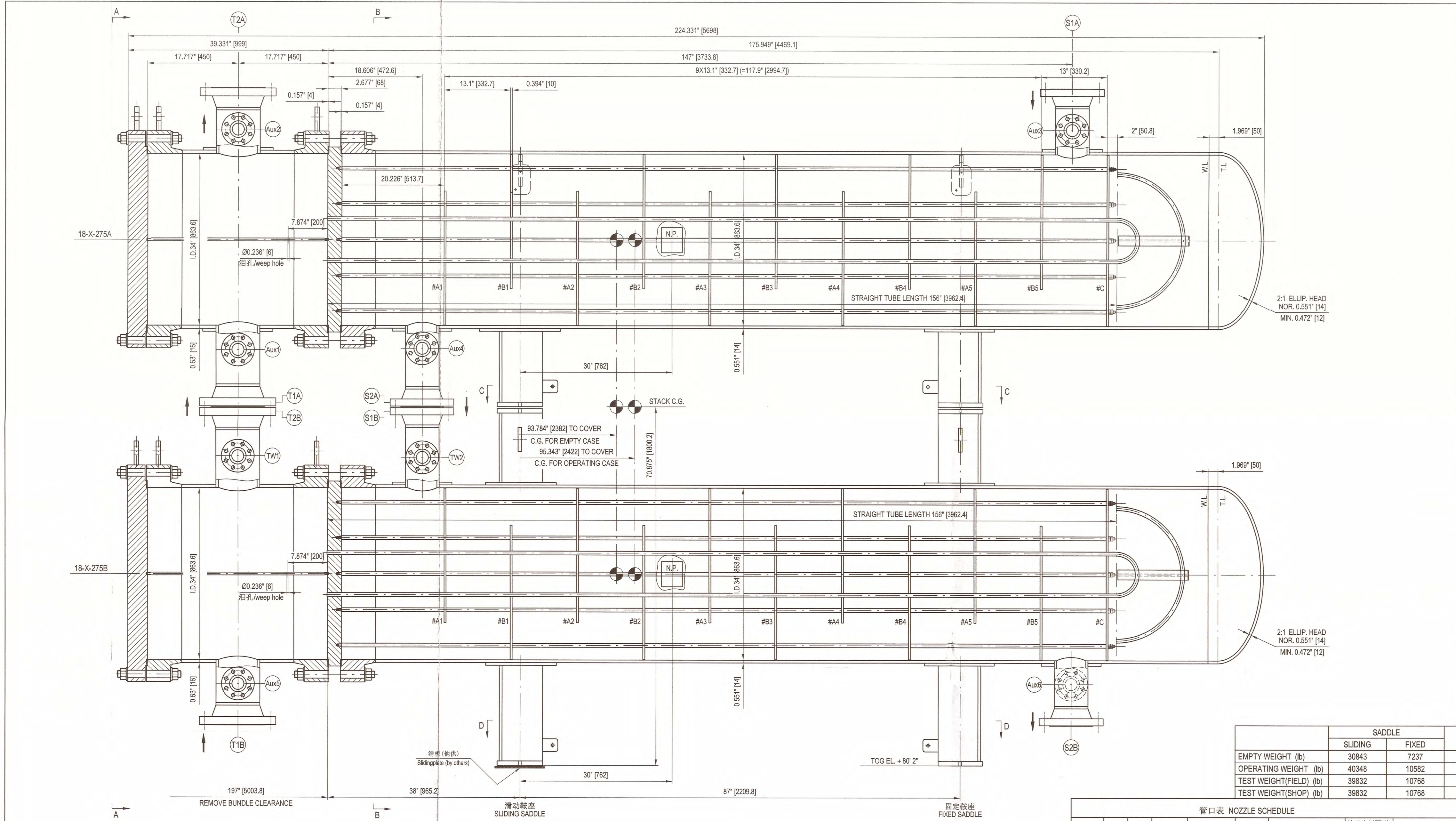




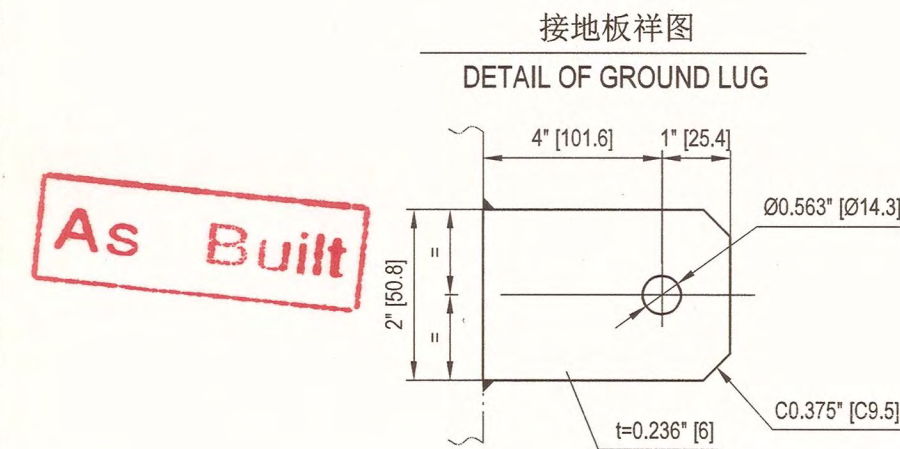
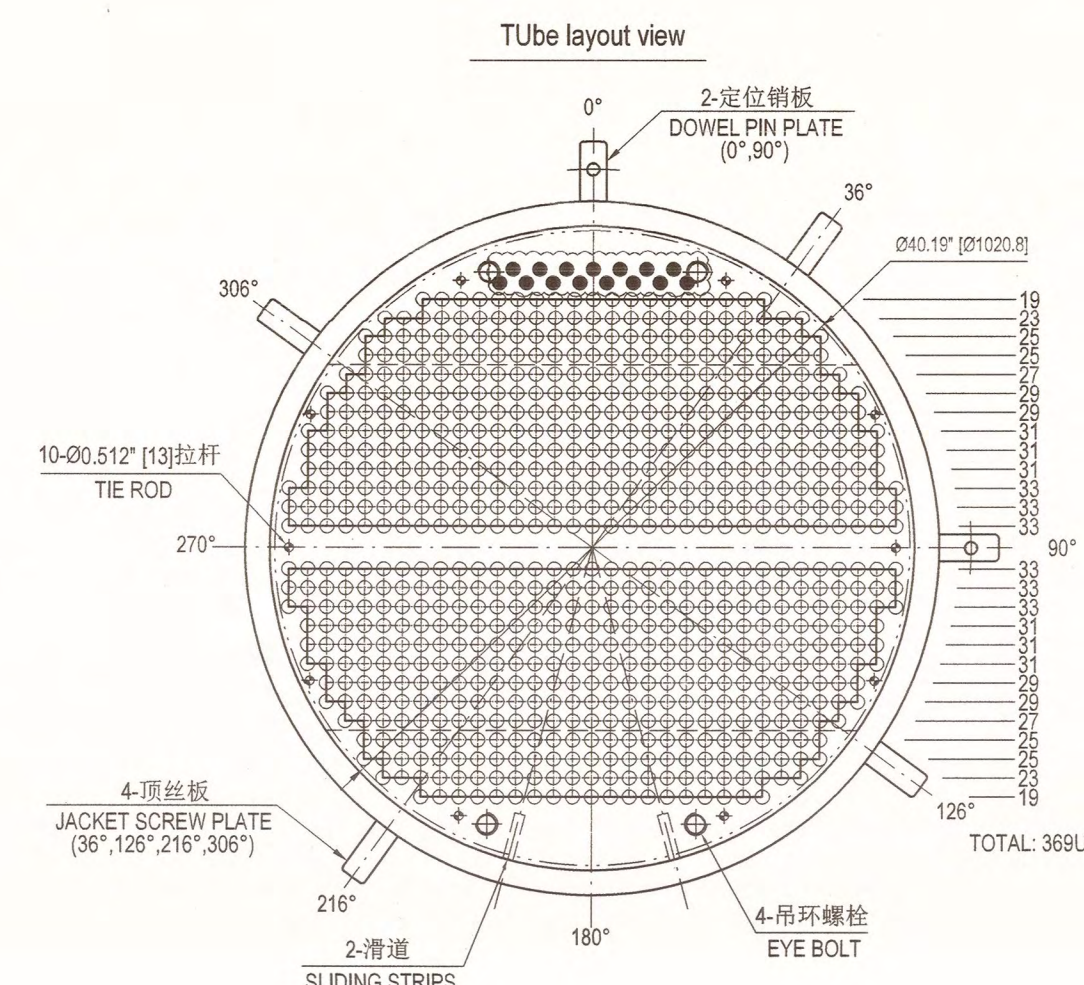
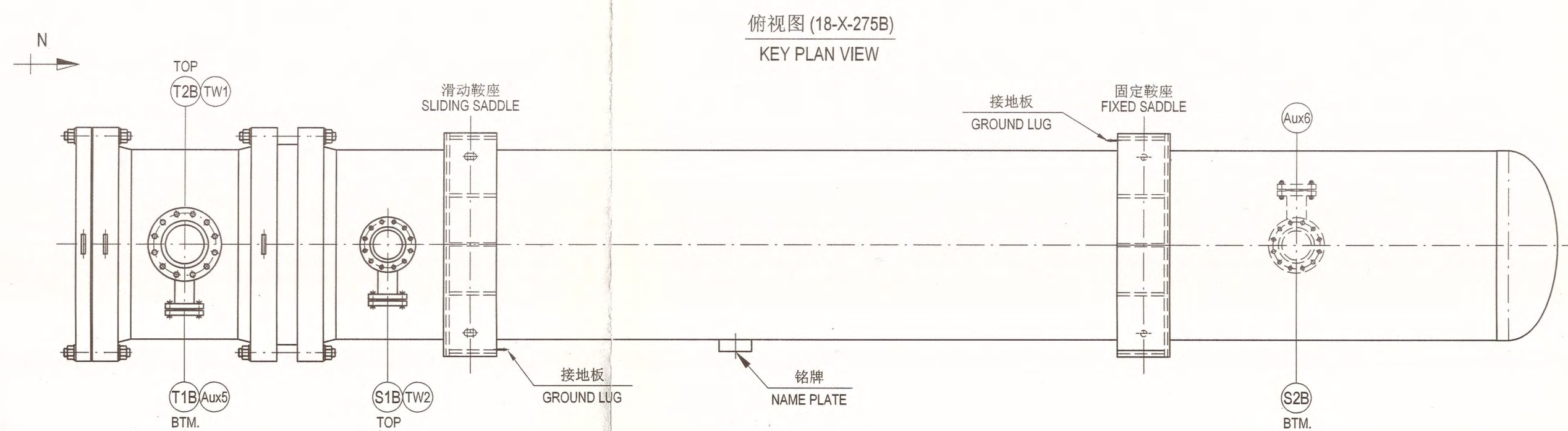
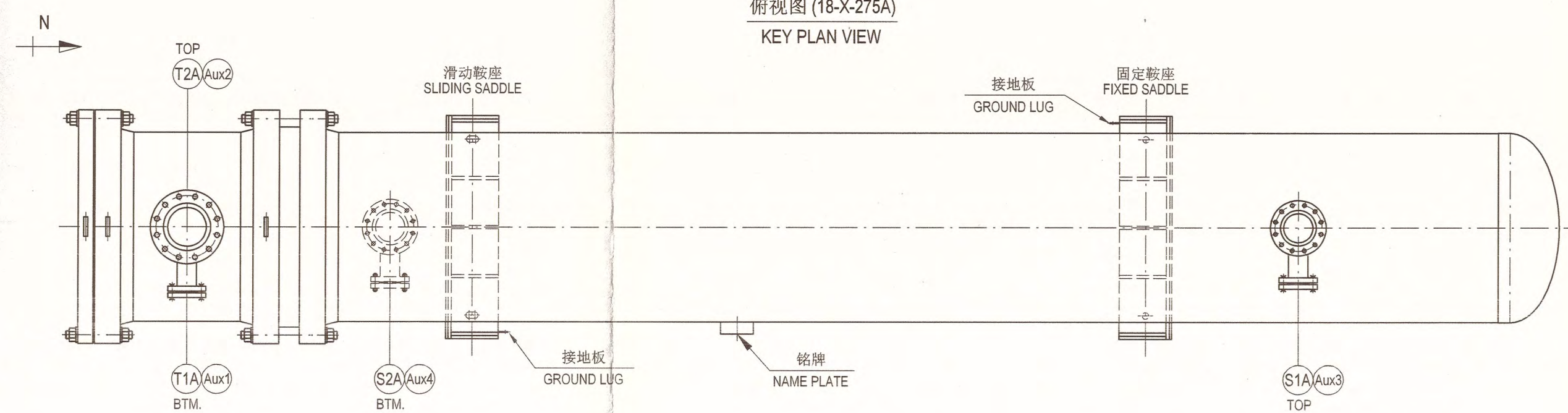
