

## 出國報告（出國類別：其他）

### 龍門計劃國外製造機械、儀電設備製程中品質查驗

服務機關：台灣電力公司核能安全處

姓名職稱：羅士貴 核能工程監

派赴國家：韓國、德國

出國期間：95年10月26日~95年11月6日

報告日期：95年12月13日

## 出國報告審核表

|                               |  |                  |
|-------------------------------|--|------------------|
| 出國報告名稱：龍門計劃國外製造機械、儀電設備製程中品質查驗 |  |                  |
| 出國人姓名(2人以上，以1人爲代表)            | 職稱   | 服務單位             |
| 羅士貴                           | 核能工程監  | 核能安全處            |
| 出國期間：95年10月26日至95年11月6日       |  | 報告繳交日期：95年12月13日 |
| 出國計畫主辦機關審核意見                  | <input checked="" type="checkbox"/> 1.依限繳交出國報告<br><input checked="" type="checkbox"/> 2.格式完整(本文必須具備「目地」、「過程」、「心得」、「建議事項」)<br><input checked="" type="checkbox"/> 3.內容充實完備.<br><input checked="" type="checkbox"/> 4.建議具參考價值<br><input type="checkbox"/> 5.送本機關參考或研辦<br><input type="checkbox"/> 6.送上級機關參考<br><input type="checkbox"/> 7.退回補正，原因： <input type="checkbox"/> (1) 不符原核定出國計畫 <input type="checkbox"/> (2) 以外文撰寫或僅以所蒐集外文資料爲內容以 <input type="checkbox"/> (3) 內容空洞簡略 <input type="checkbox"/> (4) 電子檔案未依格式辦理 <input type="checkbox"/> (5) 未於資訊網登錄提要資料及傳送出國報告電子檔<br><input type="checkbox"/> 8.本報告除上傳至出國報告資訊網外，將採行之公開發表：<br><input type="checkbox"/> 辦理本機關出國報告座談會(說明會)，與同人進行知識分享。<br><input type="checkbox"/> 於本機關業務會報提出報告<br><input type="checkbox"/> 9.其他處理意見及方式： |                  |
| 層轉機關審核意見                      | <input type="checkbox"/> 1.同意主辦機關審核意見 <input type="checkbox"/> 全部 <input type="checkbox"/> 部分_____ (填寫審核意見編號)<br><input type="checkbox"/> 2.退回補正，原因：_____<br><input type="checkbox"/> 3.其他處理意見：  |                  |

說明：

- 一、出國計畫主辦機關即層轉機關時，不需填寫「層轉機關審核意見」。
- 二、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。
- 三、審核作業應於報告提出後二個月內完成。

報告人： 單位主管：

主管處主管



總經理  
副總經理：

徐懷慶 12/18



## 行政院及所屬各機關出國報告提要

出國報告名稱：龍門計劃國外製造機械、儀電設備製程中品質查驗

頁數 61 含附件：是否

出國計畫主辦機關/聯絡人/電話：台灣電力公司/陳德隆(人事處)/02-23667685

出國人員姓名/服務機關/單位/職稱/電話：羅士貴/台灣電力公司/核能安全處/

核能工程監/02-23667199

出國類別：1 考察2 進修3 研究4 實習5 其他

出國期間：95/10/26~95/11/6

出國地區：韓國、德國

報告日期：95/12/13

分類號/目

關鍵詞：龍門計畫、品質查驗

內容摘要：依據龍門計畫採購合約規定，派員赴 BOP 附屬機械設備製造廠家執行製程中品質查驗，本次任務為分別赴（一）MS026 「Large Rubber Expansion Joints」採購案之廠家 HS R&A，因設備交運到龍門施工處後，發現部份橡膠膨脹接頭有 Face to Face 尺寸公差不符規範、接頭橡膠表面磨損或接合面裂痕、Retaining Ring 螺孔錯開、螺栓數量不足或損壞、鐵件氧化或生鏽，以及品質文件短少等缺失案，經開出品質不符案件（NCR）及接收檢驗報告缺失（RIR）函請廠家處理，惟廠家遲未採取積極改正行動，故擬派員與廠家洽商解決設備修復及改正品質缺失；（二）MS034 「Make-up Water Treatment System」採購案之 Vacuum Pump 廠家 Sterling SIHI GmbH，執行設備 Shipping Release 之品質查驗，包括 Final / Packing Inspection、QRP(Quality Record Package)審查及簽署 PQC(Product Quality Certificate)。

本文電子檔已傳至出國報告資訊網 (<http://report.gsn.gov.tw>)

## 出國報告（出國類別：其他）

### 龍門計劃國外製造機械、儀電設備製程中品質查驗

服務機關：台灣電力公司核能安全處

姓名職稱：羅士貴 核能工程監

派赴國家：韓國、德國

出國期間：95年10月26日~95年11月6日

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## 龍門計劃國外製造機械、儀電設備製程中品質查驗

### 摘 要

依據龍門計畫採購合約規定，派員赴 BOP 附屬機械設備製造廠家執行製程中品質查驗，本次任務為分別赴（一）MS026 「Large Rubber Expansion Joints」採購案之廠家 HS R&A，因設備交運到龍門施工處後，發現部份橡膠膨脹接頭有 Face to Face 尺寸公差符合規範、接頭橡膠表面磨損或接合面裂痕、Retaining Ring 螺孔錯開、螺栓數量不足或損壞、鐵件氧化或生銹，以及品質文件短少等缺失案，經開出品質不符案件（NCR）及接收檢驗報告缺失（RIR）函請廠家處理，惟廠家遲未採取積極改正行動，故擬派員與廠家洽商解決設備修復及改正品質缺失；（二）MS034 「Make-up Water Treatment System」採購案之 Vacuum Pump 廠家 Sterling SIHI GmbH，執行設備 Shipping Release 之品質查驗，包括 Final / Packing Inspection、QRP(Quality Record Package)審查及簽署 PQC(Product Quality Certificate)。

# 龍門計劃國外製造機械、儀電設備製程中品質查驗

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## 壹、出國任務說明

本項出國計畫為依據龍門計畫採購合約規定，派員赴 BOP 附屬機械設備製造廠家執行製程中品質查驗，本次任務為分別赴(一) MS026 「Large Rubber Expansion Joints」採購案之廠家 HS R&A，因設備交運到龍門施工處後，發現部份橡膠膨脹接頭有 Face to Face 尺寸公差符合規範、接頭橡膠表面磨損或接合面裂痕、Retaining Ring 螺孔錯開、螺栓數量不足或損壞、鐵件氧化或生鏽，以及品質文件短少等缺失案，經開出品質不符案件 (NCR) 及接收檢驗報告缺失 (RIR) 函請廠家處理，惟廠家遲未採取積極改正行動，故擬派員與廠家洽商解決設備修復及改正品質缺失；(二) MS034 「Make-up Water Treatment System」採購案之 Vacuum Pump 廠家 Sterling SIHI GmbH，執行設備 Shipping Release 之品質查驗，包括 Final / Packing Inspection、QRP(Quality Record Package)審查及簽署 PQC(Product Quality Certificate)。

## 貳、出國行程

|                   |                          |        |
|-------------------|--------------------------|--------|
| 95.10.26~95.10.26 | 台北-首爾                    | 往 程    |
| 95.10.27~95.10.29 | 韓國 HS R&A 公司             | 執行品質查驗 |
| 95.10.30~95.10.31 | 首爾-阿姆斯特丹-漢堡-Itzehoe      | 行 程    |
| 95.11.01~95.11.03 | 德國 Sterling SIHI GmbH 公司 | 執行品質查驗 |
| 95.11.04~95.11.06 | Itzehoe -漢堡-阿姆斯特丹-台北     | 返 程    |

## 參、品質查驗工作報告

### 一、MS026 「Large Rubber Expansion Joints」採購案

1. 龍門計畫 MS026 「Large Rubber Expansion Joints」採購案，採購合約為 8749011M02600，採購規範為 Specification No. 874-MS-026 Amendment 3, Rev. 0，Quality Class 為 R。本採購

案之採購設備如下為：

- (1). Rubber Expansion Joints (2700A x 380L : 60 sets) for Circulating Water System(CWS)
- (2). Rubber Expansion Joints (1050A x 305L : 8 sets) for Condensate pump Suction(CPS)
- (3). Rubber Expansion Joints (750A x 305L : 12 sets) for Turbine Building Service Water (TBSW)

2. 得標廠家為韓國 HS R&A 公司，目前已完成交貨到龍門施工處，惟設備交運到龍門施工處執行器材驗收時，發現部份橡膠膨脹接頭有 Face to Face 尺寸公差不符規範、接頭橡膠表面磨損或接合面裂痕、Retaining Ring 螺栓孔錯開、螺栓數量不足或損壞、鐵件氧化或生鏽，以及品質文件短少等缺失案，經開出品質不符案件（NCR）及接收檢驗報告缺失（RIR）等函請廠家處理，惟廠家遲未採取積極改正行動，故派員前往廠家稽催討論解決設備修復及改正品質缺失。

本次與廠家商討解決品質缺失之主要議題如下：

- A. 龍門施工處開立之 NCR-TGD-451
- B. 龍門施工處提出廠家 HS R&A 改正行動計劃之審查意見
- C. 本公司/石威要求廠家提供有關膨脹接頭尺寸公差及裕度在安裝及運轉時伸縮量之要求

3. 龍門施工處開立之 NCR-TGD-451（詳附件一）

- 本 NCR 為龍門施工處執行 Rubber Expansion Joints 交貨之接受檢驗，發現品質缺失開立 NCR-TGD-451 要求廠家改正，其缺失內容為 Rubber Expansion Joints (2700Ax380L) 之“Face-To-Face Length” over the tolerance(380mm+/-9mm)，



defects and damage on the rubber surface 及“Ball Seat” and “Retaining Ring” have oxidized and rusted.。

- NCR 龍門施工處於 95.3.10 以 C 龍施 95030020Z 簽送本處（核安處）後，核安處於 95.3.20 以 G-DNS-06030270Y 函石威公司轉廠家 HS R&A 處理，石威於 95.3.27 以 SWT-HSR-MS026-000123 函請廠家於 95.4.3 前提出處理方式，但廠家遲未函覆改正措施，本處再要求石威於 95.4.10 以 SWT-HSR-MS026-000124 再函催廠家儘速處理；惟廠家一直均未函覆改正措施，本處再依龍門計畫追蹤會議決議要求石威於 95.6.27 以 SWT-HSR-MS026-000129 函稽催提醒廠家儘速答覆，但廠家迄今一直未回函。
  
- 經討論告知本 NCR 各項缺失之情況及可能發生之原因，以及 NCR 處理程序及廠家應負之處置權責，廠家應正式函覆 NCR 之處理（Disposition）方式（如：USE-AS-IS/照現況使用、REPAIR/修理、REWORK/重做、REJECT/拒收、OTHERS/其他），並提出改正措施建議及相關作業程序供本公司審查核准後，才可進行修復作業；廠家解釋因本採購案 Project Manger 更換頻繁，相關作業流程未清楚交代，故一直未回覆 NCR 處置方式，廠家瞭解 NCR 處理流程後，承諾將請技術部門評估決議後儘速函覆。

#### 4. 龍門施工處提出廠家 HS R&A 改正行動計劃之審查意見

- MS026 「Large Rubber Expansion Joints」採購案交運到龍門施工處後，施工處執行進料檢驗發現缺失分別提出之 RIR（Receiving Inspection Record）、NCR（Nonconformance

Report) 及 QRP 提送等問題請製造廠家解決；惟雖經本公司及石威稽催多次廠家儘速處理，仍一直未獲廠家之回音，故本處特電請廠家 HS R&A 在台代理商振良公司連絡廠家處理，結果得知本採購案之 Project Manger 係新上任，對本採購案之缺失不甚瞭解，經本處與代理商溝通後，請龍門施工處彙整本採購案之相關缺失，透過在台代理商以電話及 E-mail 廠家要求提出改正措施，終得到廠家回函提出 Corrective Action 計畫（詳附件二），經龍門施工處提出審查意見（詳附件三）。

本處依據龍門施工處對廠家 Corrective Action 提出之審查意見，逐項與廠家說明討論後澄清如下：

➤ 品質缺失廠家函提出 Corrective Action 計畫部份

- (1). The lack of bolts quantity：龍門施工處經清點 Unit 2 尺寸 2-1/2”之螺栓缺少 36 支，廠家原 Corrective Action 為安裝後再確認可暫用 Spare Parts 替代，經討論廠家承諾無償補足。
- (2). Bolts Damaged：交運驗收時發現尺寸 1-1/2”及 1-5/8”之螺栓螺紋損壞，廠家認為交運時損傷，承諾無償補足。
- (3). Expansion joint body damaged：交運驗收時發現接頭閥體及法蘭面外緣損傷或黏合瑕疵，廠家亦認為交運時損傷造成，經討論廠家承諾併 NCR-TGD-451 之處置，將派員修復。
- (4). Unsupply of coating material：廠家未依合約提供 3 公升之設備用油漆，廠家亦承諾依合約提供。

➤ 品質缺失廠家函未提出 Corrective Action 計畫部份

- (1). The lack of bolts quantity : 龍門施工處 Unit 1 交運驗收時，尺寸 2-1/2”之螺栓核計為 3120 支與 Packing List 之 3122 支不符，經討論廠家澄清為係 Packing List 誤植 3122 支，將修訂 Packing List 為 3120 支。
- (2). Rust on Ball Seat & Retaining Ring : Unit 1 交運驗收時發現 Ball Seat 及 Retaining Ring 有氧化及生鏽現象，經討論廠家承諾無償派員修復。
- (3). The lack of QRP : 龍門施工處未收到 Unit 1 之成套品質文件 (QRP)，經行前對廠家 QRP 提送之瞭解，Unit 1 QRP 提交給廠家 HS R&A 在台代理商振良公司，Unit 2 QRP 則直接交給龍門施工處汽機課；故此行特別交待廠家應以正式函知龍門施工處提送 QRP 及 QRP 之 CD-ROM，並副知本公司相關單位及石威公司 (不需附件，僅需 Cover Letter 即可)，廠家瞭解承諾將改正。

► 廠家擬派員赴 LCO 工地執行改正行動計劃部份

- (1). 廠家針對派員計劃之 Dispatching Procedure、Supplying Repairing Tools 及 Schedule for Dispatching Person，提出將先與本公司確認派遣時程及工作範圍，派員修復前工具應先到工地，修復作業之期間 (需討論)、人員 (一為品質人員另一為製造人員) 及階段 (待工地視察會議決定)，經向廠家反應龍門施工處之意見，RIR 敘明品質缺失為執行到貨接受檢驗時提出，缺失明顯到貨前已發生並經第三者公證公司驗證，廠家應儘速無償修復，並告知應先提出如“Remedial Work Procedure”之 Corrective Proposal 供本公司審核。
- (2). 經與廠家討論赴龍門施工處工地執行改正行動計劃，

廠家提出擬計劃派二遣位人員（一為品質人員，另一為技術人員）及攜帶必備器材與材料，赴工地執行缺失檢修，並要求台電提供檢修場所及搬卸工具。本處回應要求台電提供之檢修場所及搬卸工具應無問題，但要求廠家應儘速回應改正行動計劃，並需先正式函知台電，包括 NCR 之 Disposition 回覆及 Warranty 事宜；本處並建議廠家有關解決 MS026 採購案之缺失，最好先派一位技術專家赴工地實際 Survey 瞭解後，再提出改正對策之作業範圍、程序、人力、時程、期限、材料及工具等。

5. 本公司/石威要求廠家提供有關膨脹接頭尺寸公差與裕度在安裝及運轉時伸縮量之要求
  - 有關膨脹接頭（Rubber Expansion Joints）“Face-To-Face”之尺寸公差，是否會造成運轉時伸縮量無法符合規範要求，以及廠家技術手冊內未明定配管間隙之裕度及其角偏差/平行偏差之問題，本公司/石威函請廠家澄清（詳附件四：SWT-HSR-MS026-000126），但廠家迄今未函覆說明。
  - 依據廠家製造圖面（詳附件五），2700A × 380L 之 Rubber Expansion Joints，其合約規範“Face-To-Face”尺寸為 380mm（公差 $\pm 9$ mm），設計允許軸向壓縮量（Axial Compression）為 40mm，軸向伸長量（Axial Extension）為 20mm；現因有部份膨脹接頭（Expansion Joints）之 6 點“Face-To-Face”量測值，尺寸接近公差上限 389mm 或下限 371mm 時，若現場預留安裝 Joint 空間之尺寸精算為 380mm 時，則安裝 Joint 時必須硬壓縮或硬拉伸才能安裝 Joint，並鎖緊法蘭螺

栓，故函請廠家澄清如此運轉後是否會減低允許伸縮量之 Capacity。

- 若 Joint “Face-To-Face”尺寸符合規範，但實際安裝 Joint 之空間未必剛好為 380mm 時，則現場最終實際安裝之空間為 380+X mm，請廠家提供不影響 Joint 功能之“X”允許值供安裝。另外因部份 Joint 之 6 點“Face-To-Face”量測值差異較大（即兩端 face 面未能平行），或安裝空間兩端之配管法蘭面與膨脹接頭法蘭面發生不平行時，是否需核測膨脹接頭法蘭面與管路法蘭面之 Parallel Alignment 及 Angular Alignment，如需要核測時請廠家提供相對應之最大允許值，並請廠家提供韓國電廠安裝同款膨脹接頭時，上述相關裕度之現場安裝經驗數據供參用。
- 經與廠家討論說明本公司極需前述安裝資訊，廠家瞭解後承諾將要求其技術部門，儘速回覆 TPC/S&W 函要求澄清尺寸超出公差規定之影響與因應之道以及安裝裕度之相關資訊。

#### 6. MS026 採購案品質缺失案處理及要求廠家澄清覆函，廠家遲未回應問題

經洽詢廠家為何不依合約規定處理品質缺失案及覆函，其說詞為本採購案迄今已更換了四位 Project Manger，同時 Project Manger 更換時雙方未清楚交待本採購之相關問題及作業處理方式，且原參與製造之作業人員大部份已離職或退休，其中本採購案之預算已用盡也是原因之一。

7. HS R&A 公司查驗接洽人員：

Mr. J. W. Kim (Section Chief Manager)

Mr. Raichel Park (Overseas Business Team, Engineer)

Mr. Han-Wool Yoo (Quality Control Engineer)

