MK.NO.	QUAN.	DESCRIPTION	MATERIAL	NOZ MK.	SUPPLIER	P.O. NO.	DUE
21	406	TUBES 3/4" O.D.X 0.0830" (MIN) THK PER BEND SCHEDULE 12)	SA-179				
		FORGED RING MATERIAL					
2 1	1	FLG 45 7/8" O.D.X 36" I.D.X 4 5/8" THK (f) 6)8)12)	SA-350LF2CL1				
3 1	1	FLG 45 7/8" O.D.X 36" I.D.X 6 3/16" THK (f) 6)8)12)	SA-350LF2CL1				
7 1	1	FLG 45 7/8" O.D.X 36" I.D.X 6 3/16" THK (f) 6)8)12)	SA-350LF2CL1				
		TUBESHEETS & COVERS					
19 1	1	TUBESHEET 38 11/16" O.D.X 2 9/16" THK (f) 8)12)13)	SA-516-70N				
1	1	COVER 45 7/8" O.D.X 3 1/4" THK (f) 8)12)13)	SA-516-70N				
		BAFFLES					
22	12	BAFFLES PER DWG. -8	SA-36				
22A	1	SUPT PL. PER DWG. -8	SA-36				
		HEAD					
18	1	ELLIP HD. 36" I.D.X 7/16" THK(min) W/2" SF 8)12)	SA-516-70N				
		CYLINDERS					
9	1	R&W CYL 36" I.D.X 1/2" THK X 17'-11 11/16" LG.					
		1-CYL 10'-0" 1-CYL 7'-11 11/16" 8)12)	SA-516-70				
4	1	R&W CYL 36" I.D.X 1/2" THK X 2'-2 7/16" LG. 8)12)	SA-516-70				
150 2	1	1 1/2" X 18 GA. EXP'D METAL PERSONAL PROTECTION MESH					
2		PER DWG. -3A	SA-240-316				
151 2	95	PERSONAL PROTECTION STAND-OFF CLIPS PER DWG. -3A	SA-36				
152 2	190	#8 SELF TAPPING SCREW W/ FLAT S.S. WASHER PER DWG. -3A	SA-240-316				
2		SEE -17 FOR BILL OF MATERIAL NOTES					
3		NITROGEN PURGE MAT'L.					
108 3	2	1/4" NPT GAGE W/ -30 TO 30 PSI (MINIMUM) DIAL	C.-STL.				
109 3	2	1/4" X 1" NPT BUSHING	C.-STL.				
110 3	2	1" - 3000 # SCREWED TEE	SA-234-WPB				
111 3	4	1" NPT PIPE NIPPLE 0.179" (SCH. 80) X 2" LG. (TOE)	SA-106-B				
112 3	4	1" NPT PIPE NIPPLE 0.179" (SCH. 80) X 1 1/2" LG. (TBE)	SA-106-B				
113 3	4	1" - 50 # (MAX.) THD. BALL VALVE	C-STL.				
114 3	4	1" - 3000 # HEX HEAD PLUG	C-STL.				
115 3	2	1" 3M FS THRD 90 ELL	SA-105				
		SEE -17 FOR BILL OF MATERIAL NOTES					

PROJECT NAME: WORLD ENERGY RENEWABLES PROJECT
EQUIPMENT OWNER: AIR PRODUCTS MANUFACTURING LLC
SERVICE: PRODUCT FRACTIONATOR OVERHEAD TRIM CONDENSER
LOCATION: WORLD ENERGY, PARAMOUNT, CA. USA
PRODUCT: FRACTIONATOR OVERHEAD VAPOR
ITEM NO.: 18-X-359
AIR PRODUCTS P.O. NO.: 4505600056 / A8KM-4-402-PO-1
AP PROJECT NO: EN-20-7119
VDR CODE NO.: FA01
SERIAL NO.: S21-13258-4
ENGINEER: GH
CUSTOMER / CLIENT: WORLD ENERGY PARAMOUNT