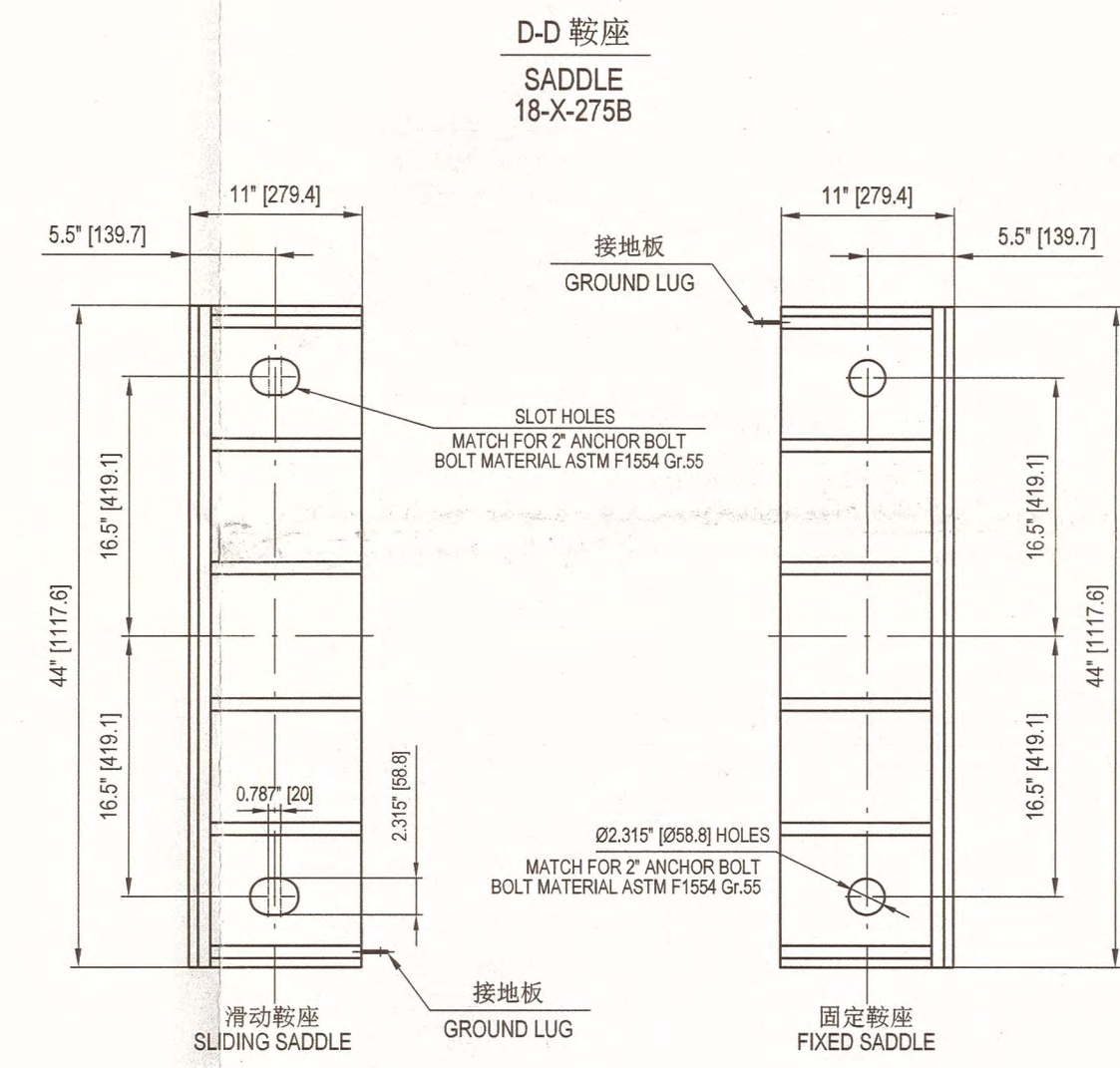
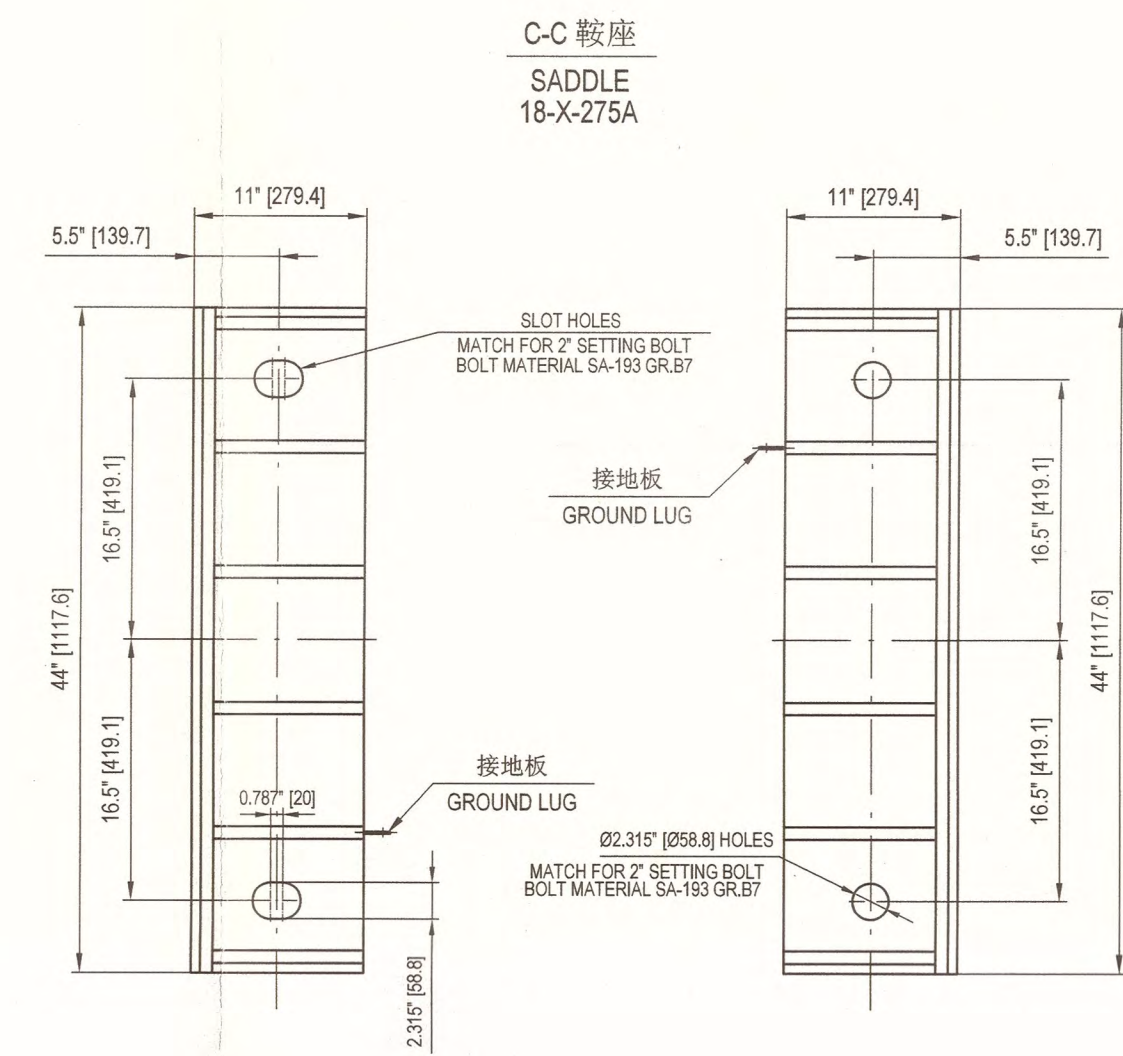
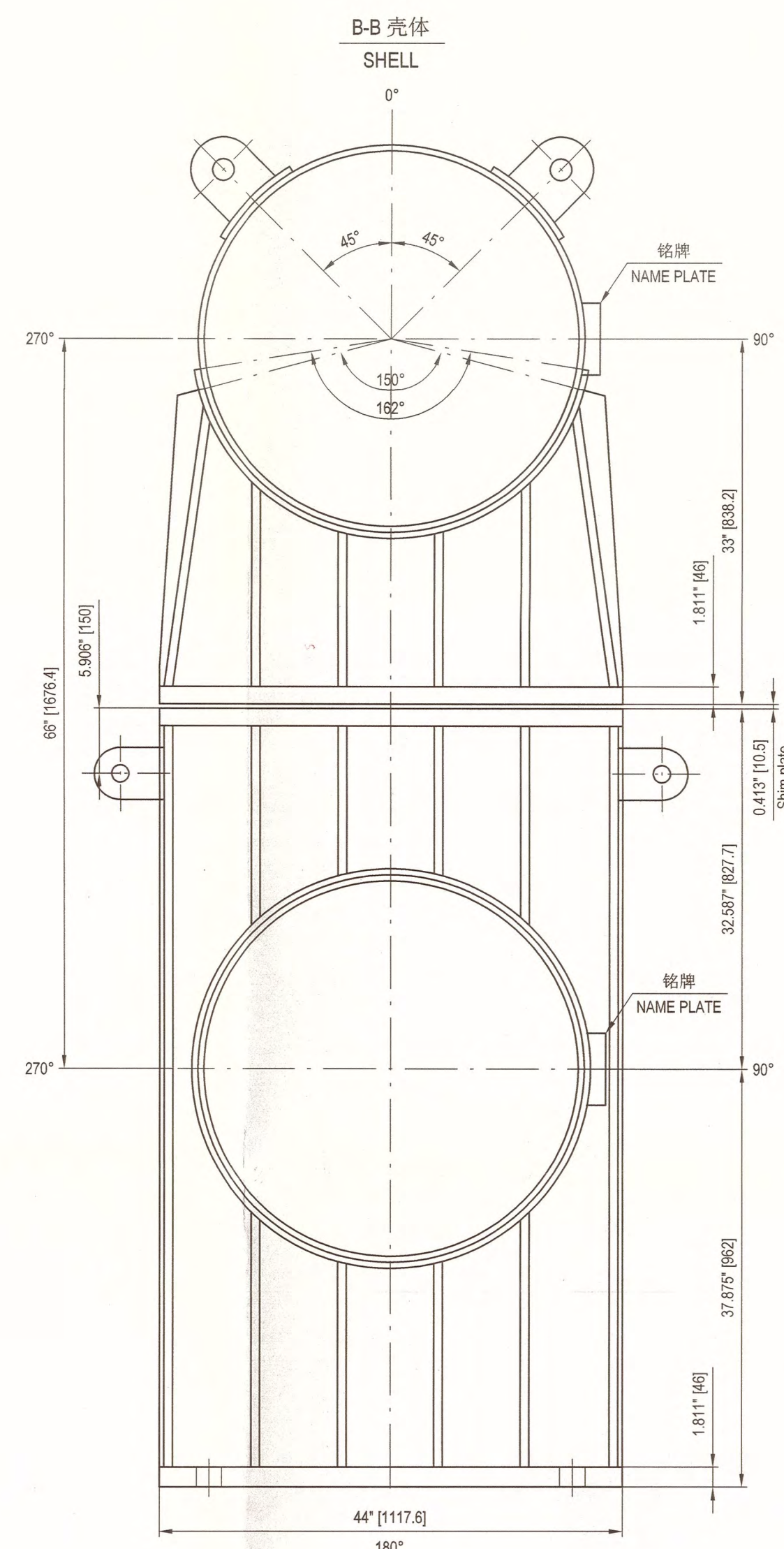
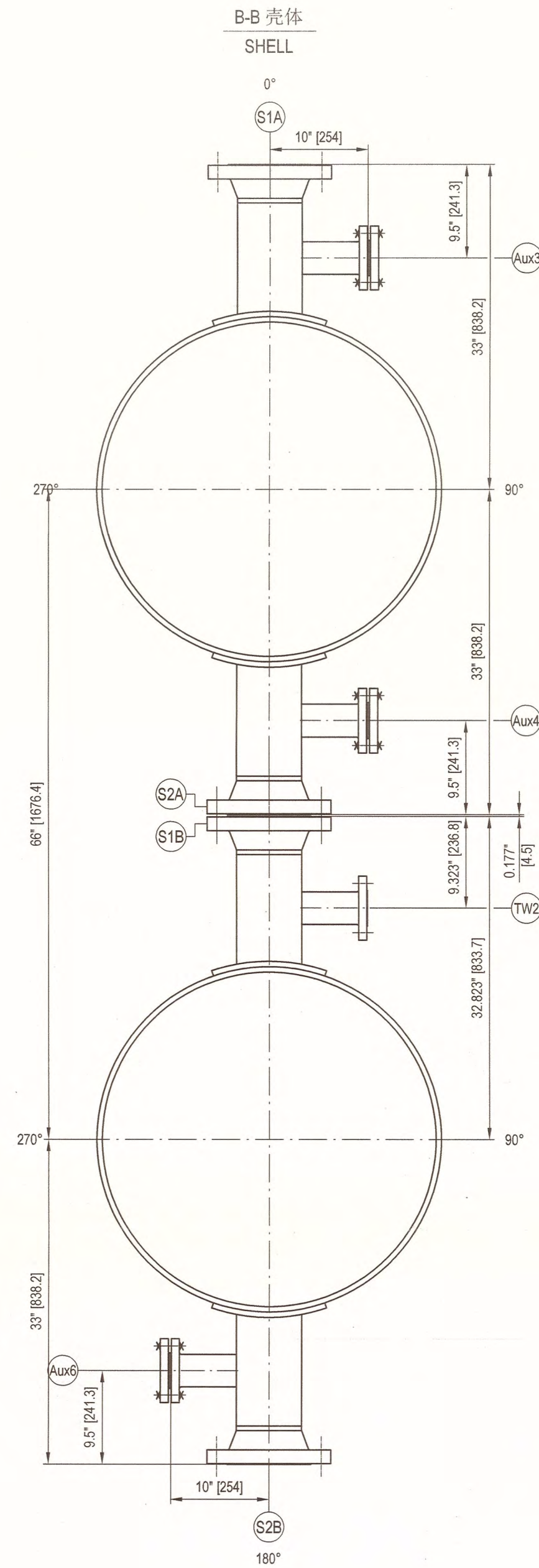
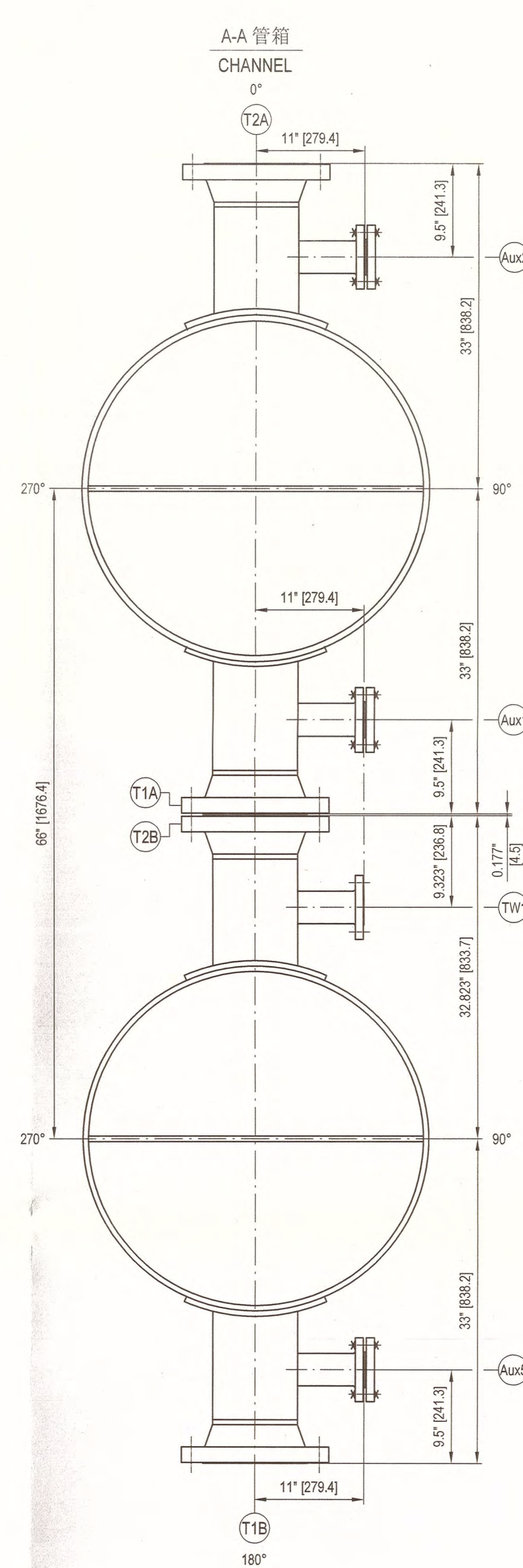
扭矩表 TORQUE TABLE		
部件 PART	螺栓规格 BOLT SIZE	扭矩 (lb-ft) TORQUE
CHANNEL COVER TO CHANNEL FLANGE	1 1/4"	1422
CHANNEL FLANGE AND SHELL FLANGE TO TUBESHEET	1 3/8"	1482
Aux (1-6)	5/8"	90
NOZZLE T1A TO T2B	7/8"	258
NOZZLE S2A TO S1B	3/4"	160