二、MS034 「Make-up Water Treatment System」採購案

1. 龍門計畫 MS034 “Make-up Water Treatment System”之 Vacuum Pumps 採購合約為 8749011M03400，Spec. No.為 874-M0053，Quality Class R，本採購設備又分 Condensate Polishing System（簡稱 CPS）及 Condensate Makeup Purification System（簡稱 CMP）；得標廠家為日本 HITACHI 公司，HITACHI 除自行採購設備外，也分包給 E&C（益鼎）及 Kurita Water Ind. Ltd. 二家公司。

本次前往德國廠家 Sterling SIHI GmbH 查驗之設備 Vacuum Pump，即為 E&C（益鼎）負責採購之設備。

2. 龍門計畫 MS034 「Make-up Water Treatment System」採購案之 CMP 二台 Vacuum Pump 是由位於德國 Itzehoe 之廠家 Sterling SIHI GmbH 承製，製程中的 Performance Test 於 95 年 10 月 17 日完成；本次任務為執行 Vacuum Pump 設備交運(Shipping Release)之 Witness 品質查驗，包括 Final / Packing Inspection、QRP(Quality Record Package)審查及簽署 PQC(Product Quality Certificate)。
3. 查驗之前經查下列品質文件已經 TPC/S&W 審查結果 (Review Status) 為“1 or 4”(註：Status 1-表示同意【Work may proceed】)。

Status 2-表示有意見應依照審查修正送審，可依照修改圖面/文件進行工作【Revise and Resubmit, Work may proceed subject to incorporation of comments】、Status 3-表示不同意應再研修重新送審【Revise and Resubmit, Work may not proceed】、Status 4-表示供參考【For information only】。

- (1). Manufacturing and Inspection Plan (Inspection and Test Plan) for Vacuum Pump, Rev. 1 於 Nov. 9, 2005 以 SWT-HIT-MS034-001192 函覆（詳附件六）。
- (2). QA Record List (QRL) for Vacuum Pump, Rev. 1 於 Oct. 4, 2004 以 SWT-HIT-MS034-000923 函覆（詳附件七）。
- (3). CMP Data Sheet for Vacuum Pump & Motor, Rev. 2 於 Aug. 31, 2005 以 SWT-HIT-MS034-001156 函覆（詳附件八）。
- (4). Inspection and Test Procedure for Vacuum Pump, Rev. 1 於 Aug. 22, 2006 以 SWT-HIT-MS034-001329 函覆（詳附件九）。
- (5). Packing, Handling and Storage Procedure (Foreign Portion), Rev. 5 於 June 16, 2005 以 SWT-HIT-MS034-001102 函覆（詳附件十）。
- (6). Operation, Installation, Maintenance and Design Manuals for Vacuum Pump, Rev. 0 於 Jan. 23, 2006 以 SWT-HIT-MS034-001222 函覆（詳附件十一）。
- (7). SIR (Seller Information Request) No. 7 and 8 for Motor Starting Currents 於 Mar. 17, 2005 以 SWT-HIT-MS034-001014 函覆（詳附件十二）。

#### 4. 製造成套品質文件(QRP：Quality Record Package)審查

Vacuum Pump 之 QRP 包括：Material Test Report、Certificate of Compliance、Hydrostatic Test Report、Visual & Dimension Inspection Report、Performance Test Report、Individual Test for Motor、TPC Accepted Drawings、Packing Inspection Record 及 Operation and Maintenance Manual。

5. 經審查 Pump Casing、Impeller、Base Plate、Sleeve 及 Shaft 等之 MTR、Hydrostatic Test Report 及 Performance Test Report 符合 Vacuum Pump Spec. No. 874-M0053 Data Sheet 之要求（詳附件十三）；其中 Performance Test Report 於 95 年 10 月 17 日完成，測試時廠家 HITACHI (Supplier)及其下包商 E&C 益鼎(Sub\_supplier)均派員 Witness，結果合格；Pump 之 Visual & Dimension Inspection 亦符合 Drawing 要求。
6. 本處前往執行 Shipping Release 品質查驗及簽署 PQC 時，經查廠家尚未依合約要求將測試合格之 Performance Test Report 函送 TPC/S&W Engineering 審查核准；另執行 Visual & Dimension Inspection 時發現 Liquid Separator 通大氣向上開口處，原核准圖未設計防護罩（詳附件十四），惟廠家為防止異物入侵加裝不銹鋼防護罩（詳附件十五），但此加裝防護罩之圖面僅獲 S&W Engineer 口頭認可，尚未正式送審核可。前述 Performance Test Report 及 Revised Drawing 文件尚未送審缺失，本處 Inspector 開出 NUC(Notice of Unsatisfactory Condition)(詳附件十六：NUC No. DNS-1)要求廠家 HITACHI 澄清回覆改正行動。
7. Packing Inspection 品質查驗



- CMP 二台 Vacuum Pump 以並連方式與其他附屬設備（Water Separator, Water Cooler, Solenoid Valve, Flow Indicator, Level Indicator, Ejector, Suction Non-Return Valves, Ball Valves, Pipeline and Switch Board Panel 等）固定於 Base Plate Skit，故僅需一個木箱裝運。
  
- Packing 前查驗設備表面均很清潔，Solenoid Valve 及 Flow Indicator 部份則以防碰撞泡綿纏繞保護，但查視設備內部是否清潔乾淨時，發現 Pump 及 Cooler 內部之積水未排除乾淨，經廠家將所有閥門全開排水，同時以吊車將設備平台吊傾斜以利排放，並用高壓空氣貫入設備內部逼出殘餘水；另發現一台 Vacuum Pump Casing 之外殼烤漆脫落（約一元硬幣大小），經廠家補漆完成後，依 Packing, Handling and Storage Procedure(Foreign Portion)程序書之要求，設備重新清潔再擺放數包乾燥劑，設備上下以透明塑膠布包覆抽真空後黏合，最後設備再以木框/木板裝釘，放入 QRP 後封箱，包裝木板箱外面依合約要求噴上 Shipping Mark 及貼妥以塑膠袋包封之 Packing List（詳附件十七），包裝過程中並依程序書規定執行 Packing Check Sheet 及 Shipping Check Sheet 之要求，經逐項核對無誤後簽名（詳附件十八）完成 Packing Inspection。

#### 8. PQC(Product Quality Certificate)簽署

- MS034「Make-up Water Treatment System」採購案廠家 HITACHI 之 Packing, Handling and Storage Procedure(Foreign Portion)程序書，第 10.0 SHIPPING DOCUMENTS 之 10.3 節 Documents included in Package 規定 QRP 及 Product Quality Certificate 晒件於封箱前應放入與設備一起交運；惟經查程序書之要求及

與廠家討論結果應係廠家的 Product Quality Certificate，非 TPC/S&W 規定之 PQC(Product Quality Certificate)。

➤ 本次 Shipping Release 品質查驗除發現 Performance Test Report 及 Revised Drawing 文件送審缺失，開 NUC No. DNS-01 追蹤要求廠家 HITACHI 澄清回覆改正行動外，其餘均合格。未免影響 Vender(Sterling SIHI GmbH)之 Packing 封箱作業，經與廠家討論後 PQC 以加註 “Take Exception : Don’t be delivered before NUC No. DNS-01 closed.” 之方式簽署（詳附件十九）。

9. 本次 MS034 採購案 Vacuum Pump (Sterling SIHI GmbH)執行 Shipping Release 品質查驗之 Final/Packing Inspection，QRP 審查及 PQC 簽署，結果因 Performance Test Report 及 Revised Drawing 文件送審缺失而不合格，開 NUC No. DNS-01 追蹤要求廠家 HITACHI 澄清回覆改正行動，前述文件及圖面送審後經 TPC/S&W 審查完成為“Review Status 1”，NUC 即可結案，廠家即可執行交運 Vacuum Pump。

10. Sterling SIHI GmbH 公司品質查驗接洽人員：

Mr. Gustav Trenckner (Sterling Project Engineer, Engineering Center Vacuum Technology)

Mr. Yoshihiro Nishikino (HITACHI Engineer, Nuclear Plant QA & Test Inspection Section, Nuclear System Quality Assurance Department)

Mr. B. Y. Chang (E&C Project Engineering Manager, PEM Group)

11. 有關 MS034 「Make-up Water Treatment System」採購案之 Vacuum Pump 設備交運，執行 Final / Packing Inspection 作業情況之照片如附件二十。

#### 肆、出國期間所遭遇之困難與特殊事項

無。

#### 伍、心得與建議

綜合本次廠家製程中品質查驗之經驗，心得如下：

1. MS026 「Large Rubber Expansion Joints」採購案，廠家韓國 HS R&A 公司雖為一非常專業之 Rubber Expansion Joints 製造廠家，但因其工作人員對 Quality Assurance Program 之觀念似嫌不足，故對品質文件與紀錄之送審要求，以及採購合約之規定要求也不夠瞭解，加上一開始石威公司之管控未落實，致曾發生設備未經查驗簽 PQC 即送到龍門工地退回再查驗之情況，廠家因此相對增加製造成本，加上參與本採購案之專案經理更換頻繁，致影響廠家對品質缺失處理之配合度。故建議本公司今後採購案召開 Kick-off Meeting 時，應特別要求廠家代表將 Meeting 之要求事項，切實帶回公司及工廠告知相關設計、製造及品質人員，遇有專案經理更換時應清楚交代，以利後續作業處理之遵行。
2. MS034 採購案廠家為 HITACHI，其品質保證系統完善，雖然大部份設備由下包廠商負責採購，但其對下包廠商（如 E&C 益鼎公司）及製造廠家（Sterling SIHI GmbH）之管制，無論是品質文件送審、品質紀錄之審核及重要製程之品質檢驗，

均非常嚴謹；因此本次赴德國廠家 Sterling SIHI GmbH 執行 Vacuum Pump 設備交運之 Final / Packing Inspection，QRP 審查及簽署 PQC 等品質查驗時，MS034 廠家 HITACHI (Supplier) 及 E&C 益鼎(Sub\_supplier)亦依 Manufacturing and Inspection Plan 選定之檢驗點派員會同查驗，經實際瞭解 HITACHI 及 E&C 派出之檢驗員均非常優秀（HITACHI 為專業廠家製程檢驗之 QA Engineer，E&C 為負責本採購案之 Project Engineering Manager），因此其對設備品質文件與紀錄審查之規定及執行會同檢驗之要求，均能充分瞭解，作業亦頗落實。故今後有關 MS034 採購案之設備若其品質分類不是很重要時，該設備交運（Shipping Release）品質檢驗之會驗，本公司擬委託石威公司執行之會驗應可免除（Waiver），要求廠家 HITACHI 將 QRP 及 PQC 送本公司審核簽署即可。

#### 陸、附件

**台灣電力公司 龍門施工處**  
**TPC LUNG MEN CONSTRUCTION OFFICE**  
**不符合報告**  
**NONCONFORMANCE REPORT (NCR) NCR-TGD-451**

外包人員 (益鼎公司)  
 95.3.2  
 謝錦華  
 品質  
 95.3.3  
 郭上銘

|                                   |                        |                     |                  |
|-----------------------------------|------------------------|---------------------|------------------|
| 工程/設備名稱<br>PROJECT/EQUIPMENT NAME | Rubber Expansion Joint | 裝箱號碼<br>PACKAGE NO. | Unit 1 & 2       |
| 工程編號/採購案號<br>CONTRACT NO./P.O.NO. | 8749111M02600          | 承包商<br>CONTRACTOR   | HS R&A CO., LTD. |

不符合狀況敘述(註明依據準則、規範、程序或圖號) DESCRIPTION OF NONCONFORMANCE

- We found some dimensions of "Face-To-Face Length" were over the tolerance. (attachment 1)
- According to the reference documents (attachment 2), the tolerance should be +1/4 to -5/16 inch.
- We found many defects and damage on the rubber surface. (attachment 3)
- "Ball Seat" and "R/Ring" have oxidized and rusted. (attachment 4)

簽報人: 李奇庭 柯榮村  
 ORIGINATOR DIVISION HEAD

認定:  成立 VALID  不成立 INVALID; 涉及 10CFR21/10CFR50.55(e):  是 YES  否 NO

VALIDATION (1) We need to compress or extend the expansion joints to fit the required dimension when installation. It will cause internal remained stress. (2) We think it may be difficult to install the equipment without leakage due to the dimension problem. (3) When operation, leakage and material failure may occur because of rubber damage. Besides, extra force may cause stress exceed their ultimate stress and result in material failure.

理由: ... REASON

主辦課: 李奇庭 柯榮村 陳秀忠 宋國器  
 COGNIZANT DIVISION QC DIVISION

處理方式:  照現況使用  修理  重做  拒收  其他 (內購承包商十五天內完成)

DISPOSITION USE-AS-IS REPAIR REWORK REJECT OTHERS (外購承包商三十天內完成)

處理說明 (DESCRIPTION OF DISPOSITION):  
 950309 請穩定如 轉知 廠商 HS R&A CO., LTD. 承包商: CONTRACTOR

處理方式審查 REVIEW OF PROPOSED DISPOSITION:  同意 AGREED  不同意 NOT AGREED

理由 REASON:

主辦課: COGNIZANT DIVISION 品質課: QC DIVISION

審定處理方式 DISPOSITION REVIEWD: 核准處理方式 DISPOSITION APPROVED:

副主任: DEPUTY SITE MANAGER 主任: SITE MANAGER

設計單位審查意見 COMMENT BY DESIGNER:  同意 AGREED  不同意 NOT AGREED (十四天內完成)

理由 REASON:

經辦: ENGINEER 課長: DIVISION HEAD 副處長: DEPUTY DIRECTOR 處長: DIRECTOR

是否接受審查意見:  接受 ACCEPTED  不接受 NOT ACCEPTED; (五天內完成)

ACCEPTANCE OF DESIGNER COMMENT

理由 REASON: 主辦課 COGNIZANT DIV:

處理結果 RESULT: 檢驗結果 INSPECTION:  接受 ACCEPTED  不接受 NOT ACCEPTED

主辦課: COGNIZANT DIVISION 品質課: QC DIVISION

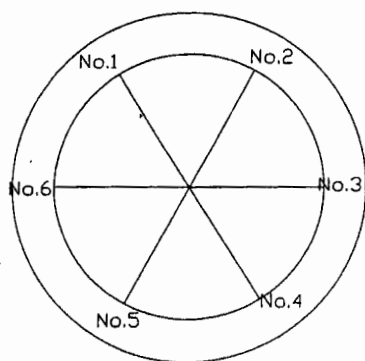
核准處理結果 RESULT APPROVAL:

副主任: DEPUTY SITE MANAGER 主任: SITE MANAGER

R4

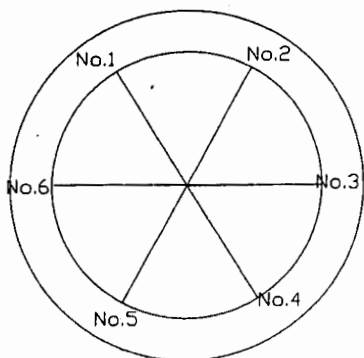
## Dimension Inspection : Unit 1 MS026 Rubber Expansion Joints

| Tag No.        | Face-To-Face length ( should be 372.0625~386.35 ) (mm) |            |            |            |            |            |               |            |            |
|----------------|--|------------|------------|------------|------------|------------|---------------|------------|------------|
|                | No.1   | No.2       | No.3       | No.4       | No.5       | No.6       | Average       | Max. (all) | Min. (all) |
| 1P28-EXJ-5002C | 377  | 383        | 382        | 383        | 386        | 378        | 381.5         | 386        | 377        |
| 1P28-EXJ-5004C | 377  | 375        | <b>372</b> | 373        | 374        | 376        | 374.5         | 377        | <b>372</b> |
| 1P28-EXJ-5001D | <b>390</b>   | 381        | 375        | 378        | 384        | 378        | 381           | <b>390</b> | 375        |
| 1P28-EXJ-5007B | 380  | 380        | 380        | 382        | 381        | 380        | 380.5         | 382        | 380        |
| 1P28-EXJ-5002D | 383  | 378        | 385        | 378        | 377        | 386        | 381.1667      | <b>389</b> | 377        |
| 1P28-EXJ-5003C | <b>371</b>   | 373        | 377        | <b>368</b> | <b>371</b> | <b>371</b> | <b>371.83</b> | 377        | <b>368</b> |
| 1P28-EXJ-5003A | 378  | <b>372</b> | 377        | 376        | 382        | 380        | 377.5         | 382        | <b>372</b> |
| 1P28-EXJ-5003D | 382  | 379        | 385        | 377        | 383        | 385        | 381.8333      | <b>387</b> | 377        |
| 1P28-EXJ-5007D | 376  | 384        | 377        | 377        | 385        | 382        | 380.1667      | 385        | 376        |
| 1P28-EXJ-5007F | 376  | <b>387</b> | 382        | 379        | 380        | 378        | 380.3333      | <b>389</b> | 376        |
| 1P28-EXJ-5007E | 378  | 376        | 378        | 383        | 374        | 385        | 379           | 385        | 374        |
| 1P28-EXJ-5003F | <b>390</b>   | 385        | <b>392</b> | 382        | 381        | <b>390</b> | <b>386.67</b> | <b>392</b> | 381        |
| 1P28-EXJ-5002E | 376  | 381        | 373        | <b>371</b> | 379        | 386        | 377.6667      | 386        | <b>371</b> |
| 1P28-EXJ-5002B | 381  | <b>372</b> | <b>387</b> | 380        | 378        | 382        | 380           | <b>387</b> | <b>372</b> |
| 1P28-EXJ-5007C | 380  | 375        | 377        | 382        | 375        | 383        | 378.6667      | 383        | 375        |
| 1P28-EXJ-5004D | 373  | 374        | <b>366</b> | 374        | 375        | <b>372</b> | <b>372.33</b> | 375        | <b>364</b> |
| 1P28-EXJ-5001A | 380  | 380        | 385        | 380        | 382        | 383        | 381.6667      | 385        | 380        |
| 1P28-EXJ-5004A | <b>387</b>   | 384        | 377        | 384        | <b>387</b> | 384        | 383.8333      | <b>392</b> | 377        |
| 1P28-EXJ-5001B | 377  | 383        | 384        | 377        | 380        | 385        | 381           | 385        | 377        |
| 1P28-EXJ-5001F | 382  | 383        | 376        | 383        | 379        | 376        | 379.8333      | 383        | 376        |
| 1P28-EXJ-5002A | 380  | <b>370</b> | 373        | 383        | 379        | 380        | 377.5         | 384        | <b>368</b> |
| 1P28-EXJ-5002F | 381  | 383        | 382        | 376        | 375        | 385        | 380.3333      | <b>387</b> | 375        |
| 1P28-EXJ-5001C | 382  | 386        | 377        | 379        | 376        | <b>372</b> | 378.6667      | 386        | <b>372</b> |
| 1P28-EXJ-5004B | 376  | 381        | 384        | 378        | 376        | 384        | 379.8333      | 384        | 376        |
| 1P28-EXJ-5004E | <b>387</b>   | 378        | 384        | 385        | 375        | 385        | 382.3333      | <b>387</b> | 375        |
| 1P28-EXJ-5007A | 375  | 380        | <b>369</b> | 382        | 383        | 376        | 377.5         | 383        | <b>367</b> |
| 1P28-EXJ-5001E | 379  | 384        | 381        | <b>391</b> | 382        | 376        | 382.1667      | <b>391</b> | 376        |
| 1P28-EXJ-5004F | 379  | 386        | <b>370</b> | 384        | <b>387</b> | 377        | 380.5         | <b>387</b> | <b>368</b> |
| 1P28-EXJ-5003E | 378  | 381        | 382        | <b>372</b> | 386        | 382        | 380.1667      | 386        | <b>372</b> |
| 1P28-EXJ-5003B | 373  | 375        | 384        | 378        | 375        | 380        | 377.5         | 384        | <b>371</b> |



