STREAM NUMBER			1 (2) (4)	1 - I (4)	2	3 (2)	3 - I	4 (2) (4) (5)	4 - I (4) (5)	6
STREAM DESCRIPTION			Saturated CO2 from B.L.	Inerts: CO2 from B.L.	Pass. Air to C-101	CO2 to Synt. Sect.	Inerts: CO2 to Synt.Sect.	CO2 Compr. Seal Loss.	Inerts: CO2 Compr. Seal Loss.	Separated H2O from C-101 Pkg
COMPOSITION	NH3	17								
	CO2	44	100.00%			100.00%		100.00%		
	UREA	60								
	WATER	18	saturated							
	FORMALDEHYDE	30								
	BIURET	103								
	HYDROGEN	2		50.00%			0.80%		0.80%	
	OXIGEN	32			23.17%		22.86%		22.86%	
	METHANE	16								
	NITROGEN	28		50.00%	75.52%		75.20%		75.20%	
	ARGON	40			1.31%		1.14%		1.14%	
TOTAL FLOW RATE		kg/h	106751	14	849	106221	858	530	5	3569
VOLUMETRIC FLOW RATE		m3/h	40283.40	60.87	97.60	378.01	7.07			3.61
TEMPERATURE		°C	49	49	48	120	120			49
PRESSURE		bar abs.	1.6	1.6	8.0	158.0	158.0			atm
PHYSICAL STATE			GAS	GAS	GAS	GAS	GAS	GAS	GAS	LIQUID
DENSITY		kg/m3	2.65	0.23	8.70	281.00	121.40			989.00
AV. MOLECULAR WEIGHT		kg/kmol	44.00	3.73	28.95	44.00	26.12	44.00	26.12	18.00

NOTES

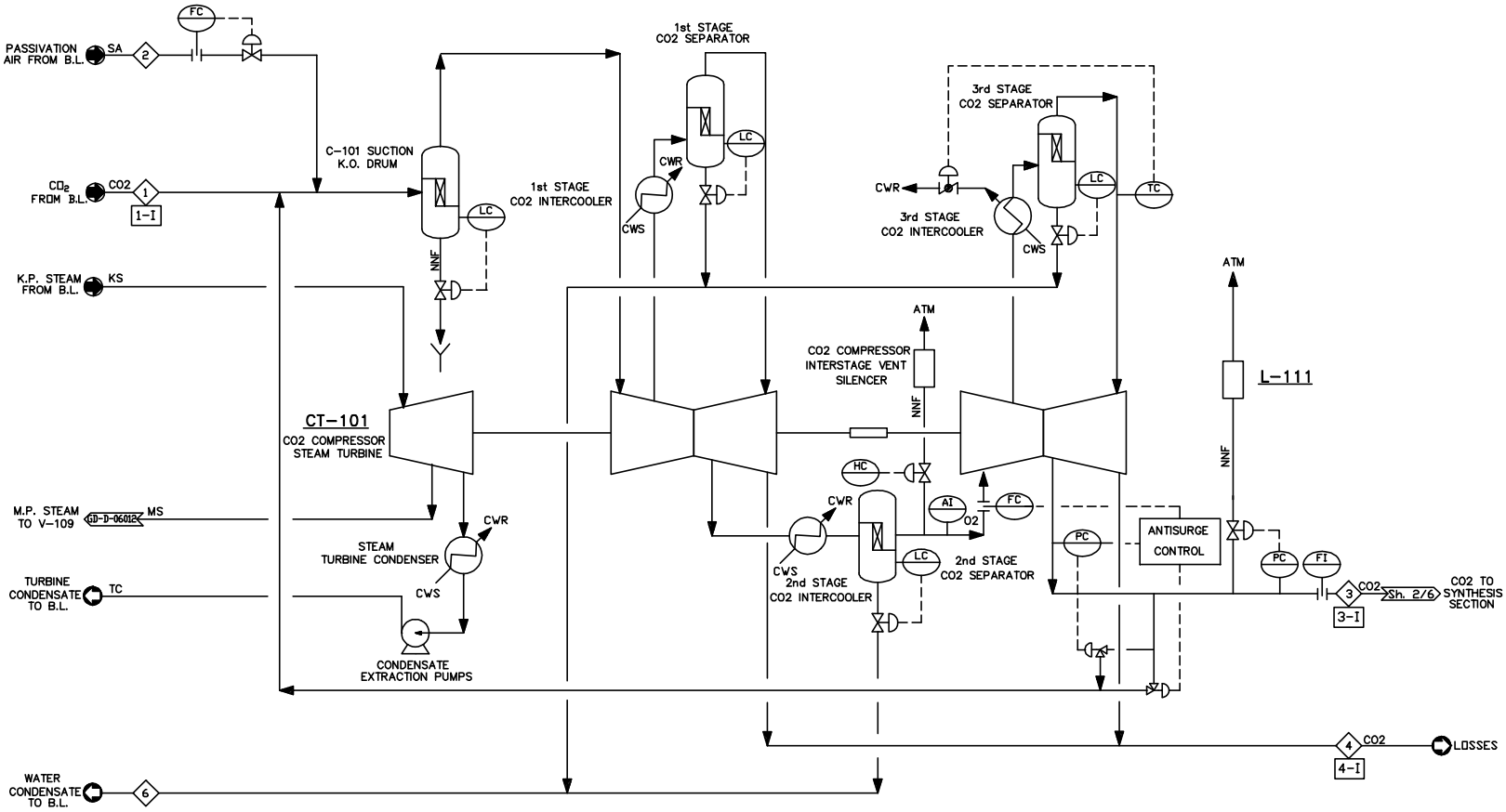
1. FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.
2. COMPOSITION ON INERTS FREE BASIS.
3. NNF: NORMALLY NO FLOW.
4. COMPOSITION ON DRY BASIS.
5. TO BE DEFINED / CONFIRMED BY C-101 PKG MFR. AND CONTRACTOR DURING DETAILED ENGINEERING PHASE.
6. FINAL SCHEME TO BE CONFIRMED BY C-101 MFR.
7. STREAM BOXES WHICH ARE COLOURED IN GREY DO NOT TAKE PART TO THE PROCESS MATERIAL BALANCE OF THE PLANT.

LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

C-101
CO2 COMPRESSOR

L-111
CO2 VENT. SILENCER



OUT OF LICENSOR'S SCOPE OF WORK

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06000
Sh 1 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001

