



**INDICATIVE WATER BALANCE  
AND BLOC DIAGRAM**

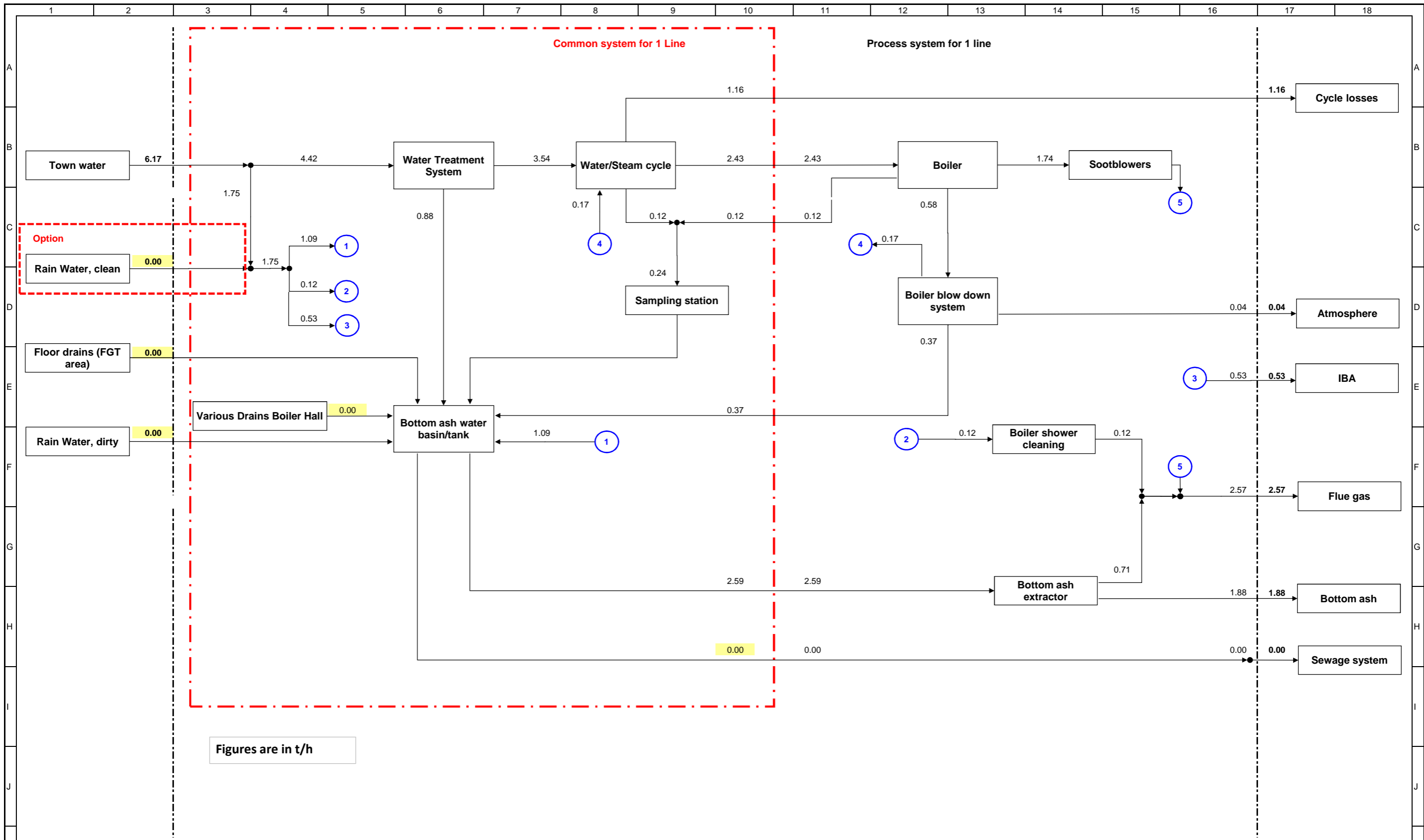
APPENDIX

**6**



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# APPENDIX 6: Indicative Water Balance and Bloc Diagram