管束详图 BUNDLE DETAIL DRAWING		WXCE6706-02	2/2		
壳体图 SHELL DETAIL DRAWING		WXCE6706-01	2/2	运输及吊装图 SHIPPING AND LIFTING DETAIL DRAWING	WXCE6706-06
装配图 III GENERAL ASSEMBLY DRAWING III		WXCE6706-00	2/3	铭牌图 NAMEPLATE DETAIL DRAWING	WXCE6706-05
装配图 II GENERAL ASSEMBLY DRAWING II		WXCE6706-00	3/3	鞍座及吊耳详图 SADDLE AND LIFTING LUG DETAIL DRAWING	WXCE6706-04
装配图 I GENERAL ASSEMBLY DRAWING I		WXCE6706-00	1/3	管口详图 NOZZLE DETAIL DRAWING	WXCE6706-03
名称 TITLE	图号 DWG. NO.	张数 SHEET NO.	名称 TITLE	图号 DWG. NO.	张数 SHEET NO.
图纸汇总表 DRAWING SUMMARY					

MAXIMUM FOUNDATION LOADING DATA (AS PER ASD)					
		SLIDING SADDLE		FIXED SADDLE	
		EMPTY	OPERATING	EMPTY	OPERATING
WIND LOAD	TRANSVERSE SHEAR (lb-ft)	569	569	569	569
	TRANSVERSE BENDING (lb-ft)	3361	3361	3361	3361
	LONGITUDINAL SHEAR (lb-ft)	200.5	200.5	200.5	200.5
	LONGITUDINAL BENDING (lb-ft)	1184	1184	1184	1184
	TRANSVERSE SHEAR (lb-ft)	19163	21507	4496	5841
EARTHQUAKE	TRANSVERSE BENDING (lb-ft)	113181	127026	26555	33317
	LONGITUDINAL SHEAR (lb-ft)	23659	27148	23659	27148
	LONGITUDINAL BENDING (lb-ft)	139736	160343	139736	160343
Bundle pull out: @150% bundle weight (lb)		12255			