Rev. 0 1

PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
CO2 COMPRESSOR SECTION

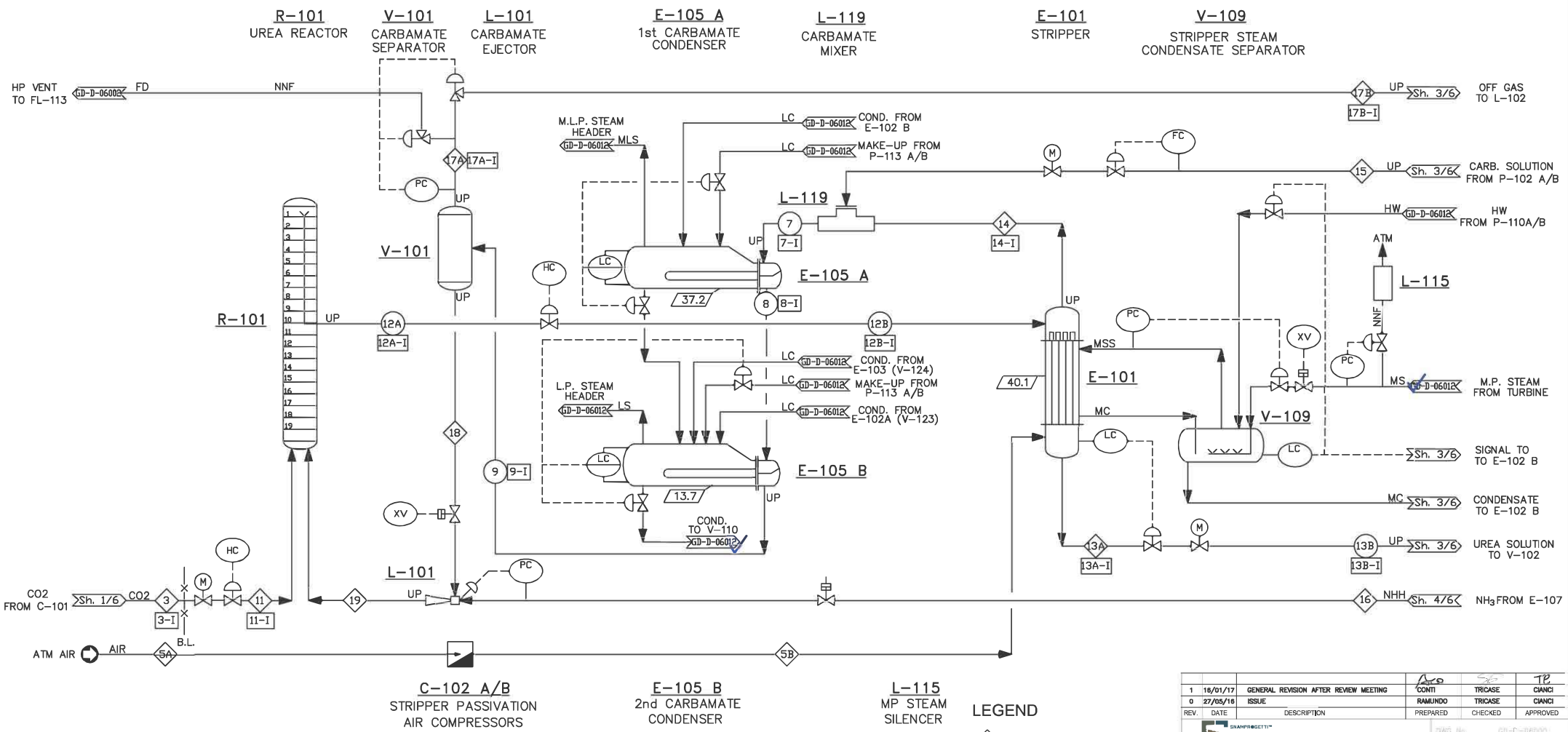
SCALE

Issuer Specific Number / Rev. 1

IN REPLACEMENT OF

REPLACED BY

STREAM NUMBER			3 (2)	3 - I	5A	5B	7-LIQ	7-GAS (2)	7-I	8-LIQ	8-GAS (2)	8 - I	9-LIQ	9-GAS (2)	9 - I	11 (2)	11 - I	12A-LIQ	12A-GAS (2)	12A - I	12B-LIQ	12B-GAS (2)	12B - I	13A	13A - I	13B-LIQ	13B-GAS (2)	13B-I	14 (2)	14-I	15	16	17A (2)	17A-I	17B (2)	17B-I	18	19
STREAM DESCRIPTION			CO2 to Synt. Sect.	Inerts: CO2 to Synt.Sect.	Air to C-102	Pass.Air from C-102	Liq. Inlet to E-105A	Gas Inlet to E-105A	Inerts: Inlet to E-105A	Liq.Inlet to E-105B	Gas Inlet to E-105B	Inerts: Inlet to E-105B	Liq. Inlet to V-101	Gas Inlet to V-101	Inerts. Inlet to V-101	CO2 to Reactor	Inerts:CO2 to Reactor	Liq. Reactor Outlet	Gas Reactor Outlet	Inerts: Reactor Outlet	Liq.Stripper Inlet	Gas Stripper Inlet	Inerts: Stripper Inlet	Stripper Sol.Outlet	Inerts: Stripper Sol.Outlet	Liq.Inlet to V-102	Gas Inlet to V-102	Inerts:Inlet to V-102	Stripper Vapours	Inerts:Stripp. Vapours	HP Carbamate Rec	HP NH3 to Eject.	Vap. from HP Sect.	Inerts:Vap. from HP Sect.	Off-gas from V-101 to L-102	Inerts:from V-101 to L-102	Carbam.Rec. to R-101	NH3 and Carbamate
COMPOSITION	NH3	17					46.45%	52.50%		45.50%	80.41%		46.90%	94.05%				29.47%	54.44%		29.47%	54.44%		25.34%		14.42%	77.41%		52.50%		46.45%	99.88%	94.05%		94.05%		46.90%	67.00%
	CO2	44	100.00%				21.07%	41.68%		31.00%	15.41%		30.66%	2.97%		100.00%		12.73%	41.41%		12.73%	41.41%		7.38%		6.27%	12.65%		41.68%		21.07%		2.97%		2.97%		30.88%	19.03%
	UREA	60																36.15%			36.15%			42.82%		51.80%											
	WATER	18					32.48%	5.81%		23.50%	4.18%		22.44%	2.97%				21.64%	4.15%		21.64%	4.15%		24.46%		27.51%	9.94%		5.81%		32.48%	0.12%	2.97%		2.97%		22.44%	13.97%
	FORMALDEHYDE	30																																			
	BIURET	103																																			
	HYDROGEN	2		0.80%					0.72%			0.72%			0.72%		0.80%			0.80%			0.80%		0.72%		0.72%		0.72%					0.72%		0.72%	
	OXIGEN	32		22.86%	23.17%	23.17%			22.89%			22.89%			22.89%		22.86%			22.89%			22.86%		22.89%									22.89%		22.89%	
	METHANE	16																																0.00%			
	NITROGEN	28		75.20%	75.52%	75.52%			75.23%			75.23%			75.23%		75.20%			75.20%			75.20%		75.23%									75.23%		75.23%	
	ARGON	40		1.14%	1.31%	1.31%			1.16%			1.16%			1.16%		1.14%			1.14%			1.14%		1.16%									1.16%		1.16%	
TOTAL FLOW RATE		kg/h	106221	858	102	102	121664	83739	910	185305	20098	910	196626	8777	910	106221	858	401917	21154	858	401917	21154	858	339331	48	280519	58812	48	83739	910	121664	120223	8777	910	8777	910	196626	316849
VOLUMETRIC FLOW RATE		m3/h	378.01	7.07	94.01	0.69	128.07	600.28	9.21	199.25	174.77	9.16	216.79	79.79	8.87	378.01	7.11	423.07	159.75	8.62	423.07	167.89	8.89	357.19	0.51	263.65	4402.10	2.97	686.39	9.44	128.07	231.64	79.79	8.87	611.64	48.12	216.79	443.15
TEMPERATURE		°C	120	120	48	70	179	179	179	170	170	170	155	155	155	120	120	188	188	188	188	188	188	204	204	142	142	142	190	190	79	94	155	155	83	83	155	135
PRESSURE		bar abs.	158.0	158.0	atm	147.0	146.5	146.5	146.5	146.5	146.5	146.5	144.0	144.0	144.0	157.0	157.0	153.0	153.0	153.0	148.0	148.0	148.0	147.0	147.0	21.2	21.2	21.2	147.0	147.0	157.0	221.0	144.0	144.0	21.2	21.2	144.0	157.0
PHYSICAL STATE			GAS	GAS	GAS	GAS	LIQUID	GAS	GAS	LIQUID	GAS	GAS	LIQUID	GAS	GAS	GAS	GAS	LIQUID	GAS	GAS	LIQUID	GAS	GAS	LIQUID	GAS	LIQUID	GAS	GAS	GAS	GAS	LIQUID	LIQUID	GAS	GAS	GAS	GAS	LIQUID	LIQUID
DENSITY		kg/m3	281.00	121.40	1.09	147.00	950.00	139.50	98.81	930.00	115.00	99.39	907.00	110.00	102.60	281.00	120.70	950.00	132.42	99.55	950.00	126.00	96.47	950.00	93.46	1064.00	13.36	16.16	122.00	98.37	950.00	519.00	110.00	102.60	14.35	18.91	907.00	715.00
AV. MOLECULAR WEIGHT		kg/kmol	44.00	26.12	28.95	28.95	19.94	22.94	26.39	21.37	18.87	26.39	21.29	17.35	26.39	44.00	26.12	26.16	22.89	26.12	26.16	22.89	26.12	22.52	26.39	29.58	19.61	26.39	22.94	26.39	19.94	17.00	17.38	26.39	17.38	26.39	21.29	19.42



NOTES

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LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI™ UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06000 Sh. 2 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001 Rev. 1

PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
SYNTHESIS AND H.P. RECOVERY SECTION

Vendor Specific Number: / Rev. 1

SCALE:

