STREAM NUMBER			1	3	4	5A/B	9	10	15	16	18	20	21	22	23	24	25	26	27	28	29	30	31	98
STREAM DESCRIPTION		(1)	Urea Sol. from Urea Unit	Urea Sol. to L-150B	Urea Dust to T-150A	Urea Gran. to L-151	Fine Urea to L-150A	Fine&Crushed Rec.to L-150A	Urea Gran. to TK-153	Urea Gran. to TK-153	Urea Sol. to TK-101	Fluid. Air to C-151	Fluid. Air out C-151	Fluid. Air to L-150B	Fluid. Air to L-150B	Fluid. Air to L-150B	Fluid. Air to L-150B	Fluid. Air to L-150B	Fluid. Air to L-150B	Atom. Air to C-157	Atom Air to E-151	Atom. Air to L-150B	Leak Air to L-150A	Exhaust Air to T-150A	Urea Sol. header drain
PHYSICAL STATE			Liquid	Liquid	Solid	Solid	Solid	Solid	Solid	Solid	Liquid	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Liquid
composition	UREA	%wt	95.90	95.84	98.595	98.595	98.595	98.595																
	FORMALDEHYDE	%wt	0.39	0.39	0.40	0.40	0.40	0.40																
	WATER	%wt	2.98	2.98	0.25	0.25	0.25	0.25																
	BIURET	%wt	0.68	0.73	0.75	0.75	0.75	0.75																
	AMMONIA	%wt	0.05	0.06	0.005	0.005	0.005	0.005															0.01	
	DRY AIR	%wt										94.68	94.68	94.68	94.68	94.68	94.68	94.68	94.68	94.68	94.68	94.68	94.13	
	MOISTURE	%wt										5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.86	
	SULPHURIC ACID	%wt																						
	AMMONIUM SULPHATE	%wt																						
		Nm^3/h										503698	503698	100740	70518	95703	95703	141035	76774	75774	76774	25185	611109	
FLOW-RATE		kg/h	156769	156769	5104	220208	29167	43750	NNF	NNF	NNF	631165	631165	126233	88363	119921	119921	176726	96202	98202	96202	31558	763299	NNF
		m^3/h	129.6	129.6								591537.3 <2>	555745.8 <2>	111759.1 <2>	78231.0 <1>	106170.8 <2>	106170.8 <2>	155608.6 <2>	90294.2	68859 <2>	79465.7 <2>	29620.2	855052.1	
TEMPERATURE		°C	135	135	107	95	65	65	95	95	135	45	54	54	54	54	54	54	48	89	135	48	107	135
PRESSURE		bar(a)	8.500 <2>	4.100	1.008	1.013	1.013	1.013	1.013	1.013	1.113	1.005 <2>	1.100 <2>	1.094 <2>	1.094 <2>	1.094 <2>	1.094 <2>	1.100 <2>	1.013	1.498 <2>	1.463 <2>	1.013	1.008	1.013
DENSITY		kg/m^3	1210	1210	750	750	750	750	750	750	1210	1.07 <2>	1.14 <2>	1.13 <2>	1.13 <2>	1.13 <2>	1.13 <2>	1.14 <2>	1.07	1.40 <2>	1.21 <2>	1.07	0.89	1210
MOLECULAR WEIGHT		kg/kmol	55.98	55.98	59.59	59.59	59.59	59.59	59.59	59.59	55.98	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.09	28.00	55.98

NOTES

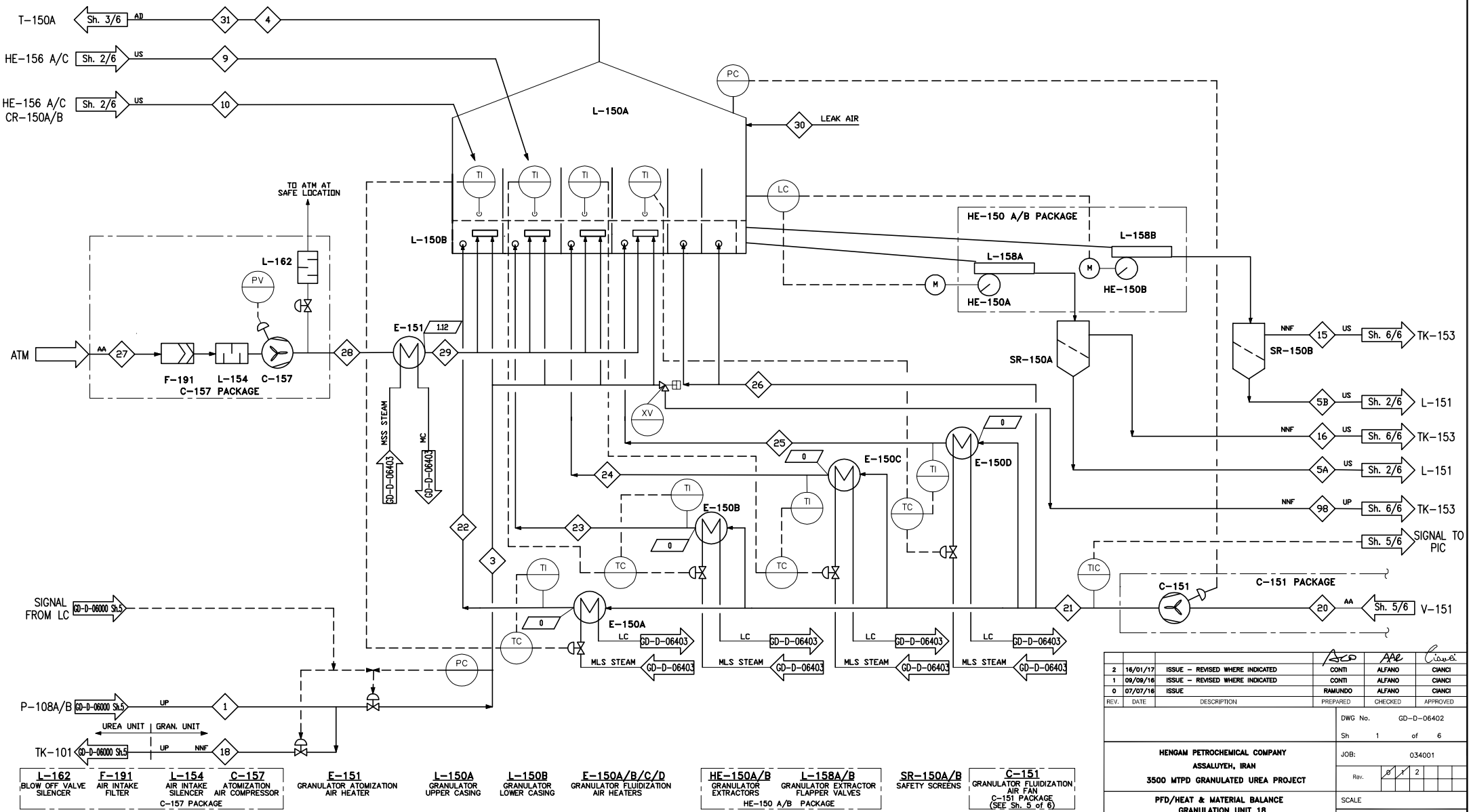
1 - FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.

