

AIR LIQUIDE

Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

COVER - SHEET

Distribution

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Processing

Date	Name	Checked by	Status
25.09.2004	Rüdiger	Chiran	Rev.0

Flexibility Test:
C = Calculation
SM = Simplified methode
PE = Professional experience

Type of Insulation:
C = Low-temperature insulation
condensed water
CV = Low-temperature insulation
vacuum jacket
EP = electric polished

G = pickled
PP = contact protection
S = sound protection
W = heat protection
W = heat and sound protection
S

W = heat and sound protection with
electric foreign heating
B = heat protection with
electric foreign heating
W = polyethylen jacket, corrosion protection
E

Coating:
P = Primer
B = Bitumised
NC = None coating

Category:
3-3 = Goodengineering practice
I = Category I
II = Category II
III = Category III

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DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
1100	A	10001	AA10C1	001	V 11001	1067	1.0254						-	S						
80	EG	10001	AA10C1	040	NG INLET	88,9	1.0254						-							
600	A	11001	AA10C1	001	V 11001	610	1.0254						-	S						
700	A	11001	AA10C1	002	Reduzierung DN600/700	711	1.0254						-	S						
400	A	11002	AA10C1	001	600 A 11001 AA10C1	406,4	1.0254						-	S						
300	WC	11003	AA10C2	023	Cooling water	323,9	1.0254						-							
	WC	11801	AA10C2	001	300 WC 11003 AA10C2	0	1.0305						-							
150	LV	11802	AA10C1	027	Oil system MAC	168,3	1.0254						-							
80	WC	11803	AA10C2	027	Cooling water	88,9	1.0254						-							
80	WC	12003	AA10C2	002	100 WC 14006 AA16C2	88,9	1.0254						-							
700	A	13001	AA10C1	002	W 13001	711	1.0254						-	S						
700	A	13002	AA10C1	004	MOLE SIEVE STATION	711	1.0254						-	W						

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	Fluid	Piping No.	Piping classification	from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
100	A	13003	AA10C1	004	700 A 13001 AA10C1	114,3	1.0254						-	W						
				004	700 A 13001 AA10C1															
100	A	13004	AA10C1	004	700 A 13002 AA10C1	114,3	1.0254						-	W						
				004	700 A 13002 AA10C1															
150	WC	13020	AA10C2	002	Reduzierung DNI50/250	168,3	1.0254						-	WE						
				002	KA 12001															
200	WC	13020	AA10C2	002	W 13001	219,1	1.0254						-	WE						
				002	250 WC 13020 AA10C2															
250	WC	13020	AA10C2	002	Reduzierung DNI50/250	273	1.0254						-							
				023	Cooling water															
80	WC	13021	AA10C2	002	200 WC 13020 AA10C2	88,9	1.0254						-	WE						
				003	W 14001															
80	WC	13026	AA10C2	002	250 WC 80004 AA10C2	88,9	1.0254						-							
				002	100 WC 80011 AA10C2															
80	WC	13030	AA10C2	002	W 13001	88,9	1.0254						-							
				002	LT 13013															
80	WC	13031	AA10C2	002	LT 13013	88,9	1.0254						-							
				002	W 13001															
80	WC	13032	AA10C2	002	W 13001	88,9	1.0254						-							
				002	LT 13003															
80	WC	13033	AA10C2	002	W 13001	88,9	1.0254						-							
				002	LT 13003															
150	WC	14001	AA10C2	003	W 14001	168,3	1.0254						-	WE						
				003	P 14100															
100	WC	14002	AA16C2	003	P 14100	114,3	1.0254						-	WE						
				002	KA 12011															

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		Piping No.	Piping classification		from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
150	WC	14003	AA10C2	003	150 WC 14001 AA10C2		168,3	1.0254						-	WE						
				003	P 14200																
100	WC	14004	AA16C2	003	P 14200		114,3	1.0254						-	WE						
				003	100 WC 14002 AA16C2																
100	WC	14005	AA16C2	002	100 WC 14002 AA16C2		114,3	1.0254						-	WE						
				002	100 WC 14006 AA16C2																
100	WC	14006	AA16C2	002	KA 12001		114,3	1.0254						-	WE						
				002	W 13001																
150	WC	14007	AA10C2	003	Chill Tower / W14001 - N5		168,3	1.0254						-							
				003	ins Freie																
80	WC	14030	AA10C2	003	W 14001 / N32		88,9	1.0254						-	WE						
				003	LT 14003																
80	WC	14031	AA10C2	003	W 14001 / N31		88,9	1.0254						-	WE						
				003	LT 14003																
700	A	15001	AA10C1	004	A 15001		711	1.0254						-	W						
				004																	
500	A	15002	AA10C1	006	Reduzierung DN500/700		508	1.0254						-							
				009	W20010 - W20040																
700	A	15002	AA10C1	004	700 A 15001 AA10C1		711	1.0254						-							
				005	Reduzierung DN500/700																
700	A	15003	AA10C1	004	A 15002		711	1.0254						-	W						
				004	700 A 15002 AA10C1																
100	A	15004	AA10C1	004	700 A 15001 AA10C1		114,3	1.0254						-	W						
				004	700 A 15003 AA10C1																
500	A	15005	AA10C1	006	500 A 15002 AA10C1		508	1.0254						-							
				006	N16007																

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DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
					from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
600	N	15006	AA10C1	005 004	W 15001 600 N 15008 AA10C1		610	1.0254						-	W						
600	N	15008	AA10C1	004 004	700 A 15001 AA10C1 700 A 15003 AA10C1		610	1.0254						-	W						
150	A	15009	AA10C1	006 006	500 A 15002 AA10C1 500 A 15002 AA10C1		168,3	1.0254						-							
600	N	15010	AA10C1	004 004	700 A 13001 AA10C1		610	1.0254						-	W						
100	N	15011	AA10C1	004 004	600 N 15010 AA10C1		114,3	1.0254						-	W						
600	N	15012	AA10C1	004 004	700 A 13002 AA10C1 600 N 15010 AA10C1		610	1.0254						-	W						
100	N	15013	AA10C1	004 004	600 N 15010 AA10C1 100 N 15011 AA10C1		114,3	1.0254						-	W						
200	A	15015	AA10C1	004 004	700 A 15002 AA10C1 UV 15037		219,1	1.0254						-							
400	A	15015	AA10C1	004 005	UV 15037		406,4	1.0254						-							
50	A	15016	AA10C1	004 025	200 A 15015 AA10C1		60,3	1.0254						-							
80	A	15018	AA10C1	004 004	50 A 15016 AA10C1 Sammelleitung		88,9	1.0254						-							
50	A	15019	AA10C1	025 025	50 N 81003 AA10C1 Sammelleitung		60,3	1.0254						-							
25	C	15020	AA10C1	004 004	A 15001 Abfluss		33,7	1.0254						-							

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	Fluid	Piping No.	Piping classification	from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	C	15021	AA10C1	004	A 15002	33,7	1.0254						-							
				004	Abfluss															
25	C	15022	BA25C1	005	W 15001	33,7	1.0305						-	W						
				005	ins Freie															
25	C	15023	BA25C1	005	25 C 15022 BA25C1	33,7	1.0305						-	W						
				005	ins Freie															
25	C	15024	BA25C1	005	W 15001	33,7	1.0305						-	W						
				005	ins Freie															
40	A	15030	AA10C1	004	80 A 15018 AA10C1	48,3	1.0254						-							
				007	Ventil V 34182															
40	A	15031	AA10C1	004	80 A 15018 AA10C1	48,3	1.0254						-							
				008	Ventil V 34282															
25	A	15033	AA10C1	004	80 A 15018 AA10C1	33,7	1.0254						-							
				012	Ventil V 61192															
25	A	15034	AA16C1	004	80 A 15018 AA10C1	33,7	1.0254						-							
				015	Ventil V 71191															
25	A	15035	AA16C1	015	25 A 15034 AA16C1	33,7	1.0254						-							
				015	Ventil V 71291															
25	A	15036	AA10C1	004	80 A 15018 AA10C1	33,7	1.0254						-							
				016	Ventil V 40191															
25	A	15037	AA10C1	012	25 A 15033 AA10C1	33,7	1.0254						-							
				012	Ventil V 61290															
25	A	15038	AA10C1	004	80 A 15018 AA10C1	33,7	1.0254						-							
				018	Ventil V 43082															
50	A	15040	AA10C1	025	50 A 15016 AA10C1	60,3	1.0254						-							
				025	25 A 15043 AA10C1															