IN REPLACEMENT OF

REPLACED BY

STREAM NUMBER		13B-LI6	13B-GAS (2)	13B-I	15	17B (2)	17B-I	20	21	22	23	31A	31B-LIQ	31B-GAS	32 (2)	32-I	33-LIQ	33-GAS (2)	33-I	34	35	36 (2)	36-I	37	38 (2)	38-I	39	39-I	40	41	42	43 (2)	43-I	44	45	46 (2)	46-I	49-LIQ	49-GAS (2)	49 - I	63	94 (2)	94 - I	97
STREAM DESCRIPTION		Liq.Inle to V-102	Gas Inlet to V-102	Inerts Inlet to V-102	HP Carbamate Rec.	Off-gas from V-101 to L-102	Inerts from V-101 to L-102	HP NH3 to E-107	Amm. W.d. Rec. to 1-101	DW to E-106	DW to E-170	MP Dec. Sol. Outlet	Liq.Inlet to V-103	Gas Inlet to V-103	Vap. from MP Dec.	Inerts Vap. from MP Dec.	Liq. to MP Abs.	Gas to MP Abs.	Inerts to MP Abs.	MP Abs. Sol. Outlet	HP Carb Pump Flush	Vap. from MP Abs.	Vap. from MP Abs.	NH3 from Cond.	Vap. from NH3 Cond.	Inerts from NH3 Cond.	Ammonia from B.L.	Inerts: Ammonia from B.L.	NH3 to Boost. Pump	NH3 to HP Pump	NH3 Refl.to MP Abs.	Ammonia from T-105	Inerts from T-105	MP Inerts Wash.Cond.	NH3 Sol. to MP Abs.	NH3 from T-103	Inerts from T-103	Liq.from E-104 to E-106	Gas from E-104 to E-106	Inerts from E-104 to E-106	T-101 drain to V-106	MP Vent to Gran.	MP vent to Gran.	MP Vent to FL-112
COMPOSITION	NH3	17	14.42%	77.41%		46.45%	94.05%		99.68%	58.78%			6.24%	3.02%	55.76%	67.85%		44.78%	98.77%		47.62%		100.00%		100.00%	100.00%		99.80%		99.88%	99.88%	100.00%				58.78%	100.00%		33.72%	86.41%			100.00%		
	CO2	44	6.27%	12.65%		21.07%	2.97%						1.70%	0.85%	14.72%	18.16%		23.29%	0.05%		21.61%																	25.45%	7.85%					
	UREA	60	51.80%										63.06%	67.17%																														
	WATER	18	27.51%	9.94%		32.48%	2.97%		0.12%	41.22%	100.00%	100.00%	28.99%	28.96%	29.52%	13.99%		31.93%	1.19%		30.78%	100.00%						0.20%		0.12%	0.12%	0.12%			100.00%	41.22%			40.83%	5.74%					
	FORMALDEHYDE	30																																									
	BIURET	103																																									
	HYDROGEN	2			0.72%			0.72%									0.72%			0.72%			0.72%			0.72%		3.30%					1.12%				1.12%			0.72%		1.12%	
	OXGEN	32			22.89%			22.89%									22.89%			22.89%			22.89%			22.89%							19.19%				19.19%			22.89%		19.19%	
	METHANE	16																										43.96%					7.02%				7.02%					7.02%	
	NITROGEN	28			75.23%			75.23%									75.23%			75.23%			75.23%			75.23%		30.76%					68.07%				68.07%			75.23%		68.07%	
	ARGON	40			1.16%			1.16%									1.16%			1.16%			1.16%			1.16%		21.98%					4.60%				4.60%			1.16%		4.60%	
TOTAL FLOW RATE	kg/h	28051t	58812	48	121664	8777	910	120223	2055	1337490	1337490	230421	216329	14092	117686	958	109984	45902	958	118664	3000	50876	958	45393	5483	958	82164	182	131822	120223	11599	1218	1142	847	2055	10	1142	76130	79756	958	NNF (3)	10	1142	NNF (3)
VOLUMETRIC FLOW RATE	m3/h	263.6t	4402.10	2.97	128.07	611.64	48.12	205.51	2.67	1351.00	1360.62	209.47	194.89	5137.44	8717.48	59.28	112.80	3588.90	53.46	124.91	3.03	3391.73	47.92	79.14	351.47	47.64	134.64	10.95	225.24	205.42	19.82	76.13	59.08	0.86	2.67	0.67	61.86	76.13	6452.75	59.43		11.36	1047.71	
TEMPERATURE	°C	142	142	142	79	83	83	96	50	46	60	160	133	133	142	142	90	90	90	79	50	49	49	44	44	44	20	20	38	36	36	27	27	50	50	50	50	120	120	120		48	48	
PRESSURE	bar abs.	21.2	21.2	21.2	157.0	21.2	21.2	222.0	21.6	5.0	4.2	21.2	4.8	4.8	21.2	21.2	20.5	20.5	20.5	20.2	27.3	20.2	20.2	20.0	20.0	20.0	24.0	24.0	20.0	26.7	26.7	19.8	19.8	27.3	19.8	19.8	19.8	20.8	20.8	20.8		1.2	1.2	
PHYSICAL STATE		LIQUID	GAS	GAS	LIQUID	GAS	GAS	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	GAS	GAS	GAS	LIQUID	GAS	GAS	LIQUID	LIQUID	GAS	GAS	LIQUID	GAS	GAS	LIQUID	GAS	LIQUID	LIQUID	LIQUID	GAS	GAS	LIQUID	LIQUID	GAS	GAS	LIQUID	LIQUID	GAS	GAS	GAS	GAS	
DENSITY	kg/m3	1064.0t	13.36	16.16	950.00	14.35	18.91	585.26	770.00	990.00	983.00	1100.00	1110.00	2.74	13.50	16.16	975.00	12.79	17.92	950.00	989.00	15.00	19.99	573.57	15.60	20.11	610.26	16.62	585.26	585.26	585.26	16.00	19.33	989.00	770.00	15.00	18.46	1000.00	12.36	16.12		0.88	1.09	
AV. MOLECULAR WEIGHT	kg/kmol	29.58	19.61	26.39	19.94	17.38	26.39	17.00	17.40	18.00	18.00	32.60	34.30	18.95	19.33	26.39	20.23	17.05	26.39	20.02	18.00	17.00	26.39	17.00	17.00	26.39	17.00	16.55	17.00	17.00	17.00	17.00	24.13	18.00	17.40	17.00	24.13	20.25	17.95	26.39		17.00	24.13	

V-102 M.P. DECOMPOSER SEPARATOR

L-102 M.P. DECOMPOSER HOLDER

E-106 M.P. CONDENSER

T-101 M.P. ABSORBER

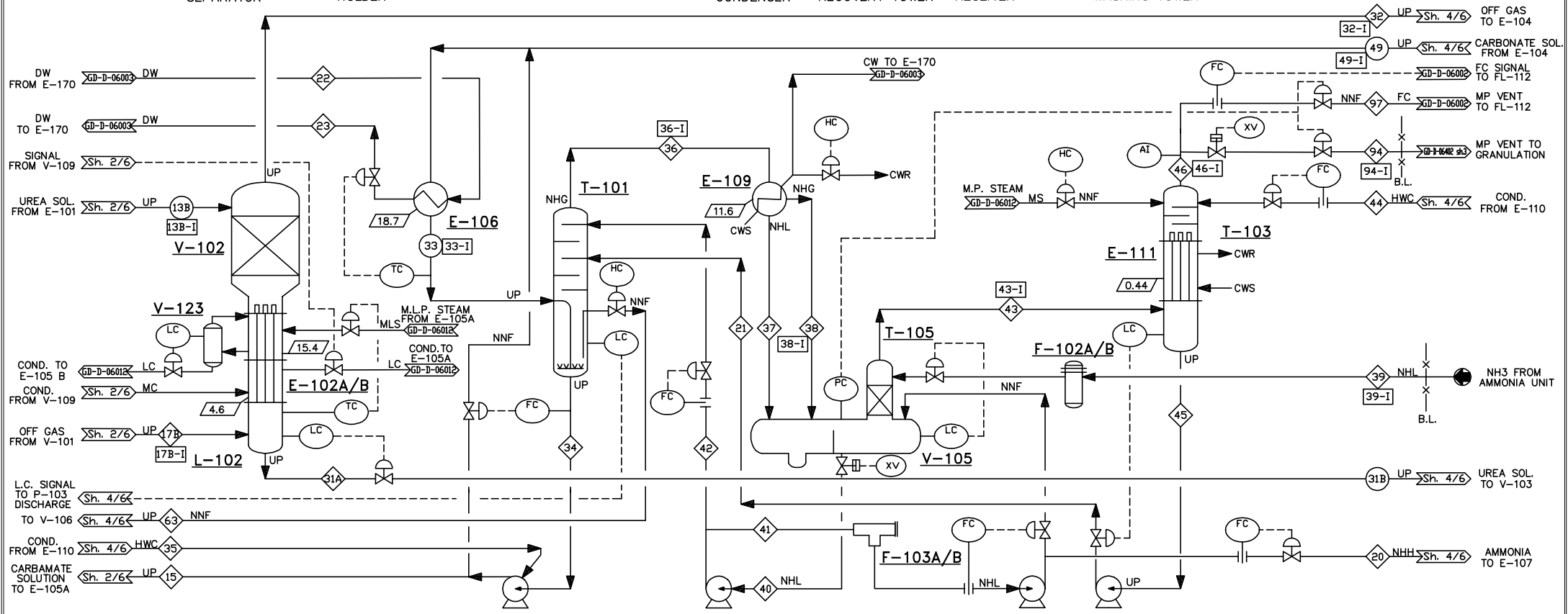
E-109 AMMONIA CONDENSER

T-105 M.P. AMMONIA RECOVERY TOWER

V-105 AMMONIA RECEIVER

T-103 M.P. INERTS WASHING TOWER

E-111 M.P. AMMONIA ABSORBER



V-123 E-102A STEAM CONDENSATE SEPARATOR

E-102A/B M.P. DECOMPOSER

P-102A/B H.P. CARBAMATE PUMPS

P-105A/B AMMONIA BOOSTER PUMPS

F-103A/B P-101A/B SUCTION FILTERS

P-101A/B H.P. AMMONIA PUMPS

P-107A/B AMMONIA SOLUTION PUMPS

F-102A/B AMMONIA FILTERS

NOTES

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3. NNF: NORMALLY NO FLOW.
4. STREAM BOXES WHICH ARE COLOURED IN GREY DO NOT TAKE PART TO THE PROCESS MATERIAL BALANCE OF THE PLANT.

LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06000
Sh 3 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
M.P. DECOMPOSITION AND RECOVERY SECTION

