Laurence and Associates, LLC
918 Government Street
Mobile, AL 36604

February 7th, 2024

SOUTH CAROLINA PORTS AUTHORITY
200 Ports Authority Dr
Mt Pleasant, SC 29464

Attention: Eric J. Scanlon
Mechanical Technical Specialist, Crane and Equipment Maintenance

Subject: SCPA ZPMC Crane H-39-037 (#37) Vessel Impact Damage Assessment
LA, LLC Project Number 2405

Mr. Scanlon,
We have inspected the damage due to vessel impact with the boom of ZPMC Crane #37 at the North Charleston Terminal (NCT) in North Charleston, SC. The initial inspection was carried out between January 5th and January 8th, 2024 immediately after the vessel impact event. Additional inspection work was carried out on January 11th, 2024 and on February 5th, 2024. The inspection included a visual inspection of the point of impact, some of the critical structural joints, obvious points of distress, and key components where alignment is critical (boom hinge, boom-girder trolley rail, and main equalizer beams). The inspection work was completed around activities to stabilize the crane.

The visible damage noted included a nearly complete wrecking of the gantry assemblies at each corner (compromising the cranes stability), minor damage to the checkers cabin, damage to the platforms and appurtenances at the boom tip (point of impact), dislodging of the crane from the pier's gantry rail system, and surface damage to the pier structure.

A visual survey of the boom hinge areas and the trolley rail along the length of the boom and girder indicates that the boom alignment is acceptable. Additionally, the boom has been raised and the trolley driven from about the middle of the boom to the extreme backreach position without issue, both providing further evidence that the boom alignment is acceptable.

The following reports on the emergency stabilization steps taken, recommendations for permanent stabilization and storage efforts, the recommendations for repair, and other work to be considered.

Emergency Stabilization:
The gantry assemblies provide the vertical and lateral support for the crane structure. The event caused significant damage to the gantry assembly such that their ability to support the crane dead weight or the lateral forces (from wind and operating inertia forces) has been compromised.

The pier structure is composed of pile supported reinforced concrete crane rail beams and interior reinforced concrete deck slabs. The crane rail beams are designed to support the operating load cases (wheel loads) of the crane (such as dead loads, lifted loads, wind loads, inertia loads, etc). The deck slabs are designed to carry the lighter loads imposed by terminal traffic (such as cargo laden trucks). During the event the crane was dislodged off of the crane rail beams and onto the deck slabs in several locations. Therefore, immediately after the event certain

Telephone: [redacted]* **Email:** [redacted]

components of the pier structure were loaded in a manner that would not have been considered in their design.

The weather forecast immediately after the event called for poor conditions including rain and high wind. There was no confidence that the wrecked state of the gantry system would be adequate to support the dead load of the crane with additional lateral loads due to wind. The crane was in danger of collapse and that emergency stabilization efforts were required to eliminate the potential for additional damage to the crane, loss of the crane entirely, or additional damage to the pier structure.

Immediate steps were taken to enhance the stability of the crane structure as follows:

1. Wide flange columns/braces were welded to the sill beam at all four corners of the crane. The columns/braces were angled down from the sill beam to the top of the pier's concrete deck. In some cases, the bottom of the columns/braces were secured with water laden containers.
2. At least four of the eight main equalizer beam connections to the intermediate beams were in a visible state of failure. At these locations, the bolts securing the connections failed allowing the components to separate. Plate materials were field cut and welded between the separated components in an effort to preserve the post event condition of the connection.
3. In a clear weather window, the crane was further stabilized by removal of the compromised gantry assembly components below the main equalizer beam and placing the remaining crane structure on cribbing as follows:
    a. Utilizing ZPMC NA's crane transporter beam (Big Bird) and Berard's Self Propelled Modular Transporters (SPMT's), the crane structure was lifted and relocated to the north end of the pier. During the relocation work the damaged 8x intermediate gantry assemblies (below the main equalizer), the 2x stowage pin brackets, the 4x tie down devices, portions of 2x landside stairways, and the checkers cabin were removed and placed in the yard.
    b. The crane was placed on crib stacks of various materials provided by ZPMC NA and Berard in a strategic location of the pier which was suitable to support the crane dead weight with limited points of support.
    c. Utilizing ZPMC NA's cribbing materials and their climbing jacks the crane was further and systematically lowered in elevation by about 4.5 ft until it rested firmly on 8x high capacity stands provided by ZPMC NA and Berard.

<u>Recommendations for Permanent Stabilization and Storage:</u>
Although the emergency stabilization effort was completed, we are recommending additional stabilization efforts to secure and store the crane for a period of 6 months or more while replacement parts are procured and final repairs can be implemented.

1. As we expect that the procurement and installation of the needed replacement parts will take over 180 days, the current and governing building code stipulates that the means to secure the crane must be suitable for full hurricane winds. Therefore, we recommend that the crane, pier and support stands are analyzed for stowed load combinations including hurricane winds. If required by analysis, additional stands and tie down devices should be

added. This analysis is currently in the works and we have confirmed that at a minimum tie downs must be installed between the crane structure and the pier to prevent toppling in hurricane winds. We are still working toward verification of the pier and stands.

2. The gantry level crane-to-crane collision absorption system (bumpers) were removed with the damaged gantry assemblies leaving the crane vulnerable to gantry collisions. We recommend that temporary gantry end stops be fabricated and secured to the concrete gantry rail beams between Crane #37 and the adjacent operating crane. The intent of these end stops would be to prevent the adjacent ship to shore crane from inadvertently colliding with the subject crane.

Recommendations for Repair:

The following outlines our recommendations for repair and returning the crane to service.

1. In order to eliminate doubt, replace all main equalizer beam to sill beam connection bolts. All of the collision forces flowed through these connections/bolts. The connection/bolts in question are not designed for such a load case.
2. During our inspection work on February 5th, we noted that although the distance between the main equalizer pins at corners 1/4 and corners 2/3 measured within ¼" of each other, the straight-line measurements between the ends of the main equalizer beams at corners 1/4 and corners 2/3 varied by as much as 2 11/16" from the least to the greatest. This is an indication that some or all of the main equalizer beams may have rotated at their connection to the sill beam and/or that there could be damage to the main equalizer beam that has permanently changed their shape. We recommend that a licensed land surveyor be engaged to complete a thorough survey of the main equalizer beams relative to the sill beams. The survey information should then be evaluated to see if additional repairs are required at the main equalizer beams. While the surveyor is on site, it might be convenient to complete a survey of points of the boom relative to the sill beams for final verification that the boom-girder are correctly aligned.
3. Although a brief visual inspection of the crane has been completed, it focused on the point of impact, alignment of the boom-girder, and the gantry assemblies. We recommend that a more thorough point to point visual structural inspection is completed on the remaining crane structure.
4. All damaged platforms at the boom tip should be repaired. In addition to the platforms the walkway lighting system and lighting grounding system will need to be repaired. In order to complete this work, the crane will need to be boomed down and the trolley used to transmit materials to the boom tip. The current support system for the crane as well as the pier structure will need to be checked for this load combination. Booming down and moving the trolley toward the water will result in increased loads on the waterside supports (stands) and the pier.
5. We recommend that all of the components below the main equalizer beam be replaced with the exception of a few items which can easily be relocated. We make this recommendation for the following reasons:
    a. The loads imposed during the event are not considered in the international design codes that would have been followed in the design of the crane. Therefore, we believe that through an analysis of the gantry componentry it would be determined that some to many of the components have been overloaded. Although

the components are robust, overload conditions may result in a reduced expected useful life.

b. The gantry assemblies are manufactured using designs, tolerances, and processes suitable for high grade machinery. This is required for the long term performance of the crane. The precession that was involved in the manufacture of the crane may have been offset by the slightest damage to an individual part.
    i. It is possible that this damage would become evident through testing, but it may not become evident for years resulting in deteriorated crane performance and additional repair cost to SCPA at a later date.
    ii. In the case that the damage becomes evident in testing, the process of repairing and returning the crane to service will be further delayed to the burden of SCPA.
c. There is obvious physical damage to many components of the assemblies. However, most of the componentry is not visible and must be disassembled entirely to physically inspect and test in order to rule out any damage.
    i. This work would need to be completed by personnel skilled in the manufacture, maintenance and repair of high grade machinery. It would be time consuming and expensive.
    ii. We would expect that some or many of the components that did survive the event and might be reuseable in the future may be damaged in the work of salvaging from the other wrecked components.
d. We understand that the original crane manufacture (ZPMC) has been engaged to provide the replacement components. They have the expertise to manufacture, assemble, outfit, and ship in significant sub-assemblies at very reasonable cost compared to what could be obtained in the US. Although we have not analyzed the potential cost differences, we would expect that receiving the sub-assemblies from ZPMC for installation by a US contractor would be more cost-effective than salvaging undamaged parts from the damaged assemblies, integrating them with the new components supplied by ZPMC and then installing them on the crane.
e. The method of jacking the crane for the installation of the new components may be different than that used for removal. The method for jacking and installation should be planned/engineered prior to arrival of the new components in case additional jacking equipment is required to complete the work.
f. After all repairs are completed above, the crane should be re-commissioned, tested (including overload testing), and recertified by OSHA.
g. After the testing, the crane will need to be relocated to its proper position on the pier with the ZPMC NA crane transport system (Big Bird) and SPMT's.
h. The temporary crane rail beam end stops will need to be removed.
i. Once all of the above are completed the crane can be returned to service.

Other Work to Consider:

1. We recommend that the underside of the pier in the area of the event is inspected.

If you have any questions concerning this letter, please feel free to call or email.

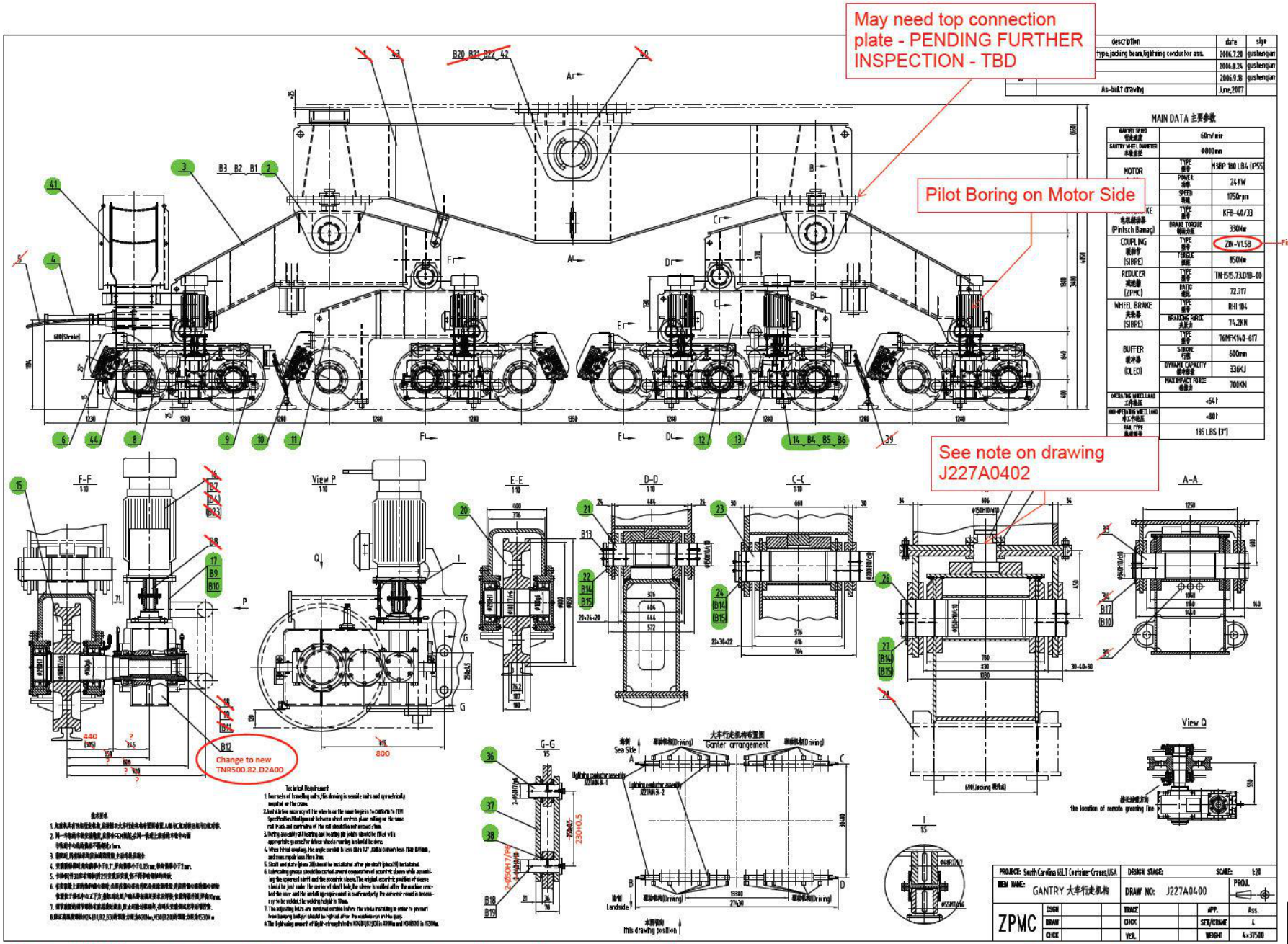
Sincerely,

[redacted]

William H. Laurence, PE

Mobile: [redacted]
E-Mail: [redacted]

Attachments:
ZPMC gantry drawings with requested new parts indicated.
ZPMC crane general arrangement drawing.



*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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SUBSIDIARY LIST

* The quantity and weight of this list is to one set

4 set/crane, 37500 kg/set, 150000 kg/crane

PAGE: 1/4

PROJECT NAME or CODE: South Carolina 65LT Container Cranes,USA	SUB-PART NAME: Gantry 大车行走机构	SUB DRAW NO: J227A0400

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	PIECE WGHT	TOTAL WGHT
~~1~~	~~J227A0401~~	Upper beam 大平衡梁	Welded 焊接件	1		8850
2	J227A0402 ✓	Support 连接支架	Welded 焊接件	2	690	1380
3	J227A0403 ✓	Middle beam 中平衡梁	Welded 焊接件	2	2500	5000
4	J227A0404 ✓	Buffer device 缓冲器装配	Assembly 组件	1		237
~~5~~	~~J227A0405~~	Buffer safety device 缓冲器安全装置	Assembly 组件	1		20
6	J227A0406b ✓	Wheel brake Ass.1 轨道制动器装配1	Assembly 组件	4	275	1100
~~7~~						
8	J227A0407 ✓	Bogie 台车	Welded 焊接件	4	670	2680
9	~~J227A0408-1~~ ✓ J227A0408-2 ✓	Enclosure 1 护栏1	Assembly 组件	4	85	340
10	J227A0409b ✓	Wheel brake Ass.2 轨道制动器装配2	Assembly 组件	1		275
11	J227A0410 ✓	Lower beam 1 小平衡梁1	Welded 焊接件	1		1210
12	J227A0411 ✓	Lower beam 2 小平衡梁2	Welded 焊接件	1		1280
13	J227A0412 ✓	Enclosure 2 护栏2	Assembly 组件	1		91
14	GTC01 ✓	Anti-break block 断轴保护块	Welded 焊接件	6	22.2	133.2
15	J227A0413 ✓	Driving shaft assembly 主动车轮轴装配	Assembly 组件	5	735	3675
~~16~~	~~J227A0414~~	cover 电动机罩壳	Assembly 组件	5	5	25
17	J227A0415 ✓	Flange 联接法兰	Welded 焊接件	5	35	175
~~18~~	~~J227A0416~~	plate 压板	Q235	5	1	5
~~19~~	~~J227A0417~~	Washer 垫片	Q235	5	0.03	0.15
20	J227A0418 ✓	Driven shaft assembly 从动车轮轴装配	Assembly 组件	5	700	3500
21	J227A0419 ✓	Shaft 轴φ150	35CrMo	4	85	340
22	J227A0420 ✓	Shaft end plate 卡轴板	Q235	4	1.1	2.2

ZPMC	DSGN		TECH		MTRL	
	CHCK		STDD		CHCK	

*Note - ZPMC Engineering to verify for accuracy

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PAGE: 2/4

PROJECT NAME or CODE: South Carolina 65LT Container Cranes,USA	SUB-PART NAME: Gantry 大车行走机构	SUB DRAW NO: J227A0400

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	PIECE WGHT	TOTAL WGHT
23	J227A0421 ✓	Shaft 轴φ200	35CrMo	2	200	400
24	J227A0422 ✓	Shaft end plate 卡轴板	Q235	2	1.6	3.2
~~25~~						
26	J227A0424 ✓	Shaft 轴φ250	35CrMo	2	415	830
27	J227A0425 ✓	Shaft end plate 卡轴板	Q235	2	2.3	4.6
~~28~~	~~J227A0426~~	Jacking pedestal 顶升梁	Welded 焊接件	1/2 台 1/2 cranes	280	
~~29~~	~~GTA01a(36)~~	Pin shaft 销轴	45	2	42	84
~~30~~	~~GTA02~~	Shaft end plate 卡轴板	Q235	4	3.8	15.2
~~31~~						
~~32~~						
~~33~~	~~J227A0428~~	Shaft 轴φ340	35CrMo	1		1126
~~34~~	~~J227A0429~~	Shaft end plate 卡轴板	Q235	4	6.6	26.4
~~35~~	~~J227A0430~~	Gannulation drawing 电气布管图	Assembly 组件	1		
36	J227A0431 ✓	Pin shaft 销轴	45	10	1.1	11
37	J227A0432 ✓	Link plate 连板	Welded 焊接件	10	4.1	41
38	J227A0433 ✓	Sleeve 轴套	Q235	10	0.2	2
~~39~~	~~J227A0434-1~~ ~~J227A0434-2~~	接地靴装配 Lightning conductor assembly	Assembly 组件	2 2		
~~40~~	~~J227A0435~~	Lubrication device 润滑装置	Assembly 组件	1		25
41	J227A0436 ✓	Pump support 泵站支架	Welded 焊接件	1		240
~~42~~	~~J227A0437~~	Support 连接支架	Welded 焊接件	1		2050
~~43~~	~~J227A0438~~	Support 支架	Welded 焊接件	1/2 台 1/2 cranes		83.6
44	J227A0439 ✓	Wheel cover 车轮罩壳	Assembly 组件	1		22