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	Fluid No.	Piping classification		from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	A	AA10C1	025	50 A 15016 AA10C1	Molsieve	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15016 AA10C1	Compressor	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15040 AA10C1	Exp. Turbine	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15040 AA10C1	Cold Box	33,7	1.0254						-							
25	A	AA10C1	025	25 A 15044 AA10C1	Cold Box	33,7	1.0254						-							
	A	MA_W	018	25 A 15038 AA10C1	Sicherheitsventil Z43032	0							-							
25	A	AA10C1	025	50 A 15019 AA10C1	Verteiler LIN Tank	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15019 AA10C1	Verteiler LOX Tank	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15019 AA10C1	Verteiler LOX Verdampfer	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15019 AA10C1	Verteiler LIN Verdampfer	33,7	1.0254						-							
25	A	AA10C1	025	50 A 15019 AA10C1		33,7	1.0254						-							
250	A	AA63C1	006	V 1601		273	1.0254						-							
150	A	AA63C1	006	250 A 16001 AA63C1		168,3	1.0254						-							

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								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)			
300	WC	16003	AA10C2	006 023	Cooling water Cooling water	323,9	1.0254						-						
25	A	16004	AA63C1	007 029	250 A 16001 AA63C1 25 N 81025 AA10C1	33,7	1.0254						-						
25	A	16005	AA63C1	007 030	25 A 16004 AA63C1 25 N 81026 AA10C1	33,7	1.0254						-						
150	LV	16801	AA10C1	028 028	V 16803 ins Freie	168,3	1.0254						-						
80	WC	16802	AA10C2	028 006	Motor Oil System BAC 300 WC 16003 AA10C2	88,9	1.0254						-						
	WC	16803	AA10C2	006 028	300 WC 16003 AA10C2 Oil system BAC	0	1.0305						-						
100	A	20001	MA-W	008 008	Reduzierung DN100/150 ET 24201	114,3							-						
150	A	20001	MA_W	009 008	W20010-W20040 Reduzierung DN150/100	168,3							-						
200	O	200019	ZB40C1	010 010	250 O 20006 ZB40C1 N20011	219,1	1.4541						-						
100	A	20002	MA_W	008 007	150 A 20001 MA_W Expander Turbine 1	114,3							-						
100	N	20004	ZB40C1	009 010	W20010 - W20040 FV20001	114,3	1.4541						-						
100	N	20005	AA63C1	010 010	R20001 HP GAN / TOP 3	114,3	1.0254						-						
250	O	20006	ZB40C1	009 010	W20010 - W20040 GOX	273	1.4541						-						

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	Fluid	Piping No.	Piping classification	from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
250	O	20007	ZB40C1	010	250 O 20006 ZB40C1	273	1.4541						-							
				010	GOX															
400	N	20008	AA10C1	010	Reduzierung DN600/400	406,4	1.0254						-							
				019	N2 Compressor 1 / V70010															
600	N	20008	AA10C1	009	W20010 - W20040	610	1.0254						-							
				010	Reduzierung DN600/400															
400	N	20009	AA10C1	010	N2 Compressor 2 / V77001	406,4	1.0254						-							
				020																
500	N	20010	AA10C1	005	700 N 20011 AA10C1	508	1.0254						-							
				005	500 N 20012 AA10C1									W						
600	N	20011	AA10C1	005	Reduzierung DN600/700	610	1.0254						-							
				003	W 14001															
700	N	20011	AA10C1	006	Reduzierung DN600/700	711	1.0254						-							
				005	W20010 - W20040															
500	N	20012	AA10C1	005	W 15001	508	1.0254						-							
				005	UK 15045									W						
100	N	20013	AA10C1	005	700 N 20011 AA10C1	114,3	1.0254						-							
				024	100 N 87001 AA10C1															
400	A	20015	MA_W	009	W20010 - W20040	406,4							-							
				009																
500	N	20016	AA10C1	005	UK 15045	508	1.0254						-							
				005	600 N 15006 AA10C1									W						
400	N	20017	AA10C1	010	600 N 20008 AA10C1	406,4	1.0254						-							
				010	N20005															
50	N	20017	AA16C1	020	250 N 75005 AA16C1	60,3	1.0254						-							
				025	80 N 81015 AA10C1															

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DN	Fluid	Piping No.	Piping classification					Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
200	N	20018	ZB40C1	010 010	FV 20002 N 20001	219,1	1.4541						-							
80	N	20018	ZB40C1	010 010	100 N 20004 ZB40C1 FV 20001	88,9	1.4541						-							
15	N	20028	AA40C1	010 015	100 N 20005 AA63C1 LIN PUMP / SEAL GAS BOX	21,3	1.0254	0	0				-							
400	A	21001	MA__W	009 014	B21001 K21001	406,4							-							
100	AL	21002	MA__W	011 014	Reduzierung DN100/150 K21001	114,3							-							
150	AL	21002	MA__W	009 011	B21001 Reduzierung DN100/150	168,3							-							
50	A	21003	MA__W	014 018	N 21020 MA__W W43001	60,3							-							
50	A	21004	MA__W	014 017	400 A 21001 MA__W 150 OL 23004 MA--W	60,3							-							
300	AL	21005	MA--W	009 009	W20010-W20040 B21001	323,9							-							
100	AL	21006	MA__W	011 011	W23001 150 AL 21002 MA__W	114,3							-							
200	OL	21007	MA__W	014 012	K22001 200 OL 21007 ZB16C1	219,1	1.4541						-							
200	OL	21007	ZB16C1	012 012	200 OL 21007 MA__W LOX Pumpe / P 61100	219,1	1.4541						-							
200	OL	21008	ZB16C1	012 012	200 OL 21007 ZB16C1 LOX Pumpe / P61200	219,1	1.4541						-							

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DN	Fluid	Piping No.	Piping		P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Flexibility-test	Category n. 97/23/EG	Remarks
			Piping classification			from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)			
50	OL	21009	ZB16C1		012	Ventil V 61293		60,3	1.4541						-						
					026	80 OL 90001 ZB16C1															
80	NL	21013	MA_W		014	B21002		88,9							-						
					015	80 NL 21014 ZB16C1															
80	NL	21013	ZB16C1		015	80 NL 21013 MA_W		88,9	1.4541						-						
					015	LIN Pumpe / P 71100															
80	NL	21014	ZB16C1		015	80 NL 21013 MA_W		88,9	1.4541						-						
					015	LIN Pumpe / P 71200															
25	NL	21015	ZB16C1		015	Ventil V 71190		33,7	1.4541						-						
					026	50 NL 90004 ZB16C1															
25	NL	21016	ZB16C1		015	80 NL 21014 ZB16C1		33,7	1.4541						-						
					015	25 NL 21015 ZB16C1															
200	NL	21017	MA_W		014	B 21002		219,1							-						
					014	K 21001															
150	N	21018	MA_W		014	B21002		168,3							-						
					011	W23001															
80	N	21019	MA_W		014	K22001		88,9							-						
					014	B21002															
	N	21020	MA_W		014	K22001		0							-						
					014	K21001															
50	N	21021	MA_W		014	K21001		60,3							-						
					013	150 NL 23007 MA_W															
150	OL	21023			014	K21001		168,3	1.4541						-						
					011	W23001															
50	OL	21024	ZB16C1		014	K21001		60,3	1.4541						-						
					026	80 OL 90001 ZB16C1															

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Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	N	21025	MA_W	014	W21001	33,7							-							
50	N	21027	MA_W	014	ins Freie								-							
400	N	22001	MA_W	013	400 A 21001 MA_W 150 AL 23002 MA_W	60,3							-							
150	O	22002	MA-W	013	K22001	406,4							-							
500	O	22003	MA-W	011	W23001	168,3							-							
350	NL	22004	MA_W	013	K22001	508							-							
500	N	22006	MA_W	014	400 N 22001 MA_W	0							-							
500	N	22007	MA_W	013	K22001	355,6							-							
500	N	23001	MA_W	014	B21002	508							-							
100	AL	23002	MA-W	011	K22001	508							-							
150	AL	23002	MA_W	013	Subcooler W20010 - W20040	508							-							
50	NL	23003	ZB16C1	010	W23001	114,3							-							
150	OL	23004	MA-W	013	Reduzierung DN150/100	168,3							-							
50	NL	23003	ZB16C1	011	Reduzierung DN150/100	168,3							-							
150	OL	23004	MA-W	013	K22001	60,3							-							
50	NL	23003	ZB16C1	035	B 72001	60,3	1.4541						-							Tankfarm
150	OL	23004	MA-W	011	W23001	168,3							-							
150	OL	23004	MA-W	017	K40002	168,3							-							

