

MATERIAL ALERT

Subject; Faulty elbows ex Zibo Wel fit, China

1.0 Background

For the Valhall Re-Development, BP is trying to source topsides pipe and fittings from reputable, western suppliers. However in today's market this is not always possible and we have found that many suppliers are using far east, and in particular, Chinese suppliers for materials. In particular, we are finding considerable quantities of 316L stainless steel coming from these areas. The attached report gives details of defective elbows supplied to the project that originated in China.

2.0 Fittings supply.

The 6 off 36" Sch 40 316L stainless steel elbows were purchased by Heerema, Zwijndrecht from SFF in Stavanger, Norway and were destined to be part of the flare system (see Figure 1). SFF had, in turn, bought from another stockist, Arcus, in Holland who had purchased from the original manufacturer, Zebo Wel Fit in China. ISO 9001 and PED certificates for Zebo are included in Appendix A together with the original certificates for the elbows and plate supplier.

It would appear that SFF did not carry out a visual inspection of the elbows prior to release. We are also waiting to hear if Arcus have undertaken any audits or independent testing of Zebo to include them on their suppliers list.

3.0 History

Contrary to project requirements, SFF had supplied the above elbows without getting approval from BP. However, the vigilance of the BP inspector found them in the Heerema stores and sought out their certification. This aroused the first suspicions as the 3.1 certificate did not show that the weld seams had been X-rayed. Upon request we received the attached X-ray report which clearly indicated that extensive repairs had been made.

On removing the protective plastic wrapping it became clear that many of the weld defects were still present and had not been repaired (see Figure 2). In addition there was extensive undercut and what appeared to be extra sections welded into each end of the elbows (Figures 3, 4 & 5). At this stage the elbows were rejected and the supplier notified. However as an additional check, one elbow was subject to X-ray and the results were appalling. In addition to all the problems observed on the welds including lack of fusion, the base material was found to contain cracking. This is shown in detail below.

4.0 Actions

As a result of the above, we have taken a number of actions to try and eliminate or at least further manage the supply from less reliable sources. These include,

- a. Reminding our fabricators and vendors of their responsibilities which are clearly stated in the design documentation this requires specific project approval of said vendors.
- b. Recommending they or their suppliers carry out a 100% visual inspection prior to release of any non Western supplied material.
- c. Implementing an extensive PMI programme to ensure correct materials have been supplied – at the same time visually inspecting items as PMI is done. (It is recognized that the poor quality welding is not related to PMI but considering other issues around at present, it was deemed to add value and would also through up anymore items supplied from China or similar).



Figure 1 Elbows as received.



Figure 2– Porosity in weld seam



Figure 3 Undercut, LOP etc.