NO.	DATE	REVISIONS
3	1/26/23	ADD N2 PURGE/FABSCO EMG
2	9/29/22	MOVED LINES/FABSCO BW/DD
1	7/8/22	REV. PER FABSCO GO/DD

BILL OF MATERIAL

DWN. BY B.W.
DATE 5/3/22
CKD. BY *DiCarlo*

Fabsco
SHELL & TUBE, LLC

DWG.NO. S21-13258-4-14
REV. 3

MK.NO.	QUAN.	DESCRIPTION	MATERIAL	NOZ MK.	SUPPLIER	P.O. NO.	DUE
△		ANSI FLANGES					
71 △	1	ASME 12" – 300 # RF WN W/ (SchXH BORE) 5)9)12)	SA-350LF2CL1	S1			
72 △	1	ASME 10" – 300 # RF WN W/ (SchXH BORE) 5)9)12)	SA-350LF2CL1	S2			
81 △	1	ASME 8" – 300 # RF WN W/ (SchXH BORE) 5)9)12)	SA-350LF2CL1	T1			
82 △	1	ASME 8" – 300 # RF WN W/ (SchXH BORE) 5)9)12)	SA-350LF2CL1	T2			
73 △	1	ASME 2" – 300 # RF LWN X 9" LG(2.000"BORE) 5)9)12)	SA-350LF2CL1	A3			
74 △	1	ASME 2" – 300 # RF LWN X 9" LG(2.000"BORE) 5)9)12)	SA-350LF2CL1	A4			
83 △	1	ASME 2" – 300 # RF LWN X 9 1/2" LG(2.000"BORE) 5)9)12)	SA-350LF2CL1	V			
84 △	1	ASME 2" – 300 # RF LWN X 9 1/2" LG(2.000"BORE) 5)9)12)	SA-350LF2CL1	D			
85 △	1	ASME 2" – 300 # RF LWN X 9" LG(2.000"BORE) 5)9)12)	SA-350LF2CL1	A1			
86 △	1	ASME 2" – 300 # RF LWN X 9" LG(2.000"BORE) 5)9)12)	SA-350LF2CL1	A2			
73C △	1	ASME 2" – 300 # RF BLIND FLG. 5)9)12)	SA-350LF2CL1	A3			
74C △	1	ASME 2" – 300 # RF BLIND FLG. 5)9)12)	SA-350LF2CL1	A4			
83C △	1	ASME 2" – 300 # RF BLIND FLG. 5)9)12)	SA-350LF2CL1	V			
84C △	1	ASME 2" – 300 # RF BLIND FLG. 5)9)12)	SA-350LF2CL1	D			
85C △	1	ASME 2" – 300 # RF BLIND FLG. 5)9)12)	SA-350LF2CL1	A1			
86C △	1	ASME 2" – 300 # RF BLIND FLG. 5)9)12)	SA-350LF2CL1	A2			
71A △	1	SMLS.PIPE 12" X(0.5000" SchXH)X 9 1/2" LG. 8)12)	SA-106-B	S1			
72A △	1	SMLS.PIPE 10" X(0.5000" SchXH)X 9 3/4" LG. 8)12)	SA-106-B	S2			
81A △	1	SMLS.PIPE 8" X(0.5000" SchXH)X 11 3/4" LG. 8)12)	SA-106-B	T1			
82A △	1	SMLS.PIPE 8" X(0.5000" SchXH)X 11 3/4" LG. 8)12)	SA-106-B	T2			
71B △	1	WELD PAD 17 1/4" OD X 16 3/4" OD X 13 3/4" ID X		S1			