ZPMC	DSGN		TECH		MTRL	
	CHCK		STDD		CHCK	

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PAGE: 3/4

PROJECT NAME or CODE:	SUB-PART NAME:	SUB DRAW NO:
South Carolina 65LT Container Cranes,USA	Gantry 大车行走机构	J227A0400

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	PIECE WGHT	TOTAL WGHT
B1	GB/T1228-91 ✓	Bolt 螺栓M24x120	10.9S Dacro 达克罗	58		
B2	GB/T1229-91 ✓	Nut 螺母M24	10H Dacro 达克罗	58		
B3	GB/T1230-91 ✓	Washer 垫圈24	Dacro 达克罗	116		
B4	GB5782-86 ✓	Bolt 螺栓M16x75	8.8S Dacro 达克罗	44		
B5	GB889-86 ✓	Nut 螺母M16	8S Dacro 达克罗	24		
B6	GB95-85 ✓	Washer 垫圈16	Dacro 达克罗	24		
~~B7~~	~~M3BP 180LB4 (IP55)~~	Motor 电动机	ABB	5	185	925
~~B8~~	~~ZIN-V1.5B~~	Coupling 联轴器	SIBRE	5		
B9	GB5783-86 ✓	Bolt 螺栓M24x50	8.8S Dacro 达克罗	20		
B10	GB855-88 ✓	Washer 垫圈24	Dacro 达克罗	36		
B11	GB5783-86 ✓	Bolt 螺栓M16x40	8.8S Dacro 达克罗	10		
B12	TNH515.73.D1B-00	Reducer 减速箱	ZPMC	5	620	3100
B13	✓	Nipple 油嘴NPT1/4"	Sta.Ste. 不锈钢	46		
B14	GB5783-86 ✓	Bolt 螺栓M20x40	8.8S Dacro 达克罗	16		
B15	GB855-88 ✓	Washer 垫圈20	Dacro 达克罗	16		
B16	GB5782-86 ✓	Bolt 螺栓M24x80	8.8S Dacro 达克罗	8		
B17	GB5783-86 ✓	Bolt 螺栓M24x45	8.8S Dacro 达克罗	8		
B18	GB95-85 ✓	Washer 垫圈30	Dacro 达克罗	10		
B19	GB91-86 ✓	Pin 开口销6.3x50	Sta.Ste. 不锈钢	10		
B20	GB/T1228-91	Bolt 螺栓M30x155	10.9S Dacro 达克罗	24		
B21	GB/T1229-91	Nut 螺母M30	10H Dacro 达克罗	24		
B22	GB/T1230-91	Washer 垫圈30	Dacro 达克罗	48		

ZPMC	DSGN		TECH		MTRL	
	CHCK		STDD		CHCK	

ZPMC to verify correct qty

ZPMC to verify correct qty

ZPMC to verify correct qty

SCPA to purchase these bolts in US

Change to new - TNR500.82.D2A00 ✓

*Note - ZPMC Engineering to verify for accuracy

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PAGE: 4/4

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South Carolina 65LT Container Cranes,USA	Gantry 大车行走机构	J227A0400

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	PIECE WGHT	TOTAL WGHT
B23	SPL-CO-2000 ✓	Nut 螺母 M16	8S Dacro 达克罗	20		

ZPMC	DSGN		TECH		MTRL	
	CHCK		STDD		CHCK	

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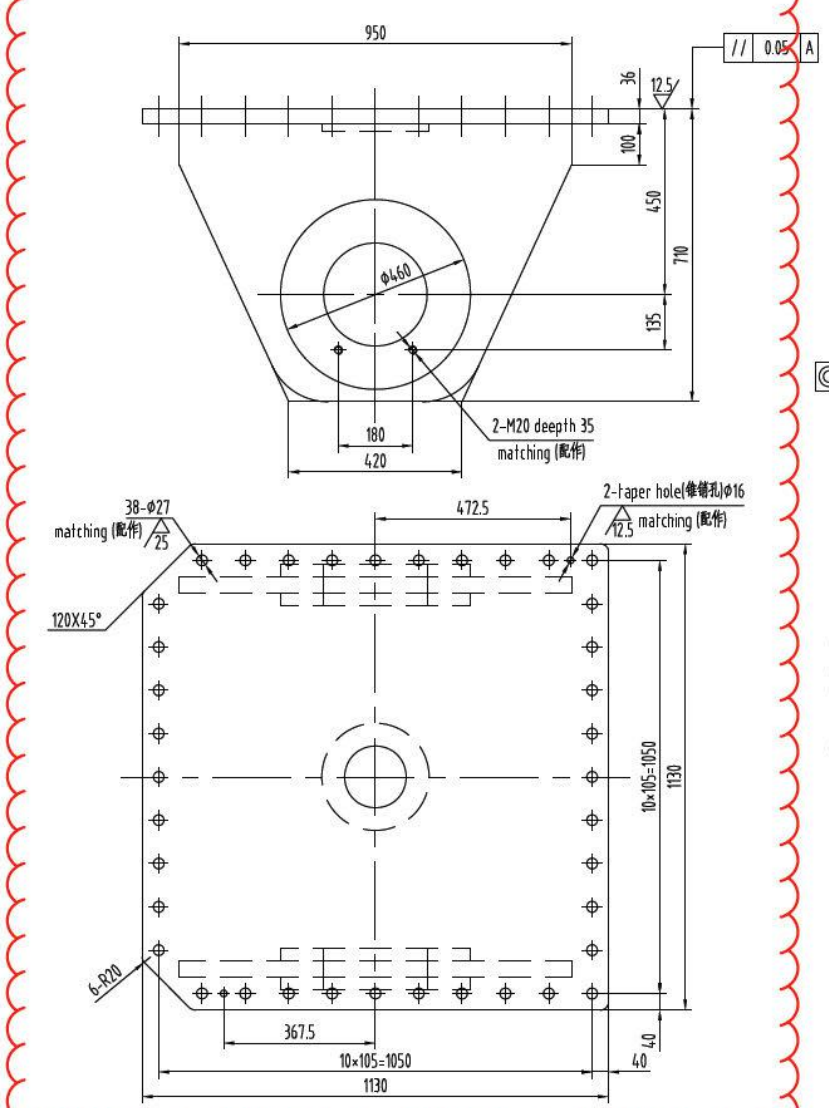
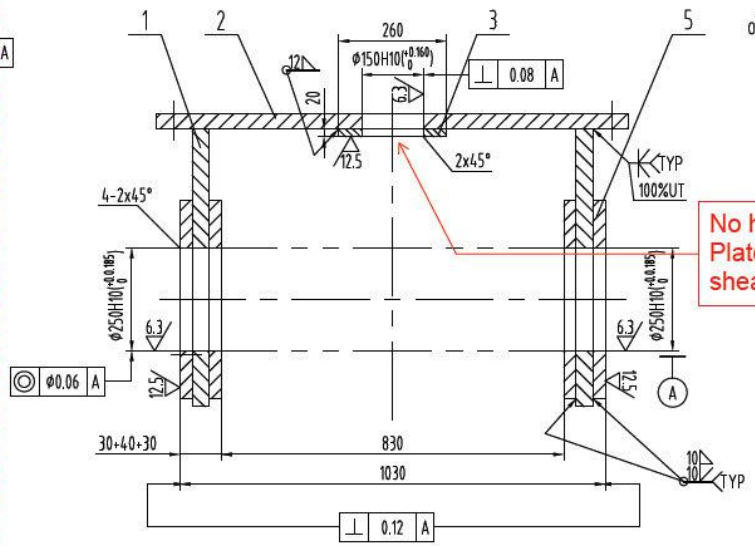
DO NOT DRILL
BOLT HOLES - TBD

Rev. No.	description	date	sign
03		2006.03.25	gushenqian
	As-built drawing	07.2007	





No hole for pin - Solid Plate - SCPA will add shear block in US

技术要求

1. 焊缝应符合AWSD1.1-2002,Section9焊接规范.
2. 切割面要求平整,特别是外露和隔板内孔.
3. 焊条采用E5015.
4. 本件与大平衡梁连接时,两倒角120x45°位于大平衡梁内档.

Technical Requirement

1. Weld shall be in accordance with AWSD1.1-2002,Section 9.
2. Cutting surface should be smooth,which is especially needed for outside.
3. Welding rods should be E5015.
4. The side of both chamfer 120x45°,should be set inside of upper beam.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
5		(-20)×φ460/φ250	A709-50-2	4	18.4	36.8	
4							
3		(-20)×φ260/φ150	A709-50-2	1		2.8	
2		(-36)×1130×1130	A709-50-2	1		346	
1		-40×674×950	A709-50-2	2	136	272	
	J227A0402	Support 连接支架	Welded 焊接件	8	8×690		1:15

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

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Rev. No.	description	date	sign
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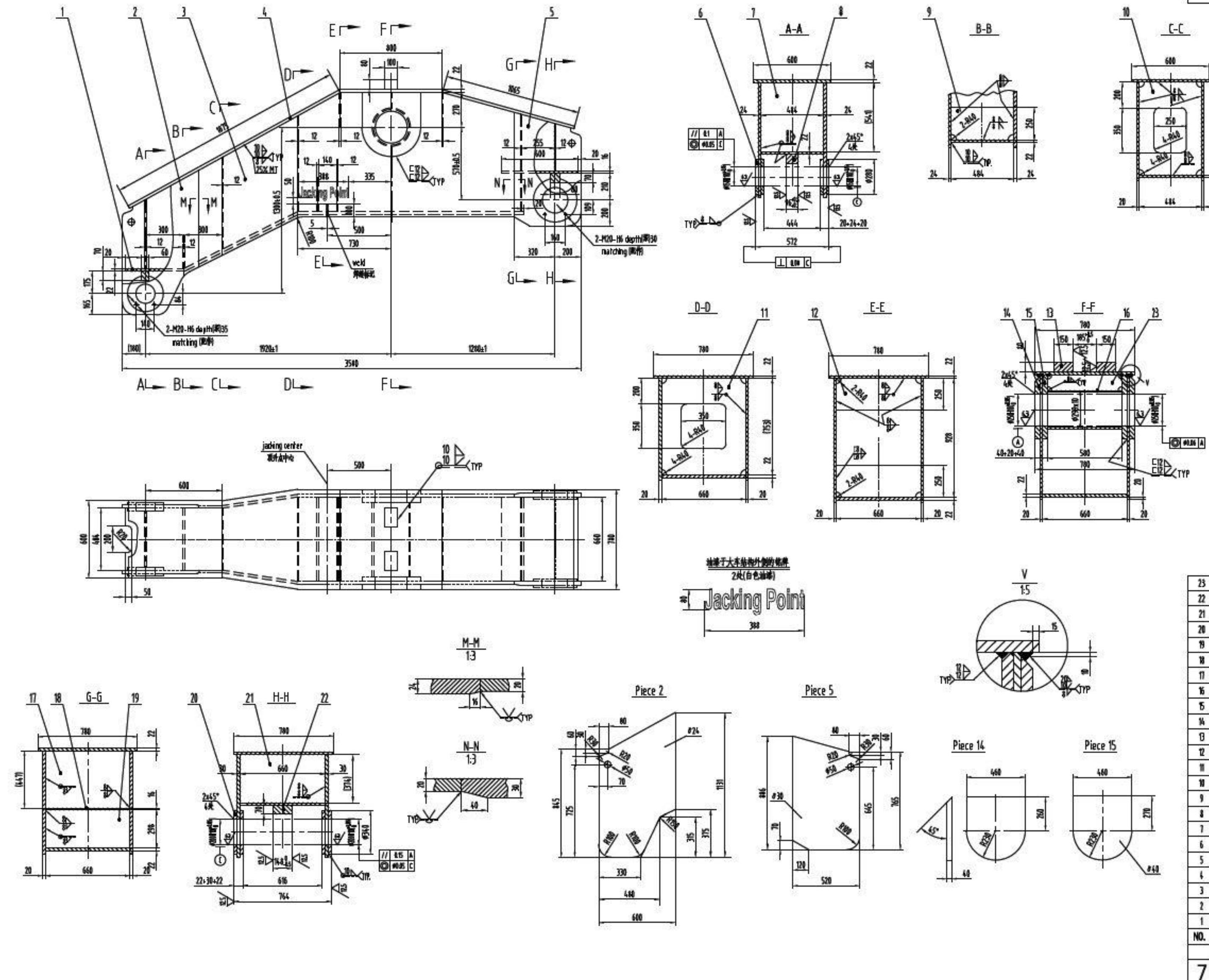
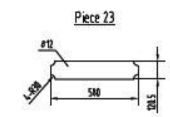
02		2006.1.13	gushengjian
03		2006.4.3	gushengjian
	As-built drawing	07.2007	





Technical Requirement

1. Weld shall be in accordance with AWSD1.1-2002 Section 9.
2. It's necessary to make 100% ultrasonic flow detection and 10% X-ray selective examination for butt groove weld.
3. For abrupt slope butt of thin plate and thick plate, the Latter's abrupt slope should be machined,and cutting is not permitted. all machining will be carried out after completion of welding.
4. 1.5 psig experment should be done in the hermetic place.
5. Weld rods should be E5015.
6. all plates over 40mm thickness will be preheated before welding.
7. The size in the subsidiary list is for reference of prepareing the feed only, the accurate size should be determined when lofting.

技术要求

1. 焊缝应符合AWSD1.1-2002 Section 9焊接规范.
2. 所有对接坡口焊,均需作100%UT探伤检查,并作10%的X光抽片抽检.
3. 厚薄板对接处的厚板斜坡过渡,斜坡部分一定要机加工制造,不许用割削,并清根去毛刺.
4. 本件密封部分需作1.5psig(0.1标准大气压)表压的压力试验.
5. 焊条采用E5015,大于40mm的板焊前预热.
6. 明细表中的尺寸仅供参考,以放样为准.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCA[redacted]
23		-12×120.5×580	A709-50-2	1		6.5	
22		-70×80×148	A709-50-2	1		6.5	
21		-12×(374)×660	A709-50-2	1		20.8	
20		(-22)×Φ340/Φ200	A709-50-2	4	10.3	41.2	
19		-12×298×660	A709-50-2	1		18.5	
18		-16×600×660	A709-50-2	1		50	
17		-12×(447)×660	A709-50-2	1		27.8	
16		Φ299×10-580	20	1		41.4	
15		-40×Φ460/Φ250	A709-50-2	2	50	100	
14		-40×Φ460/Φ250	A709-50-2	2	48	96	
13		-80×100×150	A709-50-2	2	9.4	18.8	
12		-12×250×660	A709-50-2	4	15.5	62	
11		-12×660×(753)	A709-50-2	1		35	
10		-12×484×(724)	A709-50-2	1		24	
9		-12×250×484	A709-50-2	1		11.4	
8		-60×70×96	A709-50-2	1		4.8	
7		-12×484×(541)	A709-50-2	1		24.7	
6		(-20)×Φ280/Φ150	A709-50-2	4	6.9	27.6	
5		-30×520×886	A709-50-2	2	97	194	
4		-22×780×3740	A709-50-2	1		436	
3		-20×1359×2467	A709-50-2	2	354	708	
2		-24×600×1131	A709-50-2	2	97	194	
1		-22×660×3224	A709-50-2	1		335	
	J227A0403	Middle beam 中平衡梁	Welded 焊接件	8	2500		1:[redacted]

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

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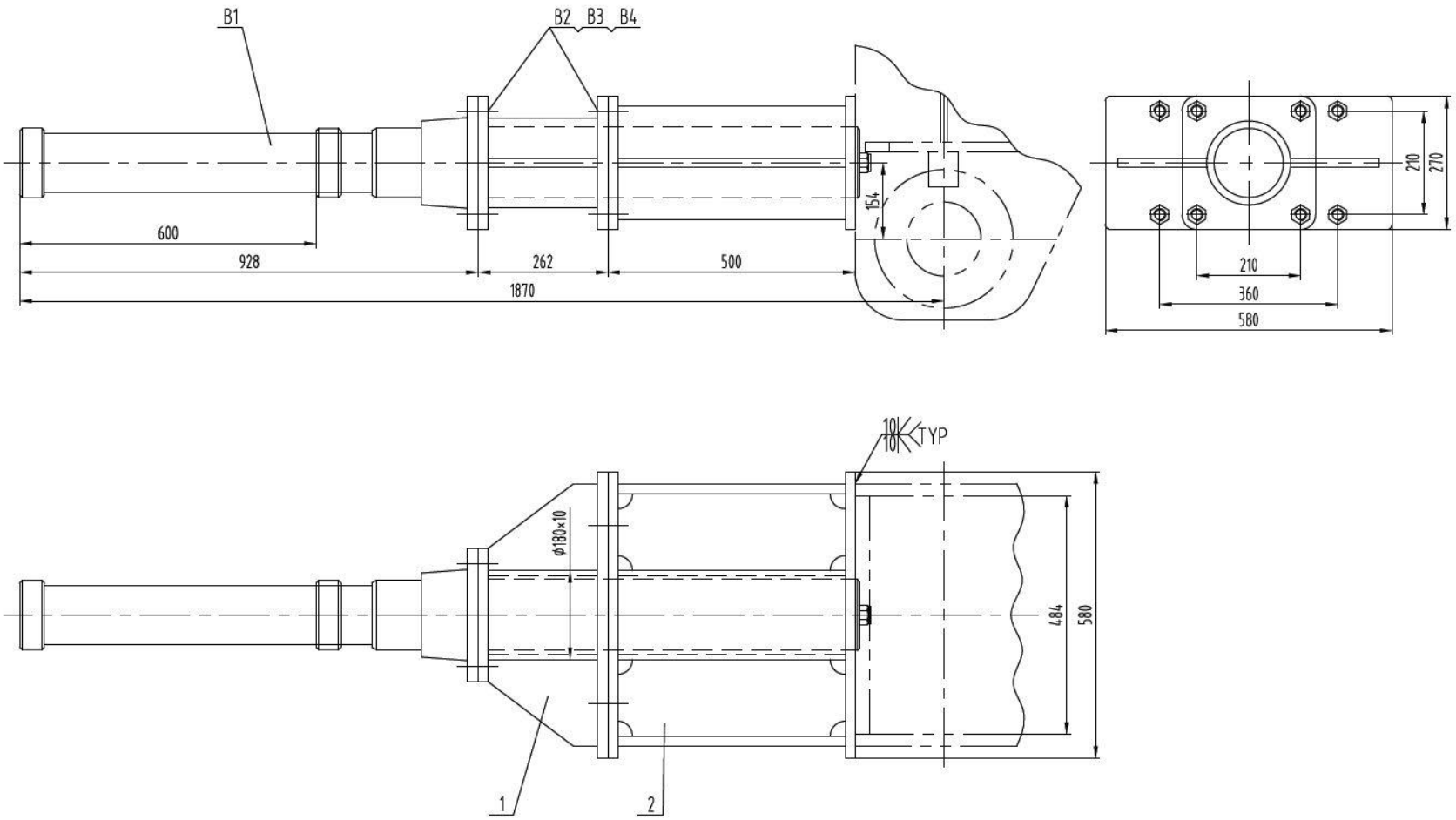