Dimension Inspection : Unit 2 MS026 Rubber Expansion Joints

| Tag No.        | Face-To-Face length ( should be 372.0625~386.35 ) (mm) |            |            |            |            |            |               |            |            |
|----------------|--|------------|------------|------------|------------|------------|---------------|------------|------------|
|                | No.1   | No.2       | No.3       | No.4       | No.5       | No.6       | Average       | Max. (all) | Min. (all) |
| 2P28-EXJ-5001C | 382  | <b>390</b> | <b>391</b> | 379        | <b>390</b> | <b>387</b> | <b>386.5</b>  | <b>391</b> | 379        |
| 2P28-EXJ-5007B | 382  | 380        | <b>389</b> | <b>388</b> | 380        | <b>390</b> | 384.8333      | <b>390</b> | 380        |
| 2P28-EXJ-5007A | 380  | <b>387</b> | 382        | 376        | <b>391</b> | 383        | 383.1667      | <b>391</b> | 376        |
| 2P28-EXJ-5003E | 378  | 384        | 386        | 382        | 381        | <b>388</b> | 383.1667      | <b>388</b> | 378        |
| 2P28-EXJ-5003B | 377  | 386        | <b>389</b> | 378        | <b>388</b> | 383        | 383.5         | <b>389</b> | 377        |
| 2P28-EXJ-5001E | 385  | 373        | <b>389</b> | 385        | 378        | <b>387</b> | 382.8333      | <b>389</b> | 373        |
| 2P28-EXJ-5007C | 384  | 379        | 382        | 386        | 374        | 385        | 381.6667      | 386        | 374        |
| 2P28-EXJ-5002B | 374  | 385        | 382        | 381        | 384        | 385        | 381.8333      | 385        | 374        |
| 2P28-EXJ-5002E | 376  | <b>387</b> | <b>388</b> | 375        | 386        | 379        | 381.8333      | <b>388</b> | 375        |
| 2P28-EXJ-5001A | 375  | 386        | 386        | 381        | 384        | <b>388</b> | 383.3333      | <b>388</b> | 375        |
| 2P28-EXJ-5001D | 376  | 382        | <b>388</b> | 380        | 384        | <b>388</b> | 383           | <b>388</b> | 376        |
| 2P28-EXJ-5004C | 382  | 378        | 384        | 378        | 379        | 386        | 381.1667      | 386        | 378        |
| 2P28-EXJ-5007D | 385  | 384        | 382        | 385        | 381        | 379        | 382.6667      | 385        | 379        |
| 2P28-EXJ-5004A | <b>388</b>   | 386        | 382        | <b>388</b> | 386        | 378        | 384.6667      | <b>393</b> | 378        |
| 2P28-EXJ-5001F | 378  | 386        | 375        | <b>370</b> | 381        | 384        | 379           | 386        | <b>370</b> |
| 2P28-EXJ-5004F | 384  | 386        | <b>398</b> | 385        | 380        | <b>391</b> | <b>387.33</b> | <b>398</b> | 380        |
| 2P28-EXJ-5002D | 382  | 385        | 381        | 384        | 380        | 376        | 381.3333      | 385        | 376        |
| 2P28-EXJ-5007E | 383  | 380        | 383        | 379        | 380        | 383        | 381.3333      | 383        | 379        |
| 2P28-EXJ-5004E | 383  | 378        | <b>387</b> | 382        | 378        | 386        | 382.3333      | <b>392</b> | 378        |
| 2P28-EXJ-5001B | <b>391</b>   | 382        | 383        | <b>392</b> | 376        | 384        | 384.6667      | <b>394</b> | 376        |
| 2P28-EXJ-5004D | <b>389</b>   | 382        | 378        | <b>388</b> | <b>390</b> | 378        | 384.1667      | <b>393</b> | 378        |
| 2P28-EXJ-5002A | <b>388</b>   | 380        | 378        | 386        | 382        | 374        | 381.3333      | <b>388</b> | 374        |
| 2P28-EXJ-5003A | 379  | 382        | 385        | 379        | 384        | <b>387</b> | 382.6667      | <b>387</b> | 379        |
| 2P28-EXJ-5003D | 383  | 382        | 379        | 382        | 381        | 386        | 382.1667      | <b>388</b> | 379        |
| 2P28-EXJ-5002F | 386  | 384        | 377        | 380        | 386        | 376        | 381.5         | 386        | 376        |
| 2P28-EXJ-5004B | <b>388</b>   | <b>388</b> | 378        | 380        | <b>389</b> | 378        | 383.5         | <b>390</b> | 378        |
| 2P28-EXJ-5003C | 382  | 384        | <b>390</b> | 385        | <b>390</b> | <b>391</b> | <b>387</b>    | <b>393</b> | 382        |
| 2P28-EXJ-5003F | 380  | 375        | 386        | 385        | 378        | <b>389</b> | 382.1667      | <b>389</b> | 375        |
| 2P28-EXJ-5002C | 381  | 381        | <b>387</b> | 383        | 386        | <b>387</b> | 384.1667      | <b>390</b> | 381        |
| 2P28-EXJ-5007F | 382  | <b>372</b> | 378        | 379        | <b>372</b> | 378        | 376.8333      | 382        | <b>371</b> |



| NO | PART NAME              | MAT'L                  | DTY       | REMARKS | REV.     | DATE        | DESCRIPTION                  | REV. APP.    |
|----|------------------------|------------------------|-----------|---------|----------|-------------|------------------------------|--------------|
| 1  | RUBBER EXPANSION-JOINT | 2700A X 380L           | SEE NOTE  |         | 4        | SEP. 12 '03 | REVISION ACCORDING TO ORDERS | S.Y.K.P.J.S. |
| 2  | RETAINING RING         | 1ST X Ø3219            | ASTM A36  | 2       | 1/2 SPLT |             |                              |              |
| 3  | HEAVY HEX BOLT & NUT   | 2 1/4 X8UNX195LX190S   | ASTM A325 | 104     |          |             |                              |              |
| 4  | HEAVY HEX BOLT & NUT   | 2 1/4 X8UNX260LX255S   | ASTM A325 | 40      |          |             |                              |              |
| 5  | CONTROL ROD STUD BOLT  | 2 1/4 X8UNX103.5LX235S | ASTM A325 | 10      |          |             |                              |              |
| 6  | PIPE SLEEVE            | 3 X 457L (S.D. 40)     | ASTM A53B | 10      |          |             |                              |              |
| 7  | CONTROL ROD PLATE      | 64T                    | ASTM A36  | 20      |          |             |                              |              |
| 8  | BALL SEAT              | 60T                    | ASTM A36  | 20      |          |             |                              |              |
| 9  | ARCH FILLER            | EPDM                   |           | 1       |          |             |                              |              |

**REVIEW RECORD STAMP**

1 - Work Can Proceed

2 - Revise and Resubmit (Work Can Proceed)

3 - Revise and Resubmit (Work Can Not Proceed)

4 - For Information Only

Responsible Discipline:  STR  QA  I/T

MEBC  HC  I/T

Others: \_\_\_\_\_ specify \_\_\_\_\_

Responsible Engineer: *Guo Lin*

Print Name: *Guo Lin*

Signature/Date: *Guo Lin 10/10/04*



MARK NUMBERS :

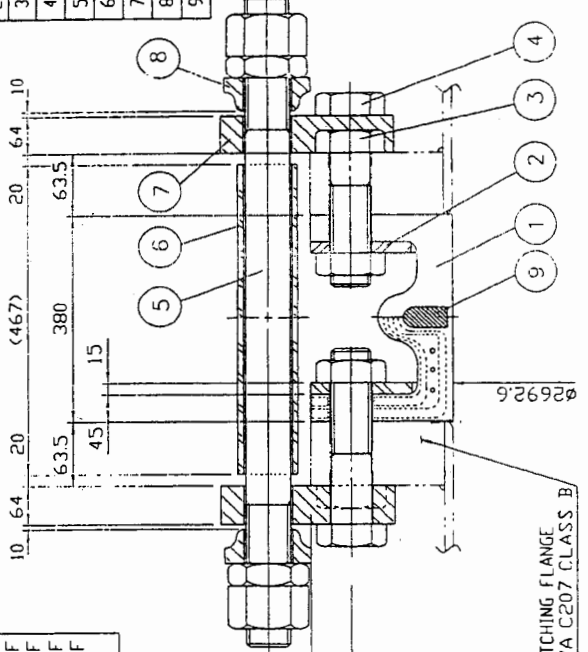
IP28-EXJ-5001A-F, 2P28-EXJ-5001A-F

IP28-EXJ-5002A-F, 2P28-EXJ-5002A-F

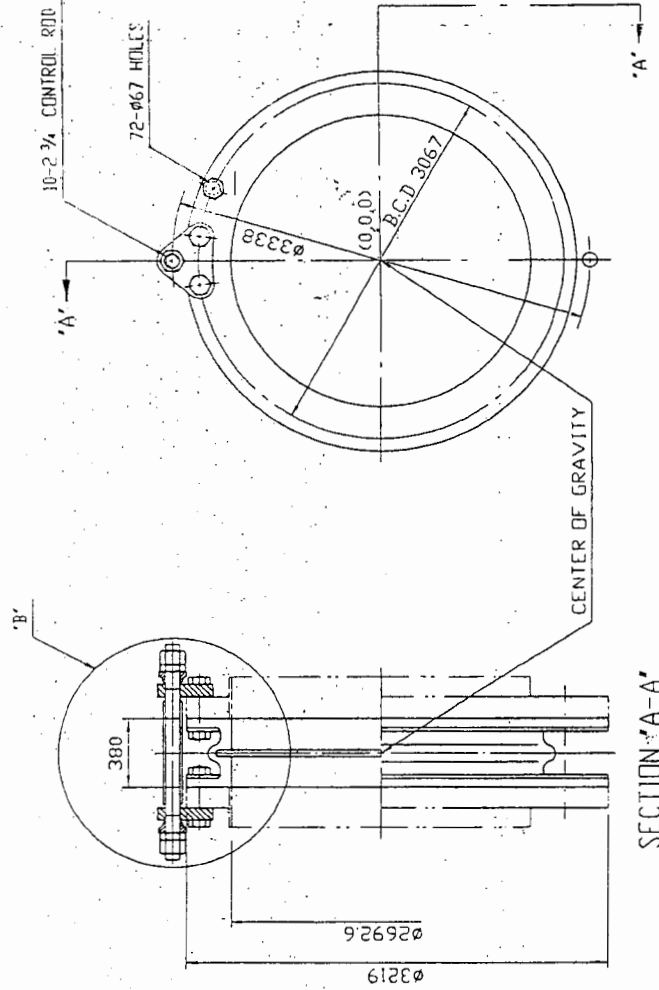
IP28-EXJ-5003A-F, 2P28-EXJ-5003A-F

IP28-EXJ-5004A-F, 2P28-EXJ-5004A-F

IP28-EXJ-5007A-F, 2P28-EXJ-5007A-F



DETAIL "B"



HS R&A

SR NO: 03403, MS026.5-12001

SHEET NO: 001 OF 001, XV283801

SCALE: NONE

THIS DOCUMENT CONTAINS SAFETY RELATED ITEMS

THIS DOCUMENT CONTAINS SEISMIC (C) ITEMS

PREPARED BY: 03403

SIG: 03403

APP. DATE

CHK. REC.

DNW. DEGN.

DATE JUN. 11. 2002

FORM A3

PROJECT DWG. NO. 03403, MS026.5-12001

SHT. NO. 1/3 CLASSIFICATION





### Appendix B: Control Unit Dimensions And Ratings

| CONTROL UNIT             |                       |                                    |        | NOMINAL PIPE SIZE EXP. JT. I.D. (INCHES) | MAXIMUM SURGE OR TEST PRESSURE OF THE SYSTEM PSIG |     |     |     |     |
|--------------------------|-----------------------|------------------------------------|--------|--|---|-----|-----|-----|-----|
| DIMENSIONS               |                       | STANDARD CONTROL UNIT ASSEMBLY OF: |        |  | NUMBER OF CONTROL RODS RECOMMENDED                |     |     |     |     |
| PLATE THICKNESS (INCHES) | ROD DIAMETER (INCHES) | RODS                               | PLATES |  | 2   | 3   | 4   | 6   | 8   |
| 3/8                      | 1/2                   | 2                                  | 4      | 1/2                                      | 1328  | —   | —   | —   | —   |
| 3/8                      | 1/2                   | 2                                  | 4      | 3/4                                      | 1106  | —   | —   | —   | —   |
| 3/8                      | 1/2                   | 2                                  | 4      | 1  | 949   | —   | —   | —   | —   |
| 3/8                      | 1/2                   | 2                                  | 4      | 1 1/4                                    | 830   | —   | —   | —   | —   |
| 3/8                      | 1/2                   | 2                                  | 4      | 1 1/2                                    | 510   | —   | —   | —   | —   |
| 3/8                      | 5/8                   | 2                                  | 4      | 2  | 661   | —   | —   | —   | —   |
| 3/8                      | 5/8                   | 2                                  | 4      | 2 1/2                                    | 529   | —   | —   | —   | —   |
| 3/8                      | 5/8                   | 2                                  | 4      | 3  | 441   | —   | —   | —   | —   |
| 3/8                      | 5/8                   | 2                                  | 4      | 3 1/2                                    | 365   | 547 | 729 | —   | —   |
| 3/8                      | 5/8                   | 2                                  | 4      | 4  | 311   | 467 | 622 | —   | —   |
| 3/8                      | 5/8                   | 2                                  | 4      | 5  | 235   | 353 | 470 | —   | —   |
| 1/2                      | 5/8                   | 2                                  | 4      | 6  | 186   | 278 | 371 | —   | —   |
| 1/2                      | 3/4                   | 2                                  | 4      | 8  | 163   | 244 | 326 | —   | —   |
| 3/4                      | 7/8                   | 2                                  | 4      | 10                                       | 163   | 244 | 325 | 488 | —   |
| 3/4                      | 1                     | 2                                  | 4      | 12                                       | 160   | 240 | 320 | 481 | —   |
| 3/4                      | 1                     | 2                                  | 4      | 14                                       | 112   | 167 | 223 | 335 | —   |
| 3/4                      | 1 1/8                 | 2                                  | 4      | 16                                       | 113   | 170 | 227 | 340 | 453 |
| 3/4                      | 1 1/8                 | 2                                  | 4      | 18                                       | 94  | 141 | 187 | 281 | 375 |
| 3/4                      | 1 1/8                 | 2                                  | 4      | 20                                       | 79  | 118 | 158 | 236 | 315 |
| 1                        | 1 1/4                 | 2                                  | 4      | 22                                       | 85  | 128 | 171 | 256 | 342 |
| 1                        | 1 1/4                 | 2                                  | 4      | 24                                       | 74  | 110 | 147 | 221 | 294 |
| 1                        | 1 1/4                 | 2                                  | 4      | 26                                       | 62  | 93  | 124 | 186 | 248 |
| 1 1/4                    | 1 3/8                 | 2                                  | 4      | 28                                       | 65  | 98  | 130 | 195 | 261 |
| 1 1/4                    | 1 1/2                 | 2                                  | 4      | 30                                       | 70  | 105 | 141 | 211 | 281 |
| 1 1/4                    | 1 1/2                 | 2                                  | 4      | 32                                       | 63  | 94  | 125 | 188 | 251 |
| 1 1/2                    | 1 5/8                 | 2                                  | 4      | 34                                       | 72  | 107 | 143 | 215 | 286 |
| 1 1/2                    | 1 3/4                 | 2                                  | 4      | 36                                       | 69  | 103 | 138 | 207 | 276 |
| 1 1/2                    | 1 3/4                 | 2                                  | 4      | 38                                       | 63  | 94  | 125 | 188 | 251 |
| 1 1/2                    | 1 1/2                 | 3                                  | 6      | 40                                       | 42  | 63  | 85  | 127 | 169 |
| 1 1/2                    | 1 5/8                 | 3                                  | 6      | 42                                       | 48  | 72  | 96  | 144 | 192 |
| 1 1/2                    | 1 5/8                 | 3                                  | 6      | 44                                       | 44  | 66  | 88  | 133 | 177 |
| 1 1/2                    | 1 5/8                 | 3                                  | 6      | 46                                       | 41  | 61  | 82  | 122 | 163 |
| 1 1/2                    | 1 3/4                 | 3                                  | 6      | 48                                       | 40  | 60  | 81  | 121 | 161 |
| 1 1/2                    | 1 3/4                 | 3                                  | 6      | 50                                       | 37  | 56  | 75  | 112 | 150 |
| 1 1/2                    | 1 3/4                 | 3                                  | 6      | 52                                       | 35  | 53  | 70  | 105 | 140 |
| 1 1/2                    | 2                     | 3                                  | 6      | 54                                       | 43  | 64  | 86  | 128 | 171 |
| 1 1/2                    | 2                     | 3                                  | 6      | 56                                       | 40  | 60  | 80  | 120 | 160 |
| 1 1/2                    | 2                     | 3                                  | 6      | 58                                       | 38  | 56  | 75  | 113 | 150 |
| 1 3/4                    | 2                     | 3                                  | 6      | 60                                       | 35  | 53  | 71  | 106 | 141 |
| 1 3/4                    | 2                     | 4                                  | 8      | 62                                       | 33  | 50  | 66  | 100 | 133 |
| 1 7/8                    | 2                     | 4                                  | 8      | 66                                       | 30  | 44  | 59  | 89  | 119 |
| 1 7/8                    | 2                     | 4                                  | 8      | 72                                       | 25  | 38  | 50  | 75  | 101 |
| 2                        | 2 1/4                 | 4                                  | 8      | 78                                       | 28  | 42  | 56  | 84  | 112 |
| 2 1/4                    | 2 1/4                 | 4                                  | 8      | 84                                       | 24  | 37  | 49  | 73  | 98  |
| 2 1/2                    | 2 1/2                 | 4                                  | 8      | 90                                       | 26  | 40  | 53  | 79  | 106 |
| 2 1/2                    | 2 3/4                 | 4                                  | 8      | 96                                       | 29  | 43  | 58  | 86  | 115 |

- NOTES:**
1. Recommended plate thickness and rod diameter based on a yield strength of 36,000 PSI with a maximum allowable stress of 23,400 PSI (65% of yield). Rod and plate load based on thrust, calculated using diameter "D." See Figure 7 and Chapter IV, Section A.2. Dimensions can vary with a manufacturer's grade of steel and material.
  2. A "Standard Control Unit Assembly" is generally furnished when ordered, if specifications and/or order does not call out a specific number of control rods or a design/test pressure of system.
  3. For Control Unit length see Appendix H.
  4. Pressures listed above do not relate to the actual design pressure of the expansion joint product (see Table II), but are the maximum pressure for a specific control rod number/dimension.