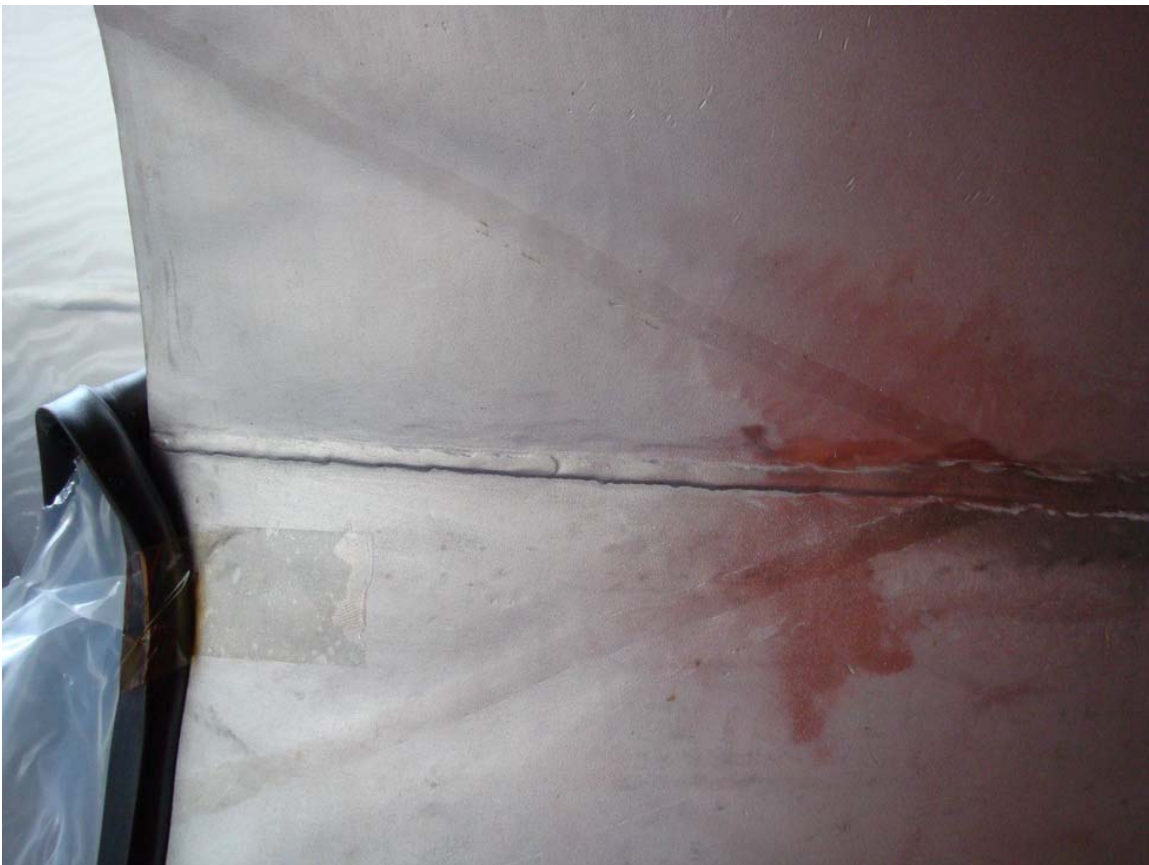


Figure 4 Apparent additional section. Note possible pitting along HAZ



Figure 5 Porosity/pitting.

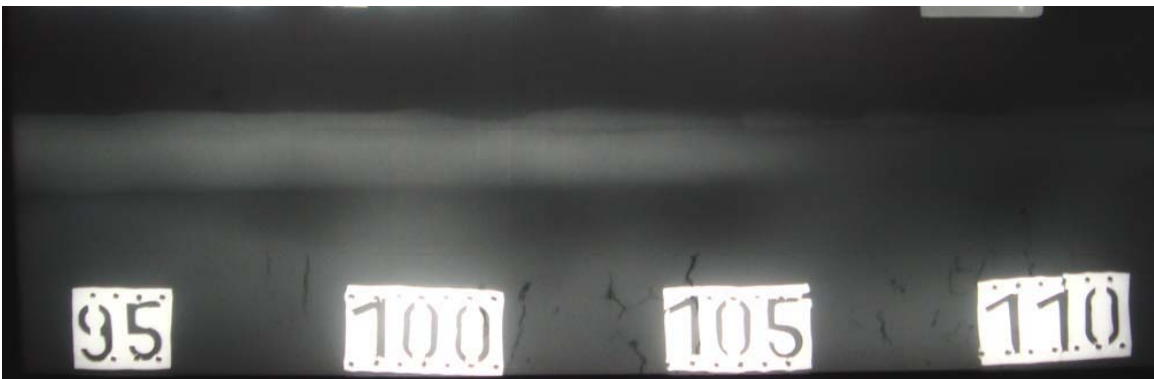


Figure 6 X-ray showing base metal cracking.

APPENDIX A



BUREAU
VERITAS

CERTIFICATE

for Product of Material Manufacturer
conforming to Pressure Equipment Directive 97/23/EC

Award to

ZIBO WEL-FIT METAL PRODUCTS CO., LTD

Address: NO18, LUSHAN ROAD, LINZI, 255418, ZIBO, CHINA

Bureau Veritas certifies that the above company has been assessed for approval of its production for pipe fittings and found that the types identified hereunder comply with the requirements of Pressure Equipment Directive 97/23/EC, Annex I, Article 4 and the required specification. A quality assurance system established and operated by the manufacturer was audited by Bureau Veritas to verify its conformity with the Directive as well.

