
Deficit/safety factor		6,39	6,39	mg/l
Oxygen saturation factor	Cs	10,80	9,10	mg/l
Beta factor (0,9 - 1,0)	β	0,95	0,95	
Altitude correction factor	H _{cor}	0,82	0,82	
O2 saturation factor at 20 deg. C	Cs,20	9,07	9,07	mg/l
Standard Oxygen Transfer Rate (Total)	SOTR20	4720	3644	kg O2/day
Standard Oxygen Transfer Rate (per unit)	SOTR20	787	607	kg O2/day
Peak load factor (maximum/average demand)		1,50	1,50	
Total number of surface aerator units		6	6	
Standard Oxygen Transfer Rate (per unit)	SOTR20	49,2	38,0	kg O2/h
Estimated aerator power demand (gearbox output)	2,00	24,6	19,0	kW
Gearbox input, at efficiency (motor output)	95%	25,9	20,0	kW
Motor input, at efficiency (electrical input)	95%	27,2	21,0	kW



AERATOR	
SPECIFICATION	DESCRIPTION & DIMENSIONS (mm)
DIAMETER	1600
SPEED (rpm)	60
SHAFT LENGTH	1100
OXYGENATION CAPACITY, STANDARD CONDITIONS (kg O ₂ /hr)	59,2
MMERSION LEVEL (POSITIVE - ABOVE TWL)	23
MATERIAL	MILD STEEL
COATING	COPON
GEARBOX	
SERVICE FACTOR SHAFT POWER / MOTOR POWER	3 / 2,5
LIFETIME OF BEARINGS	50000
GEARBOX EFFICIENCY	94,6%
TRANSMISSION RATIO	24,19
OPERATING TIME (hr)	24,00
E-MOTOR	
POWER (kW)	30
SPEED (rpm)	1500
ELECTRICAL CONNECTION	40/3/50
EFFICIENCY @ 75% OUTPUT	95,9%
INSULATION CLASS	F
POWER FACTOR	0,8
STARTING METHOD	VSD

INFORMATION REQUIRED FROM MANUFACTURER PRIOR TO ENGINEER'S APPROVAL

SPECIFICATION	DESCRIPTIONS & DIMENSIONS (mm)
AERATOR TYPE	
MOTOR TYPE	
GEARBOX TYPE	
WEIGHT OF UNIT	
SHAFT POWER (kW) / SOTR (kg/h) vs SPEED (rpm) CURVE	
SHAFT POWER (kW) / SOTR (kg/h) vs IMMERSION DEPTH CURVE	

FUNCTIONAL DETAIL

THE EXISTING BIOREACTOR FEATURES SIX BRIDGE PLATFORMS EQUIPPED WITH SURFACE-MOUNTED AERATORS, EACH COMPRISING OF A STEEL BASE PLATE, GEARBOX, AND ELECTRIC MOTOR THAT DRIVES A VERTICAL SHAFT WITH AN AERATOR IMPELLER. THE REFURBISHMENT AIMS TO OPTIMIZE THEIR FUNCTIONALITY BY SALVAGING USABLE COMPONENTS FROM THE EXISTING ASSEMBLIES. THE PLAN INCLUDES REFURBISHING THREE AERATORS USING THE BEST-SELECTED COMPONENTS WHILE REPLACING THE REMAINING THREE WITH NEW INSTALLATIONS. GIVEN THAT AERATION TYPICALLY ACCOUNTS FOR APPROXIMATELY 50% OF A WASTEWATER TREATMENT PLANT'S TOTAL ELECTRICITY DEMAND, IT IS CRUCIAL FOR THE SURFACE AERATORS TO OPERATE AT VARYING CAPACITIES RATHER THAN MAXIMUM OUTPUT TO ALIGN WITH THE DIURNAL LOAD DISTRIBUTION OF RAW WASTEWATER. CONSEQUENTLY, EACH SURFACE-MOUNTED AERATOR WILL BE EQUIPPED WITH VARIABLE SPEED DRIVE MOTORS TO ENABLE THIS ADAPTIVE PERFORMANCE.

NOTES:

LOCAL MUNICIPALITY: MAP



SPONSOR & REGULATOR: DWS



ISSUED FOR TENDER



- Ⓐ BEFORE CONTRACT COMMENCES
- Ⓐ AFTER CONSTRUCTION CONTRACT HAS COMMENCED

Nr.	DATE	AMENDMENTS
COPYRIGHT IS VESTED IN V3 CONSULTING ENGINEERS IN TERMS OF THE COPYRIGHT ACT (ACT 98 OF 1978)		

CLIENT / IMPLEMENTING AGENT



V3 CONSULTING ENGINEERS

T : +27 51 045 1950
Suite 31, Nobel House, 196 Nelson Mandela Road, Brandwag, Bloemfontein, 9301



PROJECT
TSHIAME WWTW REFURBISHMENT

DRAWING DESCRIPTION
AERATOR INSTALLATION DETAILS

DRAWING NO.	REVISION
10909001-6006	T1

DESIGNED:	AK	CHECKED:	AK
DRAWN:	EMT	ECSA PR No: 20130658	AS SHOWN
APPROVED:	AK	SCALE:	A0
ECSA PR No: 20130658		INCEPTION DATE:	SEPT'24
FILE PATH:	SHAREPOINT / BLOEMFONTEIN - 10909001 TSHIAME WWTW / 04 DOC PROC / 04 DRAW		



ISSUED FOR TENDER