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT	SCALE
2	J227A040402	Support 2 支架2	Weled 焊接件	1	115	
~~1~~	~~J227A040401~~	Support 1 支架1	Weled 焊接件	1	43	
	J227A0404	Buffer device 缓冲器装置	Ass.组件	4	4×237	1:8

B4	GB95-85	Washer 垫圈 24	Dacro.达克罗	8		
B3	GB889-86	Nut 螺母 M24	8S Dacro.达克罗	8		
B2	GB5782-86	Bolt 螺栓 M24x80	8.8S Dacro.达克罗	8		
B1	76MFK140-617	BUFFER 缓冲器	OLEO	1	79	

ZPMC

DRAW			TECH.		TRACE
CHCK			STDD		CHCK

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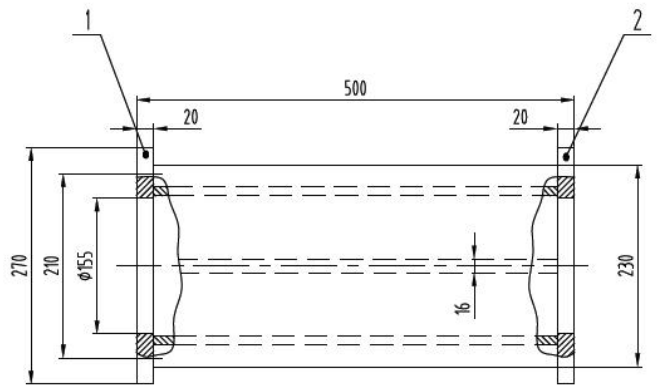

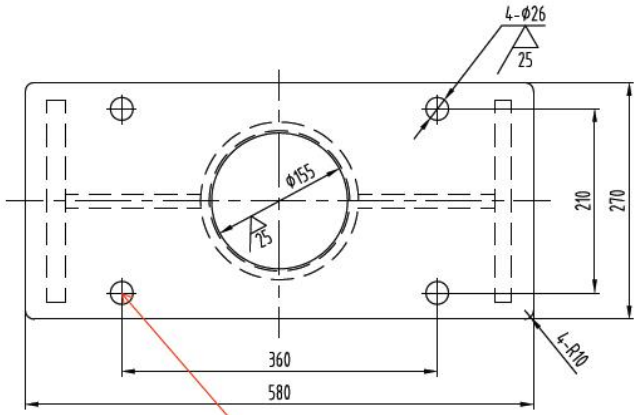

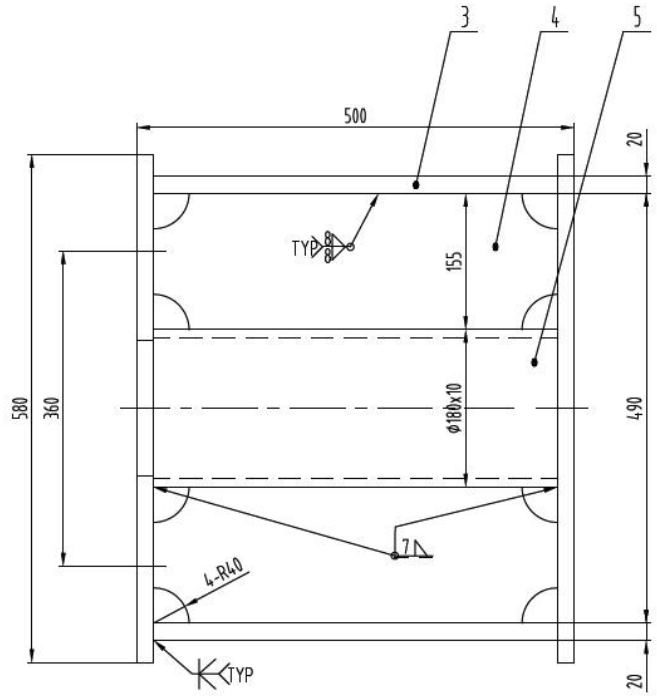

DON"T DRILL BOLT HOLES

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
5		ϕ180×10-460	20	1	20	20	
4		-16×155×460	A709-50-2	2	9	18	
3		-20×230×460	A709-50-2	2	16.6	33.2	
2		-20×270×580	A709-50-2	1	21	21	
1		-20×270×580	A709-50-2	1	21	21	
	J227A040402	Support 2 支架2	Welded 焊接件	4	4×115		1:5

ZPMC	DRAW		TECH.		TRACE	
	CHCK		STDD		CHCK	

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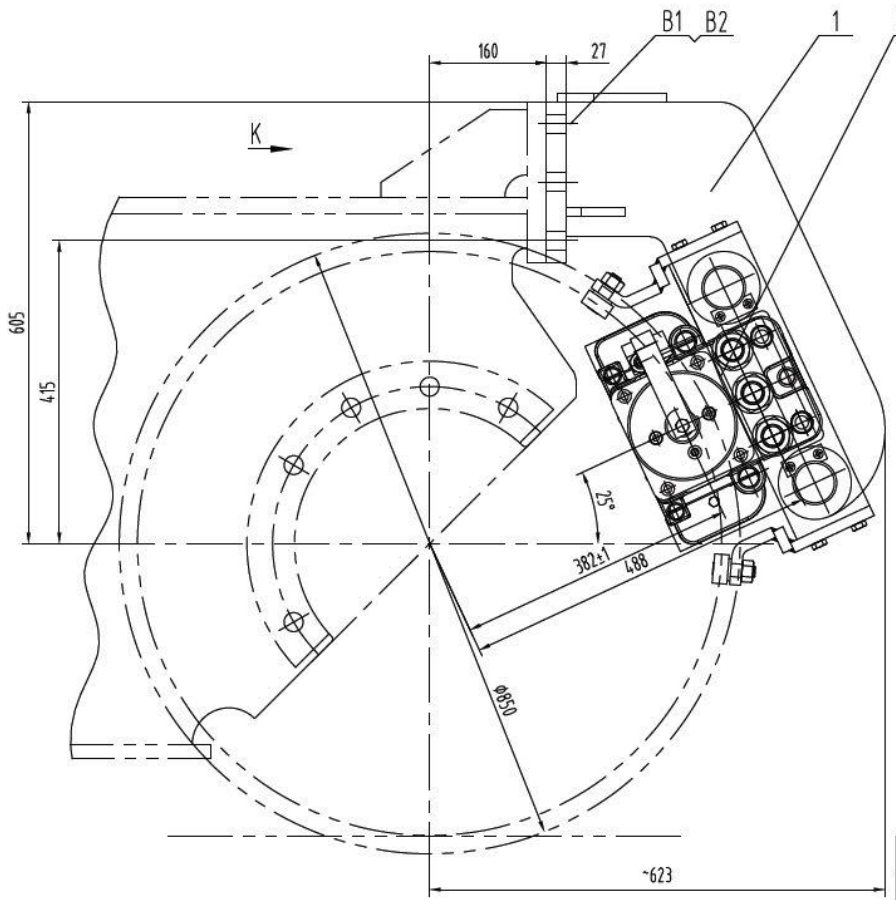

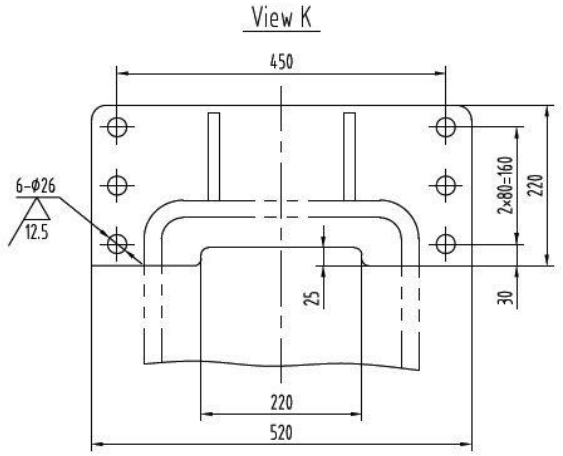

Use current Sibre model

May need to modify for new Sibre model

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	QTY/set	WEIGHT each	WEIGHT total	NOTE
B3	RHI 104	Wheel brake(夹轮器)	SIBRE	1	90	90	
B2	SPL-C0-2000	Nut(螺母) M24	8S Dacro.(达克罗)	6			
B1	GB5782-86	Bolt(螺栓) M24x95	8.8S Dacro.(达克罗)	6			
1	J227A040601b	Support(支架)	Welded(焊接件)	1	80.4	80.4	

注: M24螺栓的拧紧力矩为480Nm, k=0.145。
The tightening moment of bolts M24 is 480Nm.

PROJECT:			DESIGN STAGE:			SCALE:	1:6
ITEM NAME:	Wheel brake device 1 (轮边制动器装配)1		DRAW NO:	J227A0406b		PROJ.	
ZPMC	DSGN		TRACE		APP.		
	DRAW		CHCK		SET/CRANE		16
	CHCK		VER.		WEIGHT		16x170.4

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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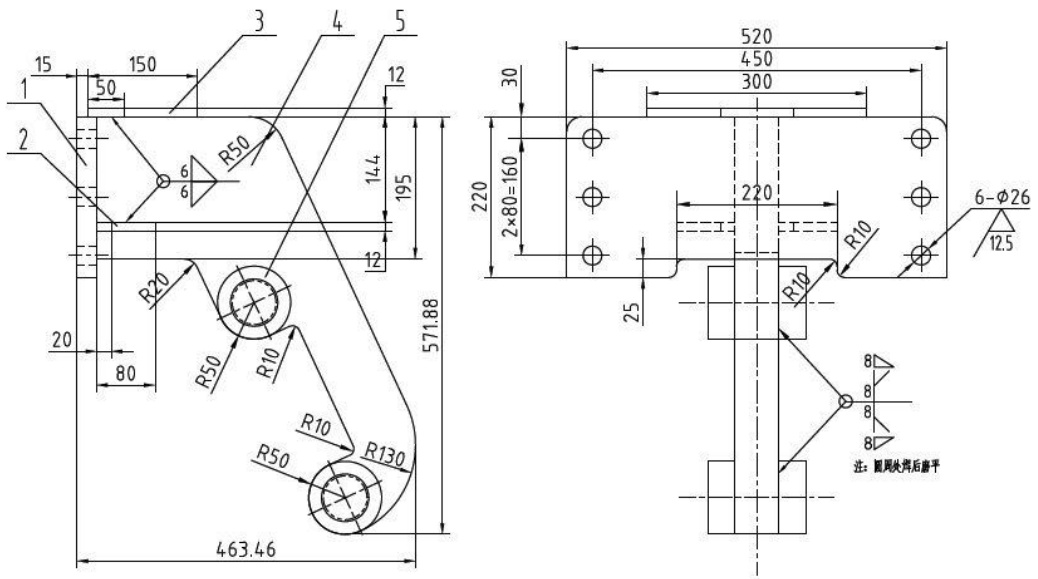

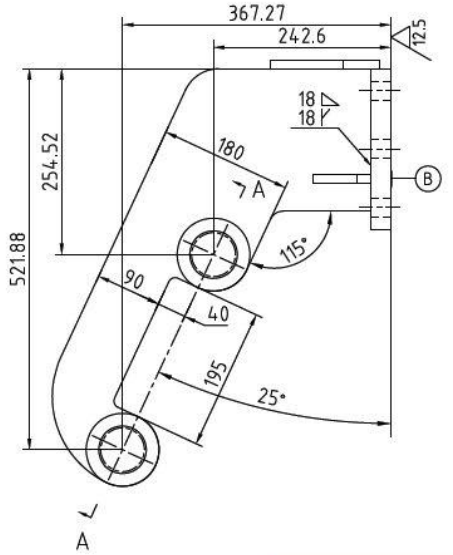

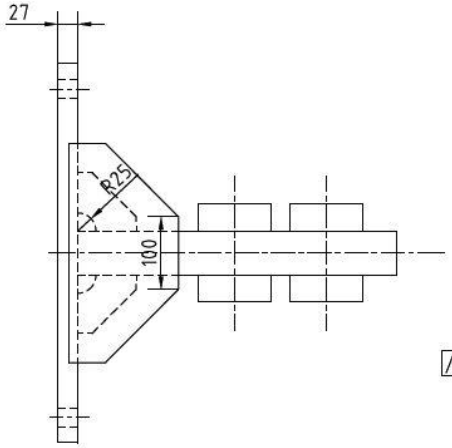

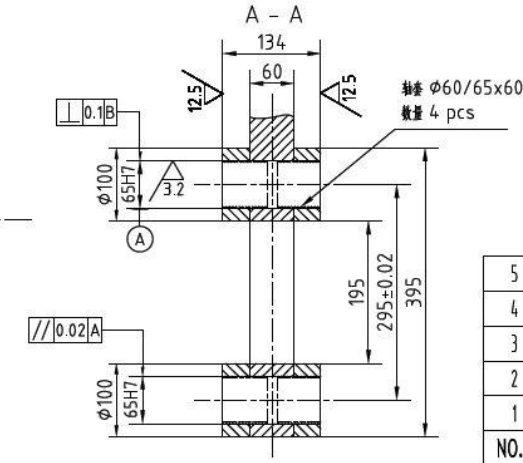

技术要求

1. 焊缝点符合AWSD1.1-2002,Section9焊接规范.
2. 焊条采用E5015.

Technical Requirement

1. Weld shall be in accordance with AWSD1.1-2002,Section 9.
2. Welding rods should be E5015.

Verify for new Sibre model wheel brake

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
5		-37xφ100xφ65	A709-50-2	4	1.3	5.2	
4		-60×436.5×572	A709-50-2	1	48.7	48.7	
3		-12×150×300	A709-50-2	1	3.3	3.3	
2		-12×80×80	A709-50-2	2	0.4	0.8	
1		(-27)×220×520	A709-50-2	1	22.4	22.4	
	J227A040601b	Support(支架)	Welded (焊接件)	16	16x80.4		1:6

ZPMC	DRAW		TECH.		TRACE	
	CHCK		STDD		CHCK	

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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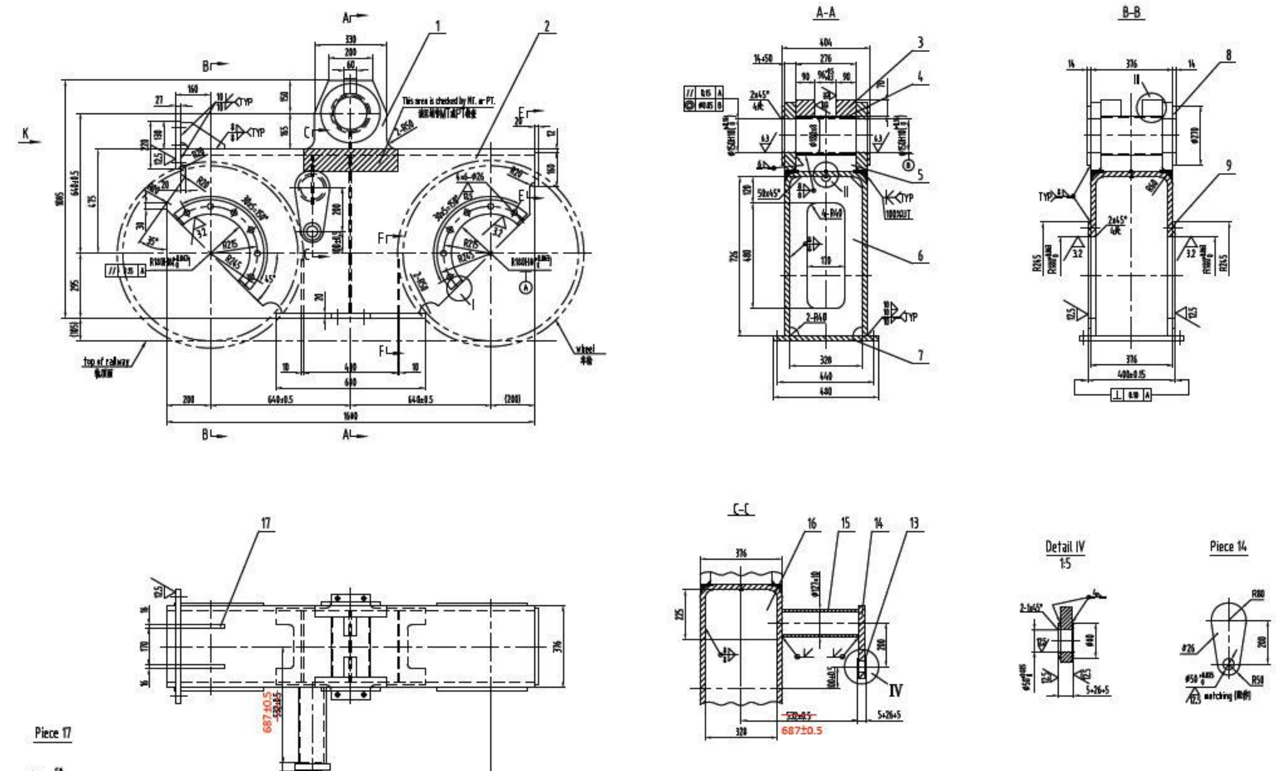
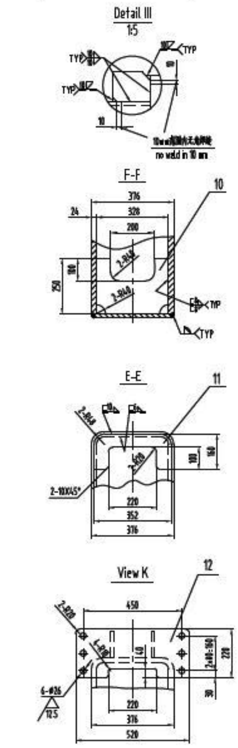
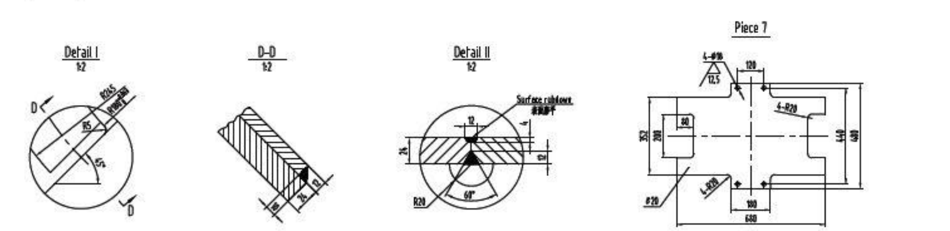
Rev. No.	description	date	sign
01		2005.12.14	gushenqian
02		2006.1.13	gushenqian
03		2006.4.3	gushenqian
04		2006.5.7	Mao
	As-built drawing	07.2007	