2 - NNF : NORMALLY NO FLOW.

LEGEND

STREAM NUMBER FOR SINGLE PHASE (SOLID OR LIQUID OR GAS)

HEAT DUTY Gcal/h



L-162	F-191	L-154	C-157	E-151	L-150A	L-150B	E-150A/B/C/D	HE-150A/B	L-158A/B	SR-150A/B	C-151
BLOW OFF VALVE SILENCER	AIR INTAKE FILTER	AIR INTAKE SILENCER	ATOMIZATION AIR COMPRESSOR	GRANULATOR ATOMIZATION AIR HEATER	GRANULATOR UPPER CASING	GRANULATOR LOWER CASING	GRANULATOR FLUIDIZATION AIR HEATERS	GRANULATOR EXTRACTORS	GRANULATOR EXTRACTOR FLAPPER VALVES	SAFETY SCREENS	GRANULATOR FLUIDIZATION AIR FAN C-151 PACKAGE (SEE Sh. 5 of 6)
C-157 PACKAGE								HE-150 A/B PACKAGE			

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
2	16/01/17	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
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0	07/07/16	ISSUE	RAMUNDO	ALFANO	CIANCI

DWG No. GD–D–06402

Sh 1 of 6

HENGAM PETROCHEMICAL COMPANY

ASSALUYEH, IRAN

3500 MTPD GRANULATED UREA PROJECT

JOB: 034001

Rev. 0 1 2

PFD/HEAT & MATERIAL BALANCE

GRANULATION UNIT 18

GRANULATOR

SCALE

IN REPLACEMENT OF

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Issuer Specific Number / Rev. 2

STREAM NUMBER		5A/B	6	7A/B	8	9	10	11A/B	12	13	14	41	42	43	44	47	48	49	50	51	52	64	79	91
STREAM DESCRIPTION	(1)	Urea Gran. to L-151	Urea Dust to T-151	Urea Gran. from HE-151A/B	Coarse Urea to L-150A	Fine Urea to L-150A	Fine&Crushed Rec.to L-150A	Urea Gran to L-156	Urea Dust from L-156	Urea Gran. to Storage	Fine Urea to L-150A	Fluid. Air to E-152	Fluid. Air to C-152	Fluid. Air to L-151	SR-151 C/D Overflow	Fluid. Air to E-154	Fluid. Air to C-156	Fluid. Air to L-156	SR-151 A/B Overflow	Exh. Air out L-151	Exh. Air out L-156	HE-156 A Overflow	HE-156 C Overflow	Urea Gran. to TK-153
PHYSICAL STATE		Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Gaseous	Gaseous	Gaseous	Solid	Gaseous	Gaseous	Gaseous	Solid	Gaseous	Gaseous	Solid	Solid	Solid
composition	UREA	%wt	98.595	98.595	98.595	98.595	98.595	98.595	98.595	98.595	98.595	98.595												
	FORMALDEHYDE	%wt	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40												
	WATER	%wt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25												
	BIURET	%wt	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75												
	AMMONIA	%wt	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005												
	DRY AIR	%wt											94.68	94.68	94.68		99.40	99.40	99.40		94.68	99.40			
	MOISTURE	%wt											5.32	5.32	5.32		0.60	0.60	0.60		5.32	0.60			
	SULPHURIC ACID	%wt																						
	AMMONIUM SULPHATE	%wt																						
		Nm^3/h											450841	450841	450841		78339	78339	78339		450841	78339			
FLOW-RATE		kg/h	220208	729	219479	14583	29167	43750	146563	729	145833	29167	564931	564931	564931	NNF	100989	100989	100989	NNF	564931	100989	NNF	NNF	NNF
		m^3/h											530236.3	532338.3 <2>	525338.4 <2>		80566.8 <2>	81006.4 <2>	79887.1 <2>		571531.9	92134.7			
TEMPERATURE		°C	95	73	65	65	65	65	65	48	10	65	48	48	51	65	6	7	10 <2>	65	73	48	65	65	65
PRESSURE		bar(a)	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.009 <2>	1.032 <2>	1.013	1.007 <2>	1.005 <2>	1.030 <2>	1.013	1.013	1.013	1.013	1.013	1.013
DENSITY		kg/m^3	750	750	750	750	750	750	750	750	750	750	1.07	1.06	1.08	750	1.25	1.25 <2>	1.26 <2>	750	0.99	1.10	750	750	750
MOLECULAR WEIGHT		kg/kmol	59.59	59.59	59.59	59.59	59.59	59.59	59.59	59.59	59.59	59.59	28.09	28.09	28.09	59.59	28.89	28.89	28.89	59.59	28.09	28.89	59.59	59.59	59.59