Certificate No. : **IDD/Q-07/018-01**

Product description: **Pipe Fittings, details see annex of this certificate**

Approved manufacturing site: **Same to Above Address.**

Audit Report No.: **IR- IDD/Q-07/018**

This certificate is valid until: **20th, July, 2010**

Subject to the continued satisfactory operation of the company, annual audits are to be performed by qualified surveyors from Bureau Veritas.

Made at : **Shanghai, P.R.C.**

On : **21st January, 2008**

Signed by :

Gilles Fan
C.C. LTD.

This certificate is subject to the terms of Bureau Veritas General Conditions of Service attached to the agreement signed by the applicant.

BUREAU VERITAS Consulting (Shanghai) CO.LTD
Add : No.1 Pudong Avenue, Shanghai 200120, China

Tel : +86(21) 6886 0543

Fax : +86(21) 6886 1421

Website : www.bureauveritas.cn



BUREAU
VERITAS

Annex to the Certificate for Product of Material Manufacturer

Certificate No. : IDD/Q-07/018-01

List of the pipe fittings for approval in acc. with PED 97/23/EC:

The fittings for which the references are indicated below comply with the essential safety requirements set out in the annex I, and Article 4 of the directive 97/23/EC

Material grade	Material specification in reference	Comments
WPB; WP5; WP9; WP11; WP22	ASME SA 234/SA 234M	a. Only for Seamless Pipe fittings and Pipe fitting Welded by plates.
WP304; WP304L; WP316; WP316L	ASME SA 403/SA 403M	b. TSmin not less than 0 Celsius Degree. c. Performed impact test batch by batch

Taking into account the following survey carried out by the qualified surveyor from Bureau Veritas Shanghai District:

- ♦ Satisfactory review of the technical documents and inspection records for approval of manufacturing process. PQR No. EM1007; EM1008; EM1009; EM1010; EM1012; EM1017; EM1018.
- ♦ Satisfactory audit on the above mentioned factory and issue the audit report ref. IR- IDD/Q-07/018 Dated on 19th, July, 2007.

BUREAU VERITAS Consulting (Shanghai) CO.LTD
Add : No.1 Pudong Avenue, Shanghai 200120, China

Tel : +86(21) 6886 0643

Fax : +86(21) 6886 1421

Website : www.bureauveritas.cn

Certificate of Registration



This is to certify that the
Quality Management System of

Zibo Wei-fit Metal Products Co., Ltd.

No. 18, Lushan Road, Fenghuang Town, Linzi District, Zibo,
Shandong Province, P. R. China

has been assessed and found complying with

ISO 9001: 2000

Approval is hereby granted for registration providing the rules and conditions relating to
certification are observed at all times. This certification has been accredited by a member of
International Accreditation Forum MLA for Quality Management System.
The certificate is not valid until the annual hologram is presented.

CERTIFICATION SCOPE:

Design and Manufacture of Stainless & Carbon Steel Butt-welding Pipe Fittings and
Accessories

REGISTRATION NO.: **110611043**


Authorised Signatory



DATE OF ISSUE: December 30, 2008
VALID UNTIL: December 29, 2009



Moody International Certification Ltd.
www.moodyint.com

The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the Accreditation Certificate 014.
The certificate remains the property of Moody International Certification Limited to whom it must be returned on request.

INSPECTION CERTIFICATE (质量保证书)

We certify that undimensioned material has been produced, inspected in accordance with order prescriptions and required specification

DESCRIPTION: HOT-ROLLED STAINLESS STEEL PLATE (品名: 热轧不锈钢板)

END USER (最终用户):
CUSTOMER (顾客): 江苏大明金属制品有限公司
SPECIFICATION (规格): ASTM A 240/480
TYPE & FINISH (钢种及处理方式): 316L

我方保证下述产品是根据订单要求, 相关规定进行
EN 10204 3.1



KUNSHAN DAEKUNG
ADD: LONGDENG ROAD, ECONOMIC TECHNICAL
DEVELOPMENT ZONE, KUNSHAN, JIANGSU 215300 P.R.
地址: 中国江苏省昆山经济技术开发区龙登路66号
TEL: (0512) 57900998 FAX: (0512) 57700372

Certificate Ref. No. (证书参考号): 2007-0912-L3DM-1-009 718
Issuing Date (发行日期): Sep. 12, 2007
Purchase Order No. (购买订单号):
CONTRACT No. (合同号): 200709-11205