△		13 1/4" ID X 1/2" THK. ROLL TO 18 1/2" IR 8)12)	SA-516-70				
72B △	1	WELD PAD 15 1/16" OD X 14 3/4" OD X 11 9/16" ID X		S2			
△		11 1/4" ID X 1/2" THK. ROLL TO 18 1/2" IR 8)12)	SA-516-70				
81B △	1	WELD PAD 13 1/4" OD X 12 5/8" OD X 9 3/4" ID X		T1			
△		9 1/8" ID X 1/2" THK. ROLL TO 18 1/2" IR 8)12)	SA-516-70				
82B △	1	WELD PAD 13 1/4" OD X 12 5/8" OD X 9 3/4" ID X		T2			
△		9 1/8" ID X 1/2" THK. ROLL TO 18 1/2" IR 8)12)	SA-516-70				
△		NOZZLE COVER MATERIAL					
180 △2	2	PL. 15" O.D. X 3/8" THK. W/(12) 9/16" DIA. HOLES	C.-STL.				
△2		EQUALLY SPACED ON 13" B.C. (8"-300#)					
181 △2	2	GASKETS: 0.175" THK 316 SS SPIRAL WOUND GRAPHITE					
△		FILLED, STYLE "CGI" W/316 SS INNER RING &					
△		C-STL. OUTER RING FOR (8"-300# RF)					
182 △2	24	1/2" HEX HD. ALL-THD. BOLTS X 3 1/2" LG. W/(1) HEX NUT	C.-STL.				
△2		AND (2) FLAT WASHERS EACH (8"-300#)					
183 △3	1	PL. 20 1/2" O.D. X 3/8" THK. W/(16) 9/16" DIA. HOLES	C.-STL.				
△2		EQUALLY SPACED ON 17 3/4" B.C (12"-300#)					
184 △3	1	GASKETS: 0.175" THK 316 SS SPIRAL WOUND GRAPHITE					
△		FILLED, STYLE "CGI" W/316 SS INNER RING &					
△		C-STL. OUTER RING FOR (12"-300# RF)					
185 △3	16	1/2" HEX HD. ALL-THD. BOLT X 4" LG. W/(1) HEX NUT	C.-STL.				
△2		AND (2) FLAT WASHERS EACH (12"-300#)					
186 △3	1	PL. 17 1/2" O.D. X 3/8" THK. W/(16) 9/16" DIA. HOLES	C.-STL.				
△3		EQUALLY SPACED ON 15 1/4" B.C (10"-300#)					
187 △3	1	GASKET: 0.175" THK 316 SS SPIRAL WOUND GRAPHITE FILLED, STYLE					
△3		"CGI" W/316 SS INNER RING & C-STL OUTER RING FOR(10"-300#RF)					
188 △3	16	1/2" HEX HD. ALL-THD. BOLT X 4" LG. W/(1) HEX NUT	C.-STL.				
△3		AND (2) FLAT WASHERS EACH (10"-300#)					
71D △4	1	WELD PAD RING 19" OD X 18 1/2" OD X 17 3/4" ID X		S1			
△4		17 1/4" ID X 1/2" THK. ROLL TO 18 1/2" IR 8)12)	SA-516-70				