NOTES

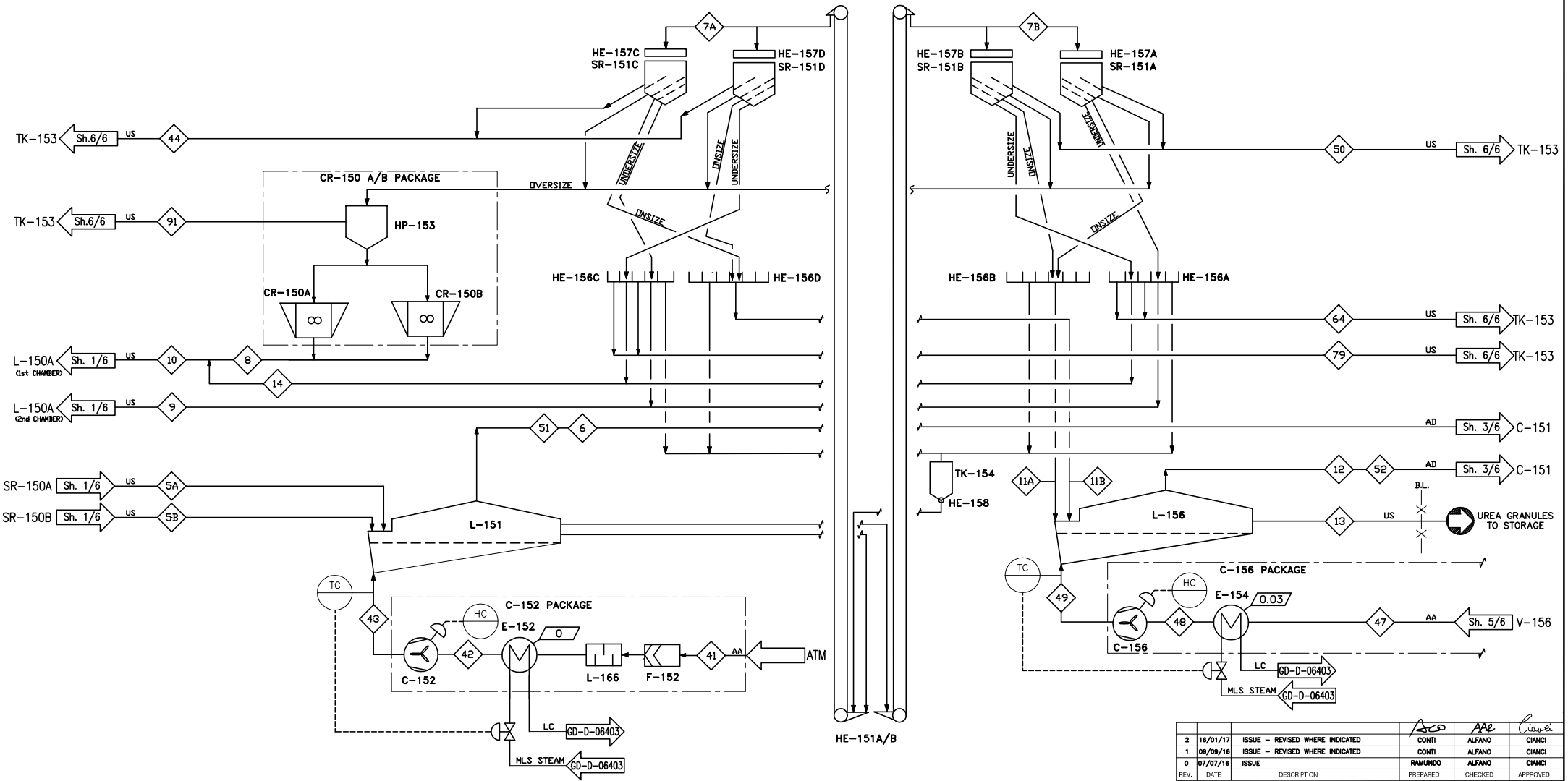
1 - FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.

2 - NNF : NORMALLY NO FLOW.

LEGEND

STREAM NUMBER FOR SINGLE PHASE (SOLID OR LIQUID OR GAS)

HEAT DUTY Gcal/h



REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
2	16/01/17	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
1	09/09/16	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
0	07/07/16	ISSUE	RAMUNDO	ALFANO	CIANCI

SNAMPROGETTI™ UREA TECHNOLOGY
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DWG No. GD–D–06402
Sh 2 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001

Rev. 0 1 2

PFD/HEAT & MATERIAL BALANCE
GRANULATION UNIT 18
FLUID BED COOLERS

SCALE

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CR–150A/B ROLL CRUSHERS
HP–153 CRUSHER FEEDER HOPPER
CR–150 A/B PACKAGE

L–151 FIRST FLUID BED COOLER

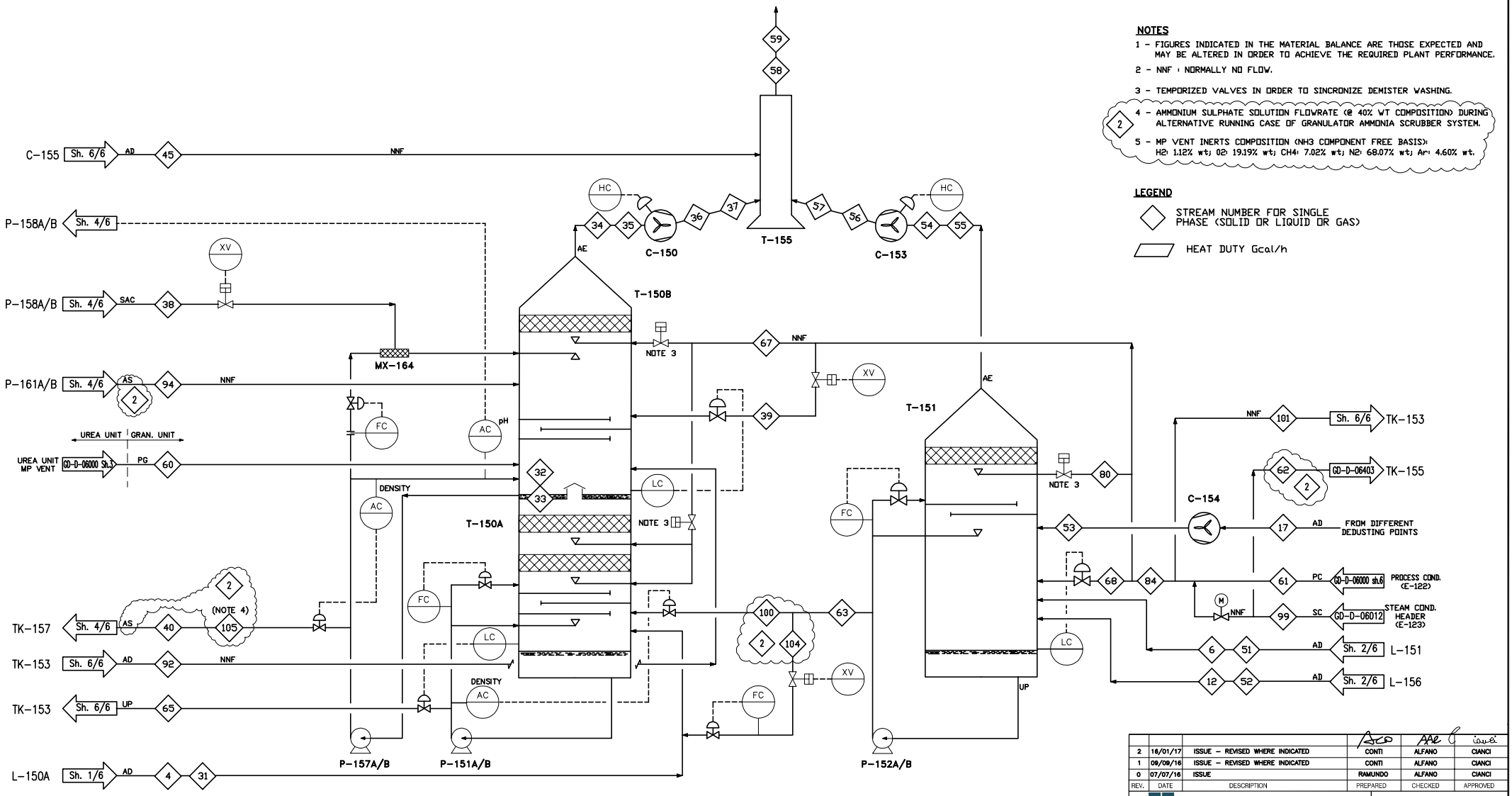
C–152 FIRST FLUID BED COOLER FLUIDIZATION AIR FAN
E–152 FIRST FLUID BED COOLER AIR PREHEATER
L–166 AIR INTAKE SILENCER
F–152 AIR INTAKE FILTER
C–152 PACKAGE