CHANNEL			SKID BARS/RAILS	SA-516 Gr.70N
CHANNEL FLAT COVER	SA-266 Gr.2N		SPACERS	SA-179
CHANNEL FLANGE	SA-266 Gr.2N		EXTERNAL ATTACHMENTS	SA-516 Gr.70N
CHANNEL SHELL	SA-516 Gr.70N		EXTERNAL BOLTING/ NUT (SHELL)	SA-193 Gr.B7M / SA-194 Gr.2HM
NOZZLE NECK	SA-106 Gr.B		EXTERNAL BOLTING/ NUT (CHANNEL)	SA-193 Gr.B7 / SA-194 Gr.2H
NOZZLE FLANGE	SA-105N		INTERMEDIATE SETTING BOLT & NUTS	SA-193 Gr.B7 / SA-194 Gr.2H
PASS PARTITION	SA-516 Gr.70N		INTERNAL BOLTING/ NUT	SA-193 Gr.B7M / SA-194 Gr.2HM
SHELL			SUPPORT SADDLES	SA-516 Gr.70N
SHELL AND SHELL HEAD	SA-516 Gr.70N		SLIDING PLATE	NA
SHELL FLANGE	SA-266 Gr.2N		ANCHOR BOLTS	ASTM F1554 GRADE.55 (by others)
NOZZLE NECK	SA-106 Gr.B		SHELLSIDE GASKET	Kammprofile, SS316L with graphite soft facing
NOZZLE FLANGE	SA-105N		TUBESIDE GASKET	Kammprofile, SS316L with graphite soft facing
TUBE BUNDLE			GROUND LUG	SS304
TUBES	SA-179 (SEAMLESS)		NAMEPLATE	SS304
TUBESHEETS	SA-266 Gr.2N		COMPLAR BRACKET	SA-516 Gr.70N
BAFFLES	SA-516 Gr.70N		COLLAR BOLTS (INTEGRAL);	NA
TIE / SEAL RODS:	SA-36		JACK SCREW / DOWEL PIN	SS304
NOZZLE FLANGE GASKET	SS316L spiral wound with graphite filler, and inner and outer rings			

管口表 NOZZLE SCHEDULE									
符号 MARK	数量 QTY.	公称口径 NPS	壁厚等级 SCH / THK	补强圈外径/厚度 REIN. PAD O.D. X THK	公称压力 RATING	连接标准, 法兰型式 CONNECTING STD / TYPE	法兰密封面到 设备中心线长度 CL TO FLANGE FACE	用途或名称 SERVICE	备注 REMARKS
S1A	1	6"	0.432" [10.97]	Ø11.81X0.551" [Ø300X14]	CL300	ASME B16.5-2017 WNR/F	33" [838.2]	SHELL SIDE INLET	
S2A	1	6"	0.432" [10.97]	Ø11.81X0.551" [Ø300X14]	CL150	ASME B16.5-2017 WNR/F	33" [838.2]	SHELL SIDE OUTLET	
T1A	1	8"	0.594" [15.09]	Ø14.96X0.63" [Ø380X16]	CL150	ASME B16.5-2017 WNR/F	33" [838.2]	TUBE SIDE INLET	
T2A	1	8"	0.594" [15.09]	Ø14.96X0.63" [Ø380X16]	CL300	ASME B16.5-2017 WNR/F	33" [838.2]	TUBE SIDE OUTLET	
S1B	1	6"	0.432" [10.97]	Ø11.81X0.551" [Ø300X14]	CL150	ASME B16.5-2017 WNR/F	32.823" [733.7]	SHELL SIDE INLET	
S2B	1	6"	0.432" [10.97]	Ø11.81X0.551" [Ø300X14]	CL300	ASME B16.5-2017 WNR/F	33" [838.2]	SHELL SIDE OUTLET	
T1B	1	8"	0.594" [15.09]	Ø14.96X0.63" [Ø380X16]	CL300	ASME B16.5-2017 WNR/F	33" [838.2]	TUBE SIDE INLET	
T2B	1	8"	0.594" [15.09]	Ø14.96X0.63" [Ø380X16]	CL150	ASME B16.5-2017 WNR/F	32.823" [733.7]	TUBE SIDE OUTLET	
TW1-2	2	2"	0.684" [16.6]	—	CL300	ASME B16.5-2017 LWNRF	见图/SEE DWG	THERMOWELL	
Aux(1-6)	6	2"	0.684" [16.6]	—	CL300	ASME B16.5-2017 LWNRF	见图/SEE DWG	AUXILIARY	With BF & Gasket & Bolt & Nut
无 损 检 验 NONDESTRUCTIVE EXAMINATION									
焊接接头型式或焊缝编号 JOINT TYPE OR WELD SEAM NO					射线探伤 R.T	超声探伤 U.T	磁粉探伤 M.T	着色探伤 P.T	备 注 REMARKS
JOINT EFFICIENCY					检测比例 EXAM. RATE	合格级别 CLASS OF ACC	Appendix 12	Appendix 6	Appendix 8
A/B类		壳程 SHELL SIDE	1.0	FULL	UW-51	/	100%	/	
CATEGORY A/B		管程 TUBE SIDE	1.0	FULL	UW-51	/	100%	/	
C类	壳程 SHELL SIDE	设备法兰与壳体 BIRTH FLANGE TO SHELL 接管与法兰 NOZZLE TO FLANGE	/	/	/	/	100%	/	
	管程 TUBE SIDE	设备法兰与壳体 BIRTH FLANGE TO SHELL 接管与法兰 NOZZLE TO FLANGE	1.0	FULL	UW-51	/	100%	/	
D类 TYPE D									
吊耳焊缝 LIFTING LUG WELDS									
鞍座焊缝 SADDLES WELDS									
换热管与管板的连接接头 TUBE TO TUBESHEET JOINT									
注: /NOTE:									
1. 应在焊后热处理前对吊耳进行超声波检查, 焊后热处理后应进行磁粉检测。 Lifting lugs shall be ultrasonically checked before post-weld heat treatment and magnetic particle inspection after post-weld heat treatment.									
2. 无损检测要求见“其他要求和说明第6条” For requirements of NDT, see clause 6 of "Other Requirements and Notes"									



AIR PRODUCTS			FLUOR.			
Air Products Project Number		EN207122	Fluor Project Number		ABKM	
Project Name		World Energy Renewables Project	RFQ No.		ABKM-4-403-RQ	
Purchase Order Number		4505600570	PO/Contract No		ABKM-4-403-PO-4	
Air Products Open Text document number		EN207122-WUXI-SV3-00035	Project Area		SWS/H2S	
Client		WORLD ENERGY PARAMOUNT	Client Doc No:			
05	竣工图/AS-BUILT		Xiaosheng Huang	Shengfang Zhao	Kevin Yang	21-APR-23
04	供批准/ISSUED FOR APPROVAL		Xiaosheng Huang	Shengfang Zhao	Kevin Yang	10-JAN-23
03	供批准/ISSUED FOR APPROVAL		Xiaosheng Huang	Shengfang Zhao	Kevin Yang	27-OCT-22
02	供批准/ISSUED FOR APPROVAL		Xiaosheng Huang	Shengfang Zhao	Kevin Yang	15-AUG-22
01	供批准/ISSUED FOR APPROVAL		Xiaosheng Huang	Shengfang Zhao	Kevin Yang	11-JUN-22
00	供批准/ISSUED FOR APPROVAL		Xiaosheng Huang	Shengfang Zhao	Kevin Yang	11-Mar-22
版次 REV.		版次说明/DESCRIPTION	设计/PREPARED	审核/REVIEWED	批准/APPROVED	日期/DATE
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WCE 无锡化工装备股份有限公司 WUXI CHEMICAL EQUIPMENT CO., LTD.			设计项目 World Energy Renewables Project 设计阶段 竣工图 设计阶段 Detail Design		设备位号 ITEM NO. 图号 DWG. NO.	
设计 PREPARED	曹晓至	2023.4.21	Lean Amine Cooler		18-X-275A/B	
审核 REVIEWED	李红	2023.4.21	GENERAL ASSEMBLY DRAWING II		WXCE8706-00	
批准 APPROVED		2023.4.21	比例 SCALE	1:1	版次 REV.	05
					第 2 页 共 3 页 PAGE 2 OF 3	

其他要求和说明:

Other Requirements and Notes:

1.一般要求(General requirements

1.1 除注明外, 所有尺寸均以英制为准, 括号外为英制尺寸, 括号内为米制尺寸。

All dimensions shall be in US customary unit as primary unit and metric unit shown in bracket, unless otherwise specified.

1.2 法兰的螺栓孔应跨换热器自然中心线。

Flange bolt holes shall straddle the natural centerlines of exchanger.

1.3 公差应符合ASME第八卷第1部分、API-660和TEMA-R的要求, 除非图纸另有规定, 否则应采用最严格的公差。

Tolerance shall be accordance with ASME SECC VIII Div-1, API-660 & TEMA-R and most stringent shall be applied unless otherwise specified on the drawing.