PROJECT NAME: WORLD ENERGY RENEWABLES PROJECT
EQUIPMENT OWNER: AIR PRODUCTS MANUFACTURING LLC
SERVICE: PRODUCT FRACTIONATOR OVERHEAD TRIM CONDENSER
LOCATION: WORLD ENERGY, PARAMOUNT, CA. USA
PRODUCT: FRACTIONATOR OVERHEAD VAPOR
ITEM NO.: 18-X-359
AIR PRODUCTS P.O. NO.: 4505600056 / A8KM-4-402-PO-1
AP PROJECT NO: EN-20-7119
VDR CODE NO.: FA01
SERIAL NO.: S21-13258-4
ENGINEER: GH
CUSTOMER / CLIENT: WORLD ENERGY PARAMOUNT

NO.	DATE	REVISIONS
4	1/26/23	REV. PER CUST. EMG
3	9/29/22	REV. PER CUST. B.W./DD
2	8/22/22	REV. .PER CUST. B.W./DD
1	7/8/22	REV. PER CUST. GD/DD

BILL OF MATERIAL

DWN. BY B.W.
DATE 5/3/22
CKD. BY DiCarlo

Fabsco
SHELL & TUBE, LLC

DWG.NO. S21-13258-4-15
REV. 4

MK.NO.	QUAN.	DESCRIPTION	MATERIAL	NOZ MK.	SUPPLIER	P.O. NO.	DUE
△		BOLTING & GASKETS					
40 △	1	LOT OF GASKETS PER DWG. −11					
41 △1	56	7/8" ROUND X 9−THREAD STUDS X 11 1/4" LG. 1&2 12)	SA−193B7				
42 △1	60	7/8" ROUND X 9−THREAD STUDS X 16 7/8" LG. 3&7 12)	SA−193B7				
43 △1	464	7/8" HEAVY HEX NUTS 9−THREAD 12)	SA−194−2H				
44 △1	232	7/8" NARROW SERIES WASHERS	F−436−1				
△							
△		SPARE STUDS & NUTS (TO SHIP LOOSE W/EXCH.)					
141 △1	6	7/8" DIA. (9−THD.) STUDS X 11 1/4" LG. 1&2 12)	SA−193−B7				
142 △1	6	7/8" DIA. (9−THD.) STUDS X 16 7/8" LG. 3&7 12)	SA−193−B7				
143 △1	46	7/8" HVY HEX NUTS (9−THD.) 12)	SA−194−2H				
144 △1	23	7/8" NARROW SERIES WASHERS 12)	F−436−1				
△							
△		BLIND FLANGE MATERIAL					
171 △	48	STUDS: 5/8" DIA. (11−THD.) X 5 3/4" LG.(2"−300# RF) 12)	SA−193−B7				
172 △	192	NUTS: 5/8" (11−THD.) HVY. HEX (2"−300# RF) 12)	SA−194−2H				
173 △	6	GASKETS: 0.175" THK 316 SS SPIRAL WOUND GRAPHITE					
△		FILLED, STYLE "CGI" W/316 SS INNER RING &					
△		C−STL. OUTER RING FOR (2"−300# RF)					
174 △1	96	5/8" NARROW SERIES WASHERS	F−436−1				
△							
△		MISC. MATERIAL					
60 △1	1	STD. NAME PLATE	304 STN STL				
61 △1	1	NAME PL BRKT PER DWG. −10 8)12)	SA−516−70				
62 △1	4	LIFTING LUGS PER DWG. −10 8)12)	SA−516−70				
23 △	135	FT. 1/2" O.D. TIE RODS	SA−36				
23B △	16	1/2" TIE ROD HEX NUTS	SA−563A				
23A △	135	FT. 3/4" O.D. SPACER TUBING	SA−214				
22S △	4	SEAL BARS 2 1/2" X 1/4" THK X 13'−2 5/8" LG.	SA−36				
22I △	17	IMP. RODS: 3/4" DIA. X 25 1/8" LG.	SA−36				
50 △	1	PASS PLATES 17 9/16" X 5/8" THK X 37 3/16" LG. 8)12)	SA−516−70				
51 △	1	PASS PLATES 35 7/8" X 5/8" THK X 37 3/16" LG. 8)12)	SA−516−70				
63 △1	4	SQUARE HEAD PULLBOLT PLUGS: 3/4" DIA. X 3 1/2" LG.	SA−36				
22R △	2	DUMMY RODS: 3/8" DIA. X 14'−8 5/8" LG.	SA−36				
65 △2	4	SHOULDER EYE BOLTS: 3/4" OD (10−THD.) W/ 2" LG					
△2		SHANK (TO SHIP LOOSE W/ EXCHANGER)	ASTM A489				
△		SUPPORT MATERIAL					
120 △1	2	PLATE 15" X 3/8" THK X 59" LG. 8)12)	SA−516−70				
121 △1	2	PLATE 32 5/8" X 1/2" THK X 24 1/4" LG.	SA−516−70				
122 △1	2	PLATE 9" X 3/4" THK X 31" LG.	SA−516−70				
123 △1	4	PLATE 4" X 3/4" THK X 14 7/8" LG.	SA−516−70				
124 △1	8	PLATE 4" X 3/4" THK X 21 5/8" LG.	SA−516−70				
125 △	2	GROUNDING LUGS: 2" X 1/4" THK. X 5" LG.	SA−240−304				
△							
△							
△		FOR BILL OF MATERIAL NOTES, SEE DWG. −17					
△2		"DELETED"					
△2		"DELETED"					
△1		PAINT PER DWG. −1A					
△							

PROJECT NAME: WORLD ENERGY RENEWABLES PROJECT
EQUIPMENT OWNER: AIR PRODUCTS MANUFACTURING LLC
SERVICE: PRODUCT FRACTIONATOR OVERHEAD
TRIM CONDENSER
LOCATION: WORLD ENERGY, PARAMOUNT, CA. USA
PRODUCT: FRACTIONATOR OVERHEAD VAPOR
ITEM NO.: 18−X−359
AIR PRODUCTS P.O. NO.: 4505600056 / A8KM−4−402−PO−1
AP PROJECT NO: EN−20−7119
VDR CODE NO.: FA01
SERIAL NO.: S21−13258−4
ENGINEER: GH
CUSTOMER / CLIENT: WORLD ENERGY PARAMOUNT