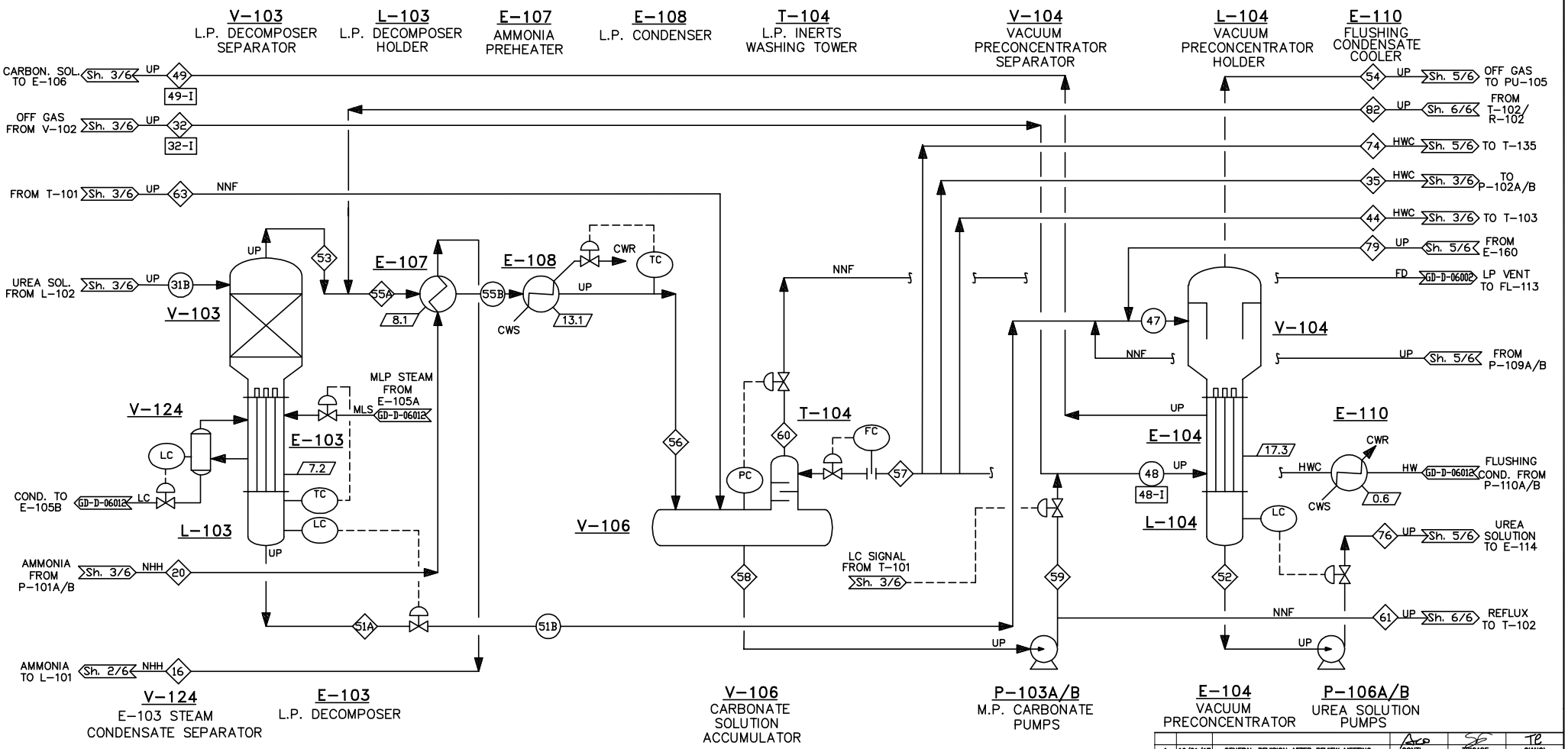
SCALE

IN REPLACEMENT OF

REPLACED BY

Issuer Specific Number / Rev. 1

STREAM NUMBER		16	20	31B-LIQ	31B-GAS	32 (2)	32-I	35	44	47-LIQ	47-GAS	48-LIQ	48-GAS (2)	48-I	49-LIQ	49-GAS (2)	49 - I	51A	51B-LIQ	51B-GAS	52	53	54	55A	55B-LIQ	55B-GAS	56	57	58	59	60	61	63	74	76	79	82
STREAM DESCRIPTION		HP NH3 to Ejector	HP NH3 to E-107	Liq.Inlet to V-103	Gas Inlet to V-103	Vap. from MP Dec.	Inerts: Vap. from MP Dec.	HP Carb.Pump Flush.	MP Inerts Wash.Cond.	Liq.Inlet to V-104	Gas Inlet to V-104	Liq.Inlet to E-104	Gas Inlet to E-104	Inerts: Inlet to E-104	Liq.from E-104 to E-106	Gas from E-104 to E-106	Inerts from E-104 to E-106	LP Dec. Sol. Outlet	Liq. From L-103 to V-104	Gas From L-103 to V-104	Preconcentr. Outlet	Vap. from LP Dec.	Vap. from Preconc.	Vap. to NH3 Preheat.	Liq. from NH3 Preheat.	Gas from NH3 Preheat.	Carb. from LP Cond.	LP Inerts Wash. Cond.	Carb.Sol.from LP Sec.	Carb. Rec. to MP Sec.	Inerts from LP Sect.	Reflux to T-102	T-101 drain to V-106	Cond. to T-135	Urea Sol. to E-114	Urea Recycle to V-104	Vap.from T-102&R-102
COMPOSITION	NH3	17	99.88%	99.88%	3.02%	55.76%	67.85%			0.49%	28.42%	38.59%	67.85%		33.72%	86.41%		1.92%	0.53%	28.42%	0.38%	40.10%	7.97%	39.20%	13.84%	56.26%	39.20%			38.59%	38.59%					0.38%		37.16%
	CO2	44			0.85%	14.72%	18.16%			2.01%	11.67%	11.16%	18.16%		25.45%	7.85%		0.71%	0.14%	11.67%	0.10%	9.47%	3.15%	11.34%	7.69%	13.80%	11.34%			11.16%	11.16%					0.10%		15.60%
	UREA	60			67.17%					71.36%								71.12%	74.83%		85.19%															85.19%	44.48%	
	WATER	18	0.12%	0.12%	28.96%	29.52%	13.99%		100.00%	100.00%	26.11%	59.91%	50.25%	13.99%		40.83%	5.74%		26.25%	24.49%	59.91%	14.29%	50.43%	88.88%	49.45%	78.47%	29.94%	49.45%	100.00%	50.25%	50.25%				100.00%	14.29%	55.00%	47.25%
	FORMALDEHYDE	30								0.01%											0.01%														0.01%	0.18%	
	BIURET	103								0.02%											0.03%														0.03%	0.34%	
	HYDROGEN	2					0.72%							0.72%			0.72%																				
	OXIGEN	32					22.89%							22.89%			22.89%																				
	METHANE	16																																			
	NITROGEN	28					75.23%							75.23%			75.23%																				
	ARGON	40					1.16%							1.16%			1.16%																				
TOTAL FLOW RATE	kg/h	120223	120223	216329	14092	117686	958	3000	847	208652	10154	38200	117686	958	76130	79756	958	204331	194177	10154	178129	26090	40677	37600	15120	22480	37600	600	38200	38200	NNF (3)	NNF (3)	NNF (3)	3500	178129	14475	11510
VOLUMETRIC FLOW RATE	m3/h	231.64	205.51	194.89	5137.44	8717.48	59.28	3.03	0.86	186.30	14221.29	44.42	8527.97	61.61	76.13	6452.75	89.43	180.82	168.85	14221.29	149.07	9521.90	203385.00	13623.19	15.75	8144.93	41.50	0.61	42.07	42.07				3.54	149.07	14.04	4038.60
TEMPERATURE	°C	94	36	133	133	142	142	50	50	112	112	134	134	134	120	120	120	148	114	114	102	133	83	133	115	115	44	50	44	44				50	102	85	132
PRESSURE	bar abs.	221.0	222.0	4.8	4.8	21.2	21.2	27.3	27.3	1.0	1.0	21.1	21.1	21.1	20.8	20.8	20.8	4.8	1.2	1.2	0.3	4.8	0.3	4.8	4.5	4.5	4.3	27.3	4.3	28.4				27.3	0.3	2.5	4.8
PHYSICAL STATE		LIQUID	LIQUID	LIQUID	GAS	GAS	GAS	LIQUID	LIQUID	LIQUID	GAS	LIQUID	GAS	GAS	LIQUID	GAS	GAS	LIQUID	LIQUID	GAS	LIQUID	GAS	GAS	GAS	LIQUID	GAS	LIQUID	LIQUID	LIQUID	LIQUID				LIQUID	LIQUID	LIQUID	GAS
DENSITY	kg/m3	519.00	585.26	1110.00	2.74	13.50	16.16	989.00	989.00	1120.00	0.71	860.00	13.80	15.55	1000.00	12.36	16.12	1130.00	1150.00	0.71	1195.00	2.74	0.20	2.76	960.30	2.76	906.00	989.00	908.00	908.00				989.00	1195.00	1031.00	2.85
AV. MOLECULAR WEIGHT	kg/kmol	17.00	17.00	34.30	18.95	19.33	26.39	18.00	18.00	36.80	19.01	18.82	19.33	26.39	20.25	17.95	36.39	36.11	37.88	19.01	44.68	18.62	18.02	18.83	18.75	18.95	18.82	18.00	18.82	18.82				18.00	44.56	26.64	19.38



NOTES

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2. COMPOSITION ON INERTS FREE BASIS.
3. NNF: NORMALLY NO FLOW.
4. STREAM BOXES WHICH ARE COLOURED IN GREY DO NOT TAKE PART TO THE PROCESS MATERIAL BALANCE OF THE PLANT.

LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI™ UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06000
Sh 4 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