Technical Requirement

1. Weld shall be in accordance with AWSD1.1-2002,Section 9.
2. Automatic welding uses welding wire H08A and welding flux HJ401-1-108A,Welding rods should be E5015.
3. Welding rods should be E5015.
4. all plates over 40mm thickness will be preheated before welding.
5. Cutting surface should be smooth,which is especially needed for outside. all machining will be carried out after completion of welding.
6. Unmarked chamfer 2x45°.
7. Unmarked welding height is 0.7 timed the thickness of the thin plate.
8. The size in the subsidiary list is for reference of prepareing the feed only, the accurate size should be determined when lofting.
9. The current piece should be symmetricly made.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
17		-16×120×200	A709-50-2	2	2	4	
16		-10×225×328	A709-50-2	1		5.8	
15		Φ127×10-349	20	1		10	
14		-26×160×330	A709-50-2	1		8.4	
13		(-5)×Φ80/Φ50	A709-50-2	2	0.2	0.4	
12		(-27)×220×520	A709-50-2	1		21.6	
11		-20×160×352	A709-50-2	1		5.2	
10		-10×250×328	A709-50-2	2	4.7	9.4	
9		(-12)×R245/R180	A709-50-2	4	4	16	
8		-14×Φ270/Φ150	A709-50-2	2	3.5	7	
7		-20×480×680	A709-50-2	1		36	
6		-10×328×726	A709-50-2	1		12	
5		-10×75×276	A709-50-2	1		1.6	
4		Φ180×8-276	20	1		9.4	
3		-60×70×90	A709-50-2	2	3	6	
2		-24×914×1680	A709-50-2	2	225	450	
1		-50×315×430	A709-50-2	2	30.5	61	
	J227A0407	Bogie 台车	welded	16	16×670		1:10

ZPMC | DRAW | CHCK | TECH. | STDD | TRACE | CHCK

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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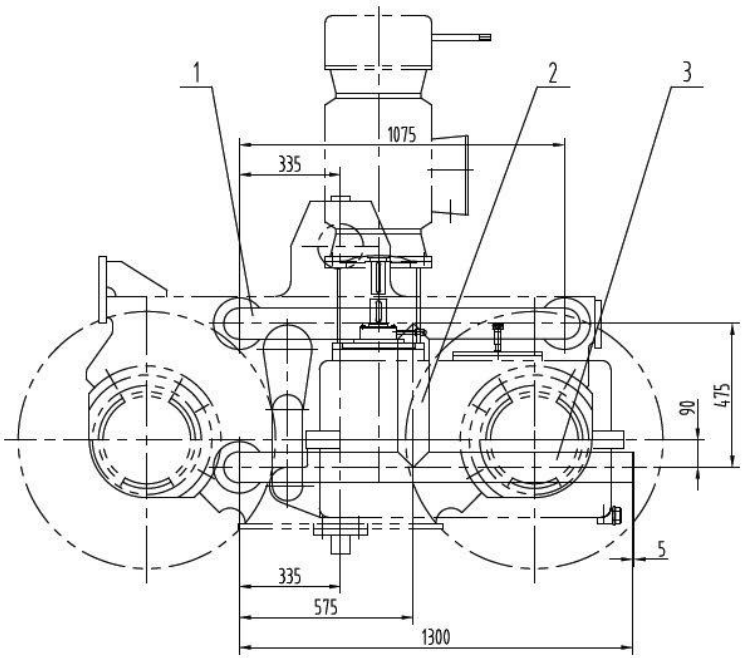
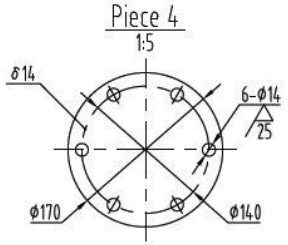
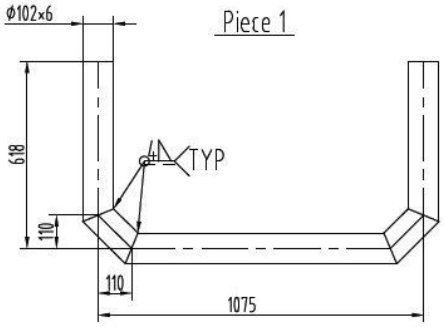
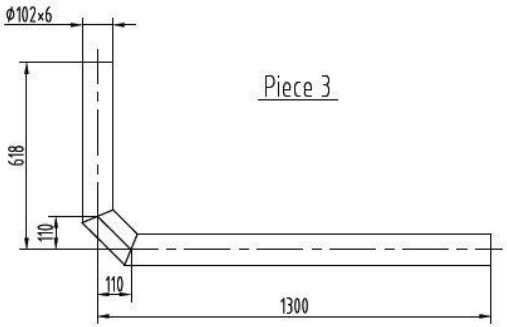


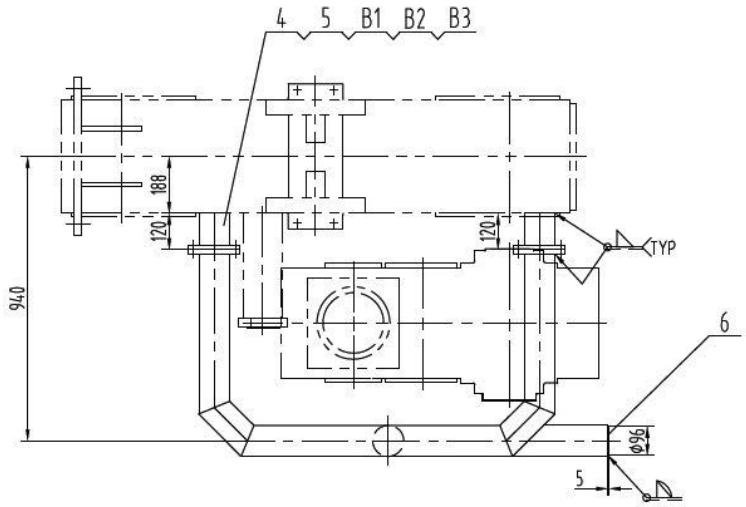


注: 对称制作共14件.

Note: The current piece should be symmetricly made.







NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
B3	GB95-85	Washer 垫圈12	Sta. Ste. 不锈钢	18			
B2	GB889-86	Nut 螺母M12	Sta. Ste. 不锈钢	18			
B1	GB5783-86	Bolt 螺栓M12x45	Sta. Ste. 不锈钢	18			
6		-5×φ96	A709-50-2	1		0.3	
5	J227A040801	Support 支座	Welded 焊接件	3	3.5	10.5	
4		-14×φ170	A709-50-2	3	2	6	
3		φ102x6-1936	20	1		28	
2		φ102x6-475	20	1		6.8	
1		φ102x6-2347	20	1		33.4	
	J227A0408-1	Enclosure 1 护栏1	Assembly 组件	14	14×85		1:15

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

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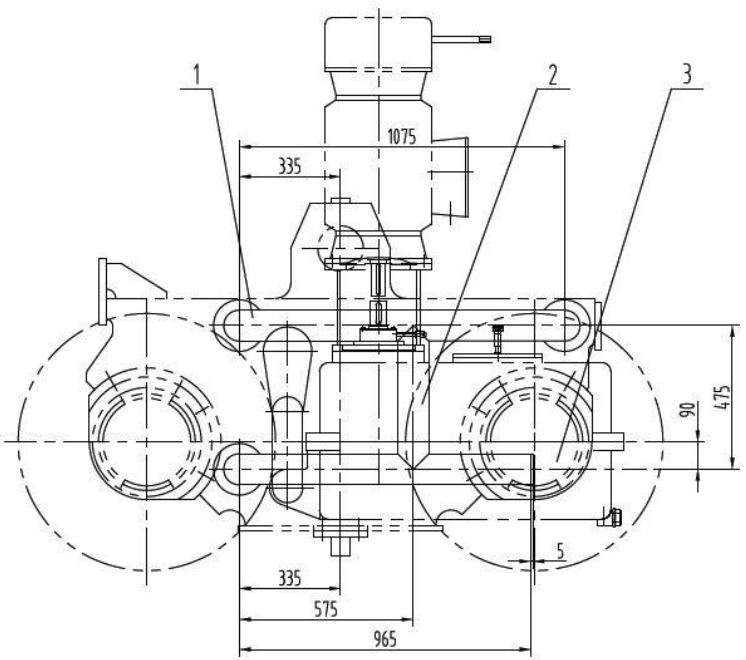
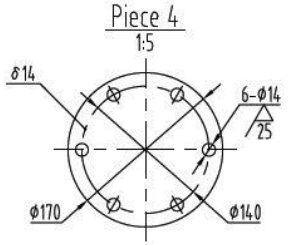
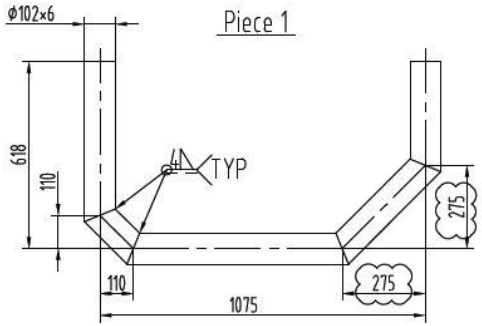
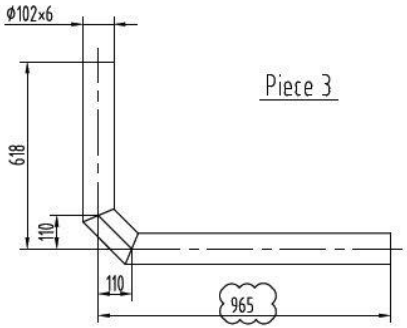


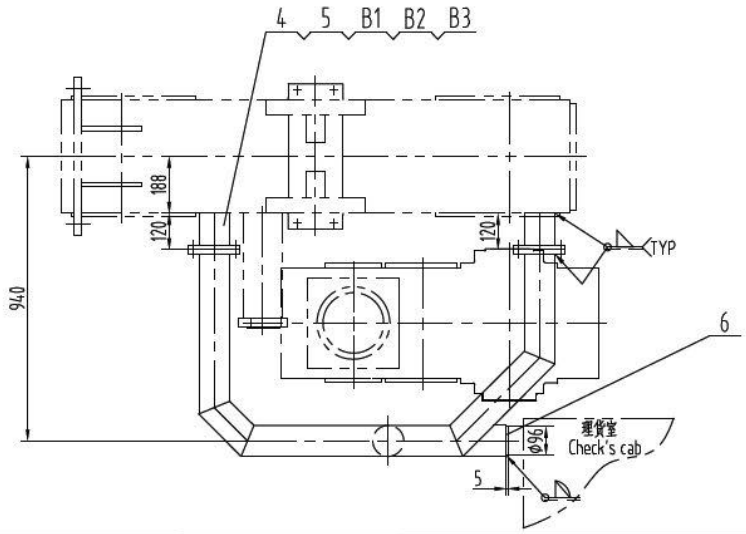






注: 对称制作共2件,安装于陆侧理货室两侧

Note: The current piece should be symmetricly made.
Installed besides the check's cab.



B3	GB95-85	Washer 垫圈12	Sta. Ste. 不锈钢	18			
B2	GB889-86	Nut 螺母M12	Sta. Ste. 不锈钢	18			
B1	GB5783-86	Bolt 螺栓M12x45	Sta. Ste. 不锈钢	18			
6		-5×φ96	A709-50-2	1		0.3	
5	J227A040801	Support 支座	Welded 焊接件	3	3.5	10.5	
4		-14×φ170	A709-50-2	3	2	6	
3		φ102x6-1601	20	1		23	
2		φ102x6-475	20	1		6.8	
1		φ102x6-2255	20	1		32	
NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
	J227A0408-2	Enclosure 1 护栏1	Assembly 组件	2	2×78.6		1:15

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

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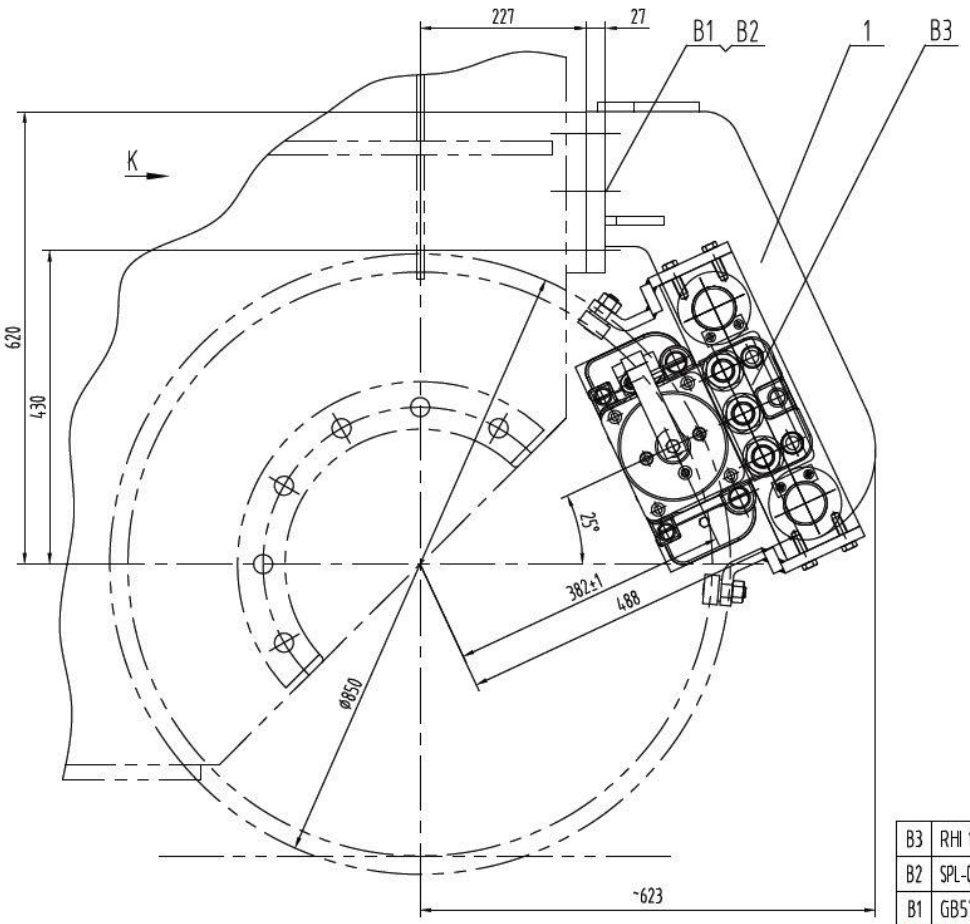

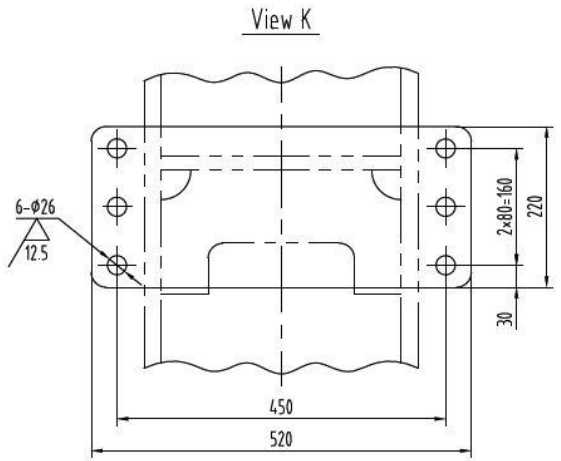

Use current Sibre model

May need to modify for new Sibre model

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	QTY/set	WEIGHT each	WEIGHT total	NOTE
B3	RHI 104	Wheel brake(夹轮器)	SIBRE	1	90	90	
B2	SPL-C0-2000	Nut(螺母) M24	8S Dacro.(达克罗)	6			
B1	GB5782-86	Bolt(螺栓) M24x95	8.8S Dacro.(达克罗)	6			
1	J227A040901b	Support(支架)	Welded(焊接件)	1	74.8	74.8	

PROJECT: | DESIGN STAGE: | SCALE: 1:6

ITEM NAME: Wheel brake device 2 (轮边制动器装配)2 | DRAW NO: J227A0409b | PROJ.