2.材料/Materials

2.1 受压元件和非受压元件材料应符合ASME Section II, Part A 项目文件SPEC-ENG-MQ042 和批准MPS文件, 文件编号: EN207122-MPS。

Material of pressure and non pressure retaining parts shall be in accordance with ASME Section II, Part A and Project specification SPEC-ENG-MQ042, and approved

Material Purchasing Specification, Document No: EN207122-MPS

2.2 所有材料应提供 EN10204中3.1类证书, 且需按照项目规范SPEC-ENG-MQ042的附录A进行复验

All materials shall be delivered with Certificates 3.1 acc. to EN 10204 and it shall be subjected to retesting per Appendix A of SPEC-ENG-MQ042

2.3 材料按照项目文件A8KM-PP-000-500512-A及WCE的程序EN207122-WCE-0010进行PMI。

PMI shall be performed in accordance with specification A8KM-PP-000-500512-A and WCE's PMI PROCEDURE EN207122-WCE-0010.

2.4 所有换热管不得拼接, 所有换热管不得有纵焊缝

All tubes shall be one piece without circumferential weld seams, All tubes shall be also without longitudinal weld seams.

2.5 垫片硬度应低于法兰接触面硬度

HARDNESS OF GASKET SHALL BE LOWER THAN THAT OF FLANGE CONTACT SURFACE

2.6 垫片应满足项目规范SPEC - ENG - MQ057的要求

GASKETS SHALL COMPLY WITH THE REQUIREMENTS OF SPEC - ENG - MQ057

2.7 U型管弯制后其弯管部分加150mm长直管段应进行消应力热处理。

Tube u-bends shall receive post bend Stress relief heat treatment.

2.8 所有承压部件的厚度应通过超声波检测进行测量, 并记录在最终档案中并可追溯到部件。包括(但不限于) 所有壳体板材、封头、管件、接管和管件。

(1)相同厚度的板材、管子仅在一个位置进行测量;

(2)对于不同厚度的锻件, 应针对每个直径测量一次(比如自增强式锻管将有两次测量: 一次在锻管大端厚度测量, 一次在颈部测量);

(3)标准管件应在焊接端测厚;

(4)标准法兰应在焊接端口及法兰盘处测厚。

(5)对于换热器管, 制造商应测量每批的5% (每根管一个位置)

Thickness of all pressure-containing components shall be measured by UT and logged in the final dossier and traceable to the component. This includes (but is not limited to) all shell plates, dished ends, forgings, pipes & fittings.

(1)Items of consistent thickness (i.e. plates, pipe) shall be measured in one location only.

(2)Forgings with varying thicknesses shall be measured once for each diameter (i.e. SRN nozzle forging would have two measurements - one at barrel and one at neck).

(3) Standard fittings (e.g. ASME B16.9) shall be checked at the weld prep end.

(4)Standard flanges (e.g. ASME B16.5/47) shall be checked at the weld prep end and flange.

(5) For heat exchanger tubes, 5% of each lot shall be measured by the fabricator (one location per tube).

3.制造与检验/Fabrication and Inspection

3.1 法兰密封面粗糙度 Ra3.2~6.3μm;

The finish of the gasket contact surface of flange facing shall be Ra125~250in;

3.2 除非已表明, 接管应与容器内表面轮廓齐平, 其接管端部应打磨呈最小5mm的圆角。

Unless specified otherwise, nozzles shall finish flush with the internal contour of the vessel. All inside edges of nozzle shall be radiused to 5 mm minimum.

3.3 加工完后的法兰面应有充分的保护防止受损伤和污染,并涂上防锈油,需要热处理时应涂上去易除的涂层保护。

Finished flange facings shall be adequately protected to prevent any deterioration, daub suitable rust inhibitor, for heat treatment conditions, protection shall be achieved by applying easily removable coatings.

3.4 补强圈应至少有一个NPT 1/8英寸的试验孔, 位于距离换热器纵轴至少45度的位置。本要求适用于每个补强圈或补强圈的每一部分。在对换热器进行压力测试之前, 应对每个补强圈或补强圈的每一部分的焊缝应通入15psi的压缩空气进行空气和肥皂泡试验。试验孔应保持打开状态, 以便在压力试验期间用作信号孔。压力试验后和装运前, 应在试验孔中填充润滑脂

Reinforcing pads shall have at least 1 test hole, tapped 1/8 inch minimum pipe thread, located at least 45 degrees off the longitudinal axis of the exchanger. This requirement applies to each pad or segment thereof. The welds of each pad or segment shall be tested pneumaticly to 15psi air-air-soap solution test before pressure testing the exchanger. Test holes shall be left open for use as tell tale holes during the pressure test. Test holes shall be filled with grease after pressure test and prior to shipment.

3.5 椭圆封头应冷成形, 成形后进行消应力处理,并按炉批号准备试板,试板应进行与封头相同的热处理,然后取样进行机械性能试验;椭圆封头形状偏差还应满足UG-81 (b) 的要求; 壳程封头最大的成型偏差e为3.98mm;

The ellip.head shall be of Cold-formed, and to be Stress relief after Cold-forming. Test specimens shall be extracted from the same heat as the head, and subjected to the same heat treatments done on the head, and then a mechanical test shall be carried out on it; The forming shape tolerance of ellipsoidal head shall meet the requirement of UG-81 (b) ; the maximum permissible deviation e of shellside ellip.head is 3.98mm.

3.6 管子与管板的连接应采用全强度胀, 带两个凹槽, 胀接长度按管束图;

Tube-to tube-sheet connection shall be full strength expansion , with two grooves and The expansion length shall be in accordance with the bundle drawing;

3.7 卧式容器的焊缝不得鞍座相碰, 相邻纵焊缝之间的距离应大于钢板厚度的5倍或150 mm (6 in)

Weld joints in horizontal vessels shall not be located coincident with or across saddle supports. Longitudinal seam offset shall be the greater of five times the plate thickness or 150 mm (6 in).

3.8 开孔和附件(包括补强板和垫板)到焊缝的间隙应至少2英寸。经买方批准, 如果无法满足以上要求, 则在将接管或附件焊接至换热器之前, 应将焊缝打磨平整, 并对开孔两侧4英寸的距离或附件覆盖的全长加上两侧4英寸的距离进行RT检测

Openings and attachments (including reinforcing and support pads) shall clear weld seams by at least 2 inches. Subject to approval of the purchaser, if this construction is not possible, the seam weld shall be ground flush and radiographed for a distance of 4 inches on either side of the opening or for the full length covered by an attachment plus 4 inches on both sides prior to welding the nozzle or attachment to the exchanger.

3.9 任何内部临时附件、对线夹、支撑杆或引弧板的剩余部分应磨平, 与母材齐平, 并在准备装运前用WFMT进行检查。应提交记录的试验结果以供审查

The remains of any internal temporary attachments, line-up clamps, backing bars or arc strikes shall be ground flush with the base metal and inspected with WFMT prior to preparation for shipment. Documented test results shall be submitted for review.

3.10 1.5"及以上的螺栓使用液压拉伸器上紧, 螺栓应具有足够的间隙和长度, 以便使用液压螺栓张紧器

At and above 1.5" diameter, bolting shall be suitable for hydraulic tensioning. bolting shall have adequate clearance and length for use of hydraulic bolt tensioner

3.11 所有螺栓或螺母垫圈Molykote D-321 R lubricant润滑剂进行润滑。

All stud bolts and nuts and waster shall be lubricated with Molykote D-321 R lubricant.

3.12 非管法兰的垫片接触面的平面度按照API 660-2020 表5的要求。

The flatness tolerances on peripheral gasket contact surfaces other than nozzle flange facings shall be measured in accordance with table 5 of API 660-2020.

3.13 螺栓每端应提供两(2)个螺母和硬化垫圈(即4个螺母和2个垫圈)

Two (2) nuts and hardened washer shall be provided for each end of the stud (i.e. 4 nuts and 2 washers)

3.14 包括外露部件在内的螺栓螺栓应涂上金属基防水润滑剂, 以防止在试验、运输和储存期间发生水腐蚀

Threads of bolts including exposed parts shall be coated with a metallic base waterproof lubricant to prevent aqueous corrosion during testing, shipping, and storage

3.15 小于等于12"的接管应该是无缝的, 大于12"的接管可以用板卷, 板卷接管焊缝应100% RT检测;

Nozzle necks up to 12 NPS made from pipe material shall be seamless for Nozzle greater than 12 NPS made from plate & Longitudinal weld seams will be full radiographed.