### Appendix C: Pressure Terminology

Early in 1971, the Rubber Expansion Joint Division of the Fluid Sealing Association sent out a terminology survey to some of the leading engineering firms in the country asking their help in defining certain terms that are continually used in our industry. The purpose of the survey was to arrive at a standard definition of these terms. Our Division Membership has made a very careful study of the answers received and after consolidating and refining the answers, have been able to reduce the terms in question to the following:

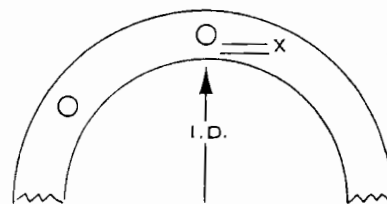
- 1. Operating Pressure.** The actual pressure at which the system works under normal conditions. This pressure may be positive or negative (vacuum).
- 2. Design Pressure.** The highest or most severe pressure expected during operation. Sometimes used as the calculated operating pressure plus an allowance for safety margin.
- 3. Surge Pressure.** Operating pressure plus the increment above operating pressure that the expansion joint will be subjected to for a very short time duration due to pump starts, valve closings, etc.
- 4. Maximum Allowable Working Pressure.** This term is used by the expansion joint manufacturer to define the maximum continuous operating pressure recommended for a specific expansion joint. See Table II.
- 5. Test Pressure.** The hydrostatic test pressure used to demonstrate system capability. Normally 1.5 times maximum allowable working pressure, as defined by the Rubber Expansion Joint Division of the Fluid Sealing Association.

It is the sincere hope of the Division Membership that the above terminology will be picked up by the industry and used in the future. Any assistance, that your firm can give in promulgating this information, will certainly be appreciated.

### Appendix D: Dimension Inspection Procedure

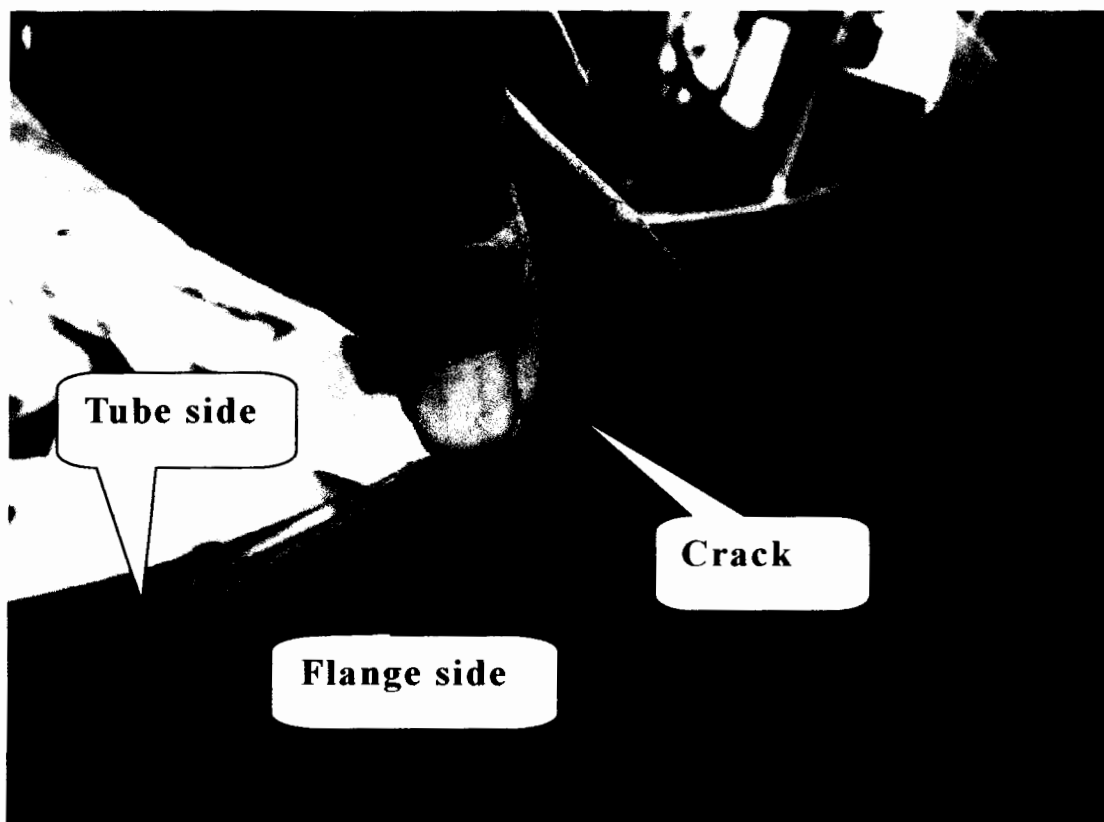
| NOMINAL PIPE SIZE EXP. JT. I.D. | TOLERANCES FOR RUBBER PIPE & EXPANSION JOINTS |                            |             |   |               |               |               | NUMBER OF MEASUREMENTS TO BE AVERAGED |
|---------------------------------|---|----------------------------|-------------|---|---------------|---------------|---------------|---------------------------------------|
|                                 | EXP. JOINT I.D. 1                             | NON-CRITICAL FLANGE O.D. 2 | BOLT LINE 3 | FACE-TO-FACE LENGTH "F" <sup>2</sup> (INCHES). ALL DIMENSIONS TO BE AN AVERAGE READING. APPLIES TO OPEN OR FILLED ARCH. |               |               |               |                                       |
|                                 |   |                            |             | 0 to 6  | 7 to 12       | 14 to 18      | 20 & UP       |                                       |
| 0 to 10                         | ±3/16   | ±1/4                       | ±3/16       | ±1/8  | +1/8<br>-3/16 | ±3/16         | +3/16<br>-1/4 | 4                                     |
| 12 to 22                        | ±1/4  | ±3/8                       | ±1/4        | ±1/8  | +1/8<br>-3/16 | ±3/16         | +3/16<br>-1/4 | 4                                     |
| 24 to 46                        | ±3/8  | ±1/2                       | ±5/16       | +1/8<br>-3/16   | ±3/16         | +3/16<br>-1/4 | ±1/4          | 4                                     |
| 48 to 70                        | +3/8<br>-1/2                                  | +3/4<br>-1/2               | ±3/8        | ±3/16   | +3/16<br>-1/4 | ±1/4          | +1/4<br>-5/16 | 5                                     |
| 72 & Up                         | +3/8<br>-5/8                                  | +1<br>-3/4                 | ±1/2        | +3/16<br>-1/4   | ±1/4          | +1/4<br>-5/16 | +1/4<br>-3/8  | 6                                     |

- NOTES:**
1. All diameters to be measured with a "Pi" tape.
  2. All linear dimensions to be measured with a steel rule and averaged.
  3. Bolt Line = Actual I.D. + 2 (Average "X" Dimension) + Bolt Hole Diameter.

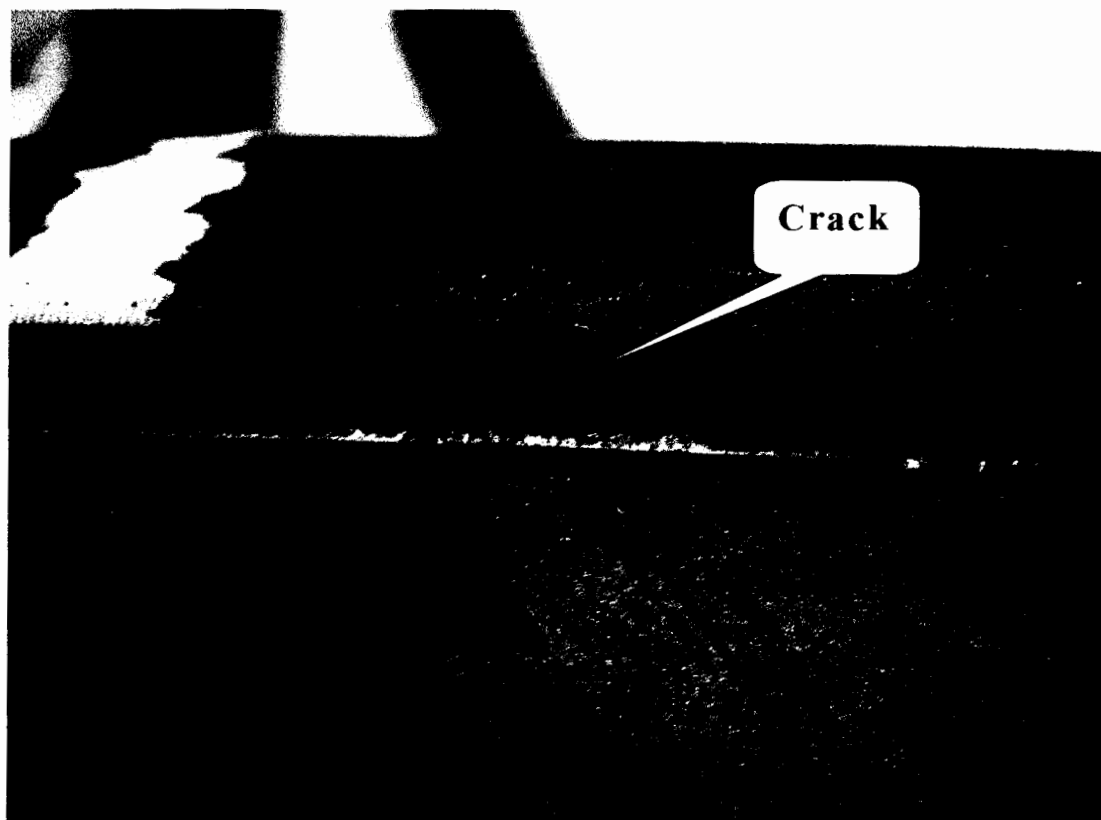


**Attachment 3**

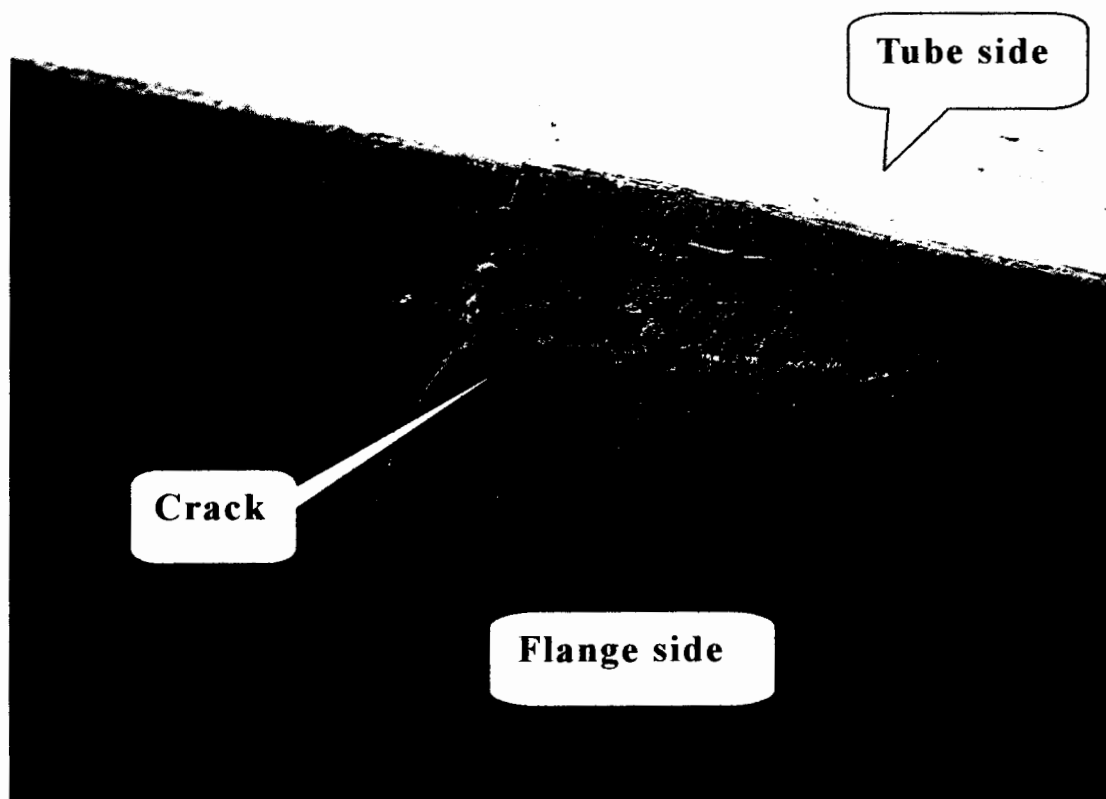
**Crack on flange surface near the tube.**