ZPMC

DSGN			TRACE			APP.	
DRAW			CHCK			SET/CRANE	4
CHCK			VER.			WEIGHT	4x164.8

注: M24螺栓的拧紧力矩为480Nm, k=0.145.
The tightening moment of bolts M24 is 480Nm.

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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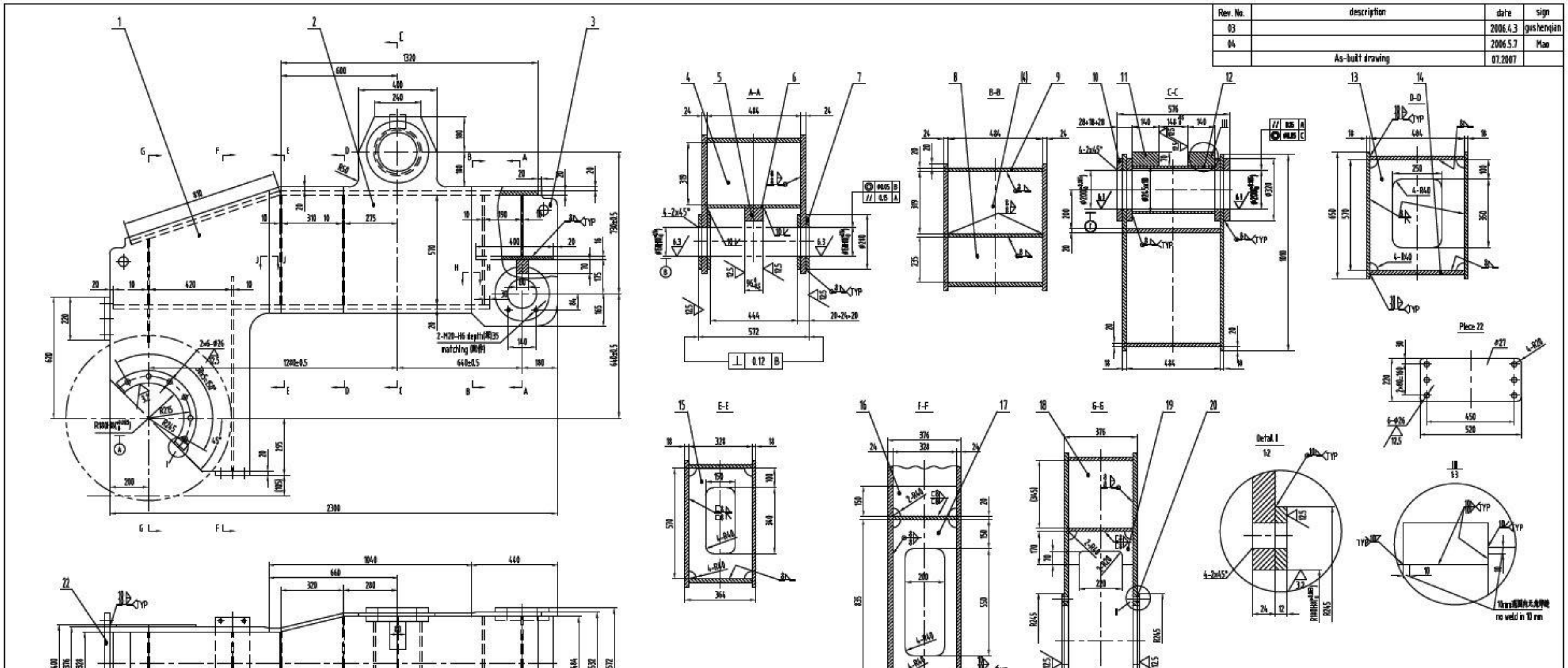
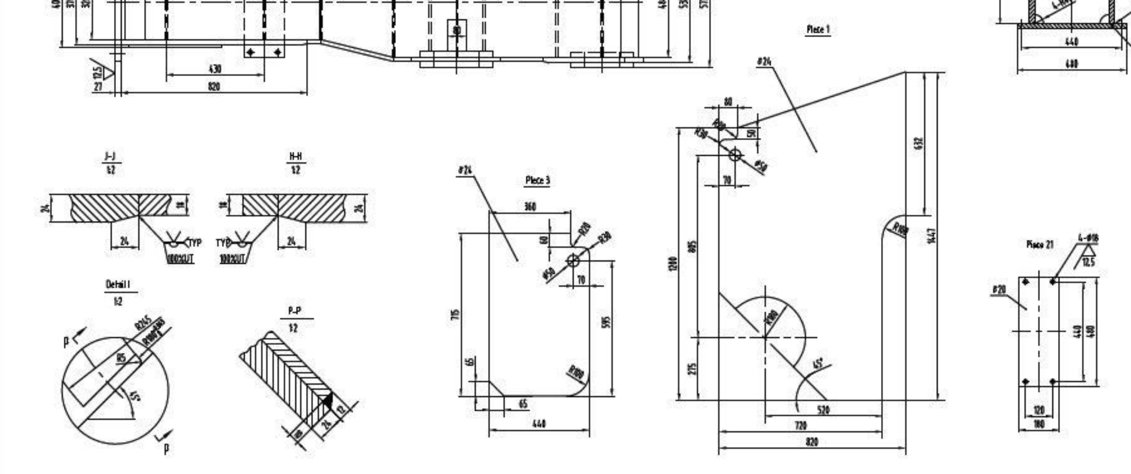
Rev. No.	description	date	sign
03		2006.4.3	gushenqian
04		2006.5.7	Mao
	As-built drawing	07.2007	





Technical Requirement

1. Weld shall be in accordance with AWSD1.1-2002 Section 9.
2. It's necessary to make 100% ultrasonic flow detection and 10% X-ray selective examination for butt grade welding.
3. For abrupt slope butt of thin plate and thick plate, the latter's abrupt slope should be machined,and cutting is not permitted. all machining will be carried out after completion of welding.
4. 1.5 psig experment should be done in the hermetic place.
5. Weld rods should be E5015.
6. all plates over 40mm thickness will be preheated before welding.
7. The size in the subsidiary list is for reference of prepareing the feed only, the accurate size should be determined when lofting.

技术要求

1. 焊缝应符合ASWD1.1-2002 Section 9焊接规范.
2. 所有对接焊口焊,均须作100%UT探伤检查,并作10%X光抽片抽检.
3. [illegible]
4. [illegible]1.5psig[illegible]
5. 焊条采用E5015,大于40mm[illegible]
6. [illegible]

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCA[redacted]
22		(-27)x220x520	A709-50-2	1	24	24	
21		-20x180x480	A709-50-2	1	13.6	13.6	
20		(-12)xR245/R180	A709-50-2	2	3.7	7.4	
19		-10x170x328	A709-50-2	1	3.1	3.1	
18		-10x328x(345)	A709-50-2	1	9.3	9.3	
17		-10x328x835	A709-50-2	1	11	11	
16		-10x150x328	A709-50-2	1	3.9	3.9	
15		-10x328x570	A709-50-2	1	10.5	10.5	
14		-20x484x1935	A709-50-2	1	122	122	
13		-10x484x570	A709-50-2	1	14	14	
12		管Φ245x10-428	20	1	25	25	
11		-70x80x140	A709-50-2	2	6.2	12.4	
10		-28xΦ320/Φ200	A709-50-2	4	13	52	
9		-20x484x2130	A709-50-2	1	138	138	
8		-10x235x484	A709-50-2	1	9	9	
7		(-20)xΦ280/Φ150	A709-50-2	4	7	28	
6		-16x400x484	A709-50-2	1	24.3	24.3	
5		-60x70x96	A709-50-2	1	4.2	4.2	
4		-10x319x484	A709-50-2	2	12	24	
3		-24x440x715	A709-50-2	2	57.2	114.4	
2		-18x1010x1049	A709-50-2	2	115	230	
1		-24x820x1447	A709-50-2	2	162	324	
	J227A0410	Lower beam 1 小平衡梁1	Welded 焊接件	4	4x1210		1:1[redacted]

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

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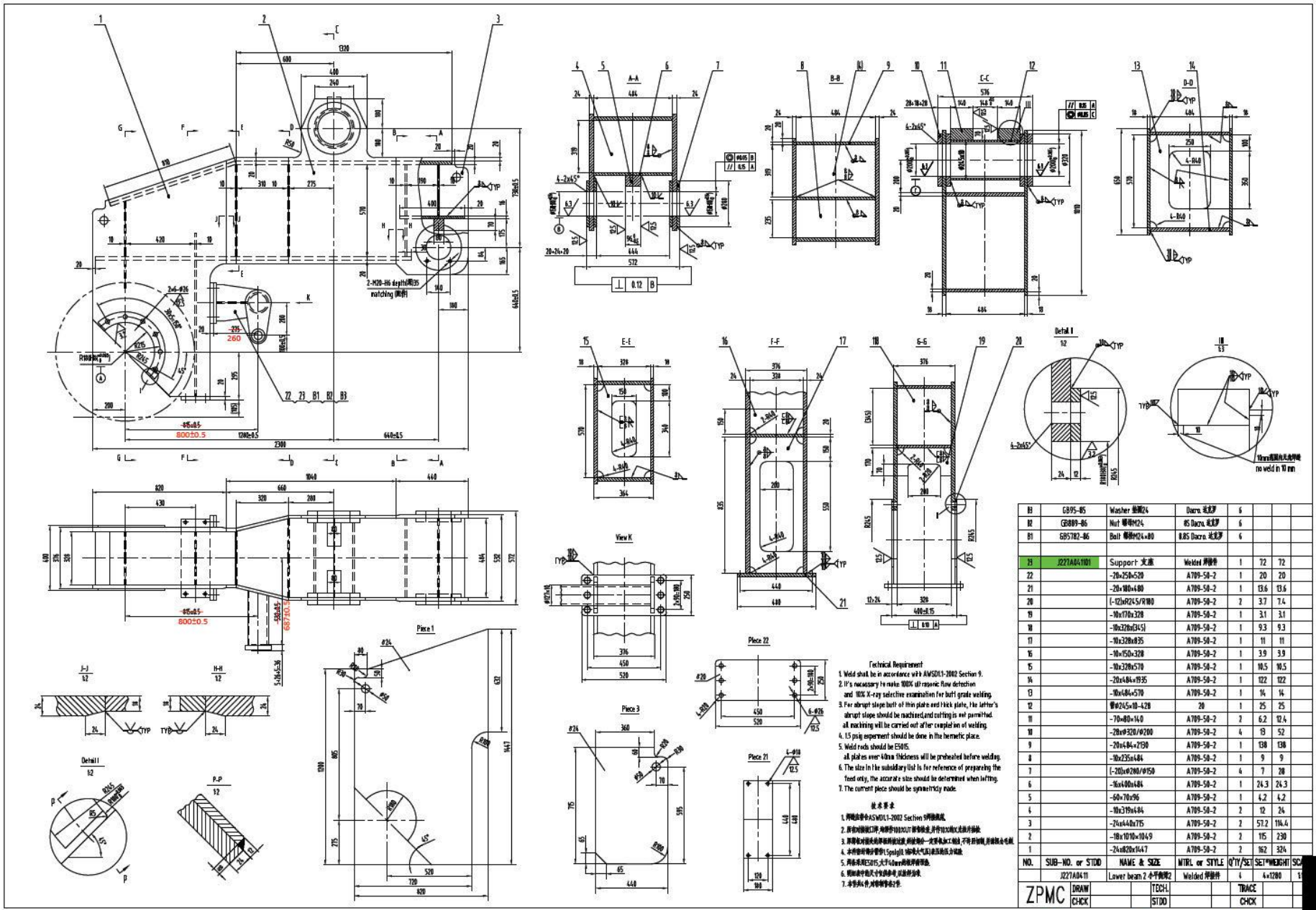

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT	SCA
	J227A0411	Lower beam 2 小平衡梁2	Welded 焊接件	1	4×1280	1
1		-24x820x1447	A709-50-2	2	162	324
2		-18x1010×1049	A709-50-2	2	115	230
3		-24x440x715	A709-50-2	2	57.2	114.4
4		-10x319x484	A709-50-2	2	12	24
5		-60×70x96	A709-50-2	1	4.2	4.2
6		-16x490x484	A709-50-2	1	24.3	24.3
7		(-20)x9280/9150	A709-50-2	4	7	28
8		-10x235x484	A709-50-2	1	9	9
9		-20x484×2190	A709-50-2	1	138	138
10		-28x9320/9200	A709-50-2	4	13	52
11		-70×80×140	A709-50-2	2	6.2	12.4
12		管Φ245×18-428	20	1	25	25
13		-16x484x570	A709-50-2	1	14	14
14		-20x484x1935	A709-50-2	2	122	122
15		-16x328x570	A709-50-2	1	10.5	10.5
16		-16×150×328	A709-50-2	1	3.9	3.9
17		-16x328x835	A709-50-2	1	11	11
18		-16x228x(345)	A709-50-2	1	9.3	9.3
19		-16x770x328	A709-50-2	1	3.1	3.1
20		(-12)xR245/R180	A709-50-2	2	3.7	7.4
21		-28x1180×480	A709-50-2	1	13.6	13.6
22		-20×250×520	A709-50-2	1	20	20
23	J227A041101	Support 支座	Welded 焊接件	1	72	72
B1	GB5782-86	Bolt 螺栓M24×80	8.8S Dacro. 达克罗	6		
B2	GB889-86	Nut 螺母M24	8S Dacro. 达克罗	6		
B3	GB95-85	Washer 垫圈24	Dacro. 达克罗	6		

ZPMC | DRAW | | TCH'L | | TRACE | | |
CHCK | | STDD | | CHCK | | |

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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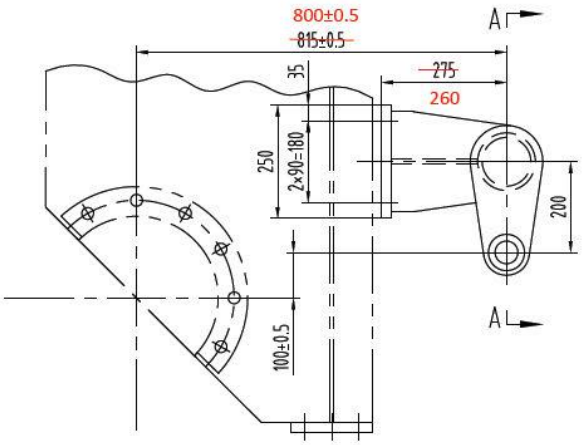

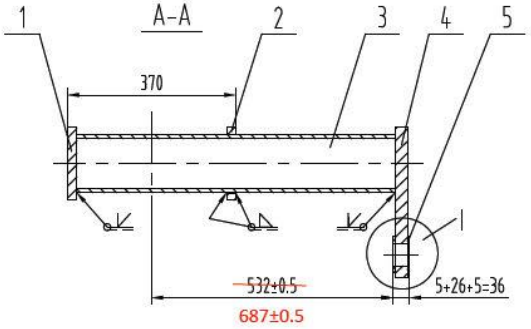

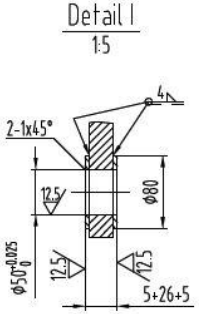

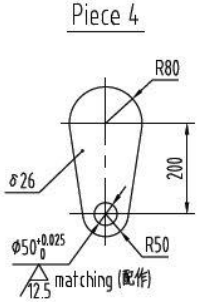

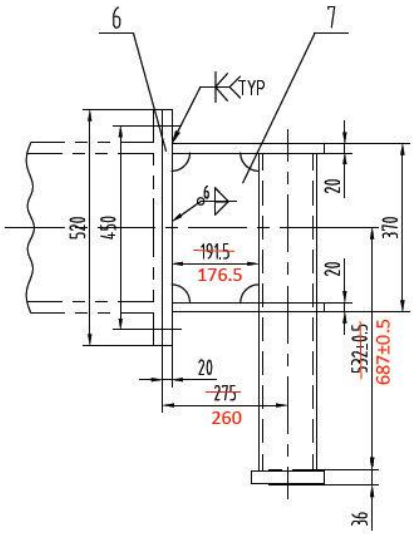

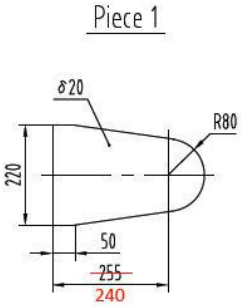

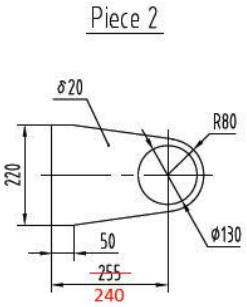

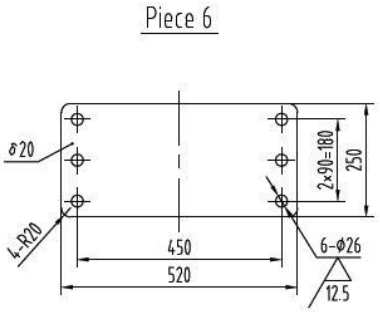

对称制作

The current piece should be symmetricly made.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET		SET*WEIGHT	SCALE
7		-12×191.5×330	A709-50-2	1		6	
6		-20×250×520	A709-50-2	1		20	
5		(-5)×Φ80/Φ50	A709-50-2	2	0.2	0.4	
4		-26×160×330	A709-50-2	1		8.4	
3		Φ127×10-702	20	1		20.3	
2		-20×220×335	A709-50-2	1		7.4	
1		-20×220×335	A709-50-2	1		9.5	
	J227A041101	Support 支座	Welded 焊接件	4		4×72	1:10