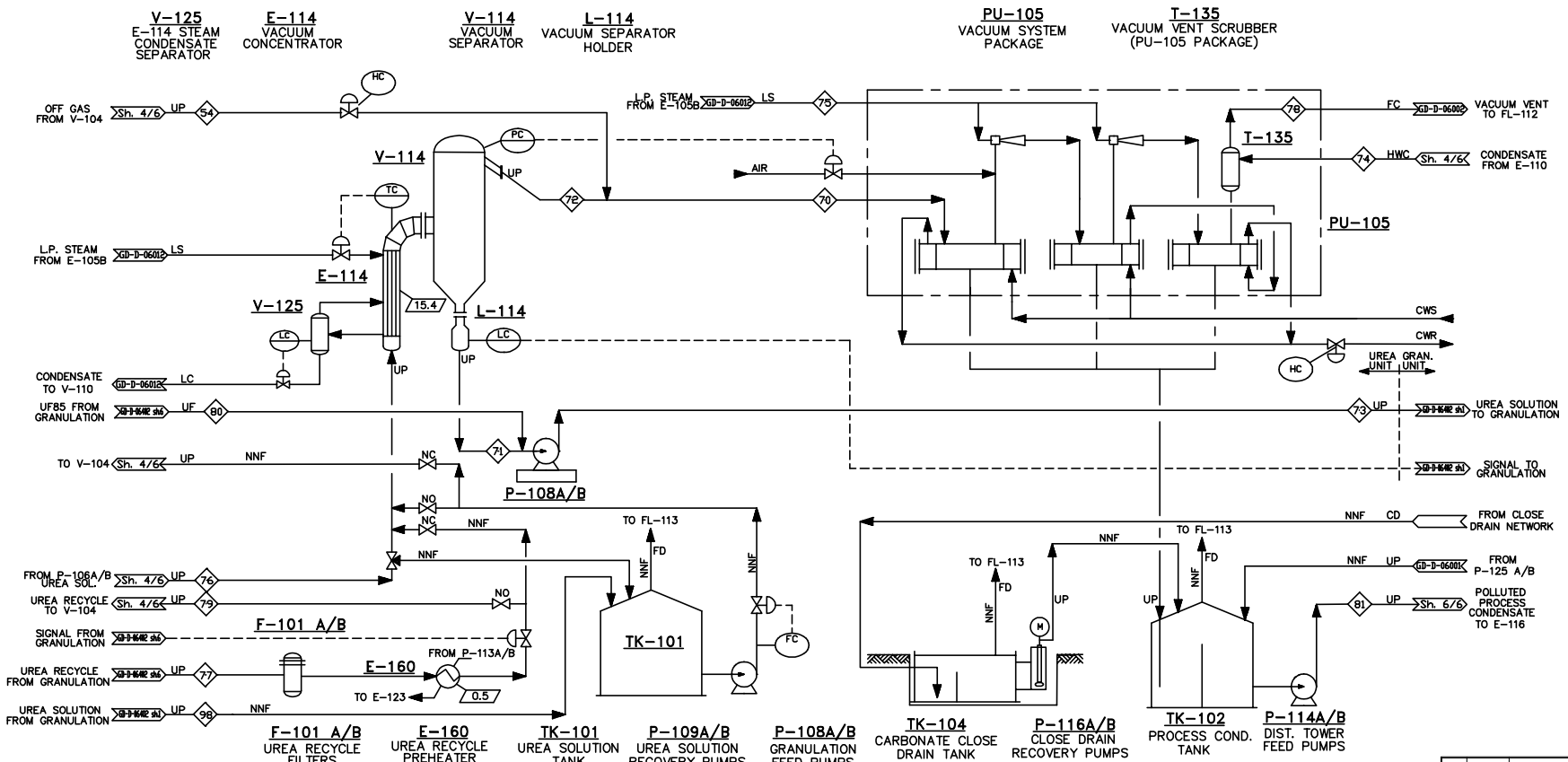
PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
L.P. DECOMPOSITION AND RECOVERY SECTION

SCALE

Issuer Specific Number / Rev. 1

IN REPLACEMENT OF
REPLACED BY

STREAM NUMBER			54	70	71	72	73	74	75	76	77	78	79	80	81	98
STREAM DESCRIPTION			Vap. from Preconc.	Vapours to PU-105	Urea Sol. from Vac.Conc.	Vap. from Vac. Conc.	Urea Sol. to Granul.	Cond. to T-135	LS Steam to PU-105	Urea Sol. to E-114	Recycle from Granul.	Inerts from PU-105	Urea Recycle to V-104	UF-85 Additive from P-150	Proc. Cond. To P-114A/B	Urea solution from Granulation
COMPOSITION	NH3	17	7.97%	6.37%	0.05%	3.46%	0.05%			0.38%					5.73%	
	CO2	44	3.15%	2.31%		0.76%				0.10%					2.08%	
	UREA	60		0.74%	96.34%	2.09%	95.90%			85.19%	44.48%		44.48%	25.00%	0.67%	
	WATER	18	88.88%	90.59%	2.91%	93.69%	2.98%	100.00%	100.00%	14.29%	55.00%		55.00%	15.00%	91.53%	
	FORMALDEHYDE	30			0.02%		0.39%			0.01%	0.18%		0.18%	60.00%		
	BIURET	103			0.68%		0.68%			0.03%	0.34%		0.34%			
	HYDROGEN	2														
	OXIGEN	32														
	METHANE	16														
	NITROGEN	28														
	ARGON	40														
TOTAL FLOW RATE		kg/h	40677	63009	155797	22332	156769	3500	3500	178129	14475	(4)	14475	972	70009	NNF (3)
VOLUMETRIC FLOW RATE		m3/h	203385.00	315065.00	128.76	111680.00	129.56	3.54	1483.05	149.07	13.04		14.04	0.73	70.86	
TEMPERATURE		°C	83	122	135	135	135	50	147	102	50		85	48	50	
PRESSURE		bar abs	0.30	0.3	0.3	0.3	8.5	27.3	4.4	0.3	7.85		2.5	5.2	11.2	
PHYSICAL STATE			GAS	GAS	LIQUID	GAS	LIQUID	LIQUID	GAS	LIQUID	LIQUID		LIQUID	LIQUID	LIQUID	
DENSITY		kg/m3	0.20	0.20	1210.00	0.20	1210.00	988.00	2.36	1195.00	1110.00		1031.00	1325.00	988.00	
AV. MOLECULAR WEIGHT		kg/kmol	18.02	18.10	56.19	18.24	55.98	18.00	18.00	44.56	26.27		26.27	30.77	18.25	



NOTES

1. FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.
2. COMPOSITION ON INERTS FREE BASIS.
3. NNF: NORMALLY NO FLOW.
4. TO BE DEFINED BY PU-105 MANUFACTURER.
5. STREAM BOXES WHICH ARE COLOURED IN GREY DO NOT TAKE PART TO THE PROCESS MATERIAL BALANCE OF THE PLANT.

LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06000
Sh 5 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
EVAPORATION & PROCESS CONDENSATE REC. SECTIONS