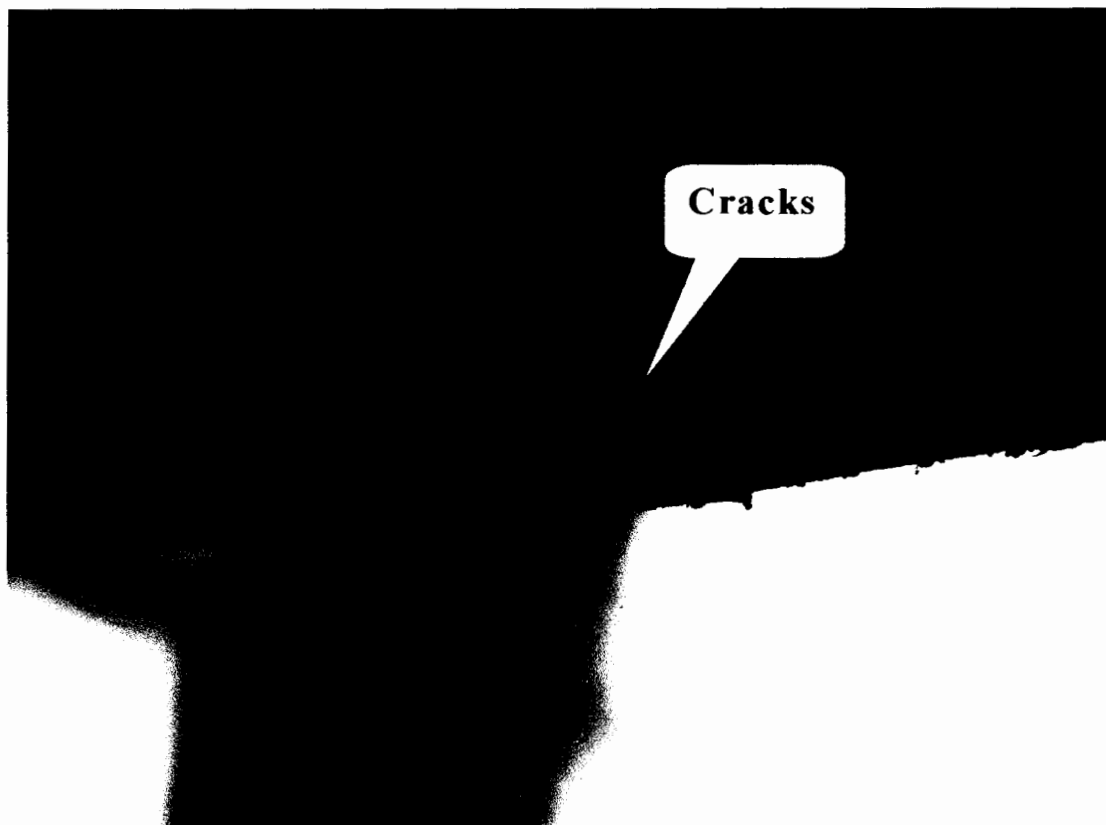
**Crack on the flange rim.**



**Crack on flange surface near the tube.**



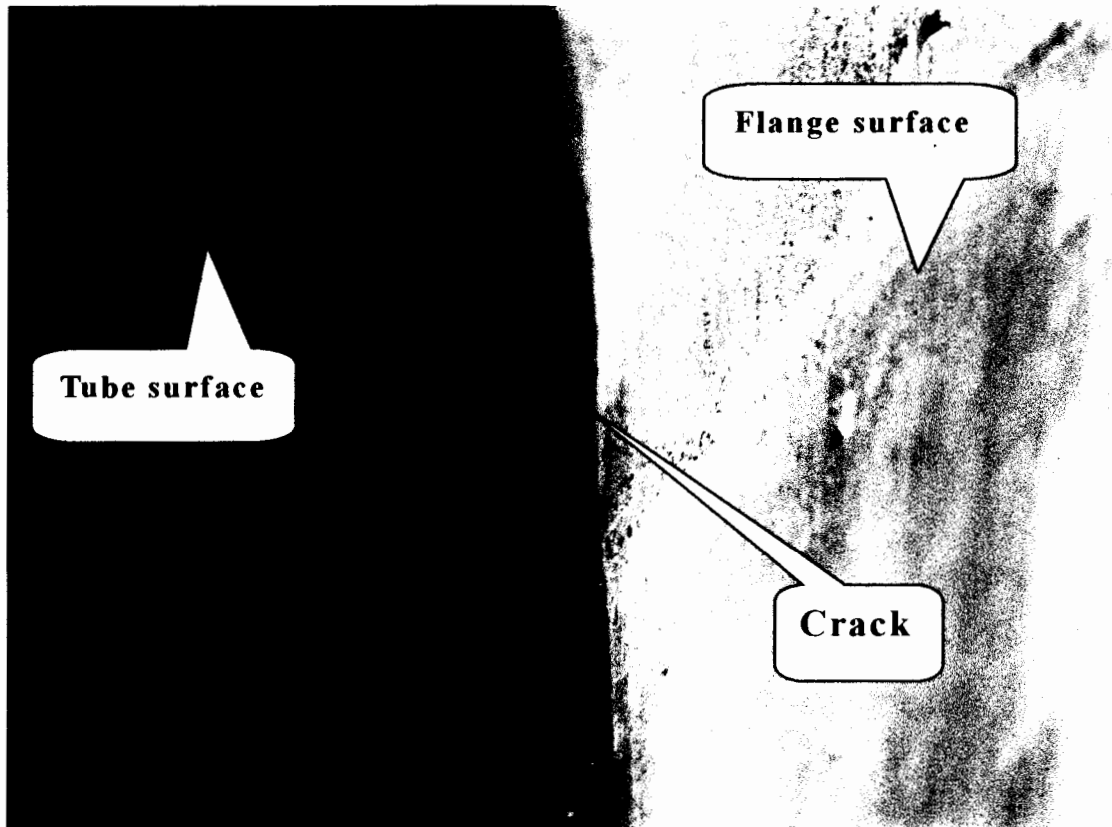
**Damage/ Cracks on flange surface.**



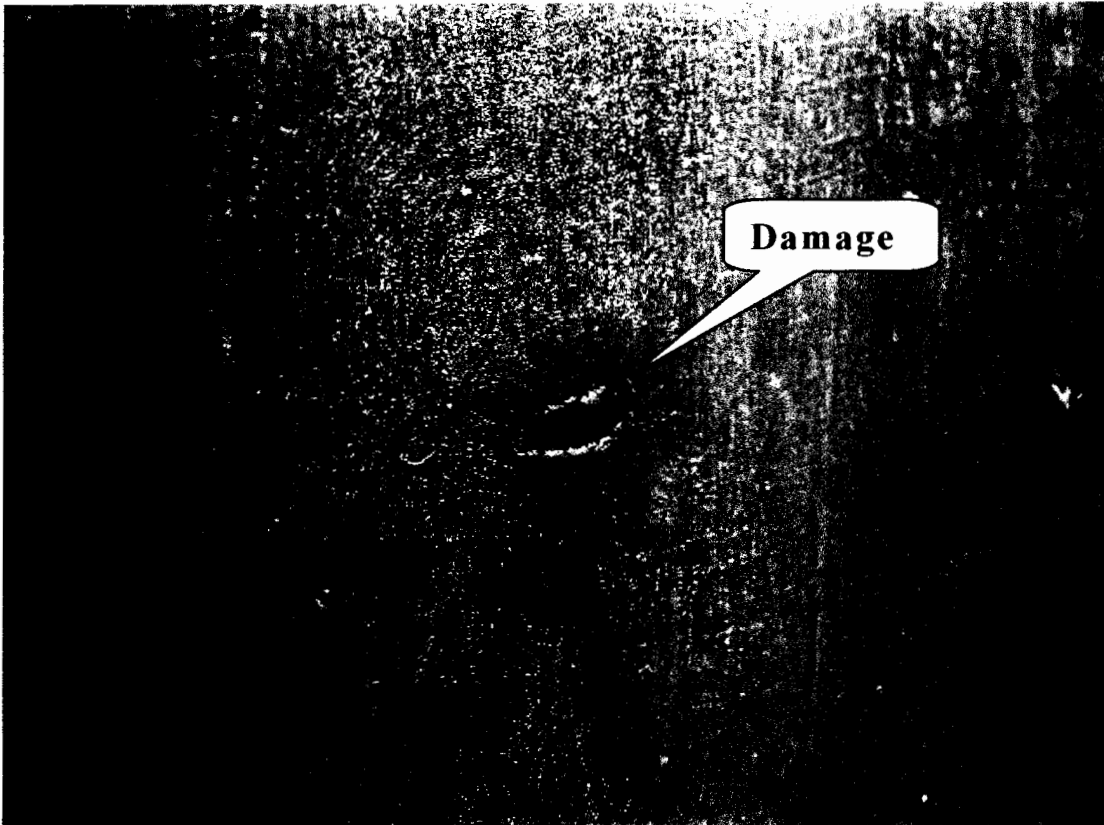
**Cracks in bolt hole.**



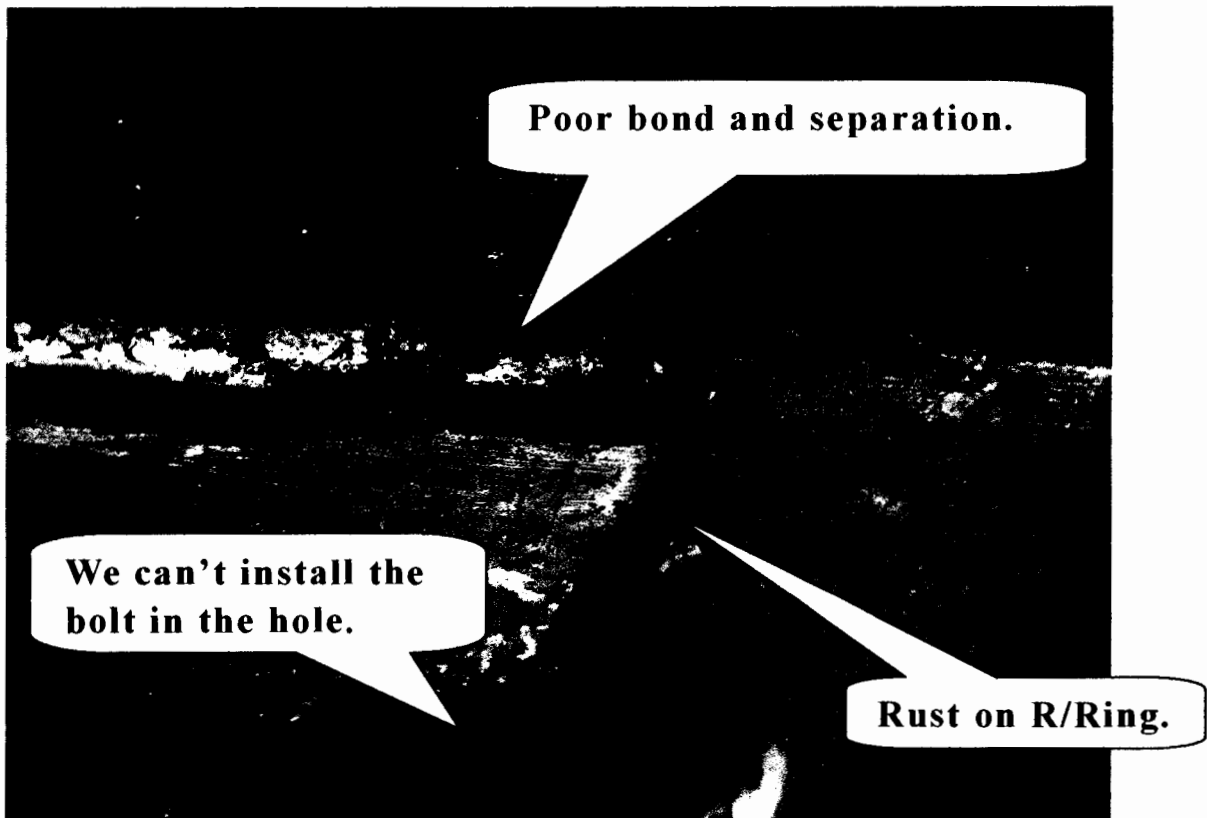
**Crack on tube near the flange surface.**



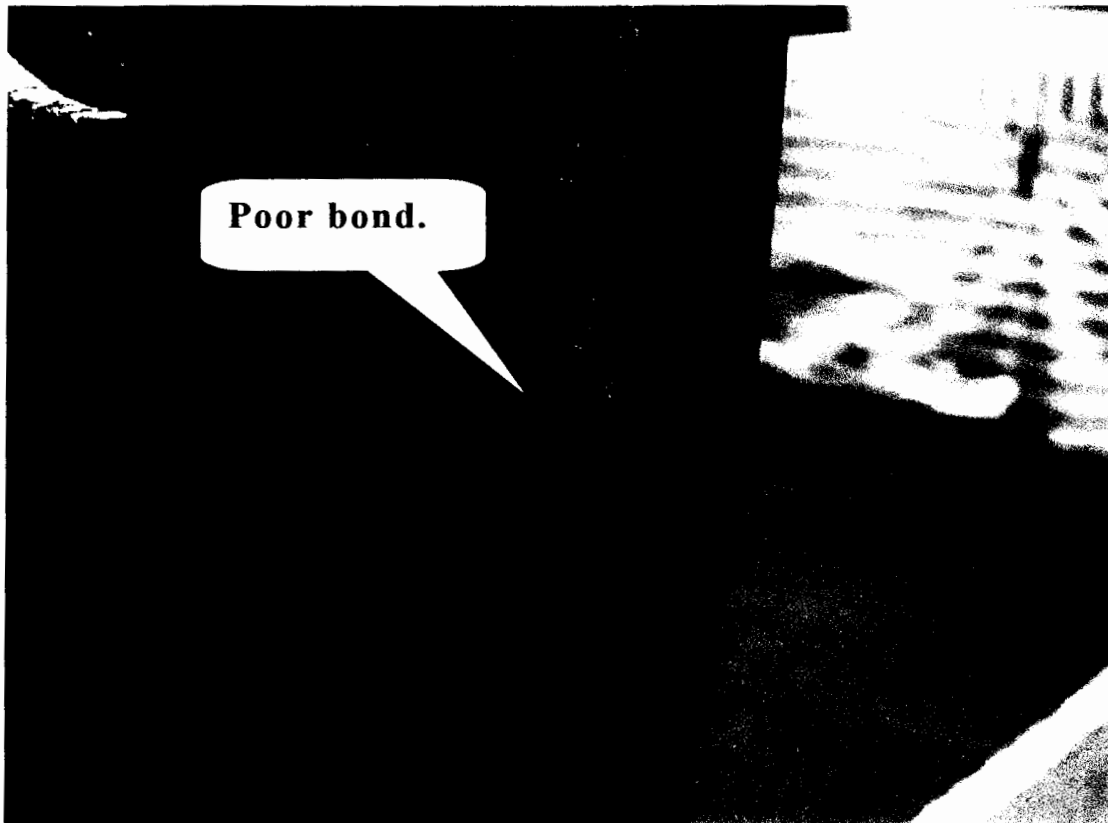
**Damage on tube surface.**



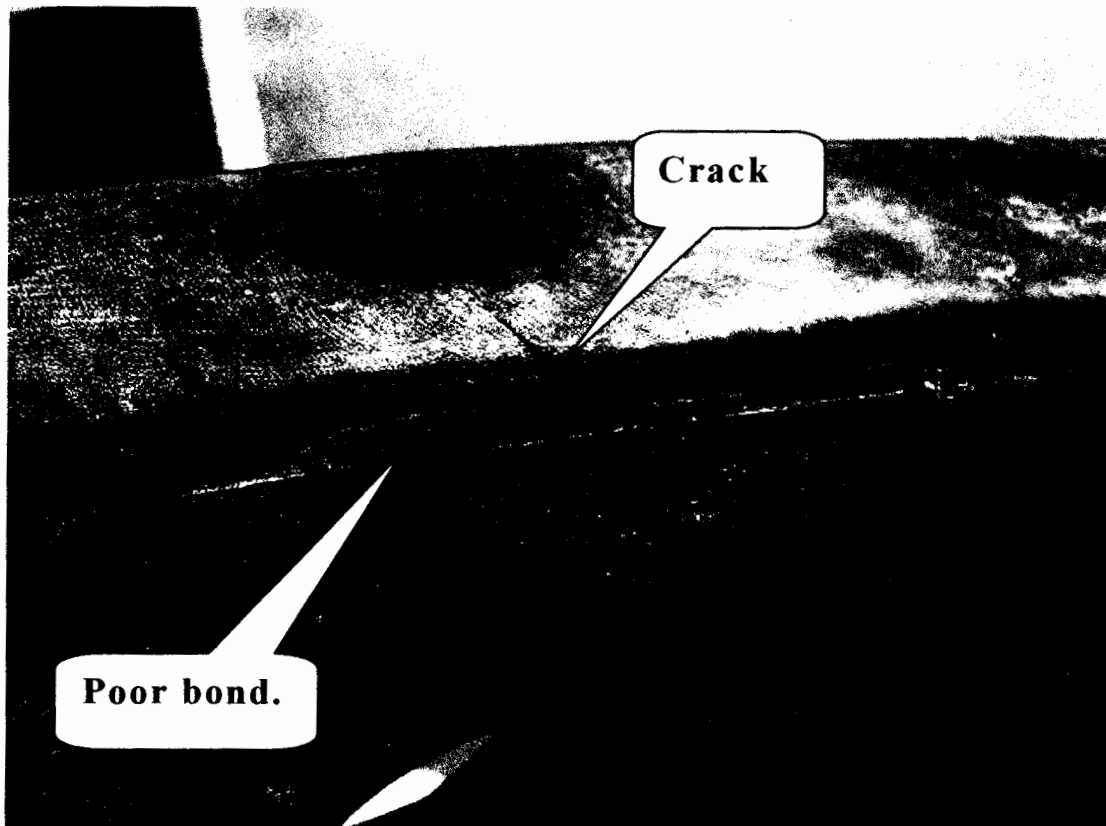
**Rust on R/Ring./ Poor bond and separation between R/Ring & Body.**



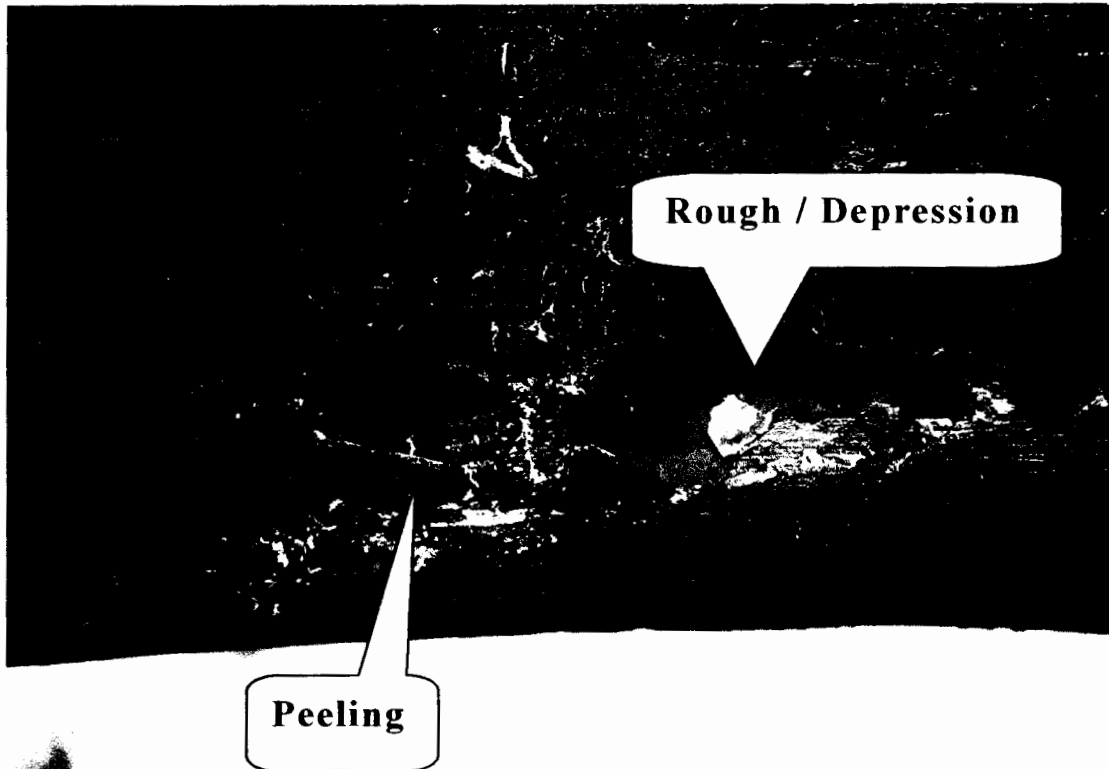
**.Poor bond between R/Ring & Body.**



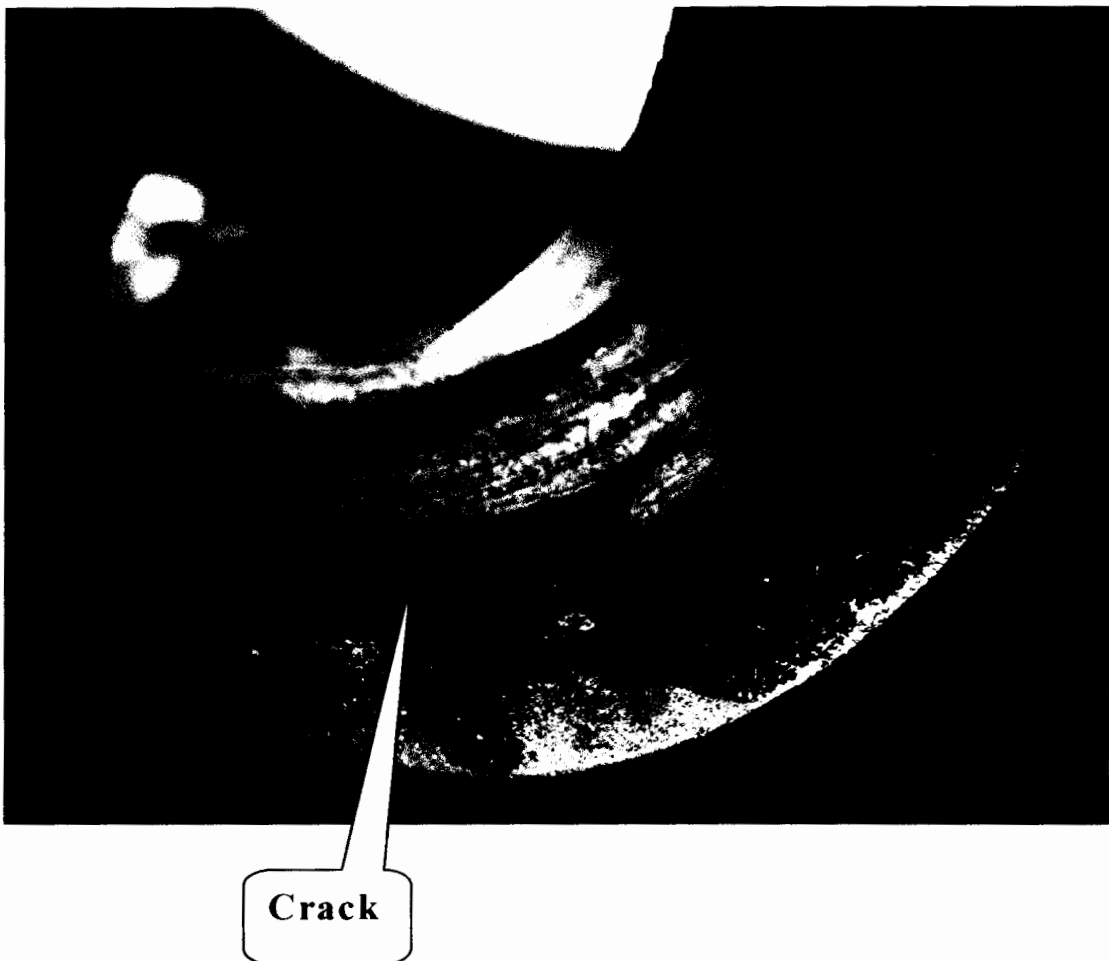
**Crack / Poor bond between R/Ring & Body.**