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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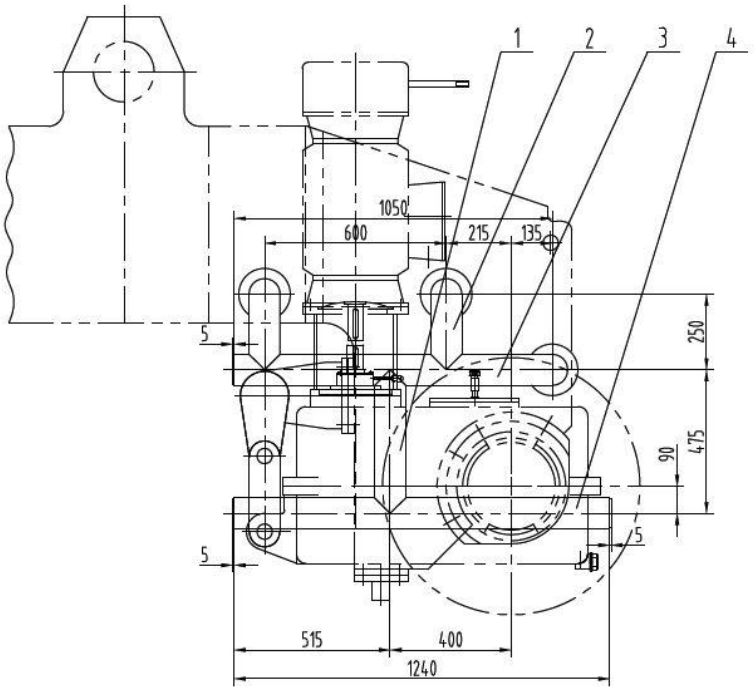
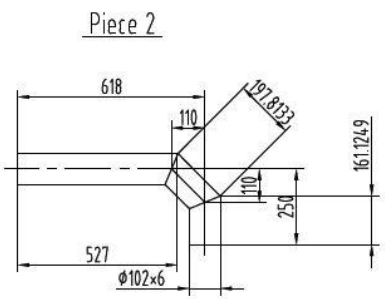
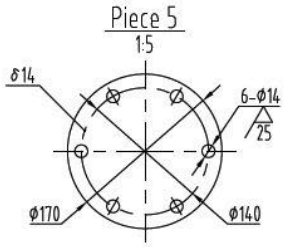
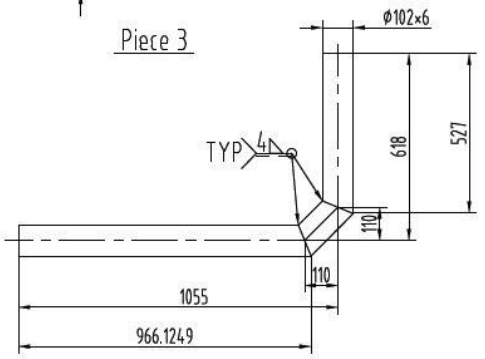


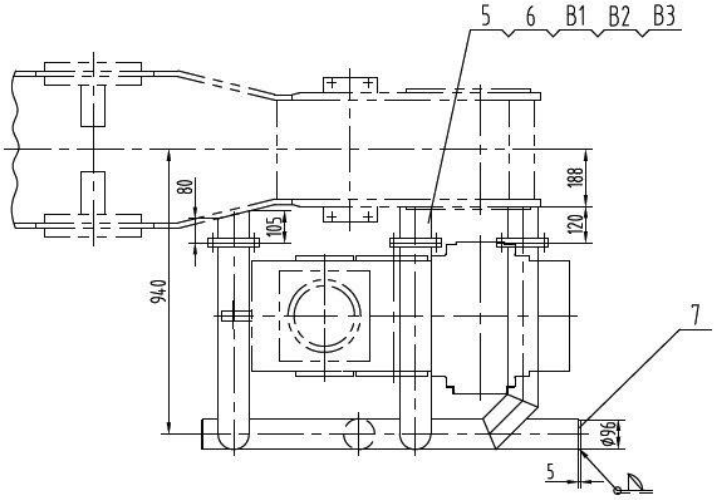






注: 对称制作共4件.

Note: The current piece should be symmetricly made.



B3	GB95-85	Washer 垫圈12	Sta. Ste. 不锈钢	18			
B2	GB889-86	Nut 螺母M12	Sta. Ste. 不锈钢	18			
B1	GB5783-86	Bolt 螺栓M12x50	Sta. Ste. 不锈钢	18			
7		-5×Φ96	A709-50-2	3	0.3	0.9	
6	J227A040801	Support 支座	Welded 焊接件	3	3.5	10.5	借用
5		-14×Φ170	A709-50-2	3	2	6	
4		Φ102x6-1240	20	1		17.8	
3		Φ102x6-1691	20	1		24.2	
2		Φ102x6-886	20	2	12.5	25	
1		Φ102x6-475	20	1		6.8	
NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
	J227A0412	Enclosure 2 护栏2	Assembly 组件	4	4x91		1:15

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

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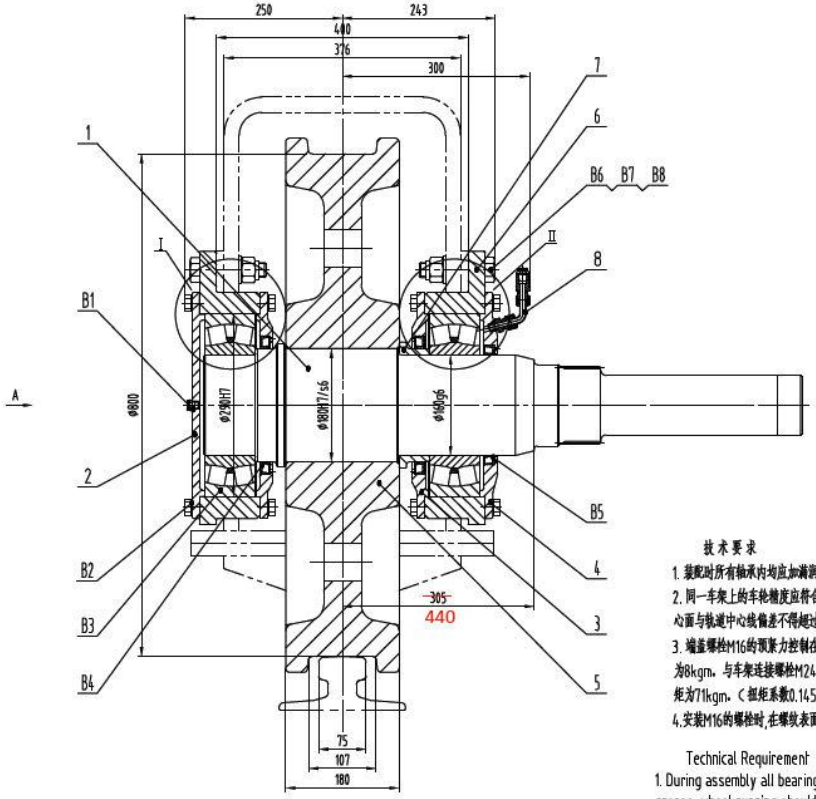
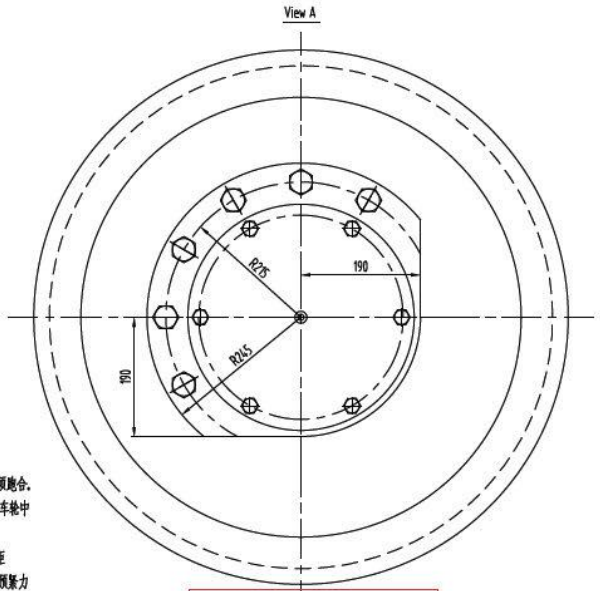
Rev. No.	description	date	sign
01		2005.12.14	gushenqian
02		2006.1.13	gushenqian
03		2006.4.3	gushenqian
	As-built drawing	07.2007	





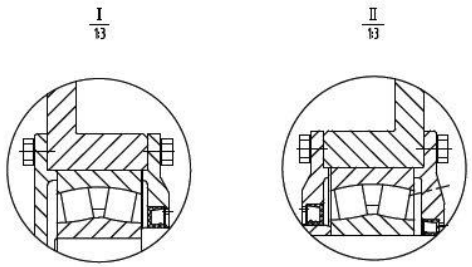
Modify per drawing
J227A041301 &
D21-114A-060401

技术要求

1. 装配时所有轴承内均应加满润滑脂，装配完毕走轮必须跑合。
2. 同一车架上的车轮踏度应符合FEM规范，同一轨道的车轮中心面与轨道中心线偏差不得超过±1mm。
3. 端盖螺栓M16的预紧力控制在3500kg以内，预紧力矩为8kgm。与车架连接螺栓M24的预紧力为15500kg，预紧力矩为71kgm。（扭矩系数0.145）
4. 安装M16的螺栓时，在螺纹表面涂防松胶。

Technical Requirement

1. During assembly all bearing should be filled with appropriate grease, wheel running should be done.
2. Installing accuracy of the wheels on the same bogie is to conform to FEM Specification. Misalingnment between wheel centers plane rolling on the same rail track and centreline of the rail should be not exceed ±1mm.
3. The M16 bolt pre-tension force is 3500kg, the torque is 8kgm. The M24 bolt pre-tension force is 15500kg, the torque is 71kgm.
4. It shall be sprayed anti seize compound on the surface of bolt M16.



NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	QTY/set	WEIGHT each	WEIGHT total	NOTE
8	GTD01-9	Connect grease(接长油嘴)	assembly(组件)	1	2	2	Standard
7	GTD01-8	Sleeve(轴套)	Q235	1		2.5	Standard
6	GTD01-7A	Bearing pedestal(轴承座)	ZG35	2	39	78	Standard
5	J227A041302	Wheel(走轮)ø800	42CrMo	1		445	
4	GTD01-4	Through-hole cover2(通盖2)	Q235	1		9.8	Standard
3	GTD01-3	Through-hole cover1(通盖1)	Q235	2	7.8	15.6	Standard
2	GTD01-2	Blind-hole cover(闷盖)	Q235	1		10.9	Standard
1	J227A041301	Driving shaft(主动轴)	45	1		120	

B8	GB889-86	Nut(螺母)M24	8S Dacro 达克罗	12			
B7	GB5782-86	Bolt(螺栓)M24x110	8.8S Dacro 达克罗	12			
B6	GB95-85	Washer(垫圈)24	Dacro 达克罗	12			
B5	HG64-692-67	Seal(旋转轴唇形密封圈)	PD160x190x16	1			橡胶(rubber)
B4	HG64-692-67	Seal(旋转轴唇形密封圈)	PD180x220x16	2			橡胶(rubber)
B3	SKF	Bearing 轴承22232CC/W33	ø160xø290x80	2	23.5	47	
B2	GB5783-86	Bolt(螺栓)M16x40	8.8S Dacro 达克罗	24			
B1		Grease fitting(油嘴) NPT1/4"	Sta.Ste. 不锈钢	2			

PROJECT: | DESIGN STAGE: | SCALE: 1:6

ITEM NAME: Driving shaft assembly 主动车轮组装配 | DRAW NO: J227A0413 | PROJ.

ZPMC

DSGN		TRACE		APP.	Assembly(组件)
DRAW		CHCK		SET/CRANE	20
CHCK		VER.		WEIGHT	20×735

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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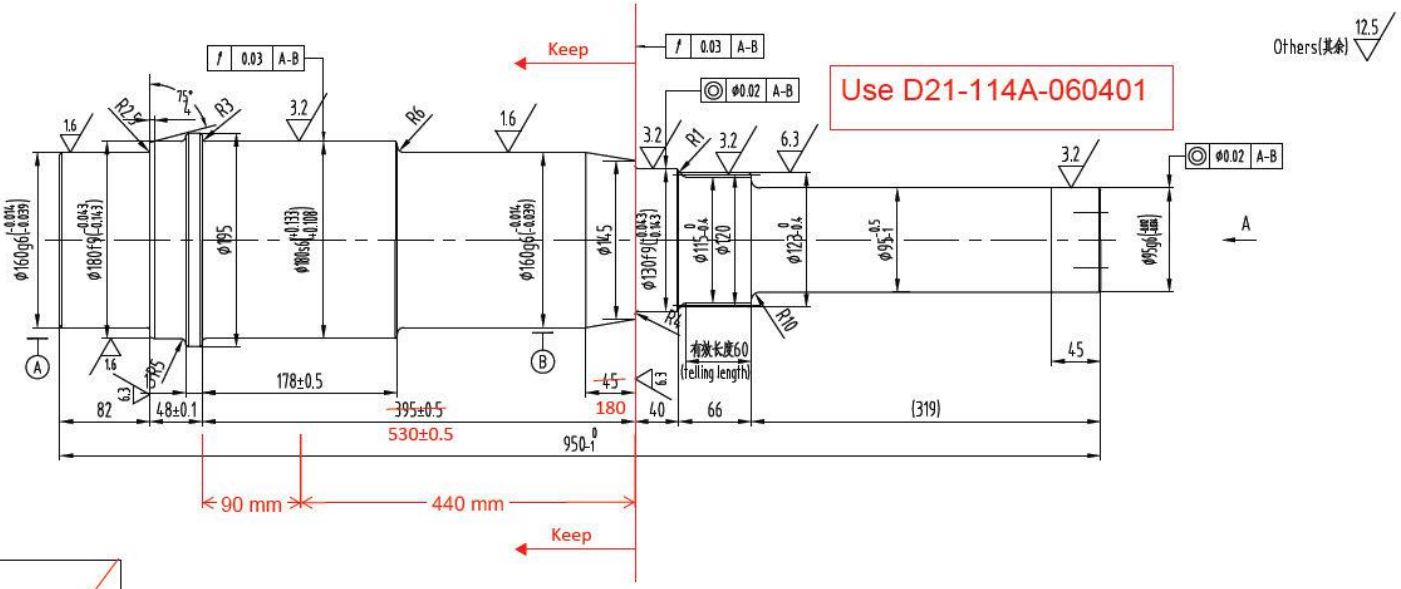
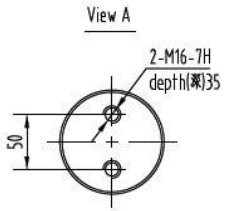
Rev. No.	description	date	sign
01		2006.1.13	gushenqian
	As-built drawing	07.2007	



外花键参数 Spline main date		
Metric Module 模 数	m	3
Teeth number 齿 数	Z	40
Pressure Angel 分度圆压力角	α	30°
Accuracy Grade 精度等级	6h (GB3478.1-83)	
Test Item 检验项目	Tolerence Value 公 差 值	
Total Accumulated Pitch Variation 周节累积误差	Fp	0.081
Tooth Profile Tolerance 齿形公差	Ff	0.043
Tooth Alignment Tolerance 齿向公差	Fβ	0.017
Maximum of Tooth Thickness 作用齿厚最大值	Svmax	4.712
Minimum of acture Tooth Thickness 实际齿厚最小值	Smin	4.578
Minimum of Tooth Thickness 作用齿厚最小值	Svmin	4.634
Maximum of acture Tooth Thickness 实际齿厚最大值	Smax	4.656



Technical Requirement
1. Original material to be checked physically and chemically.
2. Quenching and tempering: HB280-320.
3. Unmarked chamfer 2x45°.