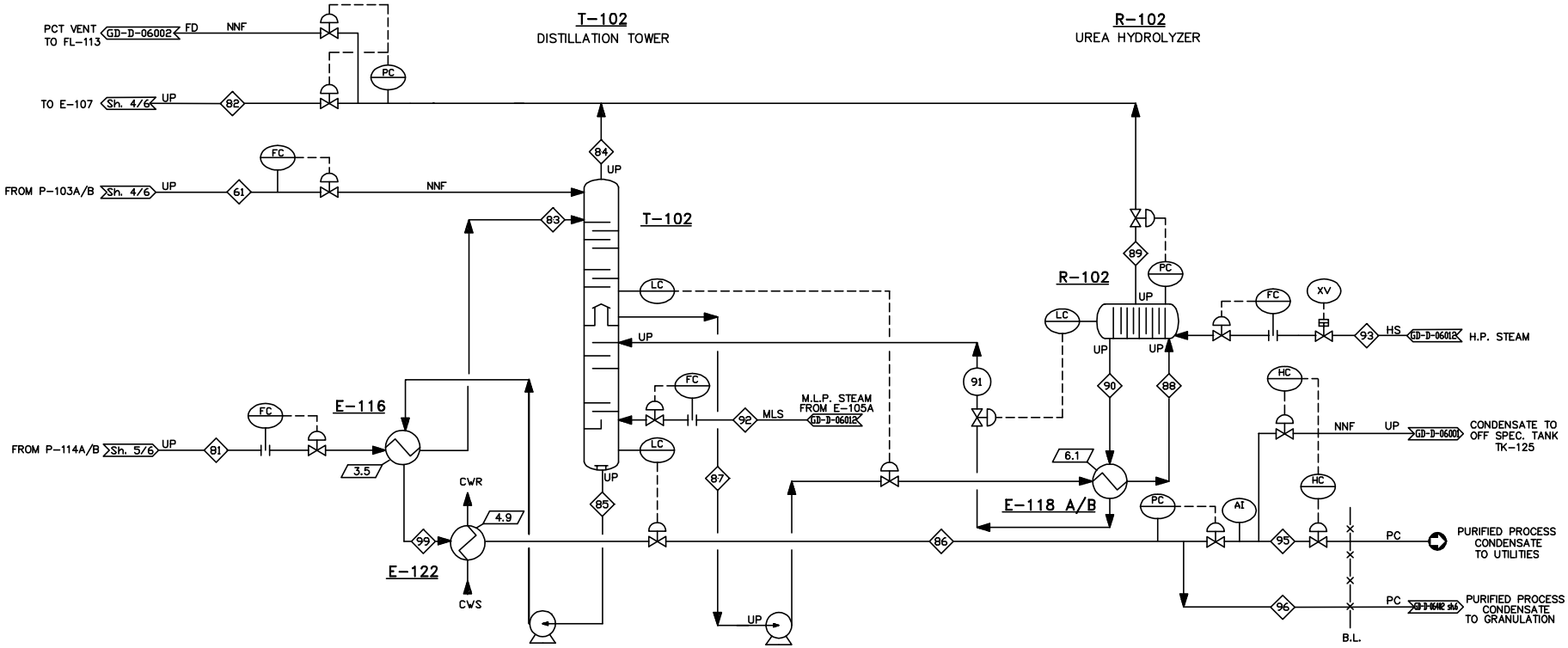
SCALE

IN REPLACEMENT OF

REPLACED BY

Issuer Specific Number / Rev. 1

STREAM NUMBER			61	81	82	83	84	85	86	87	88	89	90	91-LIQ	91-GAS	92	93	95	96	99
STREAM DESCRIPTION			Reflux to T-102	Proc. Cond. to E-116	Vap.from T-102&R-102	Proc. Cond. to T-102	Vap. from Distill. Tower	Proc. Cond. from T-102	Proc.Cond. from E-122	W.W. to Hydrolyzer	Hydrolyzer Feed	Vap. from Hydrolyzer	Hydrolyzer Outlet	Liq.Cond. Recycle	Gas Cond. Recycle	Steam to Dist. Tower	Steam to Hydrolyzer	Proc. Cond. to Batt.Limit	Proc. Cond. to Granulat.	Proc. Cond. To E-122
COMPOSITION	NH3	17		5.73%	37.16%	5.73%	44.85%			0.50%	0.50%	1.81%	0.45%	0.37%	2.99%					
	CO2	44		2.08%	15.60%	2.08%	16.15%			0.10%	0.10%	2.24%	0.08%	0.05%	1.03%					
	UREA	60		0.67%		0.67%				0.59%	0.59%	0.00%						100.00%	100.00%	
	WATER	18		91.53%	47.25%	91.53%	39.00%	100.00%	100.00%	98.81%	98.81%	12.32%	99.47%	99.58%	95.98%	100.00%	100.00%			100.00%
	FORMALDEHYDE	30																		
	BIURET	103																		
	HYDROGEN	2																		
	OXIGEN	32																		
	METHANE	16																		
	NITROGEN	28																		
	ARGON	40																		
TOTAL FLOW RATE		kg/h	NNF (3)	70009	11510	70009	8890	79601	79601	79297	79297	2620	81779	79340	2438	16000	5100	44268	35333	79601
VOLUMETRIC FLOW RATE		m3/h		70.86	4038.60	73.08	2867.74	87.28	80.57	86.19	94.29	148.02	99.73	86.52	870.71	4678.36	353.43	44.81	35.76	84.14
TEMPERATURE		°C		50	132	100	122	155	50	147	220	235	235	150	150	162	370	50	50	112
PRESSURE		bar abs.		11.2	4.8	4.9	4.9	5.4	7.0	5.2	35.0	35.0	35.0	5.2	5.2	6.5	40.0	6.0	7.0	8.9
PHYSICAL STATE				LIQUID	GAS	LIQUID	GAS	LIQUID	LIQUID	LIQUID	LIQUID	GAS	LIQUID	LIQUID	GAS	GAS	GAS	LIQUID	LIQUID	LIQUID
DENSITY		kg/m3		988.00	2.85	958.00	3.10	912.00	988.00	920.00	841.00	17.70	820.00	917.00	2.80	3.42	14.43	988.00	988.00	946.00
AV. MOLECULAR WEIGHT		kg/kmol		18.25	19.38	18.25	19.36	18.00	18.00	18.10	18.10	19.43	18.00	18.00	18.20	18.00	18.00	18.00	18.00	18.00



E-116 DISTILLATION TOWER PREHEATER

E-122 FINAL PROCESS CONDENSATE COOLER

P-120A/B PROCESS CONDENSATE PUMPS

P-115A/B HYDROLYZER FEED PUMPS

E-118 A/B HYDROLYZER PREHEATER

LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

NOTES

1. FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.
2. COMPOSITION ON INERTS FREE BASIS.
3. NNF: NORMALLY NO FLOW.
4. STREAM BOXES WHICH ARE COLOURED IN GREY DO NOT TAKE PART TO THE PROCESS MATERIAL BALANCE OF THE PLANT.

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06000
Sh 6 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

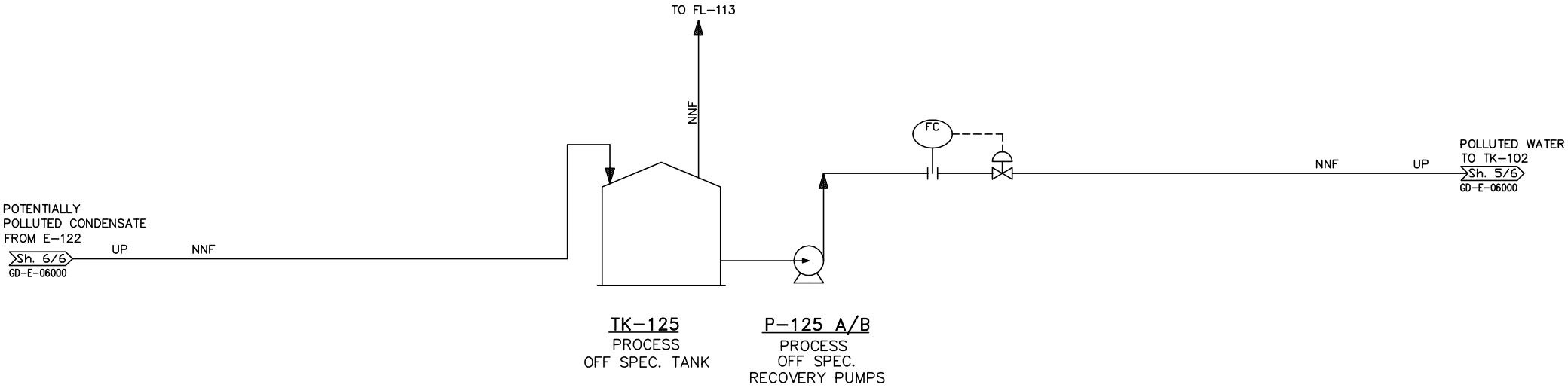
PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
PROCESS CONDENSATE TREATMENT SECTION

SCALE

IN REPLACEMENT OF

REPLACED BY

Issuer Specific Number | / | Rev. 1



NOTES

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LEGEND

- STREAM NUMBER FOR SINGLE PHASE (LIQUID OR GAS)
- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
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0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI™ UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06001
Sh 1 of 1

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

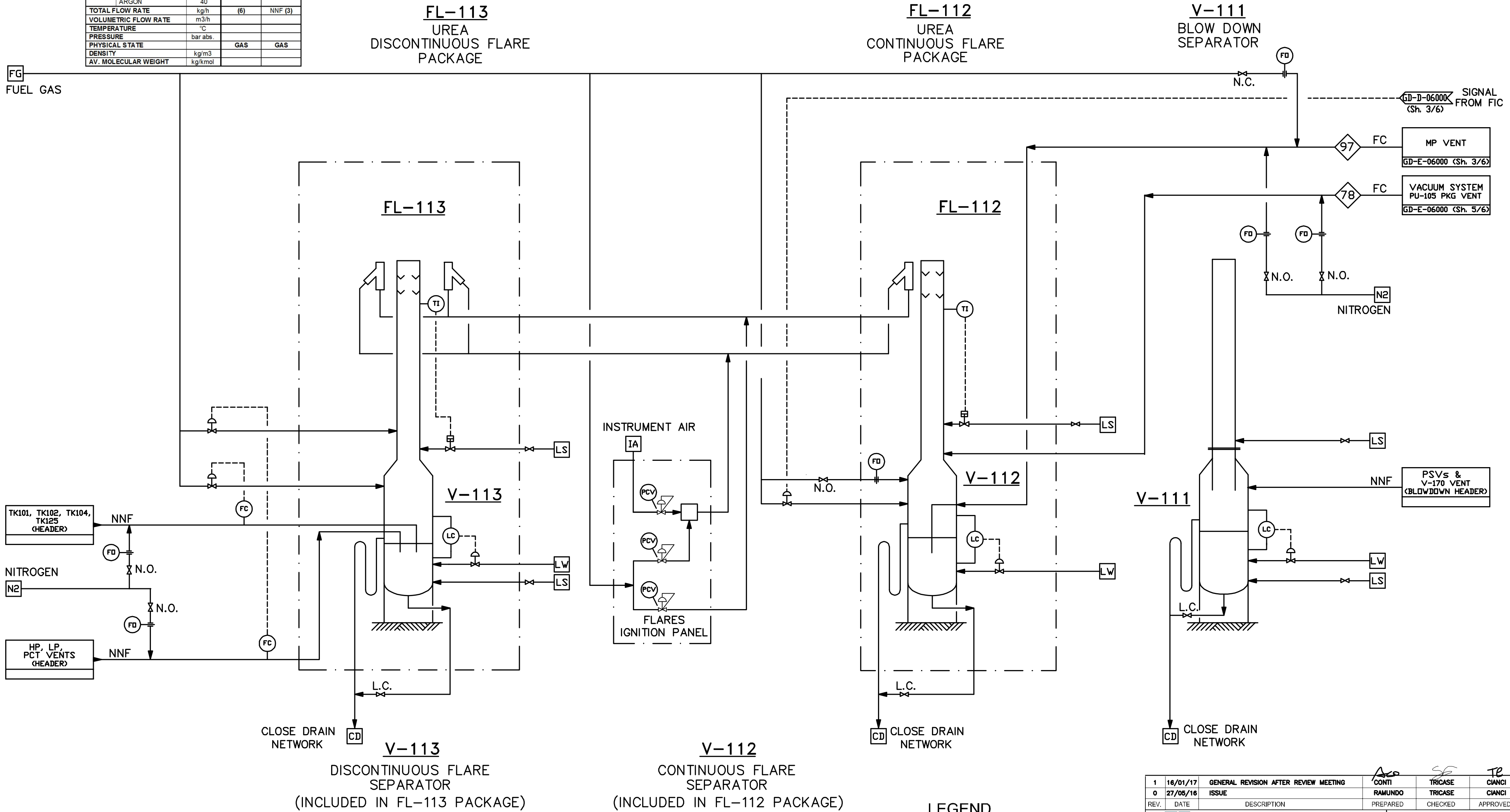
PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
OFF SPEC. CONDENSATE TANK AND PUMPS

SCALE

Issuer Specific Number / Rev. 1

IN REPLACEMENT OF
REPLACED BY

STREAM NUMBER			78	97
STREAM DESCRIPTION			Inerts from PU-105	MP Vent to FL-112
COMPOSITION	NH3	17		
	CO2	44		
	UREA	60		
	WATER	18		
	FORMALDEHYDE	30		
	BIURET	103		
	HYDROGEN	2		
	OXIGEN	32		
	METHANE	16		
	NITROGEN	28		
	ARGON	40		
TOTAL FLOW RATE		kg/h	(6)	NNF (3)
VOLUMETRIC FLOW RATE		m3/h		
TEMPERATURE		°C		
PRESSURE		bar abs.		
PHYSICAL STATE			GAS	GAS
DENSITY		kg/m3		
AV. MOLECULAR WEIGHT		kg/kmol		



LEGEND

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- STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- STREAM NUMBER FOR INERTS
- HEAT DUTY Gcal/h

NOTES

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2. COMPOSITION ON INERTS FREE BASIS.
3. NNF: NORMALLY NO FLOW.
4. NUMBER OF PILOTS TO BE DEFINED BY FLARE MFR.
5. THE FLARES SCHEME IS ONLY FOR REFERENCE, TO BE FINALIZED DURING DETAILED ENGINEERING PHASE.
6. TO BE CONFIRMED BY PU-105 MANUFACTURER.