4.焊接/Welding

4.1 承压焊缝及与承压部件直接相焊的附件焊缝应采用项目规范A8KM-PP-000-500532-A Rev.B第6.1条要求的焊接工艺进行。填充金属应符合ASME Section IX, 规定的A-1化学要求。

Pressure-retaining welds and attachments to the pressure boundary components shall be made with the article 6.1 of Project specification A8KM-PP-000-500532-A Rev.B. Filler metals shall meet an A-1 chemistry per ASME Section IX.

4.2 承压对接焊接接头应采用全截面穿透接头形式; 接管连接焊缝、吊耳焊缝应为全熔透焊缝, 非承压件与承压件之间的焊缝将是全熔透 Holding pressure butt welded joints shall be full penetration weld. Nozzle attachment welds, Lifting lug welds shall be full penetration weld. non-pressure-attachment welds to pressure parts shall use full penetration welds;

4.3 对接焊缝应在背面清根, 并对清根区域进行PT检测, 合格证明没有裂纹或其他缺陷后再进行焊接, 不能清根时应采用氩弧焊打底。

All butt welded joints shall be back chipped, and the back-gouged area shall be subject to PT to demonstrate freedom from cracks or other flaws before rewelding on that side. Wherever back chipping is not possible root run shall be welded by GTAW.

4.4 未注角焊缝焊脚高度为较薄板厚度。

The fillet weld height not dimensioned shall be equal to the thickness of thinner plate.

4.5 除特别说明外,所有焊缝均为连续焊。

Unless specified,all welds shall be continuous.

4.6 禁止使用不可拆卸的焊接背部垫板

Non-removable welding backing strips or rings are prohibited.

4.7 换热器上的所有焊接应由合格焊工根据适用的国家和地区规范进行

All welding performed on the exchanger shall be performed by qualified welders in accordance with the applicable national and regional code(s).

4.8 焊接前, 应目视检查接头: 清洁度、正确的坡口配置、对齐和根部间隙状况、定位焊缝(如有)、预热(如有规定)和待使用的填充金属。它们应符合WPS的要求。

Prior to welding, joints shall be visually inspected for: cleanliness, correct groove configuration, alignment and root gap conditions, condition of tack welds if present, preheat if specified, and filler metal to be used. They shall be in accordance with the WPS.

4.9 待焊接表面应在外径和内径的焊缝两侧清洁1 1/2英寸(38 mm)。表面应无油漆、油、污垢、氧化皮、氧化物和其他对焊缝有害的异物。

Surfaces to be welded shall be cleaned 1 1/2 inch (38 mm) on either side of the weld on the OD and ID. Surfaces shall be free from paint, oil, dirt, scale, oxides, and other foreign material detrimental to the weld

4.10 设备的内部焊缝表面应具有尽可能光滑和接近齐平

The inside weld surfaces of pressure equipment shall have the weld reinforcement as smooth

4.11 焊缝不允许有不连续性的外形, 例如用高凸度过加强的焊缝, 或凸起顶部磨平且具有锐边的焊缝, 或具有粗糙焊道外形的焊缝

Discontinuity generating profiles, such as welds overly reinforced with high crowns or with the tops of crowns ground flat and having sharp edges or welds with rough bead profiles, shall be corrected.

4.12 焊缝轮廓的验收标准应在试验开始前与二级无损检测检验员达成一致

Acceptance standards for the weld profile shall be agreed with the Level II NDE Examiner prior to the start of testing.

4.13 所有内部连接焊缝应为至少两道的全熔透对接焊缝。所有未完全焊透的外部连接焊缝应设置排气孔。

All internal attachment welds shall be full penetration butt welds with a minimum of two passes. All external attachment welds that are not full penetration shall be vented.

4.14 焊接工艺评定硬度试验应满足项目规范A8KM-PP-000-500532-A Rev.B第6.3条的要求

Weld procedure qualification hardness tests shall be made with the article 6.3 of Project specification A8KM-PP-000-500532-A Rev.B.

5. 预热及焊后热处理/Preheat and PWHT

5.1 预热要求应满足项目文件A8KM-PP-000-500550-A的要求第9条及4WEQ-1051及WCE的热处理程序EN207122-WCE-0002

的要求

Preheating and heat treatment requirements shall meet the article 9 of Project specification A8KM-PP-000-500550-A and 4WEQ-1051 and WCE's Heat Treatment Procedure EN207122-WCE-0002.

5.2 进行临时或永久性内部连接焊缝时, 应将母材预热至适用WPS中规定的温度。此外, 母材应充分预热, 以确保在整个材料厚度内达到所需的预热温度。预热温度应在进行连接焊接的构件一侧进行测量。

When making temporary or permanent internal attachment welds, the base metal shall be preheated to a temperature specified in the applicable WPS. In addition, the base metal shall be preheated sufficiently to ensure that the required preheat temperature has been achieved through the full material thickness. The preheat temperature shall be measured on the side of the member to which the attachment weld is to be made.

5.3 所有焊缝的母材和层间温度应保持在不低于规定的最低预热温度, 直到焊接完成。如果焊接过程在焊接完成之前终止, 则应将部分完成的焊缝缓慢冷却至环境温度, 然后用WFMT进行检查。应在恢复焊接前重新进行预热。

The base metal and interpass temperature of all welds shall be maintained at not less than the minimum specified preheat temperature until the weld is completed. If the welding process is terminated prior to completion of the weld, partially completed welds shall be slowly cooled to ambient and subsequently examined with WFMT. The preheat shall be re-established prior to the resumption of welding.

5.4 热处理期间, 应适当保护螺栓和垫圈表面, 防止过度氧化

Threads and gasket surfaces shall be suitably protected from excessive oxidation during heat treatment

5.5 每个焊缝最多允许进行两次完整的焊后热处理循环。未经买方批准, 不得进行进一步的焊后热处理循环

A maximum of two complete PWHT cycles is permitted for each weld. Further PWHT cycles shall not be carried out without Buyer's approval.

5.6 焊后热处理温度和时间应为1150-1200°F, 每英寸厚度至少一小时, 且不小于一小时。不允许在较低温度下使用较长时间。

The PWHT temperature and time shall be 1150-1200°F, one hour per one inch of thickness, one hour minimum. The use of a lower temperature for a longer time is not permitted.

5.7 加热和冷却速率应符合ASME VIII-1 UCS-56的要求。在加热和冷却过程中, 焊缝处测得的承压部件的最厚和最薄之间的最大温差不应超过250 ° F。

the heat-up and cool-down rates shall be in accordance with ASME Section VIII, Division 1, UCS-56. During heat-up and cool-down, the maximum temperature differential between the thickest and thinnest pressure boundary components, as measured at the weld, should not exceed 250°F.

5.8 焊后热处理应在熔炉中进行, 局部焊后热处理可用于最终封闭焊缝。如果使用局部焊带, 则其应满足WRC 452的要求, 包括焊带宽度和热输入要求。

PWHT shall be performed in a furnace or local PWHT may be used for final closure welds. If a local band is used, it shall meet the requirements of WRC 452, including the band widths and thermocouple requirements.

5.9 应连续记录焊后热处理温度。需要一份温度高于500华氏度(260摄氏度)时的加热、浸泡和冷却图表。应记录时间间隔, 并清楚标明温度和时间间隔。该图表应由炉子操作员签字, 并由买方审查

PWHT Temperature shall be continuously recorded. A chart of the heatup, soak and cooldown while at temperature above 500°F (260°C) is required. Time intervals shall be recorded with temperature and time intervals clearly indicated. The chart shall be signed by the operator of the furnace and shall be reviewed by Buyer.

5.10 所有壳程承压焊缝应在焊后热处理后对焊缝金属及热影响区进行硬度测试。硬度不得超过200 HBW

All shell side pressure-retaining welds shall be hardness tested after PWHT. Testing is required on weld metal and heat-affected zones. hardness shall not exceed 200 HBW

5.11 应在每10英尺主焊缝上进行布氏硬度试验, 但每个主焊缝的读数不得少于一组。应在每个接管或人孔焊缝上读取一个布氏硬度读数

The Fabricator shall perform Brinell hardness tests on every 10 feet of main seam weld, but not less than one set of readings for each main seam. One Brinell hardness reading shall be taken on each nozzle or manway weld

5.12 当可进入时, 应在焊缝的工艺接触侧、焊缝熔敷层上进行试验。

When access is available, tests shall be performed on the process-contacted side of the weld, on the weld deposit.