HE–157A/B/C/D VIBRATING SCREEN FEEDERS
SR–151A/B/C/D VIBRATING SCREENS
HE–156A/B/C/D PRODUCT DIVERTERS
HE–151A/B BUCKET ELEVATORS
TK–154 START–UP BIN
HE–158 START–UP BIN EXTRACTOR

C–156 FINAL FLUID BED COOLER FLUIDIZATION AIR FAN
E–154 FINAL FLUID BED COOLER AIR PREHEATER
C–156 PACKAGE SEE Sh. 5 of 6

L–156 FINAL FLUID BED COOLER

STREAM NUMBER		4	6	12	17	31	32	33	34	35	36	37	38	39	40	45	51	52	53	54	55	56	57	58	59	60 <2>	61	62 <2>	63	64	65	67	68	80	84	92	99	100 <2>	101	104 <2>	105 <2>
STREAM DESCRIPTION	(1)	Urea Dust to T-150A	Urea Dust to T-151	Urea Dust from L-156	Dedusting Air to C-154	Exhaust Air to T-150A	Exhaust Air from T-150A	Exh. Dust from T-150A	Exh. Air from T-150B	Exh. Dust from T-150B	Exhaust Air from C-150	Exhaust Dust from C-150	Sulphuric Acid to T-150B	PC to T-150B	Amm.Sulphate @10% wt	Fumes to T-155	Exh. Air out L-151	Exh. Air out L-156	Dedusting Air to T-151	Exh. Air out T-151	Exh. Dust out T-151	Exh. Air out C-153	Exh. Dust out C-153	Exh. Air out T-155	Exh. Dust out T-155	MP vent from Urea Unit	Process Cond. from Urea Unit	Steam Cond. to TK-155	Urea Solution to T-150A	Urea Sol. to TK-153	Proc Cond to T-150AB(demister)	Proc. Cond. to T-151	Proc Cond. to T-151 (demister)	Proc. Cond. to Scrubbers	Fumes to T-150B	AS from P-101 A/B	Steam Cond. from Header	Urea Sol. To Scrubber bottom	Proc. Cond. to TK-153	Urea Sol. to Gran. outlet duct	A.S. @40%wt (NOTE 4)
PHYSICAL STATE		Solid	Solid	Solid	Gaseous	Gaseous	Gaseous	Solid	Gaseous	Solid	Gaseous	Solid	Liquid	Liquid	Liquid	Gaseous	Gaseous	Gaseous	Gaseous	Gaseous	Solid	Gaseous	Solid	Gaseous	Solid	Gaseous	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid
composition	UREA	%wt	98.595	98.595	98.595				100.00			100.00				0.002					100.00		100.00		100.00					5.25	44.46									5.25		5.25	0.002
	FORMALDEHYDE	%wt	0.40	0.40	0.40																									0.18									0.02		0.02	
	WATER	%wt	0.25	0.25	0.25								3.00	100.00	90.00												100.00	100.00	94.69	55.01		100.00			100.00				94.69		94.69	60.00
	BIURET	%wt	0.75	0.75	0.75																								0.04	0.34									0.04		0.04	
	AMMONIA	%wt	0.005	0.005	0.005		0.01	0.01		0.004		0.004												0.002		0.87																
	DRY AIR	%wt				94.68	94.13	92.00		92.004		92.004					94.68	99.40	94.68	94.37		94.37		93.12		99.13 (NOTE5)																
	MOISTURE	%wt				5.32	5.86	7.99		7.992		7.992					5.32	0.60	5.32	5.63		5.63		6.88																		
	SULPHURIC ACID	%wt											97.00																													
	AMMONIUM SULPHATE	%wt													10.00																										40.00
		Nm³/h				16859	611109	633167		634101		634101					450841	78339	16859	555133		555133		1189234		1074																
FLOW-RATE		kg/h	5104	729	729	21125	763299	781013	17	782199	17	782199	17	194	2370	2530	NNF	564931	100989	21125	694349	15	694349	15	1476548	32	1152	35333	74	27103	14475	NNF	32983	NNF	35333	NNF	NNF	74	8922	NNF	18180	632 <2>
		m³/h				19627.4	855052.1	780115.4		810417.3 <2>		766783.8 <2>		0.11	2.4	2.4		571531.9	92134.7	18664.4	605726.7 <2>		645066.7 <2>		1420450.5		1066.4	35.8	0.1	26.8	13.0		33.4		35.8			0.1	8.8		18.0	0.526 <2>
TEMPERATURE	°C	107	73	48	48	107	50	50	50	59	59	59	48	50	50	52	73	48	59	43	43	46	46	53	53	48	50	50	43	50	50	50	50	50	50	50	50	43	50	43	50 <2>
PRESSURE	bar(a)	1.008	1.013	1.013	1.013	1.008	0.973	0.973	0.938 <2>	0.938 <2>	1.019 <2>	1.019 <2>	7.450	7.0 <2>	2.3 <2>	1.033	1.013	1.013	1.113	0.978 <2>	0.978 <2>	1.019 <2>	1.019 <2>	1.013	1.013	1.2	7.0 <2>	7.0 <2>	8.7	1.2 <2>	7.0 <2>	7.0 <2>	7.0 <2>	7.0 <2>	1.013	4.0 <2>	7.0 <2>	8.70	7.0 <2>	8.7	2.3 <2>
DENSITY	kg/m³	750	750	750	1.07	0.89	1.00	750	0.97 <2>	750	1.02	750	1830	988	1050	1.06	0.99	1.10	1.13	1.04	750	1.08	750	1.04	750	1.08	988	988	1010	1110	988	988	988	988	1.04	1050	988	1010	988	1010	1200 <2>
MOLECULAR WEIGHT	kg/kmol	59.59	59.59	59.59	28.09	28.00	27.65	60.00	27.65	60.00	27.65	66.00	85.48	18.00	19.70	27.65	28.09	28.89	28.09	28.03	60.00	28.03	60.00	27.83	60.00	24.04	18.00	18.00	18.69	26.27	18.00	18.00	18.00	18.00	27.65	19.70	18.00	18.69	18.00	18.69	27.5 <2>