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Piping list

Diagram No.: 792.86811

Revision: P1 TF

Date: 21.05.2004

Diagram state: RevP1

Project: ASU No9 KOSICE

Project No.: K70101

List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating		Test Medium	Test Press. (bar ti)	Coating	Heat Tracing	Insulation			Flexibility-test	Remarks
					from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)		
50	N	23005	ZB16C1	011	FV 23013		60,3	1.4541						-	CV				
				035	50 NL 23003 ZB16C1														
150	NL	23007	MA_W	013	K22001		168,3							-					
				011	W23001														
25	NL	23008	ZB10C1	011	150 NL 23007 MA_W		33,7	1.4541						-					
				011	ins Freie														
25	AL	23009	MA_W	011	150 AL 23002 MA_W		33,7							-					
				011															
50	N	23010	ZB16C1	011	W23001		60,3	1.4541						-					
				026	50 NL 90004 ZB16C1														
600	N	23010	MA_W	011	Subcooler		610							-					
				009	W20010 - W20040														
80	WC	24101	AA10C2	029	Cooling Water Oilsyst.T.1		88,9	1.0254						-					
				023	Cooling Water Oilsyst.T.1														
150	LV	24102	AA10C1	029	F24182		168,3	1.0254						-					
				029	ins Freie														
25	A	24103	AA10C1	029	Turbine 1 / ET24101		33,7	1.0254						-					
				029	ins Freie														
150	A	24105	MA_W	007	200 A 24105 MA_W		168,3							-					
				007	Turbine 1 / ET24101														
200	A	24105	MA_W	007	Reduzierung DN200/150		219,1							-					
				008	250 A 24105 MA_W														
250	A	24105	MA_W	008	200 A 24105 MA_W		273							-					
				009	400 A 20015 MA_W														
25	A	24106	AA10C1	007	Ventil V 34183		33,7	1.0254						-					
				007	Abfluss														

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W=Wasserdruckprüfung, D=Dichtheitsprüfung, P=Druckprüfung

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Piping list

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Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissible Operating		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
80	WC	24201	AA10C2	030	Cooling Water Oilsyst.T.2	88,9	1.0254						-							
				023	Cooling Water Oilsyst.T.2															
150	LV	24202	AA10C1	030	F24282	168,3	1.0254						-							
				030	ins Freie															
25	A	24203	AA10C1	030	Turbine 2 / ET24201	33,7	1.0254						-							
				030	ins Freie															
150	A	24205	MA_W	008	Turbine 2 / ET24201	168,3							-							
				008	200 A 24205 MA_W															
200	A	24205	MA_W	008	250 A 24105 MA_W	219,1							-							
				008	150 A 24105 MA_W															
25	A	24206	AA10C1	008	Ventil V 34283	33,7	1.0254						-							
				008	Abfluss															
500	WC	24301	AA10C2	023	Cooling Water	508	1.0254						-							
					Cooling Water															
200	OL	40001	ZB16C1	016	HV 40110	219,1	1.4541						-							
				016	Pumpe P 40100															
200	OL	40001	MA-W	016	K 40001	219,1							-							
				016	HV 40110															
400	R	40002	MA_W	016	K40001	406,4							-							
				017	K40002															
250	RL	40003	MA_W	017	K40002 / N7	273							-							
				017	K40002 / N3															
40	RL	40004	MA_W	017	50 RL 40004 MA_W	48,3							-							
				018	K43001 / N3															
50	RL	40004	MA_W	017	250 RL 40003 MA_W	60,3							-							
				017	ins Freie															

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Piping list

Diagram No.: 792.86811
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Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
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List state: Rev0

DN	Piping		P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permitting Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Category n. 97/23/EG	Flexibility-test	Remarks
	Fluid	Piping No.	Piping classification	from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)			
150	RL	40005	MA_W	K40002	K40001	168,3							-						
100	OL	40007	ZB10C1	K40002	K22001	114,3	1.4541						-						
40	O	40008	ZB10C1	100 OL 40007 ZB10C1	ins Freie	48,3	1.4541						-						
400	R	40009	MA_W	K40001	K40002	406,4							-						
400	R	40010	MA_W	K40002 / N6	K40002 / N4.1	406,4							-						
50	R	40011	MA_W	150 R 40015 MA_W	80 R 43005 MA_W	60,3							-						
500	O	40012	MA_W	K40002	K22001	508	1.4541						-						
25	OL	40013	ZB10C1	Ventil V 40190		33,7	1.4541						-						
25	R	40014	MA_W	K40002	ins Freie	33,7							-						
150	R	40015	MA_W	400 R 40010 MA_W	ins Freie	168,3							-						
25	NL	40016	MA_W	B21002	40 AL 43007 MA_W	33,7							-						
100	OL	40101	MA-W	V 40151	K22001	114,3	1.4541						-						
100	OL	40101	ZB16C1	Pumpe P 40100	V 40151	114,3	1.4541						-						

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Piping list

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Project: ASU N09 KOSICE
Project No.: K70101
List state: Rev0

DN	Piping		P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permitting Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility- test	Remarks
	Fluid	Piping No.	Piping classification				Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
40	OL	40102	ZB16C1	016	Ventil V 40193	48,3	1.4541					-							
80	OL	40103	MA--W	026	80 OL 90001 ZB16C1	88,9						-							
80	OL	40103	ZB16C1	016	V 40171	88,9						-							
25	RL	43001	MA__W	016	K 40001	33,7						-							
25	RL	43001	ZB16C1	018	100 OL 40101 ZB16C1	33,7	1.4541					-							
25	RL	43002	ZB16C1	042	V 40171	33,7						-							
80	RL	43003	MA__W	018	K 43001 / N6	88,9						-							
100	RL	43004	MA__W	018	25 RL 43001 MA__W	114,3						-							
80	R	43005	MA__W	018	25 RL 43001 MA__W	88,9						-							
50	RL	43006	MA__W	018	50 RL 90002 ZB16C1	60,3						-							
40	AL	43007	MA__W	018	K 43001 / N1	48,3						-							
80	N	43009	MA__W	018	W 43002	88,9						-							
80	AL	43011	MA__W	018	K 43001 / N5	88,9						-							
				018	W 43002	60,3						-							
				018	K 43001 / N4	48,3						-							
				018	25 AL 43015 MA__W	48,3						-							
				018	B 43001	88,9						-							
				011	B 43001	88,9						-							
				018	W 43002	88,9						-							
				018	B 43001 / N2	88,9						-							

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DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permitting Operating		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
100	A	43012	MA_W	018	B43001 / N5	114,3							-							
				018	W43002															
25	A	43013	MA_W	018	W43002	33,7							-							
				018	ins Freie															
25	AL	43015	MA_W	018	W43001	33,7							-							
				013	150 AL 23002 MA_W															
1/4"	RL	44003	ZB16C1	042	P44001	8	1.4541						-							
				042																
50	RL	44004	ZB16C1	042	50 RL 48004 ZB40C1	60,3	1.4541						-							
				042	50 RL 44202 ZB40C1															
1/4"	RL	44005	ZB16C1	043	50 RL 44202 ZB40C1	8	1.4541						-							
				043	LAR Back Up Pumpe P48001															
80	RL	44102	ZB16C1	041	LAR Tank 2 / B44201	88,9	1.4541						-							
				042																
25	R	44104	ZB16C1	041	LAR Tank 1	33,7	1.4541						-							
				041	ins Freie															
80	RL	44201	ZB16C1	042	B 44201	88,9	1.4541						-							
				042	LAR Tank 2 / Pumpe P44001															
	R	44202	ZB16C1	042	B44201	0	1.4541						-							
				042	ins Freie															
50	RL	44202	ZB40C1	042	LAR Tank 2 / P44001	60,3	1.4541						-							
				042	Tanker															
	R	44204	ZB10C1	042	LAR Tank 2 / B44201		1.4541						-							
				042	ins Freie															
50	RL	48001	ZB40C1	043	LAR Back Up Pumpe P48001	60,3	1.4541						-							
				044	LAR Tank B48001															

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Project: ASU No9 KOSICE
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List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Category n. 97/23/EG	Flexibility-test	Remarks
					from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)			
50	RL	48004	ZB40C1	043	50 RL 48001 ZB40C1		60,3	1.4541						-						
				041	LAR Tank 1															
25	RL	48009	ZB16C1	044	LAR Tank B48001		33,7	1.4541						-						
				044	LAR Tank B48001															
25	R	48033	ZB40C1	044	B48001		33,7	1.4541						-						
				044	W48101															
50	R	48033	ZB40C1	044	LAR Tank B48001		60,3	1.4541						-						
				044																
25	R	48034	ZB40C1	044	Reduzierung DN40/50		33,7	1.4541						-						
				044	25 R 48033 ZB40C1															
50	R	48034	ZB40C1	044	50 R 48033 ZB40C1		60,3	1.4541						-						
				044	Reduzierung DN40/50															
50	RL	48105	ZB10C1	044	LAR Tank B48001		60,3	1.4541						-						
				044	LAR Tank B48001															
100	OL	61101	MA_W	012	LOX Pumpe P61100		114,3							-						
				009	W20010 - W20040															
100	OL	61101	ZB40C1	012	LOX Pumpe / P 61100		114,3	1.4541						-						
				012	100 OL 61101 MA_W															
50	O	61102	MA_W	011	100 OL 61101 MA_W		60,3							-						
				011	50 OL 61102 ZB10C1															
50	OL	61102	ZB10C1	032	LOX Tank		60,3	1.4541	10					-	C					Tankfarm
				032	LOX															
50	O	61103	ZB16C1	011			60,3	1.4541						-						
				026	80 OL 90001 ZB16C1															
25	OL	61104	ZB16C1	012	Ventil V 61192		33,7	1.4541						-						
				012	25 OL 61110 ZB10C1															