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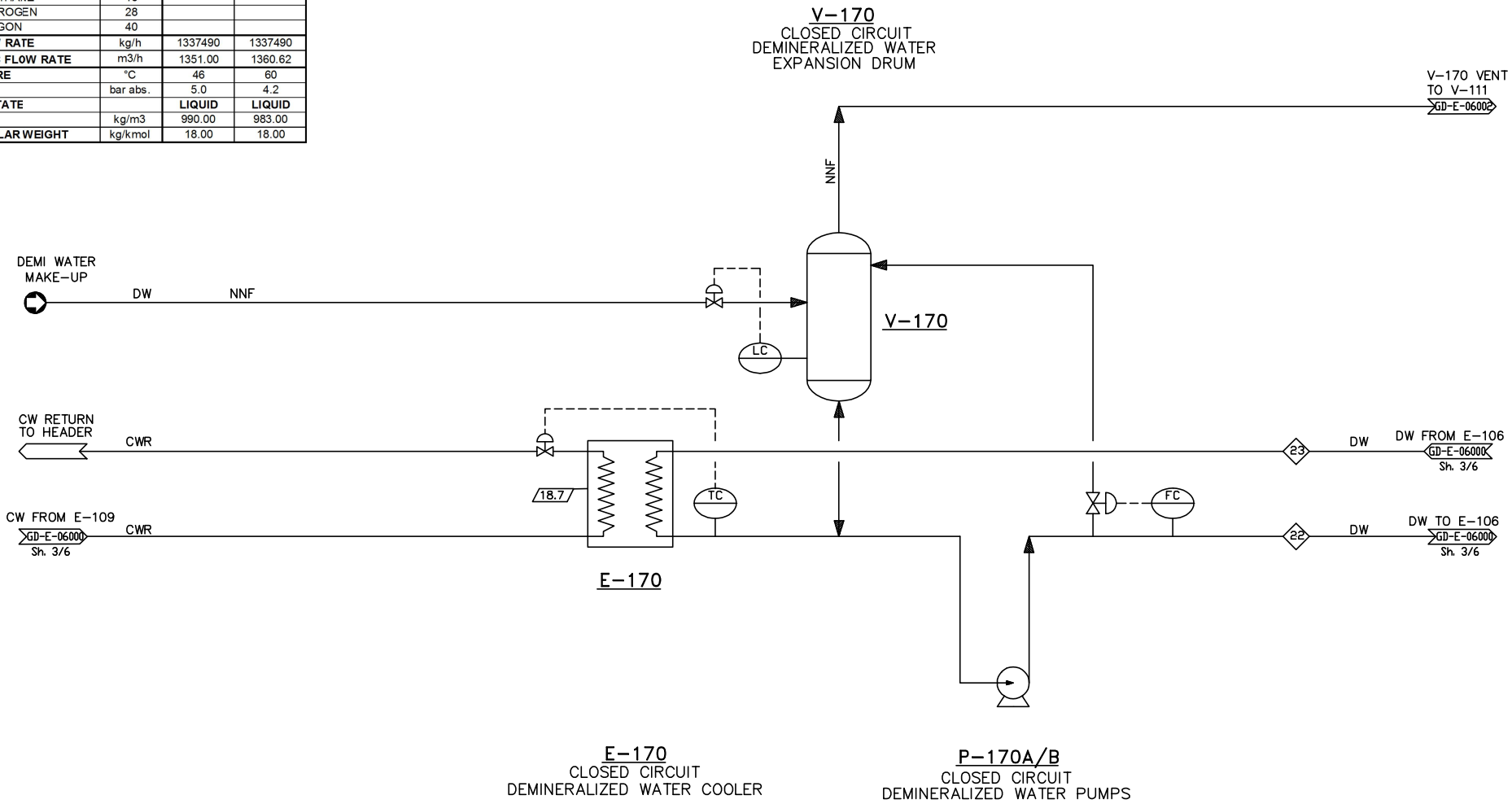
SNAMPROGETTI™ UREA TECHNOLOGY
SAIPEM

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
BLOW DOWN & FLARES SYSTEM

DWG No. GD-D-06002
Sh 1 of 1
JOB: 034001
Rev. 0 1
SCALE
IN REPLACEMENT OF
REPLACED BY
Issuer Specific Number /
Rev. 1

STREAM NUMBER			22	23
STREAM DESCRIPTION			DW to E-106	DW from E-106
COMPOSITION	NH3	17		
	CO2	44		
	UREA	60		
	WATER	18	100.00%	100.00%
	FORMALDEHYDE	30		
	BIURET	103		
	HYDROGEN	2		
	OXIGEN	32		
	METHANE	16		
	NITROGEN	28		
	ARGON	40		
TOTAL FLOW RATE		kg/h	1337490	1337490
VOLUMETRIC FLOW RATE		m3/h	1351.00	1360.62
TEMPERATURE		°C	46	60
PRESSURE		bar abs.	5.0	4.2
PHYSICAL STATE			LIQUID	LIQUID
DENSITY		kg/m3	990.00	983.00
AV. MOLECULAR WEIGHT		kg/kmol	18.00	18.00



LEGEND

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- STREAM NUMBER FOR INERTS
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NOTES

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3. NNF: NORMALLY NO FLOW.
4. STREAM BOXES WHICH ARE COLOURED IN GREY DO NOT TAKE PART TO THE PROCESS MATERIAL BALANCE OF THE PLANT.

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	16/01/17	GENERAL REVISION AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SAIPEM — SNAMPROGETTI™ UREA TECHNOLOGY

DWG No. GD-D-06003
Sh 1 of 1

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

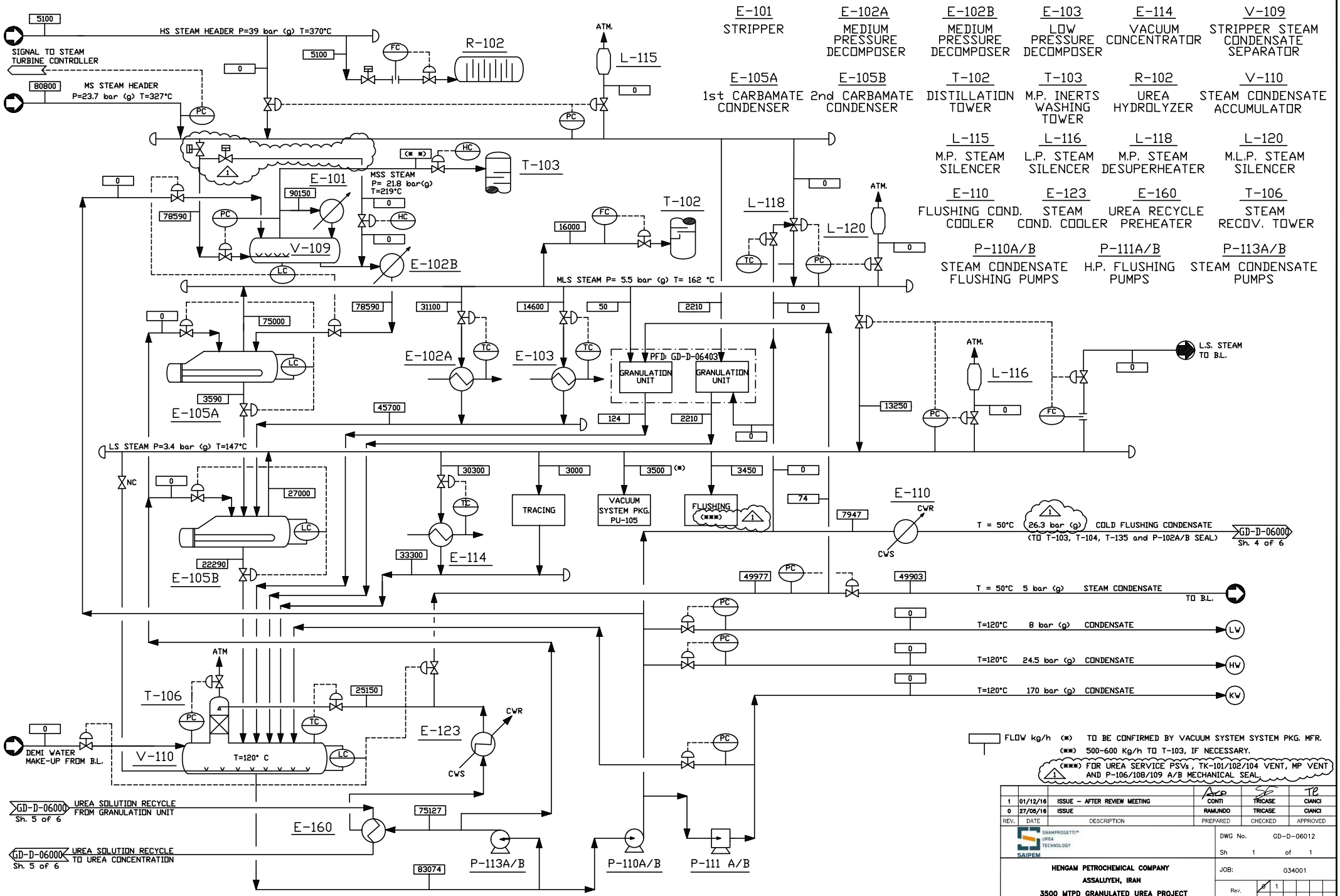
PFD / HEAT & MATERIAL BALANCE
UREA UNIT 11
DEMINERALIZED WATER CLOSED CIRCUIT

SCALE

IN REPLACEMENT OF

REPLACED BY

Issuer Specific Number / Rev. 1



REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	01/12/16	ISSUE – AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI* UREA TECHNOLOGY SAIPEM