NOTES

1 - FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.

2 - NNF : NORMALLY NO FLOW.

3 - TEMPORIZED VALVES IN ORDER TO SINCRONIZE DEMISTER WASHING.

4 - AMMONIUM SULPHATE SOLUTION FLOWRATE (@ 40% WT COMPOSITION) DURING ALTERNATIVE RUNNING CASE OF GRANULATOR AMMONIA SCRUBBER SYSTEM.

5 - MP VENT INERTS COMPOSITION (NH3 COMPONENT FREE BASIS): H2: 1.12% wt; O2: 19.19% wt; CH4: 7.02% wt; N2: 68.07% wt; Ar: 4.60% wt.

LEGEND

STREAM NUMBER FOR SINGLE PHASE (SOLID OR LIQUID OR GAS)

HEAT DUTY Gcal/h

MX-164 SULPHURIC ACID LINE MIXER

T-150A GRANULATOR DUST SCRUBBER

P-157A/B GRANULATOR AMMONIA SCRUBBER CIRCULATION PUMPS

P-151A/B GRANULATOR DUST SCRUBBER CIRCULATION PUMPS

T-150B GRANULATOR AMMONIA SCRUBBER

C-150 GRANULATOR SCRUBBER EXHAUST FAN

T-155 GRANULATION VENT STACK

P-152A/B COOLERS SCRUBBER CIRCULATION PUMPS

C-153 COOLERS SCRUBBER EXHAUST FAN

T-151 FLUID BED COOLERS SCRUBBER

C-154 DEDUSTING FAN

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
2	16/01/17	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
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0	07/07/16	ISSUE	RAMUNDO	ALFANO	CIANCI

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Sh 3 of 6

HENGAM PETROCHEMICAL COMPANY
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3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1 2

PFD/HEAT & MATERIAL BALANCE
GRANULATION UNIT 18
GRANULATION SCRUBBERS

SCALE

IN REPLACEMENT OF

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STREAM NUMBER			38	40	92	105 <2>
STREAM DESCRIPTION		(1)	Sulphuric Acid to T-150B	Amm.Sulphate @10% wt to B.L.	Amm.Sulphate from P-161A/B	Amm.Sulphate @40% wt to B.L. (NOTE4)
PHYSICAL STATE			Liquid	Liquid	Gaseous	Liquid
composition	UREA	%wt		0.002		0.002
	FORMALDEHYDE	%wt				
	WATER	%wt	3.00	90.00		60.00
	BIURET	%wt				
	AMMONIA	%wt				
	DRY AIR	%wt				
	MOISTURE	%wt				
	SULPHURIC ACID	%wt	97.00			
	AMMONIUM SULPHATE	%wt		10.00		40.00
		Nm^3/h				
FLOW-RATE		kg/h	194	2530	NNF	632 <2>
		m^3/h	0.11	2.4		0.526 <2>
TEMPERATURE		°C	48	50	50	50 <2>
PRESSURE		bar(a)	7.450	2.3 <2>	4.0 <2>	2.3 <2>
DENSITY		kg/m^3	1830	1050	1	1200 <2>
MOLECULAR WEIGHT		kg/kmol	85.48	19.70	27.65	27.5 <2>

NOTES

1 - FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.

2 - NNF : NORMALLY NO FLOW.

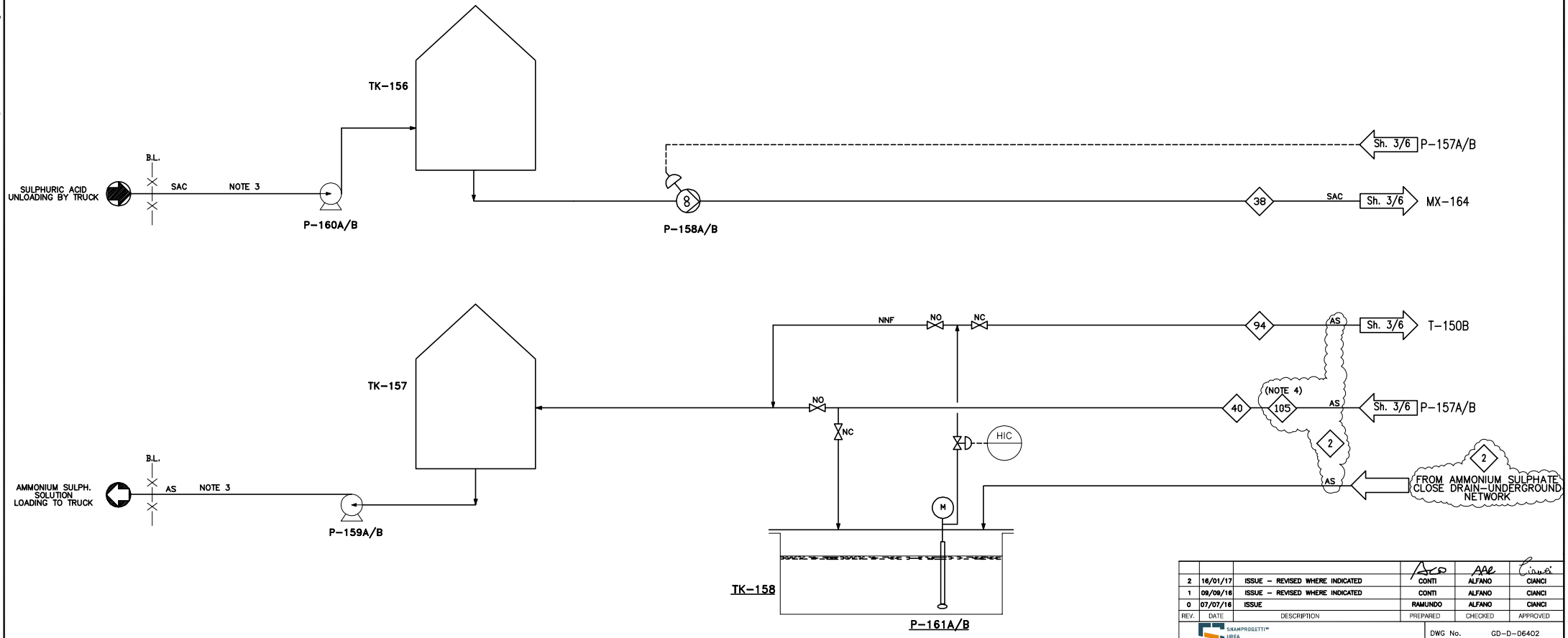
3 - DISCONTINUOUS FLOW.