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Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Piping		P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility- test	Remarks
	Fluid	Piping No.	Piping classification				Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
100	OL	61105	ZB40C1	012	LOX Pumpe / P61100	114,3	1.4541					-							
				014	V 61171														
100	OL	61105	MA-W	012	Ventil V 61171	114,3						-							
				014	K 22001 / N 24														
50	OL	61106	ZB10C1	032	50 OL 61102 ZB10C1	60,3	1.4541					-	C						Tankfarm
				032	LOX Top 5														
15	OL	61107	ZB10C1	012	25 OL 61110 ZB10C1	21,3	1.4541					-							
				012	LOX Pumpe P61100														
25	O	61108	ZB16C1	014	50 O 61111 MA-W	33,7	1.4541					-							
				026	80 OL 90001 ZB16C1														
25	OL	61110	ZB10C1	012	50 OL 21009 ZB16C1	33,7	1.4541					-							
				012	Ventil V 61193														
50	O	61111	MA-W	011	50 OL 61102 ZB10C1	60,3						-							
				014	K22001														
100	OL	61201	ZB40C1	012	LOX Pumpe / P61200	114,3	1.4541					-							
				012	100 OL 61101 ZB40C1														
25	OL	61204	ZB10C1	012	100 OL 61201 ZB40C1	33,7	1.4541					-							
				012	50 OL 21009 ZB16C1														
100	OL	61205	MA-W	012	Ventil V 61271	114,3						-							
				014	K 22001 / N 23														
100	OL	61205	ZB40C1	012	LOX Pumpe / P61200	114,3	1.4541					-							
				014	Ventil V 61271														
15	OL	61207	ZB10C1	012	400 N 20009 AA10C1	21,3	1.4541					-							
				012	LOX Pumpe P61200														
100	OL	62001	ZB10C1	032	150 OL 62001 ZB10C1	114,3	1.4541	10				-	C						Tankfarm
				033	P 64101														

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Piping list

Diagram No.: 792.86811

Revision: P1 TF

Date: 21.05.2004

Diagram state: RevP1

Project: ASU No9 KOSICE

Project No.: K70101

List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permitting Operating:		Test Medium	Test Press. (bar ti)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
150	OL	62001	ZB10C1	032	TF B 62001	168,3	1.4541	10					-	C						Tankfarm
				033	100 OL 62001 ZB10C1															
100	OL	62002	ZB10C1	032	150 OL 62002 ZB10C1	114,3	1.4541	10					-	C						Tankfarm
				032	P 62001															
150	OL	62002	ZB10C1	032	TF B 62001	168,3	1.4541	10					-	C						Tankfarm
				032	Reduzierung DN 80/150															
80	OL	62002	ZB10C1	032	150 OL 62002 ZB10C1	88,9	1.4541						-	C						Tank farm
				032	P 63001															
80	OL	62003	ZB10C1	032	P 62001	88,9	1.4541	10					-							Tankfarm
				032	Road tanker															
50	OL	62004	ZB16C1	032	TF B 62001	60,3	1.4541	10					-							Tankfarm
				032	80 OL 62003 ZB10C1															
100	OL	62005	ZB10C1	033	100 OL 62001 ZB10C1	114,3	1.4541						-	C						Tankfarm
				033	P 64201															
25	OL	62006	ZB10C1	032	TF B 62001	33,7	1.4541	25					-							Tankfarm
				032	W62001															
50	OL	62007	ZB10C1	032	W62001	60,3	1.4541						-							Tankfarm
				032	TF B 62001															
15	O	62008	ZB10C1	032	B62001	21,3	1.4541						-							Tankfarm
				032	Atmosphere															
100	O	62009	ZB10C1	032	B62001	114,3	1.4541						-							Tankfarm
				032	Atmosphere															
50	OL	63003	ZB10C1	032	P 63001	60,3	1.4541						-	C						LOX LGCC Tank farm
				032	50 OL 61102 ZB10C1															
50	OL	63004	ZB10C1	032	50 OL 63003 ZB10C1	60,3	1.4541	10					-							Tankfarm
				032	TF B 62001															

AIR LIQUIDE

Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Piping		P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
	Fluid	Piping No.	Piping classification	from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	OL	64002	ZB40C1			33,7	1.4541						-							
50	OL	64004	ZB40C1		ins Freie	60,3	1.4541						-							Tankfarm
200	O	64005	ZB40C1		W6401/W6402	219,1	1.4541						-							Tankfarm
25	O	64006	ZB40C2		250 O 20006 ZB40C1	33,7	Monel						-							Tankfarm
100	C	64007	AA10C1		W 64001	114,3	1.0254						-							Tank farm
50	OL	64101	ZB40C1		LOX BACK UP Pumpe/P 64101	60,3	1.4541						-	C						
80	OL	64101	ZB40C1		Reduzierung DN50/80	88,9	1.4541						-	C						
80	OL	64102	ZB40C1		Reduzierung DN50/80	88,9	1.4541	40					-	C						Tankfarm
50	OL	64201	ZB40C1		50 OL 64004 ZB40C1	60,3	1.4541						-	C						Tank farm
80	OL	64201	ZB40C1		80 OL 64101 ZB40C1	88,9	1.4541						-	C						Tankfarm
80	OL	64202	ZB40C1		80 OL 64101 ZB40C1	88,9	1.4541						-	C						Tankfarm
150	WC	70020	AA10C2		80 OL 64201 ZB40C1	168,3	1.0254						-							
150	WC	70021	AA10C2		80 OL 64201 ZB40C1	168,3	1.0254						-							

AIR LIQUIDE

Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping		P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permitting Operating		Test Medium	Test Press. (bar ti)	Coating	Heat Tracing	Insulation			Flexibility-test	Category n. 97/23/EG	Remarks
		Piping No.	Piping classification		from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)			
100	WC	70022	AA10C2	019	150 WC 80007 AA10C2		114,3	1.0254						-						
				019	150 WC 70020 AA10C2															
100	WC	70023	AA10C2	020	150 WC 80008 AA10C2		114,3	1.0254						-						
				020	150 WC 70021 AA10C2															
	LV	70802	AA10C1	021	V 70803		0	1.0254						-						
				021	ins Freie															
50	NL	71101	ZB16C1	015	LIN Pumpe / P 7110		60,3	1.4541						-						
				015	50 NL 71101 MA_W															
50	NL	71101	MA_W	015	LIN Pumpe / P71100		60,3							-						
				009	W20010 - W20040															
50	NL	71102	MA_W	015	Ventil V 71171		60,3							-						
				014	B21002															
50	NL	71102	ZB16C1	015	LIN Pumpe / P 71100		60,3	1.4541						-						
				015	Ventil V 71171															
25	NL	71103	ZB10C1	015	50 NL 71101 ZB16C1		33,7	1.4541						-						
				015	25 NL 21015 ZB16C1															
15	NL	71104	ZB10C1	015	25 NL 21015 ZB16C1		21,3	1.4541						-						
				015	LIN Pumpe P71100															
50	NL	71201	ZB16C1	015	LIN Pumpe P71200		60,3	1.4541						-						
				015	50 NL 71101 ZB16C1															
50	NL	71202	MA_W	015	Ventil V 71271		60,3							-						
				014	B21002															
50	NL	71202	ZB16C1	015	LIN Pumpe P 71200		60,3	1.4541						-						
				015	Ventil V 71271															
15	NL	71203	ZB10C1	015	25 NL 21015 ZB16C1		21,3	1.4541						-						
				015	LIN Pumpe P 71200															