DWG No. GD-D-06012
Sh 1 of 1

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

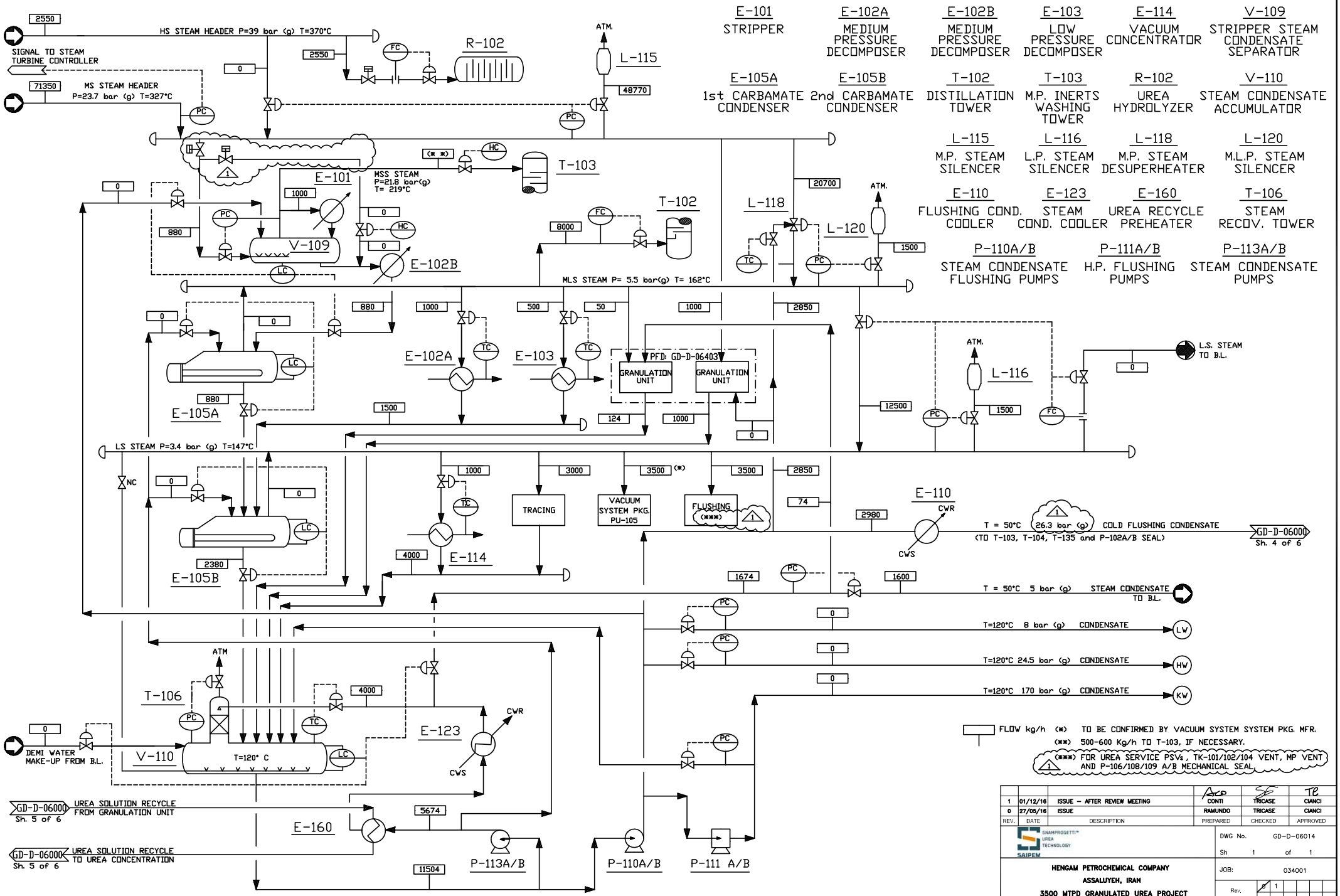
STEAM AND CONDENSATE BALANCE
NORMAL CASE

SCALE

IN REPLACEMENT OF

REPLACED BY

Issuer Specific Number / Rev. 1



REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	01/12/16	ISSUE – AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
0	27/05/16	ISSUE	RAMUNDO	TRICASE	CIANCI

SNAMPROGETTI UREA TECHNOLOGY
SAIPEM

DWG No. GD-D-06014
Sh 1 of 1

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1

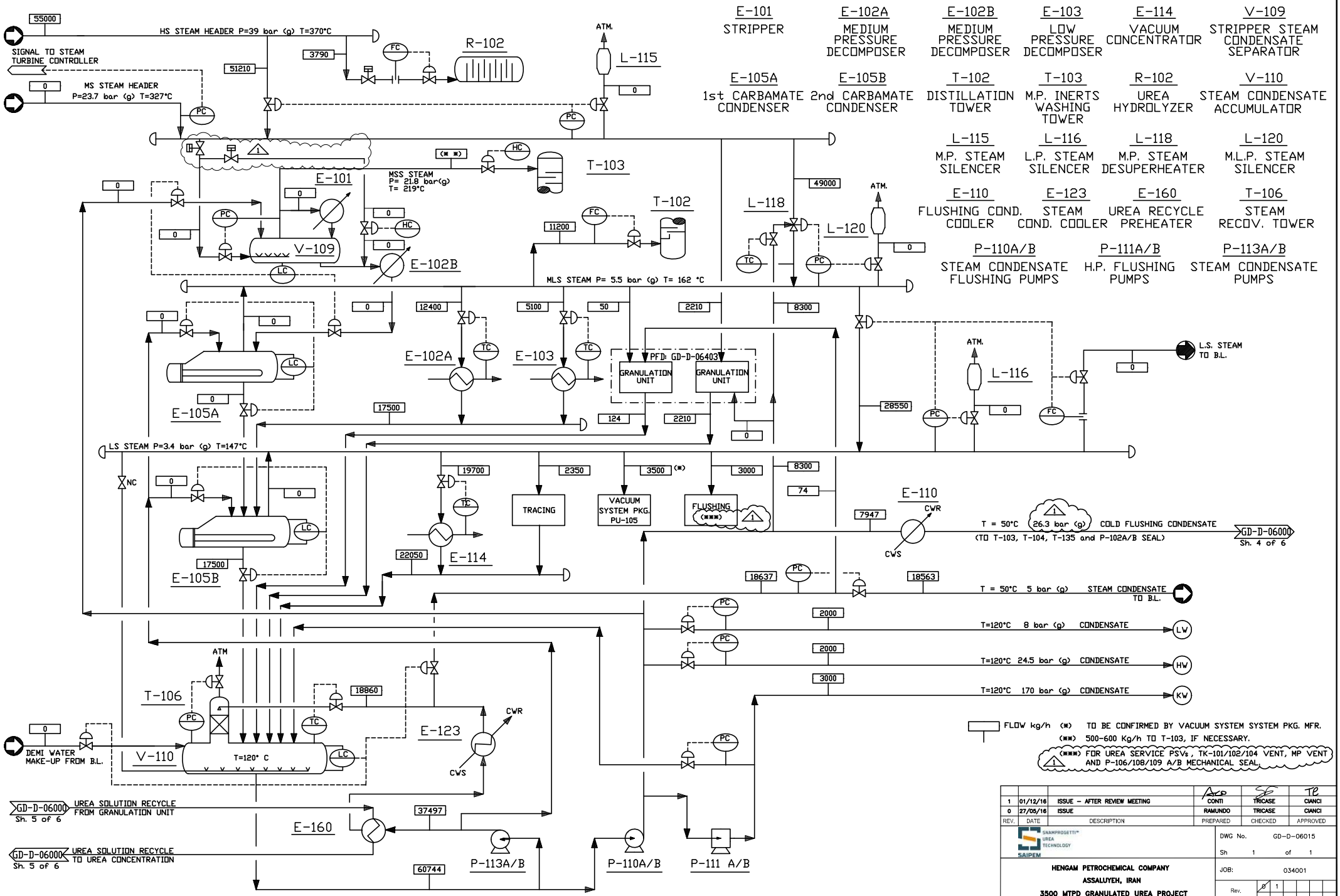
STEAM AND CONDENSATE BALANCE
START-UP CASE
(CO2 COMPRESSOR TURBINE RUNNING)

SCALE

IN REPLACEMENT OF

REPLACED BY

Issuer Specific Number / Rev. 1



REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1	01/12/16	ISSUE – AFTER REVIEW MEETING	CONTI	TRICASE	CIANCI
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SAIPEM — SNAMPROGETTI® UREA TECHNOLOGY

DWG No. GD-D-06015 Sh 1 of 1

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001

Rev. 0 1

STEAM AND CONDENSATE BALANCE
LONG SHUT-DOWN CASE
(REACTOR DRAINING AND UREA SOLUTION TANK RECOVERY)

SCALE

IN REPLACEMENT OF

REPLACED BY

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