4 - AMMONIUM SULPHATE SOLUTION FLOWRATE (@ 40% WT COMPOSITION) DURING ALTERNATIVE RUNNING CASE OF GRANULATOR AMMONIA SCRUBBER SYSTEM.

LEGEND

STREAM NUMBER FOR SINGLE PHASE (SOLID OR LIQUID OR GAS)

HEAT DUTY Gcal/h



P-160A/B	P-159A/B	TK-156	TK-157	P-158A/B	TK-158	P-161A/B
SULPHURIC ACID TRUCK UNLOADING PUMPS	AMMONIUM SULPHATE SOLUTION TRUCK LOADING PUMPS	SULPHUR ACID STORAGE TANK	AMMONIUM SULPHATE SOLUTION STORAGE TANK	SULPHURIC ACID PUMPS	AMMONIUM SULPHATE CLOSE DRAIN TANK	AMMONIUM SULPHATE CLOSE DRAIN PUMPS

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
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1	09/09/16	ISSUE - REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
0	07/07/16	ISSUE	RAMUNDO	ALFANO	CIANCI

SNAMPROGETTI UREA TECHNOLOGY
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Sh 4 of 6

HENGAM PETROCHEMICAL COMPANY
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3500 MTPD GRANULATED UREA PROJECT

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Rev. 0 1 2

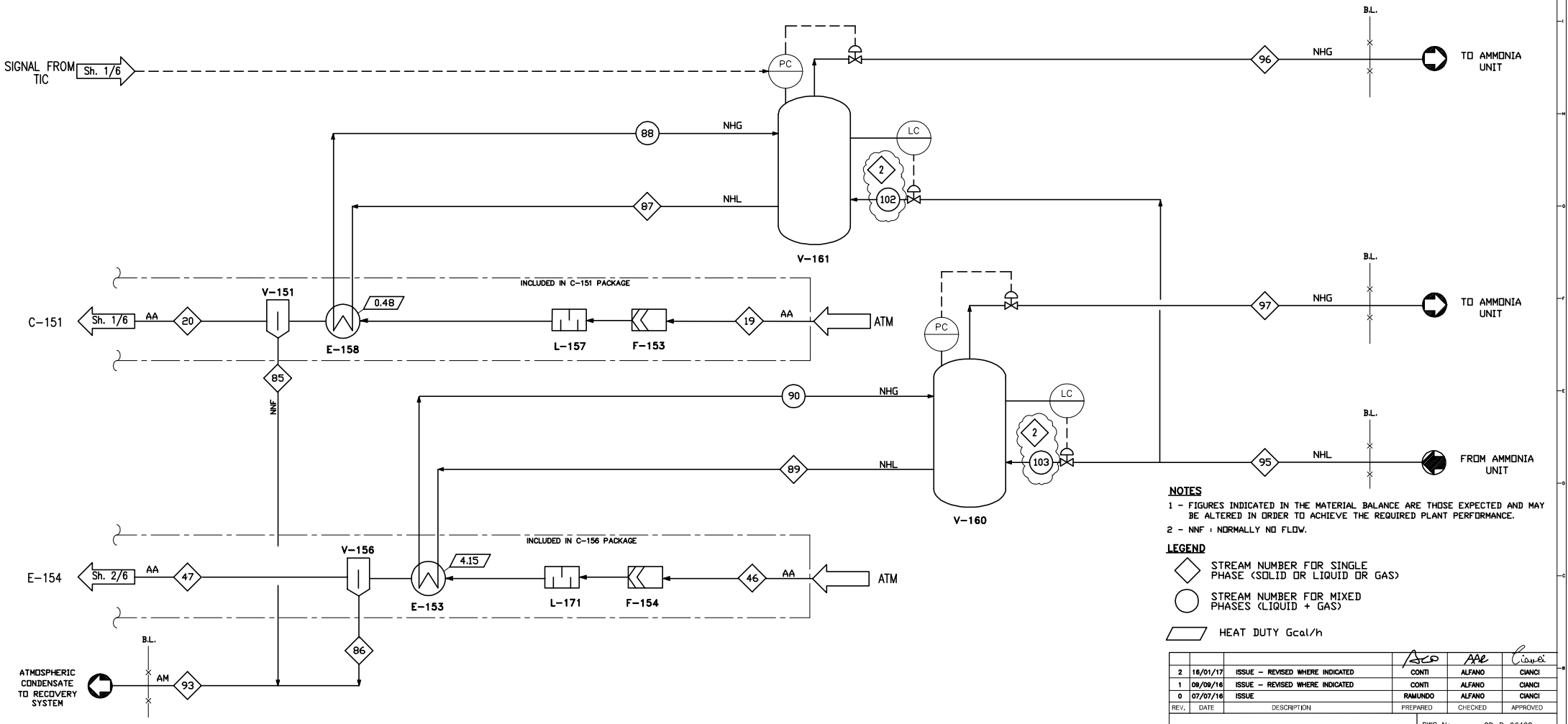
PFD/HEAT & MATERIAL BALANCE
GRANULATION UNIT 18
ACID SCRUBBING TANKS

SCALE

Issuer Specific Number / Rev. 2

IN REPLACEMENT OF
REPLACED BY

STREAM NUMBER			19	20	46	47	85	86	87	88 - LIQ <2>	88 - GAS <2>	89	90 - LIQ <2>	90 - GAS <2>	93	95	96	97	102 - LIQ <2>	102 - GAS	102 - LIQ <2>	102 - GAS
STREAM DESCRIPTION		(1)	Fluid. Air to E-158	Fluid. Air to C-151	Fluid. Air to E-153	Fluid. Air to E-154	Cond. Water out V-151	Cond. Water out V-156	Ammonia to E-158	Liquid NH3 from E-158	Gaseous NH3 from E-158	Ammonia to E-153	Liquid NH3 from E-153	Gaseous NH3 from E-153	Atm Cond.to Battery Limit	Ammonia Liquid from BL	Ammonia Vapours to BL	Ammonia Vapours to BL	Liquid NH3 to V-161	Gaseous NH3 to V-161	Liquid NH3 to V-160	Gaseous NH3 to V-160
PHYSICAL STATE			Gaseous	Gaseous	Gaseous	Gaseous	Liquid	Liquid	Liquid	Liquid	Gaseous	Liquid	Liquid	Gaseous	Liquid	Liquid	Gaseous	Gaseous	Liquid	Gaseous	Liquid	Gaseous
composition	UREA	%wt																				
	FORMALDEHYDE	%wt																				
	WATER	%wt													100.00							
	BIURET	%wt						100.00														
	AMMONIA	%wt							100.00	100.00	100.00	100.00	100.00	100.00		100.00	100.00	100.00	100.00	100.00	100.00	100.00
	DRY AIR	%wt	94.68	94.68	94.68	99.40																
	MOISTURE	%wt	5.32	5.32	5.32	0.60																
	SULPHURIC ACID	%wt																				
	AMMONIUM SULPHATE	%wt																				
		Nm^3/h	503698	503698	84619	78339																
FLOW-RATE		kg/h	631165	631165	106033	100989	NNF	5044	5597	3918	1679	45980	32186	13794	5044	17096	1765	15331	1712	53	13798	1533
		m^3/h	592402.2	591537.3 <2>	99520.9	80556.8 <2>		5.0	9.2	6.4	250.6	72.2	50.5	3853.1		28.5	293.2	4836.3	2.8	7.9	21.7	428.2
TEMPERATURE		°C	48	45	48	6	45	6	20	20	20	1	1	1	6	27	20	2	20	20	1	1
PRESSURE		bar(a)	1.013	1.005 <2>	1.013	1.007 <2>	1.005 <2>	1.007 <2>	8.600	8.60	8.60	4.460	4.46	4.46	1.007 <2>	19.80	7.80	4.00	8.60	8.60	4.46	4.46