Bundle No. (包号)	炉号	板号	产品尺寸 (mm)			数量	重量 (Kg)	TENSILE TEST		CHEMICAL COMPOSITION (%)												IMPACT TEST		AGS ASTM E 112							
			T	W	L			MPa	%	Co	C	Si	Mn	P	S	Cr	Ni	Mo	N	P	SI	SIZE	Temp								
567	SF03934	QXS1468-2-02	16.00	1500	6000	1	1149	T C A	267.9	288.8	557.4	60.0	78.2	L	0.018	0.63	1.10	0.031	0.002	16.69	10.54	2.10	0.010			6.7	合格				
567	SF03934	QXS1468-9-02	16.00	1500	6000	1	1149	T C A	267.9	288.8	557.4	60.0	78.2	L	0.018	0.63	1.10	0.031	0.002	16.69	10.54	2.10	0.010			6.7	合格				
827	7N1397C	7N1397C-5-01	16.00	1500	6000	1	1149	T C A	325.4	339.9	578.3	60.0	78.1	L	0.022	0.71	1.07	0.030	0.001	16.77	10.06	2.04	0.020			6.6	合格				
827	7N1397D	7N1397D-1-01	16.00	1500	6000	1	1149	T C A	311.6	342.6	635.4	60.0	81.2	L	0.022	0.71	1.07	0.030	0.001	16.77	10.06	2.04	0.020			6.7	合格				
827	7N1669Y	7N1669Y-4-01	16.00	1500	6000	1	1149	T C A	289.4	320.5	635.8	60.0	78.3	L	0.026	0.70	1.08	0.028	0.001	16.41	10.05	2.02	0.020			6.5	合格				
827	7N1669Y	7N1669Y-6-01	16.00	1500	6000	1	1149	T C A	289.4	320.5	635.8	60.0	78.3	L	0.026	0.70	1.08	0.028	0.001	16.41	10.05	2.02	0.020			6.8	合格				
830	SF03729	QXS0812-1-02	20.00	1500	6000	5	5862	T C A	303.0	320.1	574.2	58.0	77.1	L	0.015	0.62	1.13	0.030	0.003	16.73	10.54	2.11	0.010			6.8	合格				
830	SF03729	QXS0812-10-02	20.00	1500	6000	5	5862	T C A	303.0	320.1	574.2	58.0	77.1	L	0.015	0.62	1.13	0.030	0.003	16.73	10.54	2.11	0.010			6.8	合格				
830	SF03729	QXS0862-12-01	20.00	1500	6000	5	5862	T C A	303.0	320.1	574.2	58.0	77.1	L	0.015	0.62	1.13	0.030	0.003	16.73	10.54	2.11	0.010			6.8	合格				
830	SF03729	QXS0862-13-02	20.00	1500	6000	5	5862	T C A	303.0	320.1	574.2	58.0	77.1	L	0.015	0.62	1.13	0.030	0.003	16.73	10.54	2.11	0.010			6.8	合格				
Sub Total			10			10,342.0	Grand Total			78			56,026.0																		

DIMENSIONAL EXAMINATION: GOOD 尺寸检测: 良好

HEAT TREATMENT: SOLUTION TREATMENT 热处理: 固溶处理

1105 °C WATER COOLING 1105 °C 冷却方法: 水冷却

SURFACE CONDITION: GOOD 表面状况: 良好

ADDITIONAL SPEC (补充规格)

SURVEYOR TO: (主管):

CHECKED AND VERIFIED BY: 2007.9.12

HEAT ID: C600025

ZIBO WEL-FIT METAL PRODUCTS CO. LTD

POSITION (位置): T TOP (头部) M MIDDLE (中间) B BOTTOM (底部)

DIRECTION (方向): L LONGITUDINAL (纵向) C CROSSWISE (横向)

IMPACT TEST SPECIMEN SIZE (冲击试样尺寸): 1-10x10M 2-7.5x10M 3-5.0x10M 4-2.5x10M

10% OXALIC ACID ETCH TEST (原液浸蚀实验)