技术要求
1. 原材料需作物理和化学检查,并探伤.
2. 调质处理: HB280-320,
3. 未注倒角均为2x45°.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT	SCALE
	J227A041301	Driving shaft(主动轴)	35CrMo	20	20×120	1:4

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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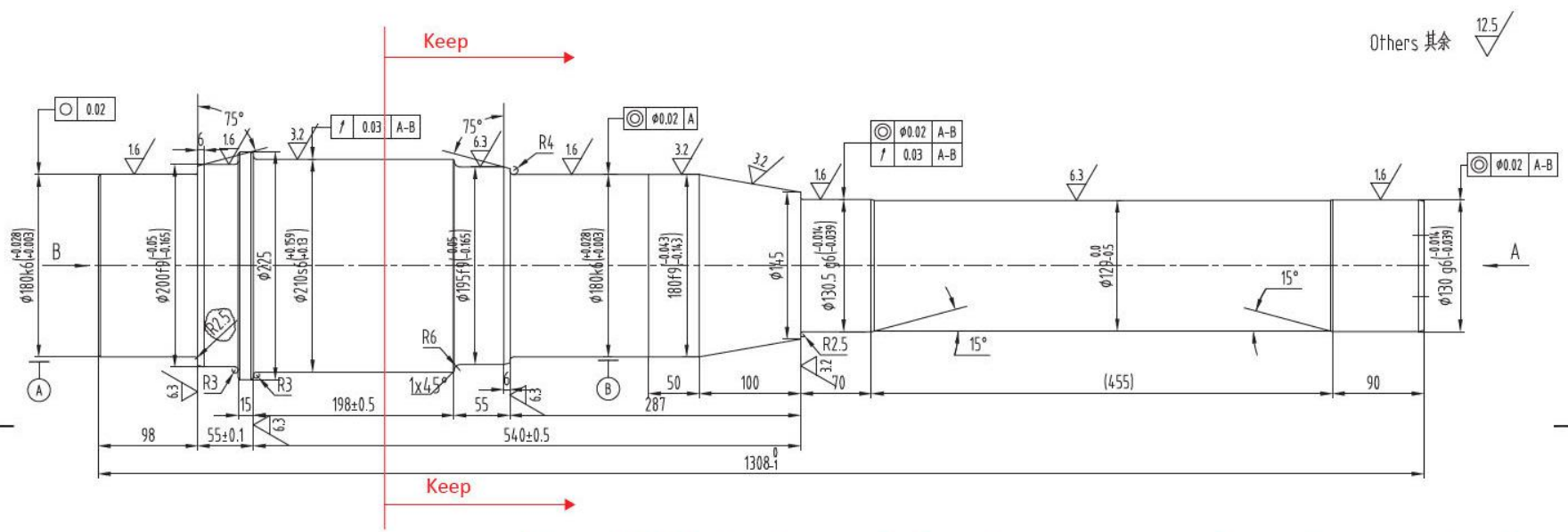
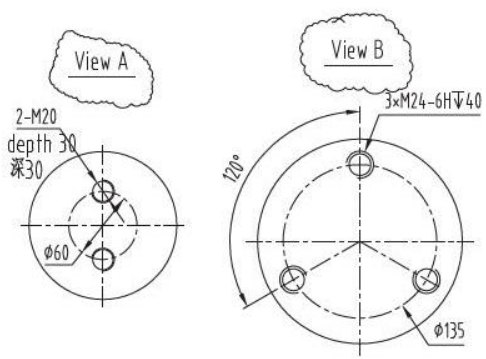
系列号 S/N	

Rev. No.	Description	Date	Sign
1		1.30.2019	Xu Biao
2		04.23.2019	Xu Biao





*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

Technical Requirement

1.The material should be UT tested.
2.Hardeding and tempering: HB 280~320
3.Unmarked chamfer 2x45°.

技术条件

1.原材料需作UT探伤检查.
2.调质处理: HB 280~320
3.未注倒角均为2X45°.

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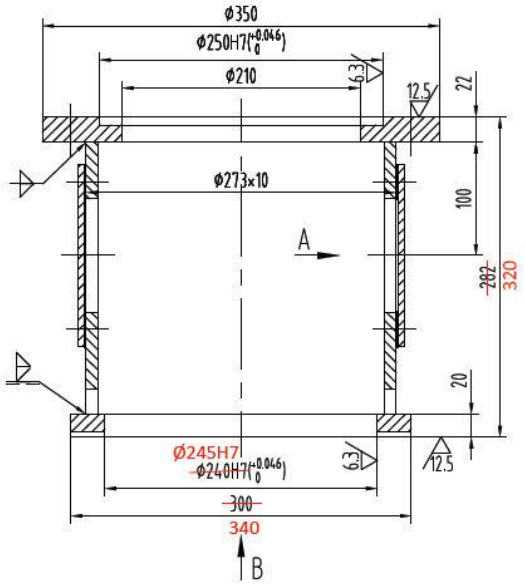
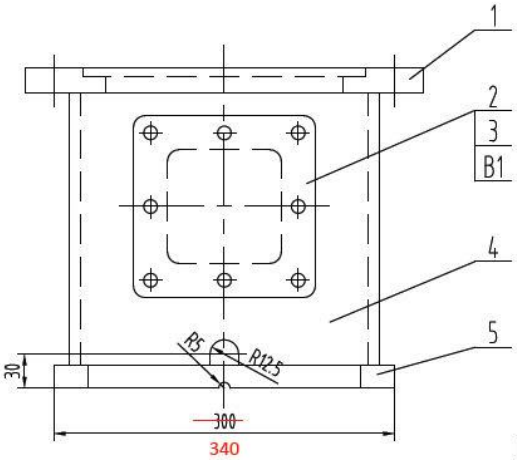
序号 NO.	图号或标准 SUB NO. OR STDD	版本 REV	名称&规格 NAME&SIZE	材质 MTRL	数量 QTY	单重 UNIT WT	总重 TOTAL WT	备注 NOTE
1			锻件 φ225 l=1308 Forging	35CrMo	1	199.20	199.2	", Δ

设计/DSGN		校对/CHK	
日期/DATE		日期/DATE	
材料/MTRL	35CrMo	图名/DRAWING NAME	主动轴 driving shaft
单重/WT(kg)	199.2	比例/SCALE	1:4
图号/DRAWING NO.	D21-114A-060401	版本/REV	
图幅/SIZE	A3	页号/PAGE	1/1

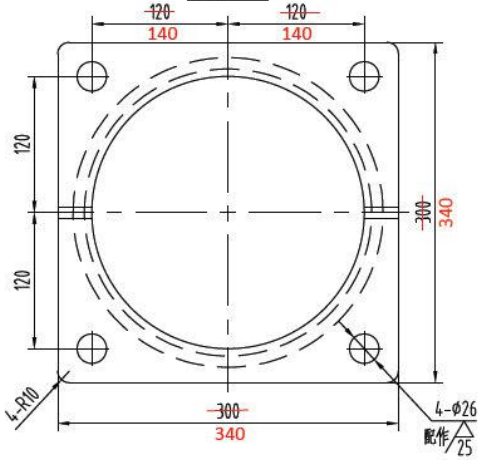
上海振华重工 ZPMC

010302dr

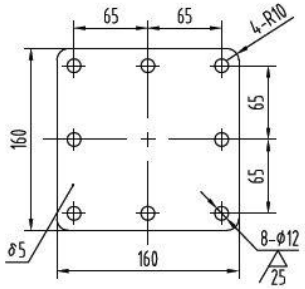




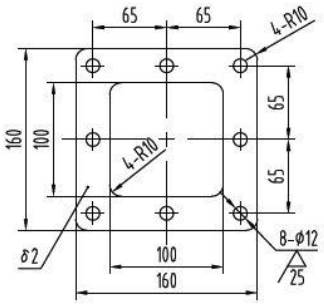
View B

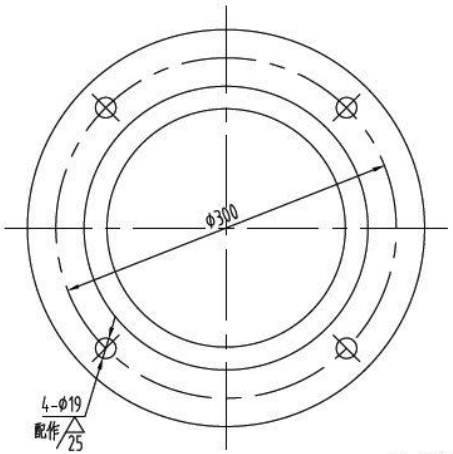


Piece 2

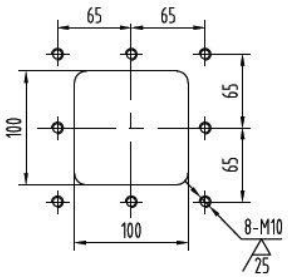


Piece 3





View A



注: 安装M10的螺栓时,在螺纹表面涂乐泰胶防松.
It shall be sprayed anti seize compound on the surface of bolt M10.

B1	GB5783-86	Bolt 螺栓M10×20	Sta. Ste. 不锈钢	16			
5		(-20)×300×300	A709-50-2	1		6.7	
4		Φ273×10-240	20	1		16	
3		-2×160×160	Rubber 橡胶	2			
2		-5×160×160	Q235	2	1	2	
1		(-22)×Φ350/Φ210	A709-50-2	1		9.8	
NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT		SCALE
	J227A0415	Flange 联接法兰	welded 焊接件	20	20×35		1:4

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

*Note - ZPMC Engineering to verify dimensions, component updates, and comments in red.

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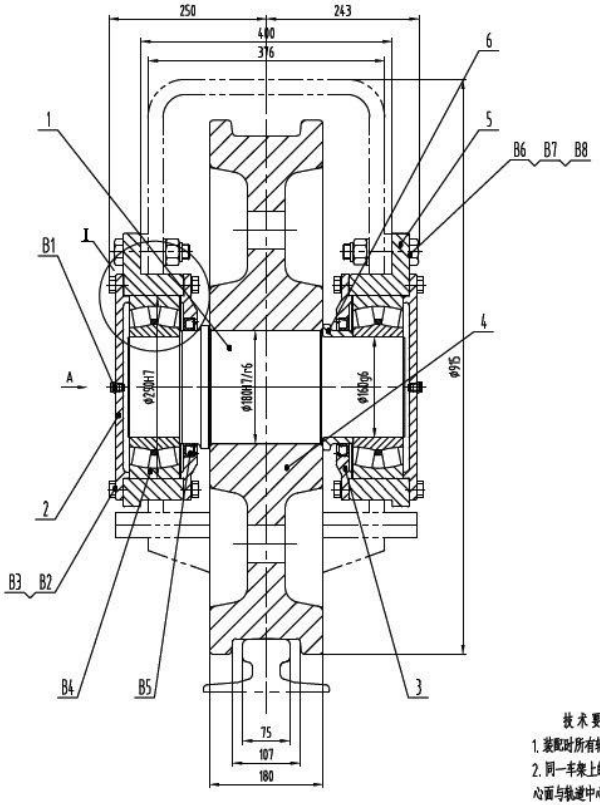

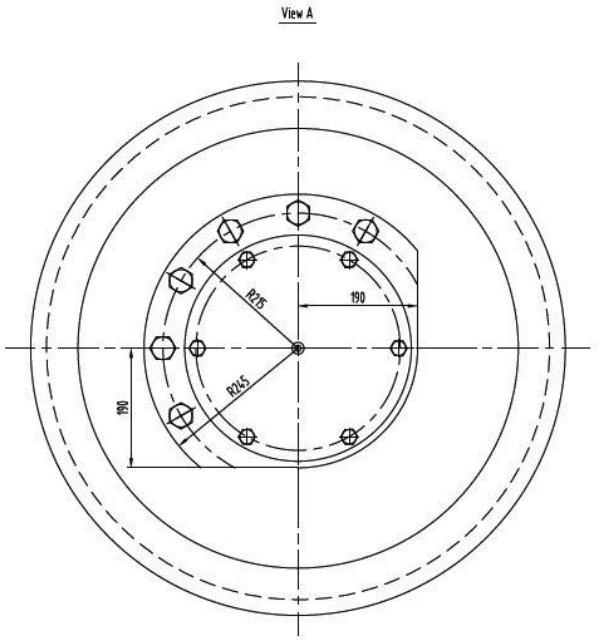

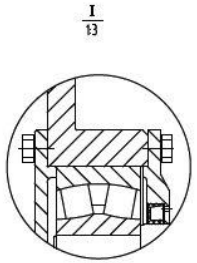

技术要求

1. 装配时所有轴承内均应加满润滑脂。装配完毕走轮必须跑合。
2. 同一车架上的车轮精度应符合FEM规范。同一轨道的车轮中心面与轨道中心线偏差不得超过±1mm。
3. 端盖螺栓M16的预紧力控制在3500kg以内，预紧力矩为8kgm。与车架连接螺栓M24的预紧力为15500kg。预紧力矩为71kgm。（扭矩系数0.145）
4. 安装M16的螺栓时，在螺纹表面涂防松胶。

Technical Requirement

1. During assembly all bearing should be filled with appropriate grease, wheel running should be done.
2. Installing accuracy of the wheels on the same bogie is to conform to FEM Specification. Misalignment between wheel centers plane rolling on the same rail track and centreline of the rail should be not exceed ±1mm.
3. The M16 bolt pre-tension force is 3500kg, the torque is 8kgm. The M24 bolt pre-tension force is 15500kg, the torque is 71kgm.
4. It shall be sprayed anti seize compound on the surface of bolt M16.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	QTY/set	WEIGHT each	WEIGHT total	NOTE
B7	GB889-86	Nut(螺母)M24	8S Dacro.达克罗	12			
B6	GB5782-86	Bolt(螺栓)M24x110	8.8S Dacro.达克罗	12			
B5	GB95-85	Washer(双耳止动垫圈) 24	Dacro.达克罗	12			
B4	HG64-692-67	Seal(旋转轴骨架密封圈)	PD180x220x16	2			
B3	SKF	Bearing(轴承)22232 CC/W33	φ160xφ290x80	2	23.5	47	
B2	GB5783-86	Bolt(螺栓)M16x40	8.8S Dacro.达克罗	24			
B1		Grease fitting(油嘴) NPT1/4"	Sts.Sta.不锈钢	2			
6	GTD01-8	Sleeve(轴套)	Q235	1	2.5	2.5	Standard
5	GTD01-7A	Bearing pedestal(轴承座)	ZG35	2	39	78	Standard
4	J227A041302	Wheel(走轮)φ800	42CrMo	1	445	445	Borrow
3	GTD01-3	Through-cover1(通盖1)	Q235	2	7.8	15.6	Standard
2	GTD01-2	Blind-cover(闷盖)	Q235	2	10.9	21.8	Standard
1	GTD01-6	Driven shaft(从动轴)	45	1	85	85	Standard

PROJECT:		DESIGN STAGE:		SCALE:	1:5	
ITEM NAME: Driven shaft assembly(从动车轮轴装配)		DRAW NO: J227A0418		PROJ.		
ZPMC	DSGN		TRACE	APP.	Assembly(部件)	
	DRAW		CHCK	SET/CRANE	20	
	CHCK		VER.	WEIGHT	20×700	

Revised
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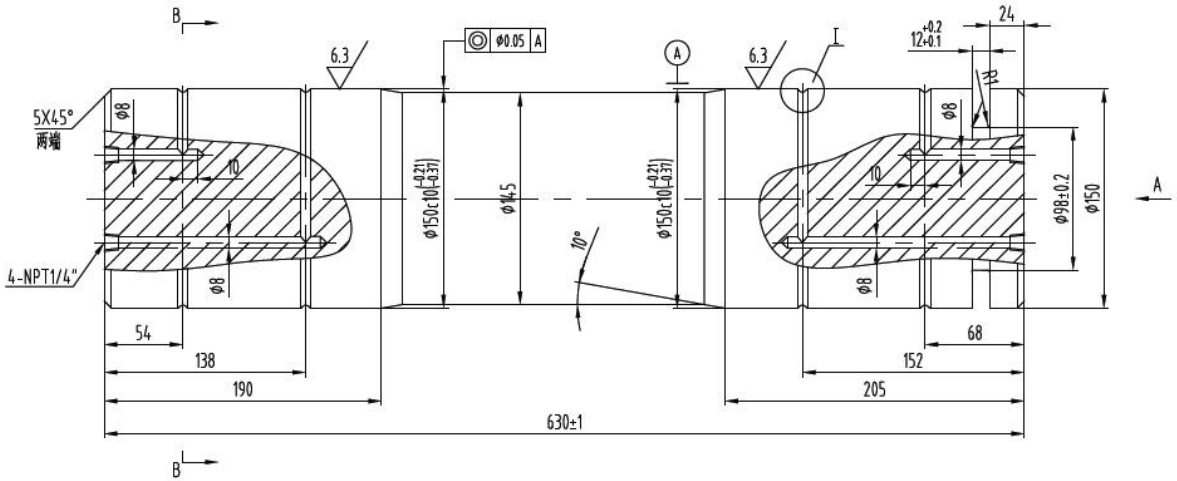
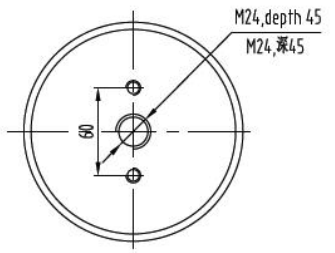
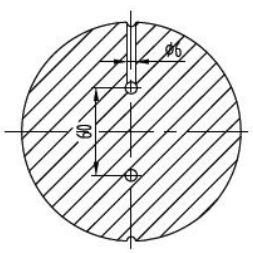
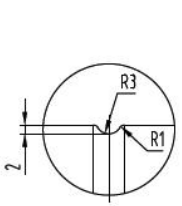
Rev. No.	description	date	sign
01		2005.12.14	gushenqian
	As-built drawing	07.2007	

Others(其余) 12.5









Technical Requirement

1. Quenching and tempering: HB280~320.
2. Original material to be checked physically and chemically.

技术要求

1. 调质: HB280~320.
2. 原材料需作物理和化学检查,并探伤.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT	SCALE
	J227A0419	Shaft(轴)⌀150	35CrMo	16	16×85	1:3

ZPMC	DRAW		TECH.		TRACE	
	CHCK		STDD		CHCK	

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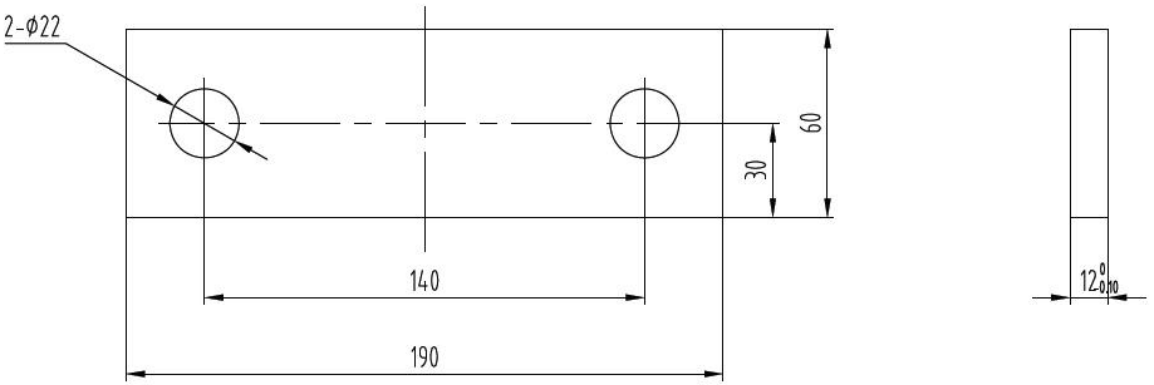
All(全部) 25



Breaking sharp cornser

注:棱边倒角1X45°.