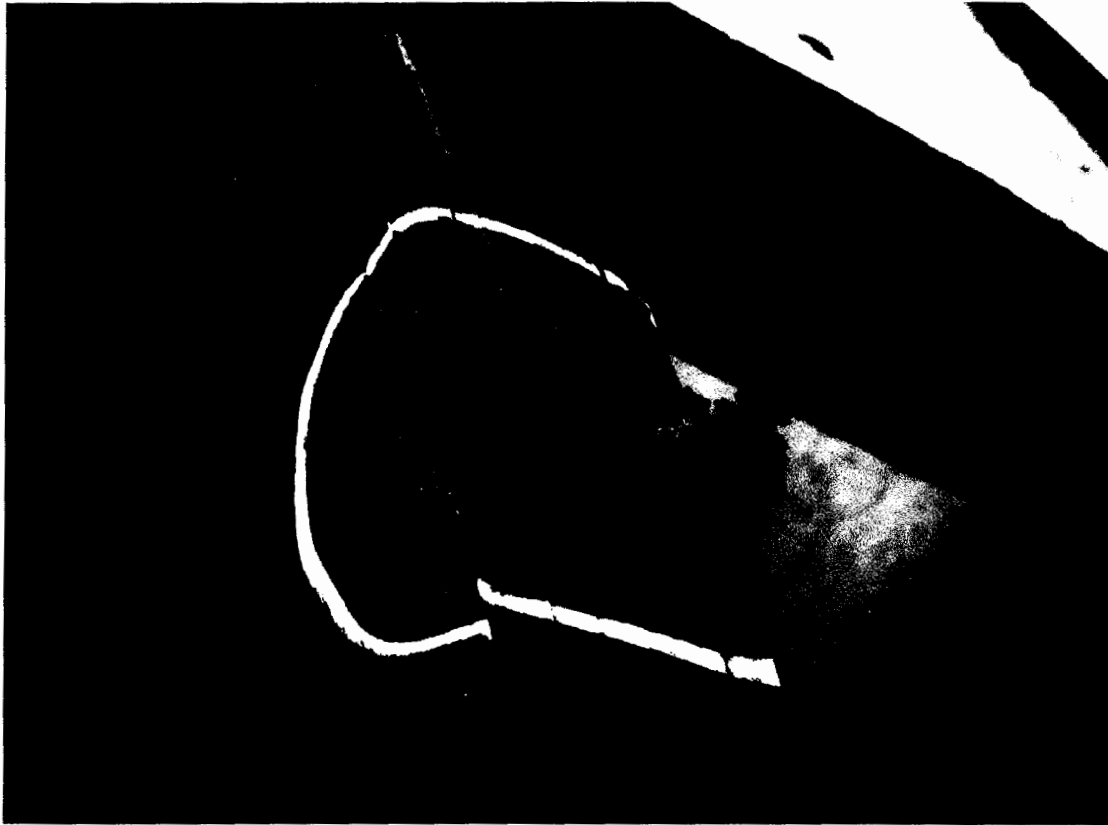
**Rough and peeling on flange surface.**



**Crack in bolthole. It shall be sealed to completely cover the carcass fabric.**



**Damage on flange rim.**



**Peeling on flange surface near the tube.**





**Attachment 4**

The unit 1 "ball seat" have oxidized and rusted.

( Coating method : ASTM B633-Electrodeposited coatings of Zinc. Min.8 $\mu$ m )



Rust on R/Ring. ( Coating method : ASTM A123-Zinc ( Hop-Dip Galvanized ) coatings. Min.458g/m<sup>2</sup> )





869-6 Eogok-dong, Yangsan, Kyungnam, Korea  
Tel : 82-55-371-3621  
Fax : 82-55-387-8812

Attn : Mr. Y. H. Hsu  
Project Manager, DNFPF  
Taiwan Power Company  
20 Floor, No. 242 Sec.3  
Taipei Taiwan, 106 Republic of China  
(Fax : 8862-2367-1675)

Date : 25th Aug. 2006  
HSR-TPC-MS026-000040

**Subject : Lungmen Nuclear Power Projects Units 1 & 2  
Contract No.8749011M02600 (Shipments 001.002)  
Rubber Expansion Joints**

Dear Mr .Y. H. Hsu

**We hereby send you our Corrective Actions for Quality Problem.  
Please kindly refer to the attached document, send back us your feedback.**

Your further information would be much appreciated.

Best regards,

W.S Choi / Manager  
Overseas Business Team



CC : Mr.J.Y.Hsu, Director of Lungmen Construction Office  
Fax No. 02-2490-2402



## Corrective Actions for Quality Problem

1.Doc NO : QA.0608125

2006. 8. 25

2.Item : Rubber Exp-joint &amp; Acc'y for Unit1 &amp; 2

3.Project : Taiwan Power Company Lungmen Project Unit 1 &amp; 2

## 4.Quality problem &amp; Corrective Actions

| Problem                         | Details   | Cause & Corrective Actions   |
|---------------------------------|---|--|
| The lack of bolts quantity      | 36 pcs of 2-1/2" bolts<br>( 1st shipment, Unit 2 )                                    | - The bolts could be put into the wrong Box during galvanizing in Korea<br>- To be confirmed after installation<br>(Spare Parts can be a substitution) |
| Bolts Damaged                   | 1pc of 1-1/2", 1pc of 1-5/8"<br>Thread damaged<br>( 1st shipment, Unit 2 )            | - Damage were occurred during transport<br>- To be supplied at free of charge after installation<br>(Spare Parts can be a substitution)                |
| Exp-joint body damaged          | All of Exp-joint for UNIT 1,2 have cracks on outforward of rubber body & flange parts | - Damage were occurred in the Site with shock from out side<br>- Dispatching staffs to instruct repairing  |
| Unsupplying of coating material | 3 liters kit of the coating material with equipment                                   | - Supplying from HS R&A  |

## 5. The plan for dispatching staffs

| Issue                           | Details   | Remark                                    |
|---------------------------------|---|---|
| Disptaching prodedure           | - To be confirmed with TPC after discussion of dispatching schedule, working scope (repaing process, installation manual is supplied)   | Overseas business Team                    |
| Supplying Repairing tools       | - Repairing tools should be arrived in Lungmen site from HS R&A before dispatching staffs   | Quality Assurance Team                    |
| Schedule for dispatching person | - Period : To be discussed<br>- Staffs : 1 of Quality Team ,<br>1 of Production Team<br>- Stage1 : Inspecting site, Having a meeting<br>- Stage2 : Repairng<br>- Stage 3 : Instructing repairing Process,<br>Having a final meeting<br>- Stage 4 : Returning HS R&A | Quality Assurance Team<br>Production Team |

## Summary of TPC Review Comments about Corrective Actions.

Reference : HSR-TPC-MS026-000040

| Review content |                            |   |   | LCO review comments   |
|----------------|----------------------------|---|---|---|
| Unit           | Problem                    | Details   | Corrective Actions  |   |
| 2              | The lack of bolts quantity | 36 pcs of 2-1/2" bolts                              | <ul style="list-style-type: none"> <li>- The bolts could be put into the wrong box during galvanizing in Korea.</li> <li>- To be confirmed after installation.</li> <li>- Spare parts can be a substitution.</li> </ul> | <ol style="list-style-type: none"> <li>1. We had checked all boxes and couldn't find the 36 pcs of bolts when doing receiving inspection.</li> <li>2. HS R&amp;A is requested to make up the difference.</li> <li>3. We will use the spare bolts if HS R&amp;A's supplemental bolts can't be received in time.</li> </ol> |
| 2              | Bolts Damaged              | 1 pc of 1-1/2",<br>1 pc of 1-5/8"<br>Thread damaged | <ul style="list-style-type: none"> <li>- Damage was occurred during transport.</li> <li>- To be supplied at free of charge after installation.</li> <li>- Spare parts can be a substitution.</li> </ul>                 | <ol style="list-style-type: none"> <li>1. Since HS R&amp;A already agree to supply those bolts free of charge, we deem this item need not to be further discussed.</li> <li>2. We will use the spare bolts if HS R&amp;A's supplemental bolts can't be received in time.</li> </ol>                                       |

| Review content |                                  |   |  | LCO review comments   |
|----------------|----------------------------------|---|--|---|
| Unit           | Problem                          | Details   | Corrective Actions   |   |
| 1<br>&<br>2    | Exp-joint body damaged           | All of Exp-joint have cracks on outforward of rubber body & flange parts. | <ul style="list-style-type: none"> <li>- Damages were occurred in the Site with shock from out side.</li> <li>- Dispatching staffs to instruct repairing.</li> </ul> | <p>1. We don't think that the damages were occurred in the Site with shock from out side. Please refer to the Survey Report (No. STPLM-0601 and 0677) : "The appearances of all packages were found in good condition without any signs of external damages." Therefore, the damages had been occurred before the joints were delivered to site.</p> <p>2. HS R&amp;A should dispatch your staffs to repair all the joints at no cost to TPC.</p> <p>3. The content of "Remedial Work Procedure" (No.03403.MS026. 8-02003 rev.2) isn't enough for repairing all the damaged conditions. HS R&amp;A should revise the procedure and issue to TPC / S&amp;W for approval before the repairing work.</p> |
| 1<br>&<br>2    | Unsupply-ing of coating material | 3 liters kit of the coating material with equipment.                      | <ul style="list-style-type: none"> <li>- Supplying from HS R&amp;A.</li> </ul>   | <p>1. Please HS R&amp;A supply them according to the Contract.</p>  |

**The corrective actions for Unit 1 equipment can't be found in your letter. Please issue your corrective actions or clarify the problems shown in following items.**

| Unit        | Problem                    | Details  | LCO comments   |
|-------------|----------------------------|--|--|
| 1           | The lack of bolts quantity | The received quantity of bolts (2-1/2"*195L) is 3120 sets. But the quantity specified on the packing list is 3122 sets.              | 1. HS R&A is requested to replace 2 sets bolts or clarify.   |
| 1           | Rust on Ball Seat & R/Ring | We found "Ball Seat" and "R/Ring" were oxidized and rusted.  | 1. We found "Ball Seat" and "R/Ring" were oxidized and rusted when doing receiving inspection. This condition had been occurred in HS R&A's shop. Therefore, it's supplier's responsibility to resolve this problem.<br>2. HS R&A is requested to issue your corrective actions. |
| 1           | The lack of QRP            | TPC had not received the Quality Record Package for unit 1 equipment (including Spare Parts).  | 1. HS R&A is requested to issue the quality document according to the Contract.  |
| 1<br>&<br>2 | NCR-TGD-451                | - Some dimensions of "Face-To-Face Length" were over the tolerance.<br>- Defects on rubber surface.<br>- Rust on Ball Seat & R/Ring. | 1. HS R&A have to decide the disposition (use as is, repair, rework, reject or others) and provide the corrective proposal in the nonconformance report and issue to TPC / S&W for approval.<br>2. The repairing work can be started only after above action have been taken.    |

**The plan for dispatching staffs in your letter.**

| Issue                           | Details  | LCO comments   |
|---------------------------------|--|--|
| Dispatching procedure           | To be confirmed with TPC after discussion of dispatching schedule and working scope.     | 1. According to the Survey Report (No. STPLM-0601 and 0677) and our receiving inspection report, we deem the nonconformance conditions had been occurred before the joints were delivered to site. HS R&A should dispatch your staffs to resolve these problems at no cost to TPC. |
| Supplying repairing tools       | Repairing tools should be arrived in Lungmen site from HS R&A before dispatching staffs. | 2. HS R&A have to decide the disposition and provide corrective proposal ( "Remedial Work Procedure" ) for the NCR and issue to TPC / S&W for approval. Moreover, HS R&A is requested to dispatch staffs to resolve these problems as soon as possible.                            |
| Schedule for dispatching person | Period, Staffs, and Stages.  | 3. If necessary, HS R&A should dispatch staffs to LCO site to discuss the detail procedure, schedule, period, working scope, material, and others before repairing action.   |



# Stone & Webster Asia, Inc.

Mr. W. S. Choi  
 Manager of Overseas Business Team  
 HS R&A Co., Ltd.  
 147-1, Kyo-Dong, Yangsan  
 Kyoungnam 626-210, Korea  
 Fax: +82-55-387-8812  
 Email: cws6874@hsrna.com  
 (Total pages: 2+)

April 24, 2006  
 JO 13016/T2.20/P28/MEC  
 SWT-HSR-MS026-000126  
*Response Required: Yes*  
*Response Due: April 30, 2006*  
 - Urgent -

**SUBJECT:** LUNG MEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
 CONTRACT NO. 8749111M02600 LARGE RUBBER EXPANSION JOINTS MS-026  
 NON-CONFORMATION REPORT NCR-TGD-451 & INSTALLATION,  
 OPERATION AND MAINTENANCE MANUAL FOR RUBBER EXPANSION  
 JOINTS

**REFERENCE:** 1. SWT-HSR-MS026-000123, dated March 27, 2006  
 2. SWT-HSR-MS026-000093, dated September 20, 2004

Dear Mr. Choi,

Regarding the NCR-TGD-451 forwarded to you by Reference 1, we have further questions as below:

1. For face to face tolerance, the tolerance specified in "Appendix A, Dimension Inspection Procedure" of FSA (Fluid Sealing Association) Technical Handbook, Six Edition, for these joints is  $\pm 3/8$  inch in average value (Enclosure 1). Due to the face to face dimension in our specification is 380mm, the piping will reserve a space of 380mm normally for the installation of rubber expansion joint. Assuming the piping installation has no accumulated tolerance, to install the 1P28-EXJ-5003C EXJ, for example, the joint needs to be elongated from 371.83mm to 380mm. This means a pre-extension of 8.17mm (380-371.83) is required. Since this joint is designed for 20mm extension, whether the joint can only take 20-8.17=11.83mm displacement in normal operation with a 8.17 mm pre-extension during installation? If yes, the joint is considered not matching the contract specification requirement. Please clarify.

In other word, please confirm we can install all those joints having a face to face smaller than 380mm into the 380mm space, pre-extend the joint to 380mm and then bolt the joint flange to the pipe flange without problem in reducing the contract movement capacity (40mm Axial Compression & 20mm Axial Extension).

As to these joints having a face to face dimension large than 380mm, please confirm we can pre-compress the joint to a face to face of 375mm (or other value suggested by HS R& A) for easy installation into the 380 mm space without problem in reducing the contract movement capacity (40mm Axial Compression & 20mm Axial Extension).

2. In installation practice, the piping will accumulate some installation tolerance, and might not result in a space equal to the 380mm for joint installation. Assuming that the final space available is  $380 \pm x$  mm, what is the allowable maximum value of "x" for this joint installation use?

For example, if HS R&A says  $x=10$ , that will mean when the face to face space is 370mm, we can install the joint by pre-compressing to 370mm and the function of required movement (40mm Axial Compression & 20mm Axial Extension) specified in specification will not be affected. It also means, when the face to face space is 390mm, we can install the joint by pre-extending to 390mm and the function of required movement (40mm Axial Compression & 20mm Axial Extension) specified in specification will not be affected.



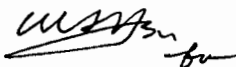
April 24, 2006  
JO 13016/T2.20/P28/MEC  
SWT-HSR-MS026-000126

Please advise the said "x" value for our use.

3. As to shown in the Reference 1 Attachment 1, the face to face lengths are not same among No.1 thru No. 6, so each joint's two flanges are not in parallel before installation. Do we need to check angular alignment or parallel alignment (referring to Fig. 1.88 & 1.89, Enclosure 2 for reference) in the installation between the joint's flange and pipe flange? If the answer is "Yes", please tell us the allowable maximum values accordingly.
4. Please also provide field installation experiences for this kind of EXJs in Korea power plants regarding tolerances stated above for our information.
5. The related document, the Installation, Operation and Maintenance Manual for Rubber Expansion Joint has been approved via References 2. However, this manual does not mention the installation tolerance, alignment and check details as the mentioned above. Please be requested to added a paragraph in the Installation, Operation and Maintenance Manual (Document No. 03403.MS026. 6-02003) and submit the revised document issued for use to S&W and TPC/DNE, respectively after closure of the subject Non-Conformance Report NCR-TGD-451.

If you have any question regarding this letter, please contact Gain Lin at 2696-6965 or by e-mail at [gain.lin@stoneweb.com.tw](mailto:gain.lin@stoneweb.com.tw).