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AIR LIQUIDE

Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permitting Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	NL	71203	ZB10C1	015	Ventil V 71293	33,7	1.4541						-							
				015	25 NL 21015 ZB16C1															
150	NL	72001	ZB10C1	035	TF B 72001	168,3	1.4541						-	C						Tankfarm
				035	Reduzierung DN150/80															
80	NL	72001	ZB10C1	035	Reduzierung DN150/80	88,9	1.4541						-	C						Tank farm
				036	LN Back up Pumpe P74101															
100	NL	72002	ZB10C1	035	Reduzierung DN150/100	114,3	1.4541						-	C						Tankfarm
				037	P 73101															
150	NL	72002	ZB10C1	035	B 72001	168,3	1.4541						-							Tankfarm
				035	Reduzierung DN150/100															
100	NL	72003	ZB10C1	037		114,3	1.4541						-	C						Tankfarm
				037	P 73201															
50	NL	72003	ZB16C1	035	TOP 6 LN	60,3	1.4541						-	C						Tankfarm
				035	TF B 72001															
25	NL	72004	ZB10C1	035	TF B 72001	33,7	1.4541	10					-	C						Tank farm
				035	50 N 72005 ZB10C1															
80	NL	72004	ZB10C1	036		88,9	1.4541	10					-	C						Tankfarm
				036	P 74201															
50	N	72005	ZB10C1	035	Reduzierung DN 25/50	60,3	1.4541	10					-							Tank farm
				035	TF B 72001															
15	O	72008	ZB10C1	035	B 72001	21,3	1.4541						-							Tank farm
				035	ins Freie															
100	NL	72101	ZB10C1	035	150 NL 72001 ZB10C1	114,3	1.4541						-	C						Tankfarm
				035	P 72001															
80	NL	72102	ZB10C1	035	P 72001	88,9	1.4541						-	C						Tank farm
				035	Road tanker															

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Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
50	N	72103	ZB10C1	035	TF B 72001	60,3	1.4541						-	C						Tankfarm
40	NL	73001	MA_W	011	80 NL 72102 ZB10C1	48,3							-							
80	NL	73001	ZB25C1	014	W23001 K21001	88,9	1.4541						-	C						Tankfarm
80	NL	73003	ZB25C1	037	80 NL 73101 ZB25C1	88,9	1.4541						-	C						Tankfarm
300	N	73004	ZB25C1	040	TF W 73101	323,9	1.4541						-							Tankfarm
300	N	73004	AA40C1	039	80 NL 73001 ZB25C1	323,9	1.0254						-							Tankfarm
50	N	73004	ZB25C1	038	TF W 73001	60,3	1.4541						-							Tankfarm
25	N	73005	AA40C1	038	Ventil V 73035	33,7	1.0254						-							Tank farm
25	N	73005	ZB25C1	039	300 N 73004 ZB25C1	33,7	1.4541						-							Tank farm
40	NL	73005	ZB16C1	039	80 NL 73003 ZB25C1	48,3	1.4541						-	C						Tank farm
100	C	73006	AA10C1	038	300 N 73004 ZB25C1	114,3	1.0254						-							Tankfarm
50	NL	73007	ZB25C1	039	50 NL 23003 ZB16C1	60,3	1.4541						-							Tankfarm
20	NL	73008	ZB40C1	038	80 NL 73001 ZB25C1	26,9	1.4541						-							Tankfarm

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AIR LIQUIDE

Piping list

Diagram No.: 792.86811

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Date: 21.05.2004

Diagram state: RevP1

Project: ASU No9 KOSICE

Project No.: K70101

List state: Rev0

DN	Piping		P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permitting Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Flexibility-test	Category n. 97/23/EG	Fluidgroup	Remarks
	Fluid	Piping No.	Piping classification	from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	NL	73017	ZB16C1	014	40 NL 73001 MA_W	33,7	1.4541						-							
80	NL	73101	ZB25C1	026	50 NL 90004 ZB16C1	88,9	1.4541						-	C						Tankfarm
80	NL	73102	ZB25C1	037	P 73101	88,9	1.4541						-	C						Tankfarm
25	N	73105	AA40C1	037	80 NL 73001 ZB25C1	33,7	1.0254						-							Tank farm
300	N	73105	AA40C1	040	300 N 73105 AA40C1	323,9	1.0254						-							Tank farm
25	WI	73180	AA10C1	040	Reduzierung DN 150/300	33,7	1.0254						-							
80	NL	73201	ZB25C1	040	INDUSTRIAL WATER	88,9	1.4541						-	C						Tankfarm
80	NL	73202	ZB25C1	037	P 73201	88,9	1.4541						-	C						Tankfarm
100	N	74090	AA40C1	037	80 NL 73001 ZB25C1	114,3	1.0254						-							Tankfarm
100	N	74090	ZB40C1	035	TF B 72001	114,3	1.4541						-							Tankfarm
50	N	74095	AA63C1	036	UV 74090	60,3	1.0254						-							Tankfarm
50	NL	74101	ZB40C1	010	100 N 20005 AA63C1	60,3	1.4541	40					-							Tankfarm
50	NL	74102	ZB40C1	036	Evaporator	60,3	1.4541						-							Tankfarm
50	NL	74101	ZB40C1	036	Ventil UV 74090	60,3	1.4541						-							Tankfarm
50	NL	74102	ZB40C1	036	100 N 74090 AA40C1	60,3	1.4541						-							Tankfarm
50	NL	74102	ZB40C1	038	Ventil PV 73015	60,3	1.4541						-							Tankfarm
50	NL	74101	ZB40C1	036	P 74101	60,3	1.4541						-	C						Tankfarm
50	NL	74102	ZB40C1	036	Evaporator	60,3	1.4541						-							Tankfarm
50	NL	74102	ZB40C1	036	50 NL 74101 ZB40C1	60,3	1.4541						-	C						Tankfarm
50	NL	74102	ZB40C1	035	TF B 72001	60,3	1.4541						-	C						Tankfarm

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AIR LIQUIDE

Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
40	NL	74180	ZB40C1	036	50 NL 74101 ZB40C1	48,3	1.4541						-	C						Tankfarm
				036	TF W 74101															
80	NL	74185	ZB40C1	036	TF W 74101	88,9	1.4541						-							Tank farm
				036	40 N 74280 ZB40C1															
50	NL	74201	ZB40C1	036	P 74201	60,3	1.4541						-	C						Tankfarm
				036	Evaporator															
50	NL	74202	ZB40C1	036	50 NL 74201 ZB40C1	60,3	1.4541						-	C						Tankfarm
				035	TF B 72001															
40	N	74280	ZB40C1	036		48,3	1.4541						-	C						Tankfarm
				0336	TF W 74201															
80	N	74285	ZB40C1	036	TF W 74201	88,9	1.4541						-							Tankfarm
				036																
40	N	74380	ZB40C1	036	TF W 74301	48,3	1.4541						-							Tankfarm
				036																
80	N	74385	ZB40C1	036	TF W 74301	88,9	1.4541						-							Tankfarm
				036																
40	N	74480	ZB40C1	036		48,3	1.4541						-							Tank farm
				036	TF W 74401															
80	N	74485	ZB40C1	036	TF W 74401	88,9	1.4541						-							Tankfarm
250	N	75005	AA16C1	019	VW70003	273	1.0254						-							
				020	Reduzierung DN250/350															
350	N	75005	AA40C1	020	Reduzierung DN250/350	355,6	1.0254						-							
				020	Top 2 / MP-GAN															
150	N	75006	AA16C1	019	350 N 75005 AA40C1	168,3	1.0254						-							
				019	ins Freie															

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AIR LIQUIDE

Piping list

Diagram No.: 792.86811

Revision: P1 TF

Date: 21.05.2004

Diagram state: RevP1

Project: ASU No9 KOSICE

Project No.: K70101

List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permitting Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
								Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
250	N	76005	AA16C1	020	350 N 75005 AA40C1	273	1.0254						-							
				020	N2 Compressor 2 / VW77003															
150	N	76006	AA16C1	020	250 N 76005 AA16C1	168,3	1.0254						-							
				020	ins Freie															
150	LV	77802	AA10C1	022	V 77803	168,3	1.0254						-							
				022	ins Freie															
500	WC	80001	AA10C2		Cooling Water	508	1.0254						-							
				023	Cooling Water															
300	WC	80002	AA10C2	023	Cooling water	323,9	1.0254						-							
				001	Cooling water															
300	WC	80003	AA10C2	023	Cooling water	323,9	1.0254						-							
				006	Cooling water															
250	WC	80004	AA10C2	023	Cooling water	273	1.0254						-							
				002	K13140 / K13240															
80	WC	80005	AA10C1	023	Cooling Water Oilsyst.T.1	88,9	1.0254						-							
				029	Cooling Water Oilsyst.T.1															
200	WC	80006	AA10C2	002	K 13140	219,1	1.0254						-		WE					
				002	P 13100															
80	WC	80006	AA10C1	023	Cooling Water Oilsyst.T.2	88,9	1.0254						-							
				030	Cooling Water Oilsyst.T.2															
150	WC	80007	AA10C2	023	Cooling Water N2 Compress1	168,3	1.0254						-							
				019	Cooling Water N2 Compress1															
200	WC	80007	AA10C2	002	P 13100	219,1	1.0254						-		WE					
				002	W 13001															
150	WC	80008	AA10C2	023	Cooling Water N2 Compress2	168,3	1.0254						-							
				020	Cooling Water N2 Compress2															