5.13 应记录硬度试验结果和位置, 以供审查。买方代表应被允许见证硬度测试, 并有权获得测试结果

Hardness test results and locations shall be recorded for review. Buyer's representative shall be permitted to witness hardness testing and shall have access to test results.

6.无损检测/Nondestructive examination

6.1 见无损检测表/See Nondestructive examination table

6.1 见无损检测表/See Nondestructive examination table

6.2 所有NDE应满足项目文件A8KM-PP-000-500550-A第10条的要求及WCE的NDE程序EN207122-WCE-0004的要求

NDE requirements shall meet the article 10 of Project specification A8KM-PP-000-500550-A and WCE's NDE Procedures EN207122-WCE-0004

6.3 所有NDE应由按照ASNT推荐规程SNT-TC-1A或经买方批准的卖方自己的认证计划认证的人员进行

All NDE shall be performed by personnel certified in accordance with ASNT Recommended Practice SNT-TC-1A or Seller's own certification program that has been approved by Buyer.

6.4 无损检测结果的解释应由获得二级或三级认证的人员执行

Interpretation of NDE results shall be performed by personnel certified Level II or III

6.5 所有无损检测(NDE)应满足以下要求: a) 焊接后至至少48小时内不得进行;且: b) 焊后热处理(PWHT)后进行。

All nondestructive examination (NDE) shall: a) Not be performed until at least 48 hours after welding and b) Be performed after postweld heat treatment (PWHT).

6.6 所有内部和外部附件上的焊缝应圈焊。应采用液体渗透法或磁粉探伤法检查焊缝。

The welds on all internal and external attachments shall be welded all around. The welds shall be checked by means of liquid-penetrant or magnetic particle methods.

6.7 应在焊后热处理前对高应力附件(如吊耳)进行射线照相或超声波检查, 焊后热处理后应进行磁粉检测。不允许有裂纹, 吊耳或耳轴附件焊缝的单独试验证书应随船装运

Highly-stressed attachments, such as lifting lugs, shall be radiographed or ultrasonically checked before post-weld heat treatment and magnetic particle inspection after post-weld heat treatment. No crack indication is allowed. A separate test certificate for the lifting lug or trunnion attachments welds shall be shipped with the vessel.

6.8 焊缝的磁粉检测应包括焊缝两侧至少一(1)英寸(25 mm)宽的母材带

MT examination of welds shall include a band of base metal at least one (1) inch (25 mm) wide on each side of the weld.

6.9 焊接坡口边缘超过2英寸范围将执行100% MT检测

Weld bevel edges over 2 inch (50 mm) shall be examined by MT (or PT for austenitic SS materials).

6.10 如果在磁粉探伤过程中发生电弧烧伤, 应清除电弧烧伤, 并用磁轭法重新检查该区域。

If arc burns occur during magnetic particle examination, the arc burns shall be removed and the area reexamined by the magnetic yoke method

6.10 对于焊后热处理设备, MT应使用磁轭法

For PWHT'd equipment, the magnetic yoke method shall be used

6.11 热处理后, 壳程承压部件的所有内部(工艺接触)焊缝表面, 包括对接焊缝、接管焊缝和附件焊缝, 包括内部焊缝的附件两侧应按照项目规范A8KM-PP-000-500532-A Rev.B第7.1条进行100% WFMT, WFMT将使用交流磁轭法;

After PWHT, All internal (process-contacted) weld surfaces on the pressure boundary for shell side. This includes butt, nozzle and attachment welds, including both sides of the attachment for internal welds shall be 100% WFMT examined according to the article 7.1 of Project specification A8KM-PP-000-500532-A Rev.B. The AC magnetic yoke method shall be used for WFMT.

6.12 如果无法进入内部焊接表面, 则应使用横波超声波检测(UT)代替WFMT。使用更先进的UT技术也可能是可以接受的, 但应得到买方的批准

Shear Wave Ultrasonic Testing (UT) shall be used in lieu of WFMT if there is no access to the internal weld surfaces. Use of more advanced UT techniques will probably also be acceptable, but shall be approved by Buyer.

6.13 所有对接焊缝应在任何要求的焊后热处理后进行100%体积检验。

All butt welds shall be 100 % volumetrically examined after any required post-weld heat treatment.

7.试验/Testing

7.1 水压试验期间的金属温度应为保持至少高于最低设计金属温度30° F (17° C), 但不需要超过120° F (48° C), 以将脆性断裂风险降至最低。。

The metal temperature during hydrostatic test be maintained at least 30°F (17°C) above the minimum design metal temperature, but need not exceed 120°F(48°C), to minimize the risk of brittle fracture.

7.2 在压力试验期间, 垫片应该与正式垫片的类型及材料相同。当设备因任何原因拆卸时, 应使用相同类型和材料的新垫圈重新组装, 并重新进行水压试验。

The gaskets used during pressure testing shall be the same type and material as the service gaskets. When equipment is dismantled for any cause, it shall be reassembled with the new gaskets of the same type & material and re-hydrotested..

7.3 水压试验时间应保持至少一小时。

Hydraulic test shall be maintained at least 1 hour.

7.4 用于水压试验的水应为冷凝水、软化水或可溶氯化物含量小于50ppm(按体积计)的饮用水。

Water used for hydrostatically testing shall be condensate, demineralized, or potable with a soluble chloride content of less than 50ppm by volume.

7.5 当且仅当水压试验水的氯化物含量小于1ppm时, 可使用热空气进行干燥。

Hot air may be used for drying if and only if the hydrostatic test water has chloride content of less than 1ppm.

7.6 如果压力试验期间使用的螺栓超过设计屈服应力或螺栓1%的验证应力, 则应更换螺栓, 并随成品容器交付新螺栓

If the bolts used during the pressure test exceed the design yield stress or 1% proof stress of the bolts, the bolts shall be replaced and new bolts shall be delivered with the finished vessel.

8.表面处理/Surface treatment

8.1 设备的油漆按照项目文件A8KM-PP-000-50520-A 及WCE的油漆工艺EN207122-WCE-0017。

Surface preparation and painting shall be carried out per Air Products specification A8KM-PP-000-50520-A and WCE's Surface Preparation and Painting Procedure

EN207122-WCE-0017.

8.2 装运前, 热交换器应无异物。每个换热器的内部和外部均应彻底清洁, 且应无油脂、焊接飞溅物、氧化皮、渣渣、铁锈和其他异物。试验后, 应彻底干燥换热器。不允许通过蒸发进行热空气烘干; 压力测试后, 不得出现任何水迹。

Heat exchangers shall be free of foreign matter prior to shipment. Each exchanger shall be thoroughly cleaned inside and outside, and shall be free of grease, weld spatter, scale, slag, rust, and other foreign matter. Exchangers shall be thoroughly dried after testing. Hot air drying by evaporation is not permitted. no trace of water shall be present after pressure testing

9.包装、标记和运输/Packing, Marking & Shipping

9.1 设备、备件和松散件的运输准备应符合项目文件4WGN-10001 的相关要求及WCE的包装运输程序EN207122-WCE-0008。

Preparation for shipping of equipment, spares, and any loose items shall be in accordance with Air Products specifications 4WGN-10001 WCE's Packing/shipping

preservation procedure EN207122-WCE-0008

9.2 已进行焊后热处理的压力容器应在壳体两侧用黑色油漆标记, 字母高度至少为100 mm (4 in.) "HEAT TREATED VESSEL NO WELDING

PERMITTED"

Pressure vessels that have received post-weld heat treatment shall be marked in black paint on both sides of the shell using a minimum letter height of 100 mm (4 in); HEAT TREATED VESSEL NO WELDING PERMITTED

9.3 每个容器应用100 mm (4 in) 高的字母喷涂 Air Products project及位号, 对于卧式容器, 该识别标志应位于90和270角位置, 并位于切线之间的大约中间位置(位于任何重心标记的右侧)

Each vessel shall be identified with the Air Products project and vessel tag numbers painted on using 100 mm (4 in) high letters. For horizontal vessels this identification marking shall be at the 90 and the 270 angle positions and located approximately midway between tangent lines (to the right of any centre of gravity marks).

9.4 换热器应使用0.34 bar g (5 psig) 干燥无油空气或氮气, 露点为-10C或更低, 总油含量(气溶胶、液体、蒸汽)<5mg/m3。