Sincerely yours,



Thomas P. Tonden  
Project Engineering Manager

TPT: gal0382

Enclosure: 1. Appendix A, Dimension Inspection Procedure of FSA  
2. Figure 1.88 & 1.89- Checking Angular and Parallel Alignment

cc: Mr. S. H. Liao - PM, DNE TPC, Fax: 2367-1675  
Mr. Y. H. Hsu - PM, DNFPP TPC, Fax: 2391-0281  
Mr. J. Y. Hsu - Director, LCO TPC, Fax: 2490-2402  
Mr. M. S. Chang - Director, DNS TPC, Fax: 2367-7885

### Appendix A: Dimension Inspection Procedure

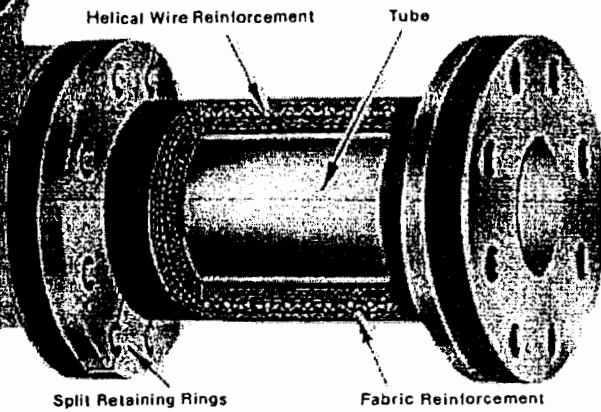


Figure 8: Cross Section View Of Flanged Type Flexible Rubber Pipe

#### G. INSTALLATION AND MAINTENANCE:

The informatin in chapter IV, Section D applies to flexible pipe connectors as well as expansion joints. See Chapter IV, Section D.

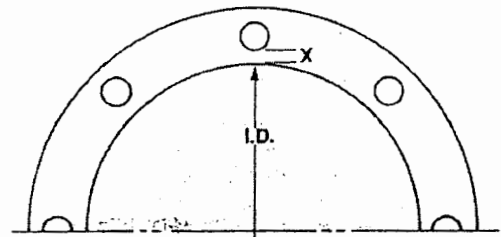
TABLE VIII: Rubber pipe connectors. Available Sizes and Suggested Length-to-Face Lengths.

| Nominal Pipe Size Connector Inside Diameter (Inches) | Recommended Face-to-Face "F" Dimension (Inches) |
|--|---|
| 1/2  | 12  |
| 3/4  | 12  |
| 1  | 12  |
| 1-1/4  | 12  |
| 1-1/2  | 12  |
| 2  | 12  |
| 2-1/2  | 12  |
| 3  | 18  |
| 3-1/2  | 18  |
| 4  | 18  |
| 5  | 24  |
| 6  | 24  |
| 8  | 24  |
| 10   | 24  |
| 12   | 24  |
| 14   | 24  |
| 16   | 24  |
| 18   | 24  |
| 20   | 24  |
| 22   | 24  |
| 24   | 24  |

NOTES: 1. For drilling See Appendix B.  
2. Above lengths are recommendations only.

| Nominal Pipe Size Exp.Jt. ID | TOLERANCES FOR RUBBER PIPE & EXPANSION JOINTS |                          |           |                              |         |          |  | Number of Measurements to be Averaged |
|------------------------------|---|--------------------------|-----------|------------------------------|---------|----------|--|---------------------------------------|
|                              | Split Joint I.D.                              | Non-Critical Flange O.D. | Bolt Line | Face-to-Face Length (Inches) |         |          | All Dimensions to be an Averaged Reading. Applies to Open or Filled Arch |                                       |
|                              |   |                          |           | 0 to 3                       | 3 to 14 | 14 to 24 |  |                                       |
| 0 to 10                      | ±3/16   | ±1/4                     | ±3/16     | ±3/16                        | ±3/16   | ±3/16    | 4  |                                       |
| 12 to 22                     | ±1/4  | ±3/8                     | ±1/4      | ±3/16                        | ±3/16   | ±3/16    | 4  |                                       |
| 24 to 48                     | ±3/8  | ±1/2                     | ±5/16     | ±3/16                        | ±3/16   | ±1/4     | 4  |                                       |
| 48 to 70                     | ±3/8  | ±3/4                     | ±3/4      | ±1/4                         | ±3/8    | ±2/8     | 6  |                                       |
| 72 & Up                      | ±3/8  | ±1                       | ±1/2      | ±1/4                         | ±3/8    | ±3/8     | 6  |                                       |

NOTES:  
1. All diameters to be measured with a "Pi" tape.  
2. All linear dimensions to be measured with a steel rule and averaged.  
3. Bolt Line = Actual I.D. + 2 (Average "X" Dimension) + Bolt Hole Diameter.



| FLANGE THICKNESS (Non-Critical) |                |           |
|---------------------------------|----------------|-----------|
| Nominal Flange Thickness        | # Measurements | Tolerance |
| 9/16                            | 4              | ± 1/6     |
| 5/8 - 7/8                       | 4              | ± 3/16    |
| 1                               | 4              | ± 1/4     |
| 1-1/8 - 1-1/4                   | 5              | ± 5/16    |
| 1 - 1-3/8                       | 6              | ± 3/8     |

NOTE: Measurements taken at the bolt hole.

gested on medium size units [(e.g., over 5 ft.) (1.5 m)]. A gap of about 0.75 to 1.5 inches (19 to 38 mm) should be allowed between the base plate and the foundation for grouting.

Adjust the metal supports or wedges until the shafts of the pump and driver are level. Check the coupling faces as well as the suction and discharge flanges of the pump for horizontal or vertical position by means of a level. Make corrections if necessary, by adjusting the supports or wedges under the base plate.

**1.4.2.1.3 Shaft/coupling alignment**

A flexible coupling is used to compensate for minor misalignment of the pump and driver shafts (Refer to pump manufacturers' recommendations).

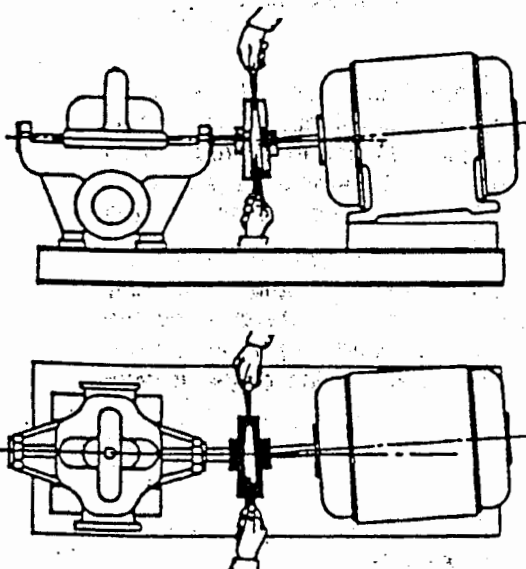


Figure 1.88 — Checking angular alignment

The main purpose of the flexible coupling is to compensate for minor temperature changes and to permit end movement of the shaft without interference with each other while transmitting power from the driver to the pump. A "hot" alignment may be required for hot pumpage, steam turbines, etc.

There are two forms of misalignment between the pump shaft and the driver shaft, as follows: Angular Misalignment - shafts with axis concentric but not parallel. Parallel Misalignment - shafts with axes parallel but not concentric.

The necessary tools for checking the alignment of a flexible coupling are a straight edge and a taper

gauge or a set of feeler gauges; or a dial indicator and inside micrometer if the alternate alignment procedure is used or when spacer couplings are being aligned.

The faces of the coupling halves should be spaced far enough apart so that they cannot strike each other when the driver rotor is moved axially toward the pump as far as it will go. A minimum dimension for the separation of the coupling halves and misalignment limits are specified by the manufacturer.

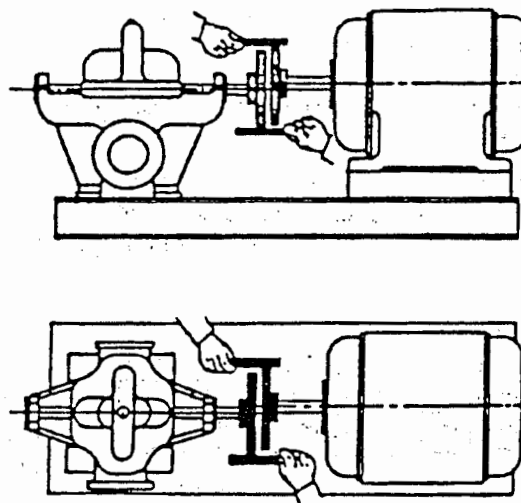


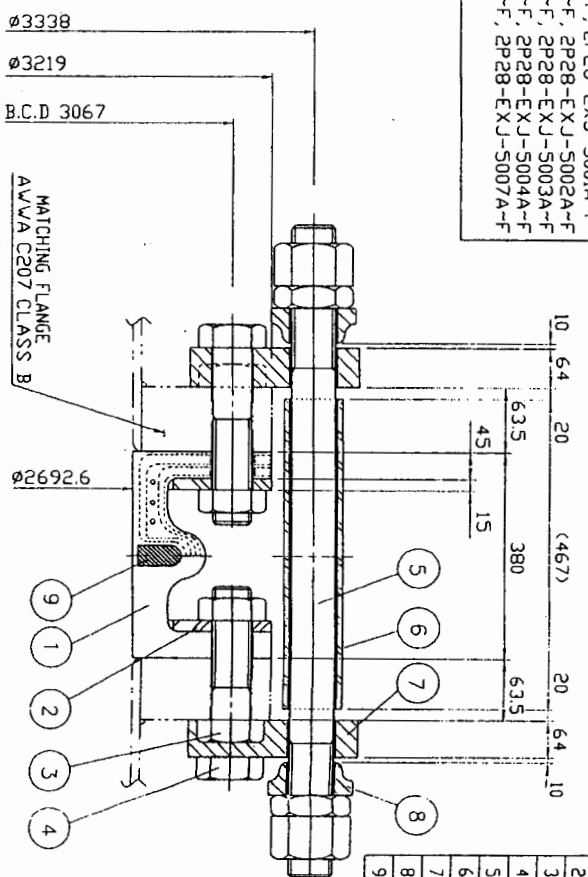
Figure 1.89 — Checking parallel alignment

Proceed with checks for angular and parallel alignment by the following method only if satisfied that face and outside diameters of the coupling halves are square and concentric with the coupling bores. If this condition does not exist, the Alternate Method of Alignment described below is recommended. A check for angular alignment is made by inserting the taper gauge or feelers between the coupling faces at 90° intervals (see Figure 1.88).

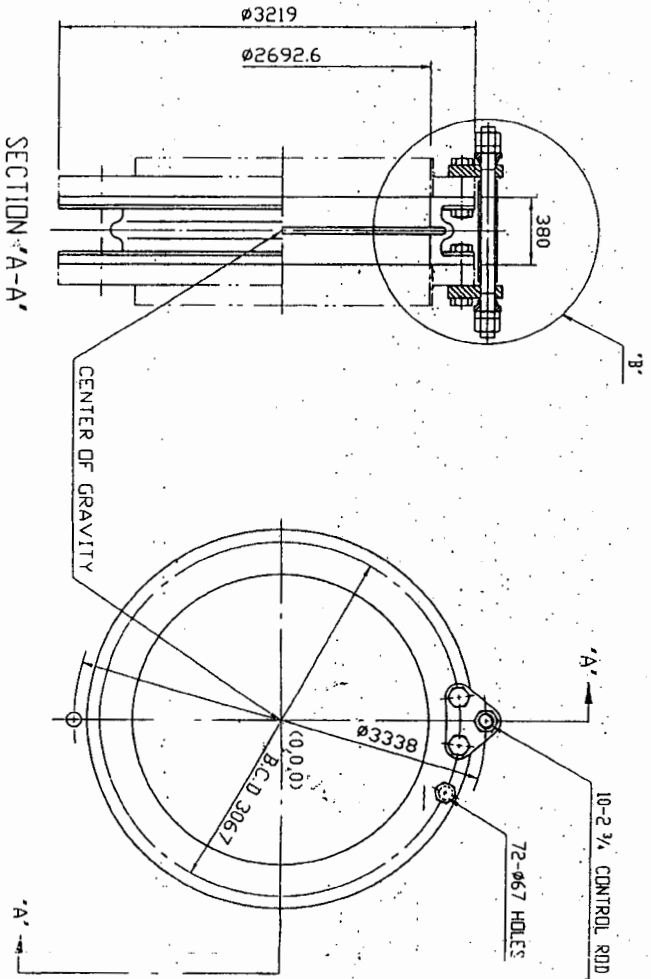
The unit will be in angular alignment when the measurements show that the coupling faces are the same distance apart at all points.

A check for parallel alignment is made by placing a straight edge across both coupling rims at the top, bottom and at both sides. The unit will be in parallel alignment when the straight edge rests evenly across both coupling rims at all positions. (see Figure 1.89).

MARK NUMBERS:  
 IP28-EXJ-5001A-F, 2P28-EXJ-5001A-F  
 IP28-EXJ-5002A-F, 2P28-EXJ-5002A-F  
 IP28-EXJ-5003A-F, 2P28-EXJ-5003A-F  
 IP28-EXJ-5004A-F, 2P28-EXJ-5004A-F  
 IP28-EXJ-5007A-F, 2P28-EXJ-5007A-F



SECTION 'A-A'



| NO | PART NAME              | MAT'L                        | QTY | REMARKS   |
|----|------------------------|------------------------------|-----|-----------|
| 1  | RUBBER EXPANSION JOINT | 2700A X 380L                 | 1   |           |
| 2  | RETAINING RING         | 15T X Ø3219                  | 2   | 1/2 SPLIT |
| 3  | HEAVY HEX BOLT & NUT   | 2 1/4 X 80MM X 19 X 190S     | 104 | ANSI 1022 |
| 4  | HEAVY HEX BOLT & NUT   | 2 1/4 X 80MM X 260L X 255S   | 40  | ANSI 1022 |
| 5  | CONTROL ROD STUD BOLT  | 2 1/4 X 80MM X 103S L X 235S | 10  | ANSI 1022 |
| 6  | PIPE SLEEVE            | 3 X 4 1/2 L                  | 10  | ANSI 1022 |
| 7  | CONTROL ROD PLATE      | 64T                          | 20  |           |
| 8  | BALL SEAT              | 60T                          | 20  |           |
| 9  | ARCH FILLER            | EPDM                         | 1   |           |

**REVIEW RECORD STAMP**

1. Work Can Proceed

2. Revise and Resubmit (Work Can Proceed)

3. Revise and Resubmit (Work Can Not Proceed)

4. For Information Only

Responsible Disciplines:  QA  STR  ELEC  I/C  UT

Other: \_\_\_\_\_ specify \_\_\_\_\_

Responsible Engineer: \_\_\_\_\_

Print Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: 1. THIS RUBBER EXPANSION JOINT SHALL HAVE THE FOLLOWING CONDITIONS:

- 1-1- MOVEMENTS
- A) AXIAL COMPRESSION
  - B) AXIAL EXTENSION
  - C) LATERAL DEFLECTION
  - D) ANGULAR MOVEMENT
  - E) TORSIONAL MOVEMENT
- 1-2- SPRING RATE
- A) AXIAL COMPRESSION
  - B) AXIAL EXTENSION
  - C) LATERAL DEFLECTION
  - D) ANGULAR MOVEMENT
- 1-3- FLUID CONDITIONS
- A) FLUID
  - B) TEST PRESS
  - C) TEST PRESS
  - D) DESIGN TEMPERATURE

2. TOLERANCE OF RUBBER EXPANSION JOINT FLUID SEALING ASSOCIATION: NOMMETALIC EXPANSION JOINT DIVISION

3. THIS RUBBER EXPANSION JOINT CONSIST OF THE FOLLOWING MATERIAL:

- INNER TUBE: EPDM RUBBER
- REINFORCEMENT: SYNTHETIC FABRIC
- REINFORCING WIRE: HARD BRAVON STEEL
- OUTER COVER: EPDM RUBBER

4. ACT'Y PART COATINGS SHALL HAVE THE FOLLOWING METHOD:

- RETAINING RING & PIPE SLEEVE: ASTM A123 - ZINC CHRP-DIP GALVANIZED COATINGS ON IRON AND STEEL PRODUCTS - (THICKNESS: MIN 450g/m<sup>2</sup>)
- OTHER STEEL PART: ASTM B633 - ELECTRODEPOSITED COATING OF ZINC ON IRON AND STEEL - (THICKNESS: MIN 30g/m<sup>2</sup>)

5. ADJUST THE INSTALLING DIMENSION OF CONTROL UNIT ACCORDING TO DETAIL 'B'

6. ALL DIMENSIONS ARE APPLIED IN MILLIMETER

7. WEIGHT OF EXPANSION JOINT: 3705kg

| NO | DATE       | DESCRIPTION                    | REV. | APP.        |
|----|------------|--------------------------------|------|-------------|
| 4  | NOV 13 '02 | REVISION ACCORDING TO COMMENTS | 1    | [Signature] |
| 3  | MAY 13 '02 | REVISION ACCORDING TO COMMENTS | 1    | [Signature] |
| 2  | APR 2 '02  | REVISION ACCORDING TO COMMENTS | 1    | [Signature] |
| 1  | JAN 20 '02 | REVISION ACCORDING TO COMMENTS | 1    | [Signature] |
| 0  | JAN 18 '02 | INITIAL ISSUE FOR REVIEW       | 1    | [Signature] |

TAIWAN POWER COMPANY  
 LUNGCHEN PROJECT FOURTH  
 NUCLEAR POWER PLANT UNIT 1 & 2  
 DIMENSIONAL OUTLINE DRAWINGS OF  
 RUBBER EXPANSION JOINT (2700A/1087)  
 FOR CIRCULATING WATER SYSTEM

TAIPOWER SIG.

HS R&A  
 Drawing No. 03403, HS026, S-12001.