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AIR LIQUIDE

Piping list

Diagram No.: 792.86811
Revision: P1 TF
Date: 21.05.2004
Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Fluid	Piping		P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
		Piping No.	Piping classification		from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
200	WC	80008	AA10C2	002	250 WC 80004 AA10C2	P 13200	219,1	1.0254						-	WE						
200	WC	80009	AA10C2	002	250 WC 80004 AA10C2	P 13200	219,1	1.0254						-	WE						
150	WC	80010	AA10C2	002	250 WC 80004 AA10C2	KA 12001	168,3	1.0254						-	WE						
100	WC	80011	AA10C2	002	250 WC 80004 AA10C2	W 14001	114,3	1.0254						-	WE						
	WC	80012	AA10C2	003	300 WC 80002 AA10C2	Oil system MAC	0	1.0254						-							
80	WC	80013	AA10C2	006	Cooling water	Cooling water / BAC Motor	88,9	1.0254						-							
150	WC	80014	AA10C2	001	300 WC 80002 AA10C2		168,3	1.0254						-							
150	WC	80015	AA10C2	006	300 WC 80003 AA10C2		168,3	1.0254						-							
80	WC	80016	AA10C2	006	300 WC 16003 AA10C2		88,9	1.0254						-							
	WC	80017	AA10C2	029	80 WC 80005 AA10C1		88,9	1.0254						-							
80	WC	80018	AA10C2	029	80 WC 24101 AA10C2		88,9	1.0254						-							
	WC	80030	AA10C2	030	80 WC 80006 AA10C1		88,9	1.0254						-							
80	WC	81001	AA10C1	030	80 WC 24201 AA10C2		0	1.0305						-							
	WC			006	300 WC 80003 AA10C2	Oil system BAC	88,9	1.0254						-							
	WC			028	Cooling water	Cooling water	88,9	1.0254						-							
	WC			001	Cooling water	Cooling water	88,9	1.0254						-							
	WC			027	Cooling water	Cooling water	88,9	1.0254						-							
	WC			025	Sammelleitung	Sammelleitung	88,9	1.0254						-							

AIR LIQUIDE

Piping list

Diagram No.: 792.86811
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Project No.: K70101
List state: Rev0

DN	Fluid	Piping No.	Piping classification	P & I Sheet	Piperouting		Pipe dimension (mm)	Material	max. permissing Operating-		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility-test	Remarks
					from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
80	N	81002	AA10C1	025	80 N 81001 AA10C1	Sammelleitung	88,9	1.0254						-							
50	N	81003	AA10C1	025	Instrumentenluft		60,3	1.0254						-							
50	N	81004	AA10C1	025	50 A 15016 AA10C1		60,3	1.0254						-							
15	N	81005	AA10C1	012	80 N 81015 AA10C1		21,3	1.0254						-							
15	N	81006	AA10C1	012	100 N 87001 AA10C1		21,3	1.0254						-							
15	N	81009	AA10C1	016	15 N 81006 AA10C1	Seal Gas Box / P61100	21,3	1.0254						-							
40	N	81010	AA10C1	025	80 N 81002 AA10C1	Oil System BAC	48,3	1.0254						-							
15	N	81011	AA10C1	025	80 N 81002 AA10C1	LN Pumpe / Seal Gas Box	21,3	1.0254						-							Tankfarm
15	N	81012	AA10C1	036	15 N 87014 AA10C1		21,3	1.0254						-							Tankfarm
15	N	81013	AA10C1	037	15 N 81011 AA10C1	Seal Gas Box / P73201	21,3	1.0254						-							
40	N	81013	AA10C1	025	80 N 81002 AA10C1	OIL SYSTEM MAC	48,3	1.0254						-							
80	N	81015	AA10C1	025	80 N 81001 AA10C1	Sammelleitung	88,9	1.0254						-							
25	O	81020	ZB40C1	010	250 O 20006 ZB40C1		33,7	1.4541						-							

AIR LIQUIDE

Piping list

Diagram No.: 792.86811
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Diagram state: RevP1

Project: ASU No9 KOSICE
Project No.: K70101
List state: Rev0

DN	Piping		P & I Sheet	Piperouting from... to...	Pipe dimension (mm)	Material	max. permissing Operating		Test Medium	Test Press. (bar ü)	Coating	Heat Tracing	Insulation			Fluidgroup	Category n. 97/23/EG	Flexibility- test	Remarks
	Fluid	Piping No.	Piping classification				Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
15	O	81021	ZB10C1	025	25 O 81020 ZB40C1	21,3	1.4541					-							
				012	Seal Gas Box														
15	O	81022	ZB10C1	025	25 O 81020 ZB40C1	21,3	1.4541					-							
				016	P40100 / Seal Gas Box														
15	O	81023	ZB10C1	025	25 O 81020 ZB40C1	21,3	1.4541					-							Tankfarm
				033	P 64101														
15	O	81024	ZB10C1	025	15 O 81024 ZB10C1	21,3	1.4541					-							Tankfarm
				033	P 64201														
25	N	81025	AA10C1	025	80 N 81002 AA10C1	33,7	1.0254					-							
				029	Oilsystem Exp. Turbine 1														
25	N	81026	AA10C1	025	80 N 81002 AA10C1	33,7	1.0254					-							
				030	Oilsystem Exp. Turbine 2														
15	O	81028	ZB10C1	012	15 O 81021 ZB10C1	21,3	1.4541					-							
				012	Seal Gas Box / P61100														
15	O	81029	ZB10C1	025	25 O 81020 ZB40C1	21,3	1.4541					-							Tankfarm
				032	SEAL GAS BOX - LOX TANK														
	N	81030	AA10C1	025	80 N 81002 AA10C1	0	1.0254					-							
				025	Sammelleitung														
200	S	84001	BA25C1	031	TOP 11 Steam	219,1	1.0305					-	W						Tankfarm
				031	Distribution														
200	S	84001	BA25C1	031	CUSTOMER STEAM	219,1	1.0305					-							Tankfarm
				031															
100	S	84002	BA25C1	031	200 S 84001 BA25C1	114,3	1.0305					-	W						
				005	W 15001														
100	S	84003	BA25C1	031	200 S 84001 BA25C1	114,3	1.0305					-	W						
				026	Reduzierung DN250/100														

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		Piping No.	Piping classification		from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
250	S	84003	BA25C1	026	Reduzierung 250/100		273	1.0305						-	W						
				026	W90001																
150	S	84005	BA25C1	031	200 S 84001 BA25C1		168,3	1.0305						-	W						Tankfarm
				034	TF W 64001																
150	S	84006	BA25C1	031	200 S 84001 BA25C1		168,3	1.0305						-	W						Tankfarm
				039	TF W 73001																
25	S	84010	BA25C1	026	100 S 84003 BA25C1		33,7	1.0305						-							
				026	B90001																
25	S	84011	BA25C1	031	25 S 84016 BA25C1		33,7	1.0305						-							
				031	Ventil V 88082																
25	S	84012	BA25C1	031	100 S 84002 BA25C1		33,7	1.0305						-							
				031	A88002																
25	S	84013	BA25C1	031	25 S 84012 BA25C1		33,7	1.0305						-							
				031	Ventil V88084																
25	S	84014	BA25C1	031	150 S 84006 BA25C1		33,7	1.0305						-							
				031	A88003																
25	S	84015	BA25C1	031	25 S 84014 BA25C1		33,7	1.0305						-							
				031	Ventil V88086																
25	S	84016	BA25C1	031	200 S 84001 BA25C1		33,7	1.0305						-							
				031	A88001																
25	S	84017	BA25C1	026	25 S 84016 BA25C1		33,7	1.0305						-							
				026	B90001																
25	S	84018	BA25C1	031	100 S 84003 BA25C1		33,7	1.0305						-							
				031	A 88004																
25	S	84019	BA25C1	031	25 S 84018 BA25C1		33,7	1.0305						-							
				031	V 88088																

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		Piping No.	Piping classification		from...	to...			Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	S	84020	BA25C1	031	150 S 84005 BA25C1	A 88005	33,7	1.0305						-							
25	S	84021	BA25C1	031	25 S 84020 BA25C1	V 88090	33,7	1.0305						-							
25	S	84022	BA25C1	034	150 S 84005 BA25C1	Ventil V 64094	33,7	1.0305						-	W						Tankfarm
25	S	84023	BA25C1	034	25 S 84022 BA25C1	Drain	33,7	1.0305						-	W						Tankfarm
25	S	84024	AA10C1	034	25 S 84022 BA25C1	Drain	33,7	1.0254						-							Tankfarm
25	S	84026	BA25C1	039	150 S 84006 BA25C1	Drain	33,7	1.0305						-	W						Tank farm
25	S	84027	BA25C1	039	25 S 84026 BA25C1		33,7	1.0305						-	W						Tank farm
25	S	84028	AA10C1	039	25 S 84028 AA10C1		33,7	1.0254						-							Tank farm
25	S	84030	BA25C1	005	100 S 84002 BA25C1		33,7	1.0305						-							
25	S	84031	BA25C1	005	25 S 84030 BA25C1		33,7	1.0305						-							
100	N	87001	AA10C1	024	Sammelleitung		114,3	1.0254						-							
25	N	87002	AA10C1	024	100 N 87001 AA10C1	HE Box	33,7	1.0254						-							
25	N	87003	AA10C1	024	100 N 87001 AA10C1	HE Box	33,7	1.0254						-							