Figures are in t/h

**Operating condition**  
 - Normal operation at load point:  
 - No. of Lines in operation:  
 - Rain water not considered

LP N  
1

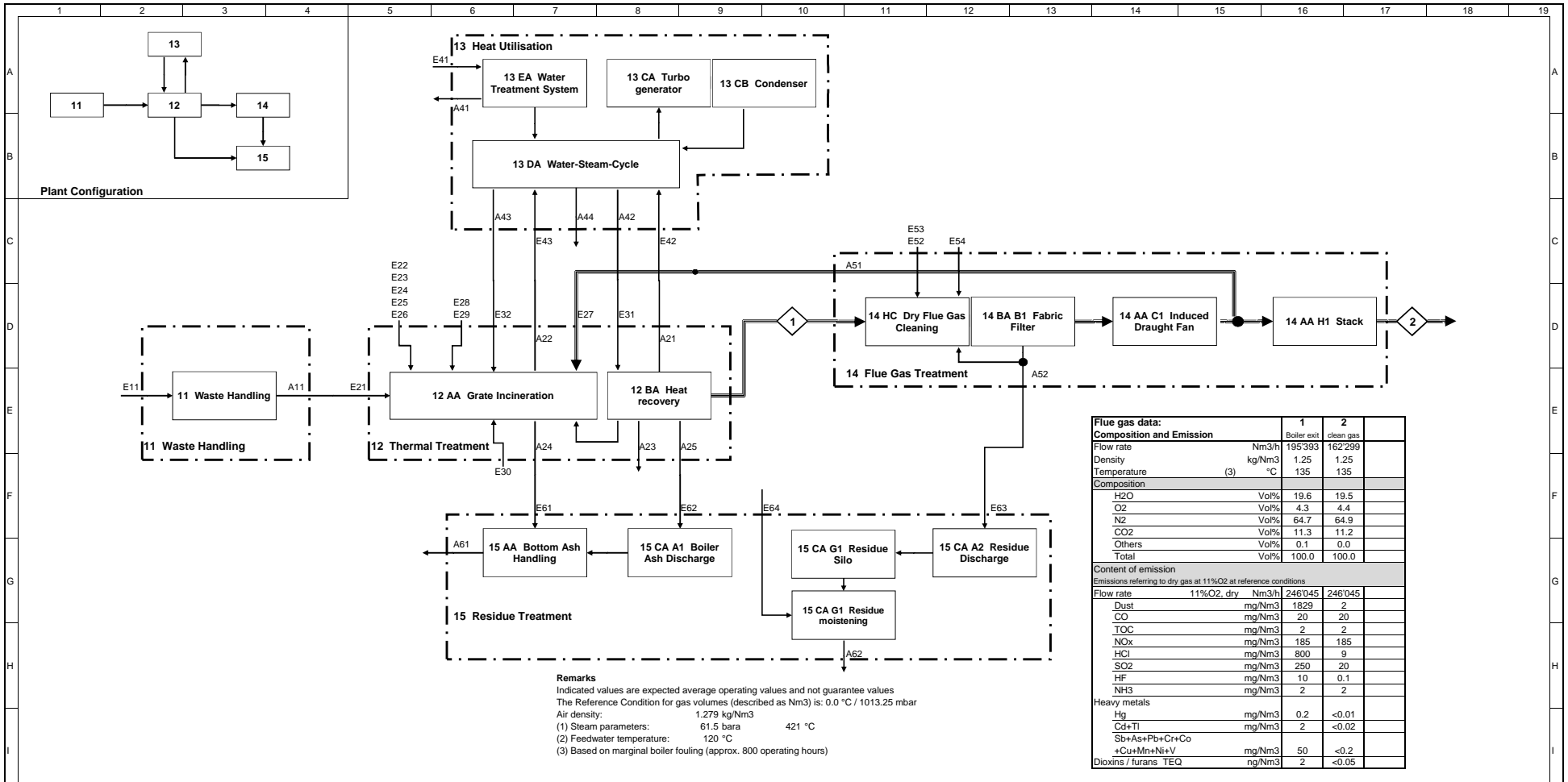
**Design Data**  
 Thermal power waste per line 101.8 MW  
 Waste throughput per line 37.5 t/h  
 Ash content waste 23.0%  
 Flue gas temp. inlet FGT 135 °C