DENSITY		kg/m^3	1.07	1.07 <2>	1.07	1.25	990	1000	611	611	6.70	637	637	3.58	1000	600.00	6.02	3.17	611	6.70	637	3.58
MOLECULAR WEIGHT		kg/kmol	28.09	28.09	28.09	28.89	18.00	18.00	17.00	17.00	17.00	17.00	17.00	17.00	18.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00



NOTES

1 - FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.

2 - NNF : NORMALLY NO FLOW.

LEGEND

- ◇ STREAM NUMBER FOR SINGLE PHASE (SOLID OR LIQUID OR GAS)
- ○ STREAM NUMBER FOR MIXED PHASES (LIQUID + GAS)
- ▱ HEAT DUTY Gcal/h

2	16/01/17	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
1	09/09/16	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
0	07/07/16	ISSUE	RAMUNDO	ALFANO	CIANCI
REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

V-151 MOISTURE SEPARATOR AIR CHILLING UNIT FOR GRANULATOR

E-158 GRANULATOR FLUIDIZATION AIR CHILLER

L-157 AIR INTAKE SILENCER

F-153 AIR INTAKE FILTER

INCLUDED IN C-151 PACKAGE — SEE Sh. 1 of 6

V-156 MOISTURE SEPARATOR AIR CHILLING UNIT FOR FINAL FLUID BED COOLER

E-153 FINAL FLUID BED COOLER AIR CHILLER

L-171 AIR INTAKE SILENCER

F-154 AIR INTAKE FILTER

INCLUDED IN C-156 PACKAGE — SEE Sh. 2 of 6

V-161 NH3 CHILLING SEPARATOR FOR GRANULATOR

V-160 NH3 CHILLING SEPARATOR FOR FINAL FLUID BED COOLER

DWG No. GD-D-06402
Sh 5 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1 2

PFD/HEAT & MATERIAL BALANCE
GRANULATION UNIT 18
GRANULATION REFRIGERATION SYSTEM

SCALE

Issuer Specific Number / Rev. 2

IN REPLACEMENT OF
REPLACED BY

STREAM NUMBER		2	15	16	44	45	50	64	65	66	69	70	77	79	91	92	98	101
STREAM DESCRIPTION	(1)	UF-85 to P-108A/B	Urea Gran. to TK-153	Urea Gran. to TK-153	SR-151 C/D Overflow	Fumes to T-155	SR-151 A/B Overflow	HE-156 A Overflow	Urea Sol. to TK-153	Urea Rec. to Urea Unit	Urea Sol. from TK-153	Water to TK-153	MLS Steam to L-153A/B	HE-156 C Overflow	Urea Gran. to TK-153	Fumes to T-150B	Urea Sol. Header drain	Proc. Cond. to TK-153
PHYSICAL STATE		Liquid	Solid	Solid	Solid	Gaseous	Solid	Solid	Liquid	Liquid	Liquid	Liquid	Steam	Solid	Solid	Gaseous	Liquid	Liquid
composition UREA	%wt	25.00							44.48	44.48								
composition FORMALDEHYDE	%wt	60.00							0.18	0.18								
composition WATER	%wt	15.00							55.01	55.01								
composition BIURET	%wt								0.34	0.34								
composition AMMONIA	%wt																	
composition DRY AIR	%wt																	
composition MOISTURE	%wt																	
composition SULPHURIC ACID	%wt																	
composition AMMONIUM SULPHATE	%wt																	
composition	Nm^3/h																	
FLOW-RATE	kg/h	972	NNF	NNF	NNF	NNF	NNF	NNF	14475	14475	NNF	NNF	NNF	NNF	NNF	NNF	NNF	NNF
FLOW-RATE	m^3/h	0.7							13.0	13.0								
TEMPERATURE	°C	48	95	95	65	52	65	65	50	50	50	50	162	65	65	50	135	50
PRESSURE	bar(a)	5.2	1.013	1.013	1.013	1.033	1.013	1.013	1.2 <2>	7.85	1.013	1.9	6.5	1.013	1.013	1.013	1.013	7.0 <2>
DENSITY	kg/m^3	1325	750	750	750	1.06	750	750	1110	1110	1110	1005	3.42	750	750	1.04	1210	988
MOLECULAR WEIGHT	kg/kmol	30.77	59.59	59.59	59.59	27.65	59.59	59.59	26.27	26.27	26.27	18.00	18.00	59.59	59.59	27.65	55.98	18.00