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	SET*WEIGHT	SCALE
	J227A0420	Shaft end plate(卡轴板)	Q235	16	16×1.1	1:2

ZPMC	DRAW			TECH.			TRACE		
	CHCK			STDD			CHCK		

Revised

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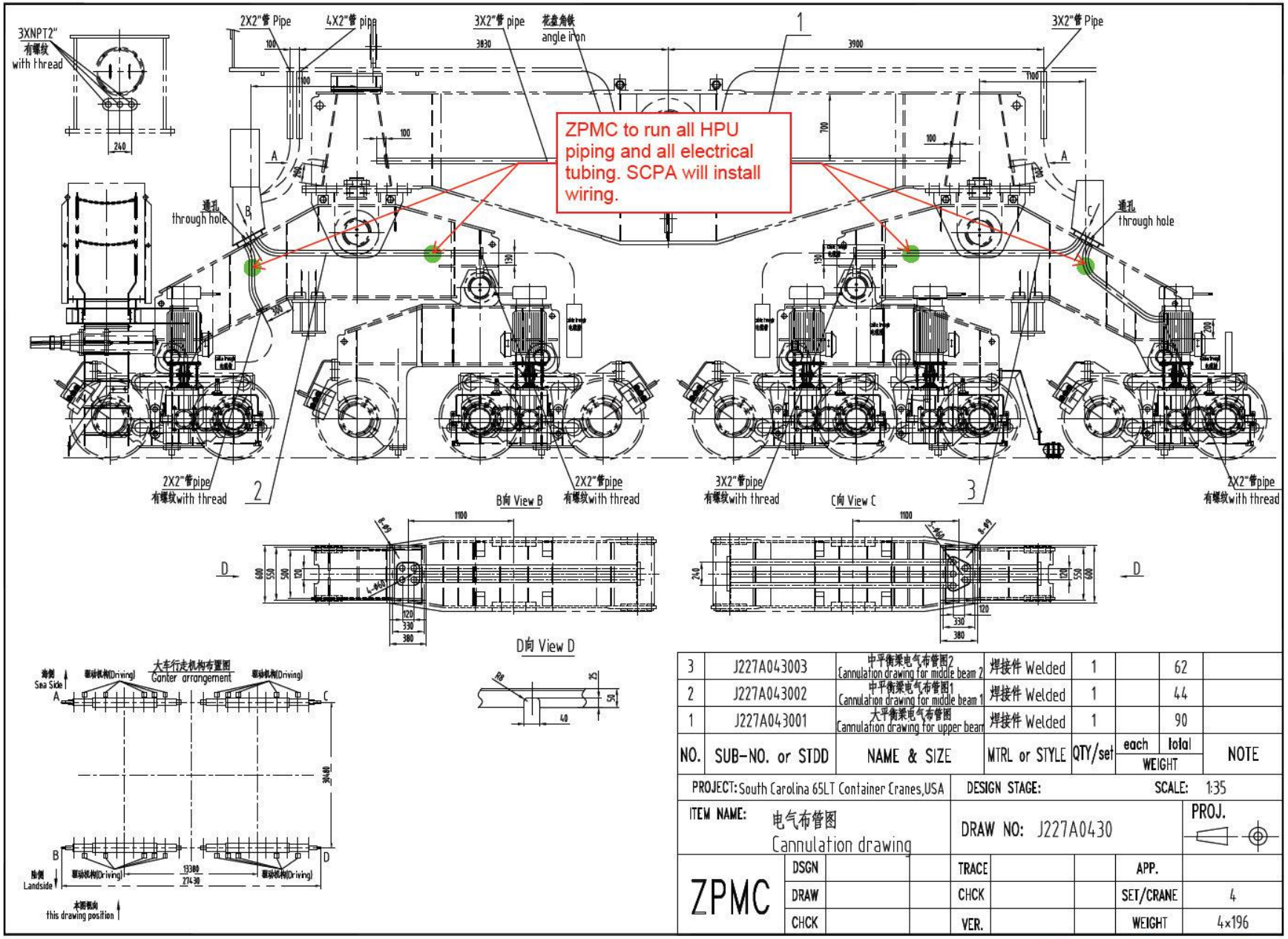

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	QTY/set	WEIGHT each	WEIGHT total	NOTE
3	J227A043003	中平衡梁电气布管图2 Cannulation drawing for middle beam 2	焊接件 Welded	1		62	
2	J227A043002	中平衡梁电气布管图1 Cannulation drawing for middle beam 1	焊接件 Welded	1		44	
1	J227A043001	大平衡梁电气布管图 Cannulation drawing for upper beam	焊接件 Welded	1		90	

PROJECT: South Carolina 65LT Container Cranes,USA

DESIGN STAGE:

SCALE: 1:35

ITEM NAME: 电气布管图 Cannulation drawing

DRAW NO: J227A0430

PROJ.

ZPMC

DSGN		TRACE		APP.	
DRAW		CHCK		SET/CRANE	4
CHCK		VER.		WEIGHT	4×196

Revised

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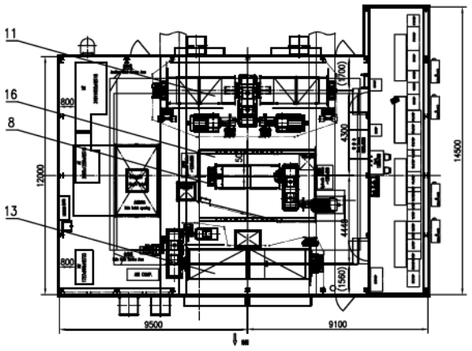
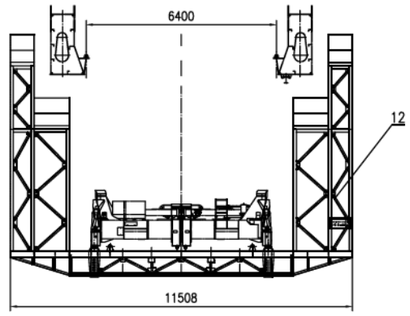
Rev. No.	description	date	sign
02		12.15.2005	Mao
03		01.15.2006	Mao

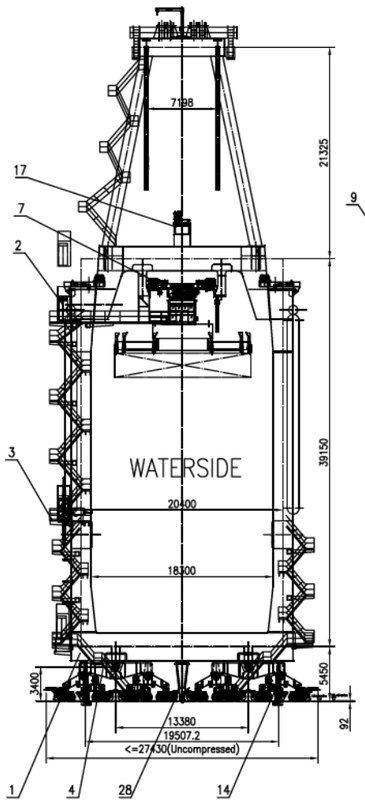
Rated Load under Spreader		Twin Twenty	65LT					
		Single Container	50LT					
Rated Load under Hook		80LT						
Speeds	Main Hoist	Lifted Load(LT)	65	50	40	25	with empty spreader	
		Speed(m/min)	60	70	85	115	170	
	Main Trolley	240m/min						
	Gantry	60m/min						
	Boom Hoisting Time	≤5 min						
Motors	Main Hoist	2x373 Kw	635/1800 rpm	IP55				
	Main Trolley	400 Kw	1750 rpm	IP55				
	Gantry	20x24 Kw	1750 rpm	IP55				
	Boom Hoist	300 Kw	1750 rpm	IP55				

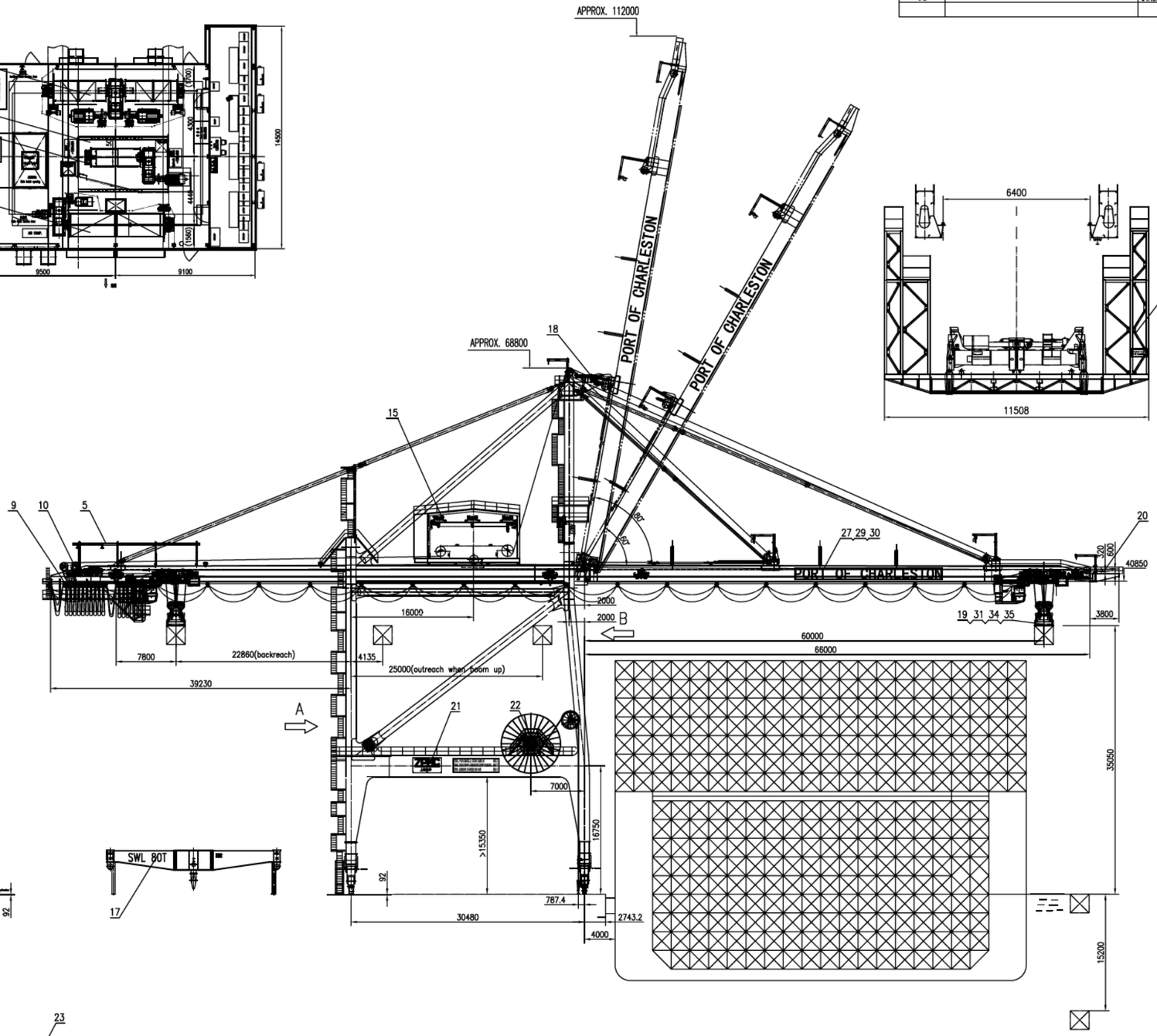
Rail Gage	30.48m	Trim	±3.5°
Out reach	60m	List	±5°
Back reach	22.86m	Skew	±3°
Height of lift	Above rail	35.05m	
	Total	50.25m	
Power	4.16kV, 3ø, 60Hz	Electical Capacity	

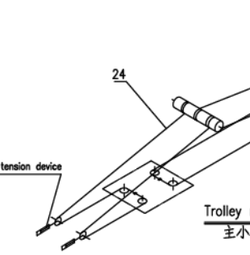




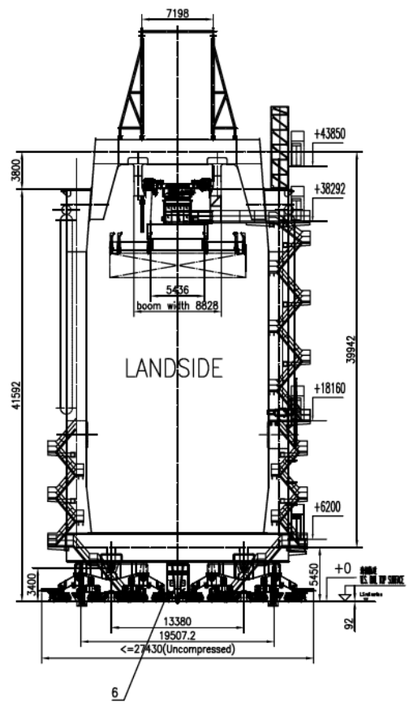
VIEW B

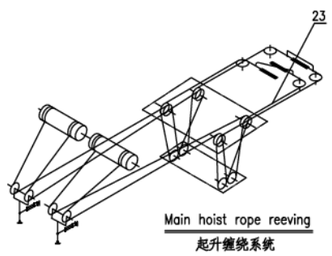






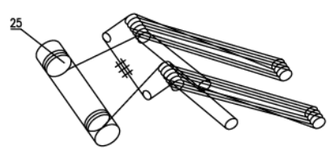
VIEW A



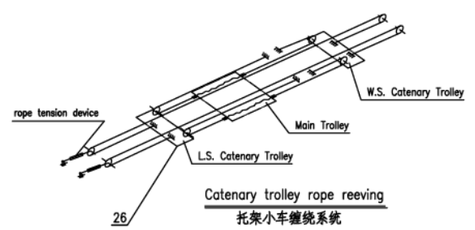


Main hoist rope reeving
起升缠绕系统

Trolley rope reeving
主小车缠绕系统



Boom hoist rope reeving
俯仰缠绕系统



Catenary trolley rope reeving
托架小车缠绕系统

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	QTY/set	each WEIGHT	total WEIGHT	NOTE
PROJECT: North Charleston 65LT Container Cranes, SC, USA			DESIGN STAGE:		SCALE: 1:250		
ITEM NAME: 总布置图 GENERAL ARRANGEMENT			DRAW NO: J227A00		PROJ.		
ZPMC	DSGN		TRACE		APP.		
	DRAW		CHCK		Q'TY/SET		
	CHCK		VER.		SET/CRANE		

SUBSIDIARY LIST

* The quantity and weight of this list is to one set

1 set/crane, _____ kg/set, _____ kg/crane PAGE: 1/2

PROJECT NAME or CODE: North Charleston 65LT Container Cranes	SUB-PART NAME: 总布置图 GENERAL ARRANGEMENT	SUB DRAW NO: J227A00

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	PIECE WGHT	TOTAL WGHT
1	J227A0100	钢结构	Structure	1		
2	J227A0200	电梯	Manlift arrangement	1		
3	J227A0300	梯子,走道,平台	Stairs , Platforms& walkways	1		
4	J227A0400	大车行走机构	Gantry	4		
5	J227A0500	室外维修行车	Outdoors maintenance lift	1		
6	J227A0600	陆侧锚定及理货室	Landside anchor+checker's cab	1		
7	J227A0700	主小车总成	Trolley arrangement	1		
8	J227A0800	主小车驱动机构	Trolley Drive	1		
9	J227A0900	电缆托令系统	Festoon System	1		
10	J227A1000	防挂舱装置	Snag	1		
11	J227A1100	主起升机构	Main Hoist Drive	1		
12	J227A1200	大梁维修平台	Service Platform	1		
13	J227A1300	俯仰机构	Boom hoist drive	1		
14	J227A1400	防风拉索装置	Tie down system	1		
15	J227A1500	机器房	Machinery house	1		
16	J227A1502	换绳装置	Rereeving system	1		
17	J227A1600	80LT吊钩横梁	Cargo Beam	2/4		
18	J227A1700	安全钩	Boom Latch	1		
19	J227A1800	吊具上架	Headblock	1		
20	J227A1900	头部倾转装置	Trim.list &skew device	1		
21	J227A2000	铭牌布置	Nameplate arrangement	1		
22	J227A2100	大车电缆卷筒	HV cable reel device	1		

ZPMC	DSGN			TECH			MTRL		
	CHCK			STDD			CHCK		

SUBSIDIARY LIST

* The quantity and weight of this list is to one set

1 set/crane, _____ kg/set, _____ kg/crane PAGE: 2/2

PROJECT NAME or CODE: North Charleston 65LT Container Cranes	SUB-PART NAME: 总布置图 GENERAL ARRANGEMENT	SUB DRAW NO: J227A00

NO.	SUB-NO. or STDD	NAME & SIZE	MTRL or STYLE	Q'TY/SET	PIECE WGHT	TOTAL WGHT
23	J227A2200	主起升缠绕系统	Main hoist Rope Reeving	1		
24	J227A2300	主小车缠绕系统	Main trolley rope reeving	1		
25	J227A2400	俯仰缠绕系统	Boom hoist rope reeving	1		
26	J227A2500	托架小车缠绕系统	Catenary trolley rope reeving	1		
27	J227A2600	整机限位布置	Limit switch	1		
28	J227A2700	海侧锚定	Seaside Anchor	1		
29	J227A2800	润滑系统	Lubrication system	1		
30	J227A2900	空压机系统	Air compressor system	1		
31	J227A3000	试重水箱	Test Tank	2/4		
32	J227A3100	俯仰室	Boom operate station	1		
33	J227AH	液压系统	Hydraulic system	1		
34	J227AE	电气系统	Electrical system	1		
35		RAM 吊具	RAM Spreader	1		
36		RAM 超高架	Overheight Spreader	1/4		

ZPMC	DSGN			TECH			MTRL		
	CHCK			STDD			CHCK		