1. STEP STRUCTURE (附铸组织) 2. DUAL STRUCTURE (混合组织) 3. DITCH STRUCTURE (沟状组织) 4. ISOLATED FERRITE POOLS (游离铁素体组织)

5. INTERDENDRITIC DITCHES (枝晶沟状) 6. END GRAIN PITCHING LII (晶界点蚀)

GAUGE LENGTH (标准长度): RECTANGULAR (板材) A: 50mm B: 70mm C: 100mm D: 5.65-VA E: 50mm F: 70mm G: 5.65-VA ROUND (棒材)

DIVISION (成分分析): L LADLE ANALYSIS (钢水分析) P PRODUCT ANALYSIS (产品分析)

We commit ourselves to the highest Technology & Top Quality in all products (我方承诺: 技术领先, 品质至上)

KUNSHAN DAEKUNG CORP.

Purchaser: ARCUS NEDERLAND B.V.
Order No.: DE04028V0411068
Invoice No.: ZXR070255

PROJECT: Vahall Re-development
CLIENT: HEEREMA ZWINDRECHT B.V.
CLIENT ART. CODE: 1065
PRODUCT NO.: 46833
Compliance with Client specification: Signed: KJ
OFF Q.C. - DEPT

MILL TEST CERTIFICATE
ZIBO WEL-FIT PIPING SYSTEMS CO., LTD
FENGHUANG TOWN INDUSTRIAL PARK, LINZI, ZIBO, P.R. CHINA 255418



ORIGINAL

Date: Jan 20, 2008
Certificate No.: ZXR070255
Certificate to: EN 10204-2004 3.1

Material Specification
ASTM A403/ASME SA403
WFS316(L) NACE MR0175-02

Specification for Inspection
ASME B16.9-03
MSS-SP43-91

Visual and Dimensional Inspection: GOOD

Hardness: Max 22HRC <22HRC

Cr+Ni+Cr+Mo

Cr+Mo

MT(B)

IGC(B) GOOD

PMI(B) GOOD


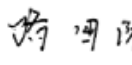

Product Description	Heat I.D.	Quantity (Pcs)	Tension Test (1)			Chemical Composition %													Heat Treatment (2)	Raw Material																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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LR 90 ELBOW SCH40S 316/316L-WX	36 C600025	6	303	574	58	0.030	1.00	2.00	0.045	0.030	16.0	2.00	10.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</

Note: (1) YS=Yield Strength TS=Tensile Strength E=Elongation (2) CE=C+MnS-(Cr+Mo+V)/5+(Ni+Cu)/15
Note: (3) HF: Hot formed (600-900 °C) and cooled in still air. S: Cold formed and normalized (900 °C±50°F), cooled in still air.
SA: Cold formed and solution annealed at 1050 °C±10°F, water quenched. (4) 1=Seamless Pipe 2=Welded Pipe 3=Steel Plate
Note: (5) IGC=Intergranular Corrosion Test to ASTM A262 E PMI=Positive Material Inspection RT=Radiographical Test MT=Magnetic Particle Test
Note: (6) DKC=KUNSHAN DAEKUNG
ACCORDING TO EN 10204.3.1
MATERIAL: ASTM A 403/ASME SA403, ANSI B16.9 PMH ASTM A262 PRACT E NACE MR-0175
BASE MATERIAL ACC TO EN 10204.3.1 PED 97/23/EC ISO 9002 304/304L AND 316/316L
General Note: The analysis for the elements with an amount of less than 0.001% are not represented by a symbol above.

We hereby certify that the products detailed herein have been manufactured and inspected in accordance with the specifications concerned and also with the purchaser's requirements and that the test results shown herein are correct. This material was manufactured, tested, and inspected without mercurial contamination

淄博鑫源管路配件有限公司
ZIBO WEL-FIT PIPING SYSTEMS CO., LTD.