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		Piping No.	Piping classification					Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)			
25	N	87004	AA10C1	024	100 N 87001 AA10C1	33,7	1.0254						-						
				024	Cold Box														
25	N	87005	AA10C1	024	100 N 87001 AA10C1	33,7	1.0254						-						
				024	Cold Box														
25	N	87006	AA10C1	024	100 N 87001 AA10C1	33,7	1.0254						-						
				024	Cold Box														
25	N	87007	AA10C1	024	100 N 87001 AA10C1	33,7	1.0254						-						
				024	Cold Box														
25	N	87008	AA10C1	024	100 N 87001 AA10C1	33,7	1.0254						-						
				024	Cold Box														
25	N	87011	AA10C1	024	Purge gas	33,7	1.0254	10					-						Tankfarm
				032	TF B 62001														
15	N	87012	AA10C1	032	N2 Sealgas	21,3	1.0254	10					-						Tankfarm
				032	P 63001														
25	N	87013	AA10C1	024	Cold-Box	33,7	1.0254						-						Tankfarm
				035	TF B 72001														
15	N	87014	AA10C1	035	25 N 87013 AA10C1	21,3	1.0254						-						Tankfarm
				036	P 72001 / P 74101														
80	OL	90001	ZB16C1	026	W90001	88,9	1.4541						-						
				026	Sammelleitung														
50	RL	90002	ZB16C1	026	Dump vaporizer	60,3	1.4541						-						
				026	Sammelleitung														
50	NL	90004	ZB16C1	026	Dump vaporizer	60,3	1.4541						-						
				026	Sammelleitung														
25	S	90007	BA25C1	026	N90004	33,7	1.0305						-						
				026	A90004														

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	Fluid	Piping No.	Piping classification				Press. (bar)	Temp. (°C)					Type	Thickn. (mm)	Weight (kg/m)				
25	S	90008	BA25C1	026 026	25 S 90007 BA25C1 Ventil V 90085	33,7	1.0305												

 AIR LIQUIDE ENGINEERING TECHNICAL COMMISSION	DESIGN SAFETY RECOMMENDATION	DSR B.02.03 (0) Page : 1/13
<p align="center">GASEOUS VENTING TO THE ATMOSPHERE IN AIR SEPARATION UNITS</p>		

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Supersedes :

Summary :


Gaseous Oxygen or Nitrogen venting to the atmosphere in Air Separation Units can cause local abnormal oxygen concentrations in the atmosphere.

Design rules for the venting stacks heights and installation principles must therefore be set.

This document deals with Oxygen venting but can be used also for Nitrogen venting.

Issue	Date	Modified Pages	Remarks
0	27/04/00	Creation	

Prepared by : J.F.Orliac / G. Delabrouille	Reading committee : L. Blamoutier, F. de Bussy, P. Fournier, L. Greter, D. Magnet, C. Marius, C. Puech, G. Salzgeber, B. Saulnier, M. Sturma, T. Sueur, J.P. Tranier, C. Tronchon
On : April 27, 2000 Visa :	Owner : Engineering Technical Commission
Approved by : C. Tronchon	
On : April 27, 2000 Visa :	Enforced on : June 1, 2000
File : DSR-B02-03(0)O2venting.doc	

 AIR LIQUIDE ENGINEERING TECHNICAL COMMISSION	DESIGN SAFETY RECOMMENDATION	DSR B.02.03 (0) Page : 3/13
<p style="text-align: center;">GASEOUS VENTING TO THE ATMOSPHERE IN AIR SEPARATION UNITS</p>		

1 PURPOSE

This document gives design rules for stacks venting gas on air separation units only.

2 SCOPE OF APPLICATION

This document applies primarily to gaseous oxygen venting stacks. It applies also to all plants likely to vent oxygen enriched gas (35% oxygen or more). The rules given can also be used for gaseous nitrogen venting, although the formation of an oxygen enriched atmosphere at ground level is more likely than an oxygen deficient one.

This DSR's intent is to :

- Ensure that any oxygen enriched cloud stay at a minimum distance above ground level
- Ensure that compressor inlets are outside any significantly oxygen enriched atmosphere
- Predict the extent of atmosphere enriched in oxygen at plant fence line

This document does not apply to :

- Oxygen enriched gas venting with less than 35% oxygen
- Relief valves

3 REFERENCES

- 1 CGA P14 - 1992 ACCIDENT PREVENTION IN OXYGEN RICH ATMOSPHERES
- 2 CGA SB-2 1992 OXYGEN-DEFICIENT ATMOSPHERES
- 3 IGC 04-93 PREVENTION OF THE ACCIDENTS ARISING FROM ENRICHMENT OF THE OXYGEN IN THE ATMOSPHERE
- 4 IGC 40-90 DANGER OF INERT GASES

IGC is the same as EIGA

4 DEFINITIONS - ABBREVIATIONS

As the oxygen enriched and the oxygen deficient atmospheres are usual risks in Air Separation Units, the industrial gases producers associations have issued several recommendations on this topic (see the references below)

CGA considers that the atmosphere becomes :

- "enriched in oxygen" when the oxygen volume concentration exceeds 23%. (reference 1)
- "oxygen deficient" if the concentration is lower than 19.5%. (reference 2)

EIGA considers that the situation becomes "dangerous":

GASEOUS VENTING TO THE ATMOSPHERE IN AIR SEPARATION UNITS

5.2.4 WIND VELOCITY

Diffusion is considered to be natural (worst case) when the wind velocity is less than 1m/s. Stronger wind causes a longer and narrower oxygen rich cloud, that extends nearly horizontally from the stack outlet. Over 5m/s, gusts of wind will certainly occur, causing high turbulence and efficient oxygen dilution in the atmosphere.

5.2.5 TEMPERATURE DIFFERENCE BETWEEN THE OXYGEN AND AMBIENT AIR

Oxygen venting is generally performed approximately 10°C below the ambient temperature. It depends on the oxygen pressure before the letting down and venting, though.

The colder the oxygen, the higher the stack must be. If the oxygen is colder than 40°C below ambient temperature, a specific study is required.

If the oxygen is warmer than ambient temperature, the -10°C curve is to be used (oxygen 10°C colder than ambient temperature).

5.2.6 COMPOSITION OF THE VENTED GAS

The simulations for the DSR were made with pure oxygen venting. Obviously, the oxygen enriched area when venting pure oxygen and when venting the same quantity of a gas with 40% oxygen and 60% nitrogen is not the same. In order to take it into account, the required stack height may be reduced and based on a "corrected venting flow" for the venting of oxygen enriched air.

The corrected venting flow shall be determined as follows :

$$Q_c = Q_A \times 125 \times (c - 20\%)$$

Q_c is the modified venting flow to be taken into account for the stack height determination

Q_A is the actual (design) venting flow

c is the oxygen content (in %) of the gas being vented.

The venting velocity still has to be at least 10 meters per second with the real flow Q_A .


Example : if a stack must be sized for venting 2000 tons per day of a gas containing 40% oxygen and 60% nitrogen, the formula above gives :

$$Q_c = 2000 \times 125 \times (40\% - 20\%) = 500$$

Therefore, the stack height is the same as the height required for the venting of 500 t/day of pure oxygen, 10 to 12 meters depending on the temperature of the gas being vented instead of 16 to 18 meters for 2000 tons per day of pure oxygen.

5.2.7 OBSTACLES

Obstacles close to the stack can disturb the diffusion. A specific study must be performed if high or wide constructions other than the cold box like buildings or large storage tanks are present in the oxygen cloud as shown in section 5.4 below.

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- At more than 25 % oxygen because of the increased fire hazard (reference 3),
- At less than 16% oxygen for anoxia reasons (reference 4)

Those two last values have been retained as a basis for stack design.

In this document references are made to a "25% oxygen cloud" meaning a cloud of gas where the oxygen concentration is equal to or greater than 25%.

5 DESIGN OF ATMOSPHERIC VENTS

5.1 GENERAL

Gaseous oxygen is heavier than air by 11%. Therefore, it can accumulate above the ground if there is little or no wind, even if it is vented at ambient temperature. Nitrogen is somewhat lighter than air, the accumulation risk outside confined areas is smaller than with oxygen.

The recommendations below given for oxygen stacks can also be used for nitrogen stacks, even if the requirements may be somewhat excessive. Therefore, the following is written for oxygen venting.