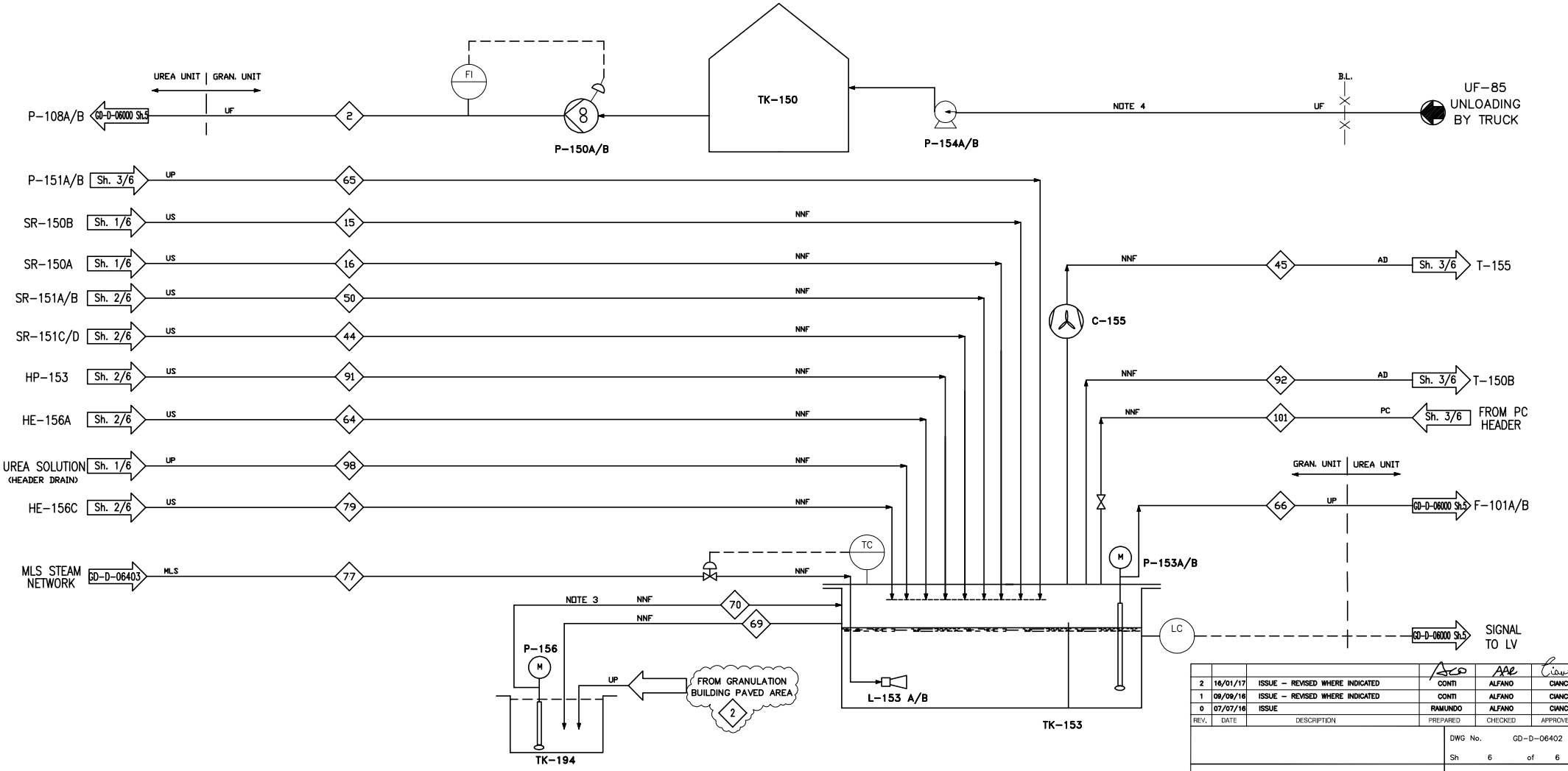
NOTES

1 - FIGURES INDICATED IN THE MATERIAL BALANCE ARE THOSE EXPECTED AND MAY BE ALTERED IN ORDER TO ACHIEVE THE REQUIRED PLANT PERFORMANCE.
2 - NNF : NORMALLY NO FLOW.
3 - WATER WITH UREA 45% MAX.
4 - DISCONTINUOUS FLOW.

LEGEND

STREAM NUMBER FOR SINGLE PHASE (SOLID OR LIQUID OR GAS)

HEAT DUTY Gcal/h



P-150A/B UF-85 METERING PUMPS

TK-150 UF-85 STORAGE TANK

TK-194 EMERGENCY CHEMICAL SEWER GRANULATION BASIN

C-155 FUMES EXTRACTION FAN

L-153 A/B STEAM EJECTORS

TK-153 UREA SOLUTION RECYCLE TANK

P-156 EMERGENCY CHEMICAL BASIN GRANULATION PUMP

P-154A/B UF-85 TRUCK UNLOADING PUMPS

P-153A/B UREA SOLUTION RECYCLE PUMPS

REV.	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
2	16/01/17	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
1	09/09/16	ISSUE – REVISED WHERE INDICATED	CONTI	ALFANO	CIANCI
0	07/07/16	ISSUE	RAMUNDO	ALFANO	CIANCI

DWG No. GD-D-06402
Sh 6 of 6

HENGAM PETROCHEMICAL COMPANY
ASSALUYEH, IRAN
3500 MTPD GRANULATED UREA PROJECT

JOB: 034001
Rev. 0 1 2

PFD/HEAT & MATERIAL BALANCE
GRANULATION UNIT 18
GRANULATION TANKS

SCALE

IN REPLACEMENT OF
REPLACED BY

Issuer Specific Number / Rev. 2