QUALITY ASSURANCE MANAGER

 ZIBO WEL-FIT METAL PRODUCTS CO., LTD 淄博鑫利金属制品有限公司 NO 18, LUSHAN ROAD, LINZI, ZIBO, P.R.CHINA 255418 中国淄博市临淄区山路18号 255418		Radiographic Examination Report 射线检验报告 Report No. 报告编号: ZBXR-0025S-001 Date of Exam. 检验日期: 2007-12-28	
Client 客户: Desc. 工件名称: EL Base Material 母材: 316/316L Welder Name 焊工姓名: Dou Welan 窦维安 Spec. 检验标准: ASME VIII DIV1/UW51		Contract No. 合同号: Size 规格: SCH40S 36 Base Mat.Thk. 母材厚度: 10 Welder Code 焊工编号: WF-04 Procedure 探伤工艺编号: ZBWF-03-97	
		Job No. 订单号: XR0025S Heat ID 炉号: C600025 Weld Thickness 焊缝厚度: 12 Weld Proc. 焊接方法: PAW Dwg No. 图纸编号:	
Radiographic System 射线检验系统			
Apparatus 仪器	Equip. Make 设备型号: XXH-3005Z		Radiographic <input type="checkbox"/> Gamma 伽玛射线
	Serial No. 设备编号: 27808		Type 射线种类: <input checked="" type="checkbox"/> X-Ray X射线
	Focal Spot Size 焦点尺寸: 1.0X3.5		Isotope 同位素:
Accessorial Material 辅材	Film Brand 胶片型号: Tianjin III 天津III型		IQI 像质计型号: ASME B
	No. of Film in Each Cassette 每只胶片暗盒中的胶片数量: 1		Sensitivity 灵敏度: Pb Front/ Back 0.03mm
Examination Conditions 射线检验拍片条件			
Radiographic Technique 射线照相技术: Single Wall Single Viewing 单壁透照单壁观察			
Strength 伽玛源强度Ci:		Tube Volt. 管电压KV: 190	Tube Current 管电流mA: 5
Source to Film Distance 焦距: 600mm		Exp Time S 曝光时间(秒): 180	No. of Exp. 曝光数量:
Image Quality 像质: 7		IQI Placement 像质计位置:	Source Side 线源侧
Film Proc 冲洗方式: Manual 手工		Developer 显影液: 冲洗套药	Time m 显影时间(分): 5
Temp. 温度°C: 20			
S/N 序号	Seam No. 焊缝编号	Film No. 底片编号	Acc. 合格
			Rej. 不合格
Remarks 备注			
1	01A1	1	<input checked="" type="checkbox"/>
2	01A1	1R	<input checked="" type="checkbox"/>
3	01A1	2	<input checked="" type="checkbox"/>
4	01A1	2R	<input checked="" type="checkbox"/>
5	01A1	3	<input checked="" type="checkbox"/>
6	01A1	3R	<input checked="" type="checkbox"/>
7	01A1	4	<input checked="" type="checkbox"/>
8	01A1	5	<input checked="" type="checkbox"/>
9	01A1	6	<input checked="" type="checkbox"/>
10	01A1	7	<input checked="" type="checkbox"/>
11	01A1	7R	<input checked="" type="checkbox"/>
12	01A1	8	<input checked="" type="checkbox"/>
13	01A1	8R	<input checked="" type="checkbox"/>
14	01A1	9	<input checked="" type="checkbox"/>
15	01A1	9R	<input checked="" type="checkbox"/>
16	01A1	10	<input checked="" type="checkbox"/>
17	01A1	10R	<input checked="" type="checkbox"/>
18	01A2	1	<input type="checkbox"/>
19	01A2	2	<input type="checkbox"/>
20	01A2	3	<input type="checkbox"/>
21	01A2	4	<input checked="" type="checkbox"/>
22	01A2	5	<input checked="" type="checkbox"/>
23			<input type="checkbox"/>
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27			<input type="checkbox"/>
28			<input type="checkbox"/>
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37			<input type="checkbox"/>
38			<input type="checkbox"/>
39			<input type="checkbox"/>
40			<input type="checkbox"/>
C=Crack 裂纹 P=Porosity 圆形气孔 Worm Porosity 长形气孔 SI=Slag Inclusion 夹渣 IF=Incomplete Fusion 未熔合 IP=Incomplete Penetration 未焊透 UC=Undercut 咬边 BT=Burn Through 烧穿 RC=Root Concavity 根凹			
Result 结论: Accepted. 合格.			
Sketch 略图			
Examined by: 检验:  Signature: 签名:		Level: SNT-TC-1A RT III 级别: Date: 2007-12-28 日期:	
Approved by: 批准:  Signature: 签名:		Level: SNT-TC-1A RT III 级别: Date: 2007-12-28 日期:	
Client 客户:			