Preliminary

**Remarks**  
 - The purpose of this mass balance calculation is to determine the overall process water consumption of the plant. It does not show all internal connections.  
 - The unit of all values is t/h (1'000 kg/h) except indicated otherwise.  
 - All given values are expected/assumed operating values and are given as mean values over the operation period.  
 - Water steam cycle losses are counted fully as losses despite partly being recovered in bottom ash and/or process water basin.  
 - The given values shall not be used for pipe sizing purposes since it may not correspond to the design value of it.  
 - The calculation of cooling water flow for boiler blowdown is based on the following assumptions:  
 Temperature of cooling water: 20 °C  
 Temperature of after cooling: 100 °C

**Mass Balance, status:** i.o.  
 - Total water input 6.17 t/h  
 - Total water output 6.17 t/h

2		
1		
0	25.08.17	First Issue
Rev.	Date	Description
Project Name		Project No
Rockingham		YE-3324
Date		Name
Prepared 25.08.17		Rem
Checked		
Approved		
Prog. No. : CSP-104 / V4.5		
Load point		Hitachi Zosen INOVA
LP N		
<b>Water Balance - Process</b>		
Bloc Diagram		
HZI doc. N° :		Revision
-		1
Print date : 25.08.17		Page : 1/1



Flue gas data:		1	2
<b>Composition and Emission</b>		Boiler exit	clean gas
Flow rate	Nm <sup>3</sup> /h	195'393	162'299
Density	kg/Nm <sup>3</sup>	1.25	1.25
Temperature	(3) °C	135	135
<b>Composition</b>			
H <sub>2</sub> O	Vol%	19.6	19.5
O <sub>2</sub>	Vol%	4.3	4.4
N <sub>2</sub>	Vol%	64.7	64.9
CO <sub>2</sub>	Vol%	11.3	11.2
Others	Vol%	0.1	0.0
Total	Vol%	100.0	100.0
<b>Content of emission</b>			
Emissions referring to dry gas at 11%O <sub>2</sub> at reference conditions			
Flow rate	11%O <sub>2</sub> , dry Nm <sup>3</sup> /h	246'045	246'045
Dust	mg/Nm <sup>3</sup>	1829	2
CO	mg/Nm <sup>3</sup>	20	20
TOC	mg/Nm <sup>3</sup>	2	2
NO <sub>x</sub>	mg/Nm <sup>3</sup>	185	185
HCl	mg/Nm <sup>3</sup>	800	9
SO <sub>2</sub>	mg/Nm <sup>3</sup>	250	20
HF	mg/Nm <sup>3</sup>	10	0.1
NH <sub>3</sub>	mg/Nm <sup>3</sup>	2	2
<b>Heavy metals</b>			
Hg	mg/Nm <sup>3</sup>	0.2	<0.01
Cd+Tl	mg/Nm <sup>3</sup>	2	<0.02
Sb+As+Pb+Cr+Co	mg/Nm <sup>3</sup>	50	<0.2
+Cu+Mn+Ni+V	ng/Nm <sup>3</sup>	2	<0.05
<b>Dioxins / furans - TEQ</b>			
	ng/Nm <sup>3</sup>	2	<0.05