NO.	DATE	REVISIONS
△2	8/22/22	REV. PER CUST. B.W./DD
△1	7/8/22	REV. PER CUST. GD/DD

BILL OF MATERIAL

DWN. BY B.W.
DATE 5/3/22
CKD. BY *DiCarlo*

Fabsco
SHELL & TUBE, LLC

DWG.NO. S21−13258−4−16
REV. 2

MK.NO.	QUAN.	DESCRIPTION	MATERIAL	NOZ MK.	SUPPLIER	P.O. NO.	DUE
△		NOTES:					
△		1) ALL WELD BEVELS PER WELD & BEVEL DETAIL DWG ATTACHED					
△		2) ALL FORMED HEADS TO BE IN ACCORDANCE WITH UCS-79.					
△		3) ALL COLD FORMED PRESSURE PARTS, INCLUDING BUT NOT					
△		LIMITED TO CYLINDER & HEADS, TO BE CERTIFIED AS					
△		REQ'D. BY ASME SECTION VIII, DIV. 1, para. UG-79(c).					
△		4) C.M.T.R'S. REQ'D. FOR ALL MATERIAL. ACCEPTABLE					
△		COUNTRY'S OF ORIGIN ARE AUSTRIA, BELGIUM, CANADA,					
△		CZECH REPUBLIC, DENMARK, FINLAND, FRANCE, GERMANY,					
△		IRELAND, ITALY, JAPAN, LUXEMBOURG, THE NEATHERLANDS,					
△		NORWAY, MEXICO, POLAND, SPAIN, SOUTH KOREA,					
△		SOUTH AFRICA, SWEDEN, SWITZERLAND, TAIWAN, UNITED					
△1		KINGDOM, UNITED STATES OF AMERICA (TUBES)					
△		5) NOZ. FLG'S TO HAVE 125-250 MICROINCH RA FINISH.					
△		6) FLANGE'S TO BE AS FOLLOWS:					
△		A) BODY FLG. FORGINGS TO BE U.T. PER SA-388 &					
△		ASME CODE SECT VIII DIV. 2, PARA 3.3.4.					
△		B) THE ENTIRE SURFACE OF FORGING, AFTER FINISH					
△		MACHINING, SHALL BE M.P.E OR D.P.E.					
△		7) ANY REQUIRED TEST SPECIMENS FOR MECHANICAL TESTING					
△		SHALL BE TAKEN FROM THE SAME HEAT LOT AT 1/2T.					
△		8) CARBON EQUIVALENT (CE) SHALL BE CALCULATED USING THE					
△		FOLLOWING FORMULA, UNLESS CODE REQUIREMENTS ARE MORE					
△		CONSERVATIVE: C.E. SHALL NOT EXCEED .42					
△		CE=C+(Mn)/6+(Cr+Mo+V)/5+(Ni+Cu)/15					
△		9) FLG. FACINGS SHALL BE PROTECTED DURING FABRICATION & SHIPPING.					
△		10) TEMPERING TEMPERATURE SHALL NOT BE LESS THAN 1200°F.					
△		11) ALL NORMALIZED MATERIAL TO BE FINE GRAIN PRACTICE.					
△		12) ALL CARBON STEEL FORGINGS, PLATE, PIPE,					
△		BOLTING, SHALL BE KILLED EXCEPT FOR BAFFLES AND					
△		"MISC. MATERIAL" HEADING.					
△		13) PLATE TO BE 100% U.T. BEFORE FORMING					
△		PER SA-435, SUPPL. REQT. S1.					
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PROJECT NAME: WORLD ENERGY RENEWABLES PROJECT
EQUIPMENT OWNER: AIR PRODUCTS MANUFACTURING LLC
SERVICE: PRODUCT FRACTIONATOR OVERHEAD TRIM CONDENSER
LOCATION: WORLD ENERGY, PARAMOUNT, CA. USA
PRODUCT: FRACTIONATOR OVERHEAD VAPOR
ITEM NO.: 18-X-359
AIR PRODUCTS P.O. NO.: 4505600056 / A8KM-4-402-PO-1
AP PROJECT NO: EN-20-7119
VDR CODE NO.: FA01
SERIAL NO.: S21-13258-4
ENGINEER: GH
CUSTOMER / CLIENT: WORLD ENERGY PARAMOUNT

NO.	DATE	REVISIONS
1	7/8/22	REV. PER CUST. GD/DD

BILL OF MATERIAL NOTES

DWN. BY B.W.
DATE 5/6/22
CKD. BY

Fabsco
SHELL & TUBE, LLC

DWG.NO. S21-13258-4-17
REV. 1