Several parameters have an influence when venting large amounts of gaseous oxygen to the atmosphere :

- Oxygen jet direction and velocity
- Stack height
- Oxygen flow rate
- Wind velocity
- Temperature difference between the oxygen and ambient air
- Composition of the vented gas
- Presence of large obstacles that modify the diffusion conditions

When venting oxygen to the atmosphere, steady state diffusion is reached after approximately 10 minutes. The design rules intend to avoid reaching a 25% oxygen concentration 4 meters above ground for all operating conditions in the considered plant, for any wind velocity, once steady state conditions are achieved.

The 4 meters height is required to avoid of the "ground effect", which is the influence of the ground proximity on diffusion. The dilution of the oxygen vented to the atmosphere requires that diffusion be possible. If the oxygen enriched cloud gets close to the ground, diffusion is blocked in half the space (mirror effect), which causes the oxygen enriched area to expand on the ground.

Computer simulations were made with "PHAST Professional" version 5.2

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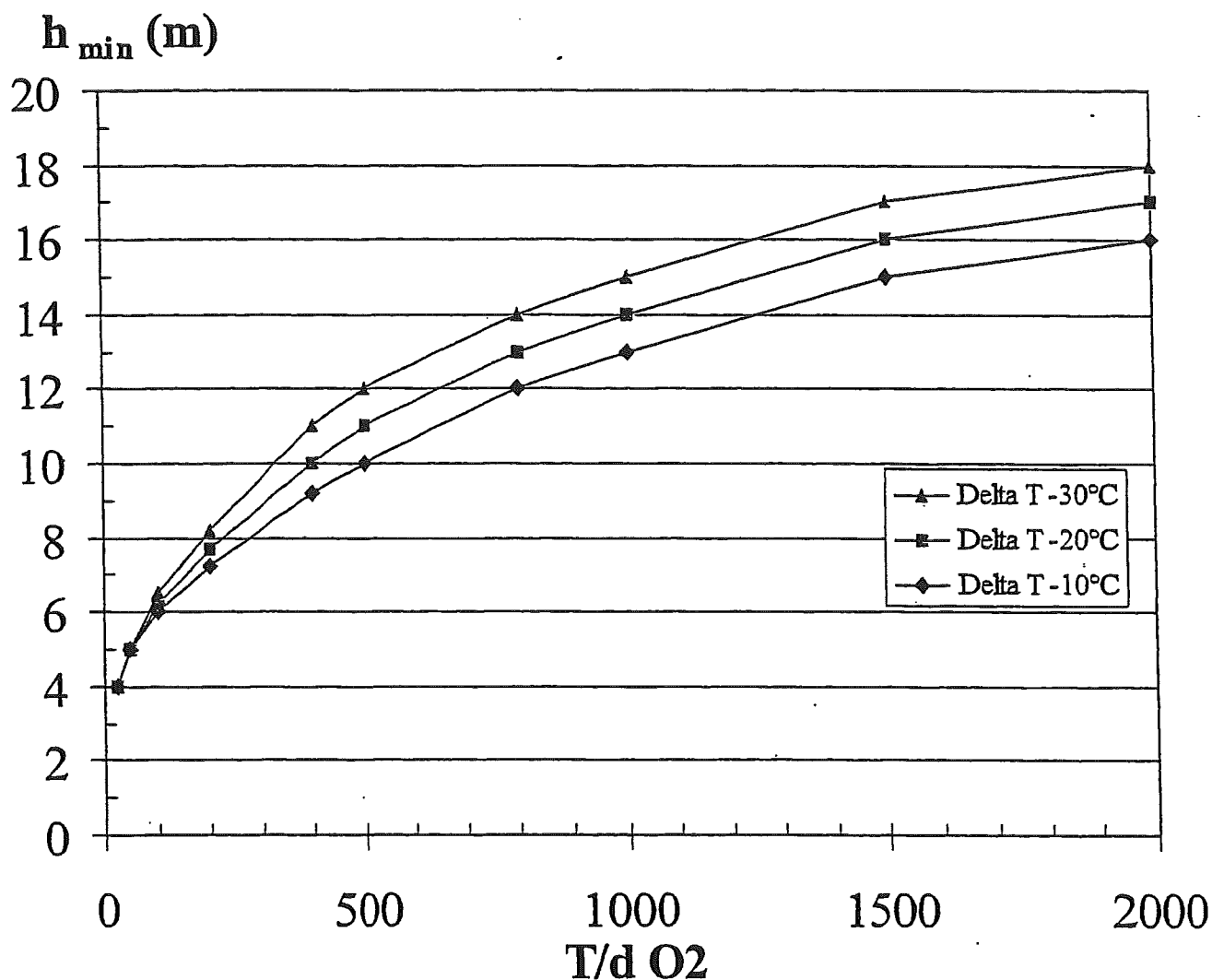


GASEOUS VENTING TO THE ATMOSPHERE IN AIR SEPARATION UNITS

5.3 VENTS SIZING

The following graphs give minimum stack heights as a function of the nominal venting flowrate (in most cases equal to the plant capacity), taking into account the worst venting conditions. The selected height may be more than indicated below.

The following graph shows the effect of the oxygen temperature for a venting velocity of 10 m/s.





GASEOUS VENTING TO THE ATMOSPHERE IN AIR SEPARATION UNITS

5.5 POSSIBLE VENTING SOLUTION

One possible solution for avoiding most potentially oxygen enriched atmosphere occurrences is mixing the oxygen jet with residual nitrogen, either downstream of the water nitrogen cooling tower (in order not to upset the cooling tower when venting), or possibly with the outlet of the front end purification regeneration outlet.

However, great caution must be used in that case. Neither the oxygen stack nor the oxygen velocity when venting should be lower than the limits given above if there is any possibility of oxygen venting with no residual nitrogen. This may be particularly true if the networks of several cold boxes are mixed there may be oxygen venting without residual nitrogen.

Besides, there will have to be some precautions for getting near the "residual nitrogen" outlet different if there is a possibility of oxygen venting.

6 OXYGEN VENTING EXAMPLES

The following graphs are the results of simulation calculations showing the oxygen enriched cloud obtained with a decreasing stack height.

Oxygen vented 30 °C below ambient temperature

Wind velocity : 1 meter per second

Flow rate : 500 tons per day at a velocity of 5 m/s

Decreasing stack heights :

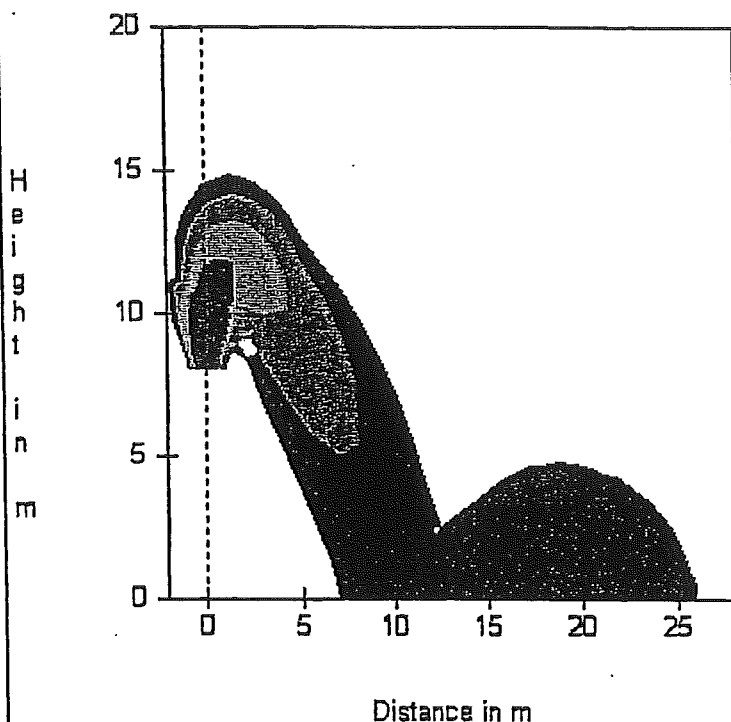
12 meters

10 meters

8 meters

The different colors on the dispersion graphs are the boundaries of the 25%, 30%, 40% and 50% oxygen zones.

Note that the required stack height for 500 tons per day vented at a 5 m/s velocity is 15 meters per second in order to avoid an oxygen enriched atmosphere below 4 meters elevation.

GASEOUS VENTING TO THE ATMOSPHERE
IN AIR SEPARATION UNITS $v = 5 \text{ m/s} - (-30^\circ\text{C})$ 

PHAST Professional Version 5.2

Study: MISEAAIR

Material: OXYGEN

Case: 500t/j

Weather: F 1.0 m/s

Continuous

Concentrations (Mol%)

25%

30%

40%

50%

Averaging time 600.00 s