**Remarks**  
 Indicated values are expected average operating values and not guarantee values  
 The Reference Condition for gas volumes (described as Nm<sup>3</sup>) is: 0.0 °C / 1013.25 mbar  
 Air density: 1.279 kg/Nm<sup>3</sup>  
 (1) Steam parameters: 61.5 bara 421 °C  
 (2) Feedwater temperature: 120 °C  
 (3) Based on marginal boiler fouling (approx. 800 operating hours)

Input			Output			Input			Output		
<b>11 Waste Handling</b>						<b>13 Heat Utilisation</b>					
E11 Waste (NCV = 9.77 MJ/kg)	37500 kg/h	A11 Waste	37500 kg/h	E41 Water water treatment system	1'554 kg/h	A41 Blowdown water treatment system	403 kg/h	E42 Superheated steam (1)	128'511 kg/h	A42 Feedwater (2)	129'287 kg/h
E12		A12		E43 Condensate air preheater	6'750 kg/h	A43 Steam air preheater pressure level 1	6'170 kg/h	E44		A44 Cycle losses & sampling	771 kg/h
E13		A13		<b>14 Flue Gas Treatment</b>							
<b>12 Thermal Treatment</b>						<b>15 Residue Treatment</b>					
E21 Waste	37500 kg/h	A21 Superheated steam (1)	128'511 kg/h	E45		A45		<b>15 Residue Treatment</b>			
E22 Primary air	96'254 Nm <sup>3</sup> /h	A22 Condensate air preheater	6'750 kg/h	E46		A46		E61 Bottom ash, wet	8'310 kg/h	A61 Recirculated flue gas	34'594 Nm <sup>3</sup> /h
E23 Secondary air	26'926 Nm <sup>3</sup> /h	A23 Continuous boiler blowdown	380 kg/h	<b>14 Flue Gas Treatment</b>			<b>15 Residue Treatment</b>				
E24 Burner cooling air	3'400 Nm <sup>3</sup> /h	A24 Bottom ash, wet	8'310 kg/h	E52 Activated carbon	9.8 kg/h	A52 Residues FGT	1'240 kg/h	E62 Boiler ash	300 kg/h	E53 Hydrated lime	500 kg/h
E25 Leaking air through feed hopper	1'280 Nm <sup>3</sup> /h				E54 Air	1'500 Nm <sup>3</sup> /h	A54				
E26 Air rear ventilated refractory lining	2'750 Nm <sup>3</sup> /h				E55		A55				
E27 Recirculated flue gas	34'594 Nm <sup>3</sup> /h				E56		A56				
E28 SNCR solution reaction medium	7 kg/h				<b>15 Residue Treatment</b>						
E29 SNCR injection air	908 Nm <sup>3</sup> /h	A29		E61 Bottom ash, wet	8'310 kg/h	A61 Bottom ash, wet	8'610 kg/h	E62 Boiler ash	300 kg/h	A62 Residues moistened	1'463 kg/h
E30 Water bottom ash extractor	1'746 kg/h	A30		E63 Residues dry	1'240 kg/h	A63		E64 Water for moistening residues	223 kg/h	A64	
E31 Feedwater (2)	129'471 kg/h	A31		E65		A65		E66		A66	
E32 Steam air preheater pressure level 1	6'170 kg/h	A32									
E33		A33									
E34		A34									
E35		A35									
E36		A36									

Indicated values taken from the following design calculations:

Heat Mass Balance - Boiler	Prog. No.	Doc. No.	Rev.	Date
	CSP-005	N/A	0	23.08.2017
	-	N/A	0	xx.xx.xxxx
	-	N/A	0	xx.xx.xxxx
	-	N/A	0	xx.xx.xxxx

Rev.	Date	Description
1	31.08.17	Residue moistening included
0	25.08.17	First Issue

Project Name	Project No	Load point	Hitachi Zosen INOVA
Rockingham	YE-3324	LPN	
Date	Name	BLOC DIAGRAM	
23.08.2017	strobil / Kas		
Prepared			
Checked		HZI doc. N°:	Revision
Approved		-	1

Prog. No. CSP-103 / V2.0  
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