THIS DOCUMENT CONTAINS SAFETY RELATED ITEMS  
 YES Y NO N

THIS DOCUMENT CONTAINS SEISMIC (SD) ITEMS  
 YES Y NO N

PREPARED BY: \_\_\_\_\_

SIG. 03403

| APP.        | DATE |
|-------------|------|
| [Signature] |      |
| [Signature] |      |
| [Signature] |      |

DATE: JUN 11, 2002  
 PROJECT DWG. NO.: 03403 HS026, S-12001  
 SHEET NO.: 1/3  
 CLASSIFICATION:



# Stone & Webster Asia, Inc.

Mr. Hisashi Souma  
Project Manager  
Lungmen Make-Up Water Treatment System Project  
International Project Management Dept.  
Planning & Management Division, Nuclear System Division  
1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
Ibaraki-ken, 317-8511, Japan  
Fax: +81-294-41-8199  
Email: hit\_cfd@pis.hitachi.co.jp  
junko\_ushigome@pis.hitachi.co.jp  
cfd@hitachi-teo.com.tw  
(Total page: 1)

November 9, 2005  
JO 13016 /JB Q3.1/ I/T  
SWT-HIT-MS034-001192  
*Response Required: No*

**SUBJECT:** LUNGMEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
CONTRACT NO. 8749011M03400  
MANUFACTURING AND INSPECTION PLAN FOR VACUUM PUMPS (STERLING  
SIHI GMBH SCOPE), PDD NO. 06537-0P11-0259 REV. 1

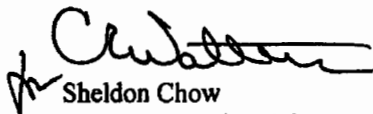
**References:** 1. HTC-SWT-CM0950, dated October 21, 2005  
2. G-DNS-05100363, dated November 3, 2005

Dear Mr. Souma,

In response to reference 1, we have reviewed the subject document and have no comment. The review status is "1".

If you have any questions regarding this letter, please contact Mr. George Hsi at +886-2-2696-6923 or by e-mail at [george.hsi@stoneweb.com.tw](mailto:george.hsi@stoneweb.com.tw)

Sincerely yours,

  
Sheldon Chow  
Taiwan Operations Manager

SCC: geh5442

cc: Mr. S. H. Liao, Project Manager DNE TPC, Fax: 2367-1675  
Mr. M. S. Chang, Director DNS TPC, Fax: 2367-7885



# Stone & Webster Asia, Inc.

Mr. Yasutaka Iwata, Project Manager  
Lungmen Make-Up Water Treatment System Project  
Nuclear Plant Engineering Department  
Hitachi Engineering and Production Division  
Nuclear System Division  
1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
Ibaraki-ken, 317-8511, Japan  
Fax: +81-294-55-9898  
Email: yasutaka\_iwata@pis.hitachi.co.jp  
junko\_ushigome@pis.hitachi.co.jp  
(Total page: 1)

October 4, 2004  
JO 13016 /JB Q3.1/ I/T  
SWT-HIT-MS034-000923  
*Response Required: No*

**SUBJECT:** LUNG MEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
CONTRACT NO. 8749011M03400  
QA RECORD LIST FOR PUMP (STERLING SIHI GMBH VACUUM PUMP  
PORTION, 06537-0P11-0114, REV. 1)

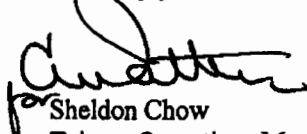
**References:** 1. HTC-SWT-CM0662, dated September 17, 2004  
2. G-DNS-04090413, dated September 29, 2004

Dear Mr. Iwata,

In response to reference 1, please be advised that we have no further comment on the subject document.  
The review status is "1".

If you have any questions regarding this letter, please contact Mr. George Hsi at +886-2-2696-6923 or by  
e-mail at [george.hsi@stoneweb.com.tw](mailto:george.hsi@stoneweb.com.tw)

Sincerely yours,

  
Sheldon Chow  
Taiwan Operations Manager

SCC: geh4338

cc: Mr. S. H. Liao, TPC Project Manager DNE, Fax: 2367-1675  
Mr. Y. H. Hsu, TPC Project Manager DNFPP, Fax: 2391-0281



# Stone & Webster Asia, Inc.

Mr. Hisashi Souma  
 Project Manager  
 Lungmen Make-Up Water Treatment System Project  
 International Project Management Dept.  
 Planning & Management Division, Nuclear System  
 Division  
 1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
 Ibaraki-ken, 317-8511, Japan  
 Fax: +81-294-41-8199  
 Email: hit\_cfd@pis.hitachi.co.jp  
 junko\_ushigome@pis.hitachi.co.jp  
 cfd@hitachi-teo.com.tw  
 (Total pages: 1+)

August 31, 2005  
 JO 13016 /T2.20/P11/MEC  
 SWT-HIT-MS034-001156  
 Response Required: No

**SUBJECT:** LUNG MEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
 CONTRACT NO. 8749011M03400 – MAKE-UP WATER TREATMENT SYSTEM  
 COMMENTS ON CMP DATA SHEETS FOR VACUUM PUMP & MOTOR, REV. 2

**Reference:** 1. Hitachi letter HTC-SWT-CM0911 dated August 12, 2005  
 2. DNE-SWT-0508-6229-N41 dated August 26, 2005

Dear Mr. Souma,

TPC and Stone & Webster have reviewed the subject document transmitted via Reference 1 and have no comments.

The reviewed document has the following status:

| Project Document            | Document Title                         | Review Status       | Pages Returned<br>w/ comments |
|-----------------------------|--|---------------------|-------------------------------|
| 06537-0P11-2702J,<br>Rev. 2 | Data Sheets for Vacuum Pump &<br>Motor | 1, Work Can Proceed | Cover Page                    |

Please proceed in accordance with the contractual requirements.

If you have any questions regarding this letter, please contact Paul Cheng at 886-2-2696-3356 ext. 5416 or by e-mail at [paul.cheng@stoneweb.com.tw](mailto:paul.cheng@stoneweb.com.tw).

Sincerely yours,

Marc Boothby  
 Project Engineering Manager  
 MLB: pyc0877

Enclosure: Stamped Cover of Document Listed Above

cc: Mr. S. H. Liao - PM, DNE TPC



# Stone & Webster Asia, Inc.

Mr. Hisashi Souma  
 Project Manager  
 Lungmen Make-Up Water Treatment System Project  
 International Project Management Dept.  
 Planning & Management Division, Nuclear System  
 Division  
 1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
 Ibaraki-ken, 317-8511, Japan  
 Fax: +81-294-41-8199  
 Email: hit\_cfd@pis.hitachi.co.jp  
 junko\_ushigome@pis.hitachi.co.jp  
 cfd@hitachi-teo.com.tw  
 (Total pages: 1+)

August 22, 2006  
 JO 13016 /T2.20/P11/MBC  
 SWT-HIT-MS034-001329  
 Response Required: No

**SUBJECT:** LUNG MEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
 CONTRACT NO. 8749011M03400 – MAKE-UP WATER TREATMENT SYSTEM  
 COMMENT ON CMP “INSPECTION & TEST PROCEDURE FOR VACUUM  
 PUMP (STERLING SIHI GMBH SCOPE)” (PDD NO. 06537-0P11-0241, REV. 1)  
 (FOREIGN PORTION)

**REFERENCE** 1. HTC-SWT-CM1079 dated August 17, 2006

Dear Mr. Souma,

We have reviewed the subject document transmitted via Reference 1 and have no comments.

The reviewed document has the following status:

| Project Document          | Document Title   | Review Status        | Pages Returned<br>w/ comments |
|---------------------------|--|----------------------|-------------------------------|
| 06537-0P11-0241<br>Rev. 1 | Inspection & Test Procedure for<br>Vacuum Pump (Sterling SIHI<br>GmbH Scope) | 1, Work Can Proceed) | Cover Page                    |

Please proceed in accordance with contractual requirements.

If you have any questions regarding this letter, please contact Paul Cheng at 886-2-2696-3356 ext. 5416  
 or by e-mail at [paul.cheng@stoneweb.com.tw](mailto:paul.cheng@stoneweb.com.tw).

Sincerely yours,

Thomas P. Tonden  
 Project Engineering Manager  
 TPT: pyc1264

Enclosure: Stamped Cover of Document Listed Above

cc: Mr. S. H. Liao - PM, DNE TPC





# Stone & Webster Asia, Inc.

Mr. Hisashi Souma  
Project Manager  
Lungmen Make-Up Water Treatment System Project  
International Project Management Dept.  
Planning & Management Division, Nuclear System Division  
1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
Ibaraki-ken, 317-8511, Japan  
Fax: +81-294-41-8199  
Email: hit\_cfd@pis.hitachi.co.jp  
junko\_ushigome@pis.hitachi.co.jp  
cfd@hitachi-teo.com.tw

June 16, 2005  
JO 13016 /JB Q3.1/ I/T  
SWT-HIT-MS034-001102  
*Response Required: No*

(Total page: 1)

**SUBJECT:** LUNG MEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
CONTRACT NO. 8749011M03400  
PACKING, HANDLING AND STORAGE PROCEDURE FOR EQUIPMENT  
(FOREIGN PORTION) PDD NO. 06537-0P11-0234, REV. 5

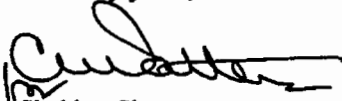
**References:** 1. HTC-SWT-CM0868, dated June 3, 2005  
2. DNE-SWT-0506-5524-N41, dated June 10, 2005

Dear Mr. Souma,

In response to reference 1, we have reviewed the subject document and have no comment. The review status is "1".

If you have any questions regarding this letter, please contact Mr. George Hsi at +886-2-2696-6923 or by e-mail at [george.hsi@stoneweb.com.tw](mailto:george.hsi@stoneweb.com.tw)

Sincerely yours,

  
Sheldon Chow  
Taiwan Operations Manager

SCC: geh5099

cc: Mr. S. H. Liao, TPC Project Manager DNE, Fax: 2367-1675  
Mr. Y. H. Hsu, TPC Project Manager DNFPP, Fax: 2391-0281  
Mr. J. Y. Hsu, TPC Director LCO, Fax: 2490-2402



# Stone & Webster Asia, Inc.

Mr. Hisashi Souma  
 Project Manager  
 Lungmen Make-Up Water Treatment System Project  
 International Project Management Dept.  
 Planning & Management Division, Nuclear System Division  
 1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
 Ibaraki-ken, 317-8511, Japan  
 Fax: +81-294-41-8199  
 Email: hit\_cfd@pis.hitachi.co.jp  
 junko\_ushigome@pis.hitachi.co.jp  
 cfd@hitachi-teo.com.tw  
 (Total pages: 1+)

January 23, 2006  
 JO 13016 /T2.21/P11/MEC  
 SWT-HIT-MS034-001222  
 Response Required: No

SUBJECT: LUNG MEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
 CONTRACT NO. 8749011M03400 – MAKE-UP WATER TREATMENT SYSTEM  
 COMMENT ON CMP OPERATION, INSTALLATION, MAINTENANCE AND DESIGN  
 MANUALS (PUMP OF STERLING SIHI GMBH PORTION) REV. 0

REFERENCE 1. HTC-SWT-CM0982 dated December 16, 2005  
 2. DNE-SWT-0512-8030-N41 dated January 6, 2006

Dear Mr. Souma,

TPC and Stone & Webster have reviewed the subject document transmitted via Reference 1 and have no comments.

The reviewed document has the following status:

| Project Document           | Document Title   | Review Status       | Pages Returned<br>w/ comments |
|----------------------------|--|---------------------|-------------------------------|
| 06537-0P11-0039,<br>Rev. 0 | Operation, Installation, Maintenance and<br>Design Manuals (Pump of Sterling SIHI<br>GmbH Portion) | 1, Work Can Proceed | Cover Page                    |

Please proceed in accordance with contractual requirements.

If you have any questions regarding this letter, please contact Paul Cheng at 886-2-2696-3356 ext. 5416 or by e-mail at [paul.cheng@stoneweb.com.tw](mailto:paul.cheng@stoneweb.com.tw).

Sincerely yours,

  
 Thomas P. Tonden  
 Project Engineering Manager

TPT: pyc0985

Enclosure: Stamped Cover of Document Listed Above

cc: Mr. S. H. Liao - PM, DNE TPC



# Stone & Webster Asia, Inc.

Mr. Yasutaka Iwata, Project Manager  
Lungmen Make-Up Water Treatment System Project  
Nuclear Plant Engineering Department  
Hitachi Engineering and Production Division  
Nuclear System Division  
1-1, Saiwai-cho, 3-chome, Hitachi-shi,  
Ibaraki-ken, 317-8511, Japan  
Fax: +81-294-55-9898  
Email: [yasutaka\\_iwata@pis.hitachi.co.jp](mailto:yasutaka_iwata@pis.hitachi.co.jp)  
[junko\\_ushigome@pis.hitachi.co.jp](mailto:junko_ushigome@pis.hitachi.co.jp)  
[cfd@hitachi-teo.com.tw](mailto:cfd@hitachi-teo.com.tw)  
(Total pages: 1+)

March 17, 2005  
JO 13016 /T2.20/P11/MEC  
SWT-HIT-MS034-001014  
*Response Required: No*

**SUBJECT:** LUNGMEN NUCLEAR POWER PROJECT UNITS 1 AND 2  
CONTRACT NO. 8749011M03400 – MAKE-UP WATER TREATMENT SYSTEM  
RESPONSE TO SIR NO. 7 AND SIR NO. 9 FOR MOTOR STARTING CURRENTS

**Reference:**

1. Hitachi letter HTC-SWT-CM0725 dated November 30, 2004
2. Hitachi letter HTC-SWT-CM0734 dated December 17, 2004
3. TPC letter DNE-SWT-0503-5279-E10 dated March 14, 2005

Dear Mr. Iwata,

Enclosed please find our replies to the SIR No. 7 and SIR No. 9 transmitted by the References 1 and 2.

We accept Hitachi's clarification about the motor starting currents. Hitachi can proceed with related works.

If you have any questions regarding this letter, please contact John Wang at telephone number 02-26963356 ext.5506 or by e-mail at [john.wang@stoneweb.com.tw](mailto:john.wang@stoneweb.com.tw).

Sincerely yours,

Marc Boothby  
Project Engineering Manager

MLB: jw0579

Enclosure: S&W replies to Hitachi's SIR No. 7 and SIR No. 9

cc: Mr. S. H. Liao - PM, DNE TPC



STONE & WEBSTER  
SELLER INFORMATION REQUEST

| JOB ORDER  | P.O./CONTRACT NO(s) | RECORD TYPB CODE  | SIR NO.        |
|--|---------------------|---|----------------|
|  | 8749011M03400       | 1   | 7              |
| TO: Stone & Webster Asia Inc.<br>Attn: Mr. Marc Boothby, Project Engineering Manager   |                     | FROM: Y. Iwata, Hitachi Lungmen Make-up Water Treatment System Project Project Manager<br><br>Hitachi Ltd 1-1 Saiwai-cho, 3-chome Hitachi-shi, Ibaraki-ken, |                |
| Page 1 of 11<br>Date of Request: 2004/8/31   |                     |   |                |
| <b>Problem Description:</b><br>For the vacuum pump motor design, there was the comment that "It's can not exceed requirement of 6 times rated full load current." in SWT-HIT-MS034-000817.   |                     |   |                |
| <b>Proposed Solution (Include technical justification if necessary; see back side)</b><br>1. The CMP's vacuum pumps(OP11-EXH-5018A/B) were manufactured by Sterling in Germany. There are no suitable motor maker which can meet the forementioned condition.<br>2. The start current requirements were defined in IEC(International Electrotechnical Commission) Standard Publication 34-12, 1980.(This standard was referred in JIS-C4034-1) (Attachment-3). According to this standard, this pump start current was permitted by 870% rated current. So We can judge that this pump motor can be used.;<br>$I_s/I_c \leq S1 * \eta * pf$ $I_s: \text{Start Current, } I_c: \text{Rated Current,}$ $S1: \text{Locked Rotor Apparent Power, } \eta: \text{Efficiency,}$ $Pf: \text{Power Factor}$ In the above equation, this pump motor was calculated as follows;<br>$S1: 11 \text{ (This pump power is 40HP, so 11 was selected by Table II of Standard.)}$ $\eta: 0.932 \text{ (See Attachment1)}$ $pf: 0.849 \text{ (See Attachment1)}$ $I_s/I_c \leq 11 * 0.932 * 0.849 = 8.70 \text{ (870\%)}$ |                     |   |                |
| Signature and Title of Seller Rep. Making Request  |                     | Dept.-Tel. No.  | Need reply by: |
| <i>Y. Iwata</i>  |                     | (Tel):81-294-55-4433)   | 2004/09/10     |
| Attachments:<br><input checked="" type="checkbox"/> yes <input type="checkbox"/> no  |                     |   |                |
| S&W Reply  |                     |   |                |
| <i>The starting currents of motor op11-EXH-5018A/B are 306A &amp; 308A respectively. They are slightly higher (6.4 x I<sub>fc</sub>) than the specification required (6 x I<sub>fc</sub>). However, they comply with the IEC &amp; JIS. Therefore, they are technical acceptable.</i>  |                     |   |                |
| Furnished by: <i>James Huang</i>   |                     | Date: <i>12/17/04</i>   |                |
| E& DCR Required <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |                     | E & DCR Number  |                |



**STONE & WEBSTER  
SELLER INFORMATION REQUEST**

| JOB ORDER  |  | P.O./CONTRACT NO(s)   | RECORD TYPE CODE                           | SIR NO.   |
|--|--|---|--|---|
|  |  | 8749011M03400   | 1  | 9   |
| TO: Stone & Webster Asia Inc.<br>Attn: Mr. Marc Boothby, Project Engineering Manager   |  | FROM: Y. Iwata, Hitachi Lungmen Make-up Water Treatment System Project Project Manager<br><br>Hitachi Ltd 1-1 Saiwai-cho, 3-chome Hitachi-shi, Ibaraki-ken, | Page 1 of 6<br>Date of Request: 2004/12/17 |   |
| <p><b>Problem Description:</b><br/>As commented in SWT-HIT-MS034-000811, in the Flowserve pumps (0P11-P-5005A/B, 5009A/B, 5010A/B, 5025A/B) of CMP. the locked rotor current exceed 6.0 times of full load current which is contrary to the requirement in Technical Specification No. 875-M0053 Paragraph 3.3.5.9.2.5.</p>  |  |   |  |   |
| <p><b>Proposed Solution (Include technical justification if necessary; see back side)</b></p> <p>In NEMA MG1 clause 12.35.1, the Locked- Rotor current at 40 HP, 50 HP of 230 voltages can be accepted by 580 and 725 Amperes for design letter B,C,D shown in attached pages' 2&amp;3. So considering our design of 460 voltages, the corresponded Locked-Rotor currents can be accepted by 290 and 362.5 Amperes.<br/>The design locked rotor current for the said motors is 290A for 40HP motor and 362.5A for 50HP motor shown in attached pages' 4,5 and 6.<br/>By forementioned description, we judged that the said motors can meet our design.</p> |  |   |  |   |
| Signature and Title of Seller Rep. Making Request  |  | Dept.-Tel. No.  | Need reply by:                             | Attachments:  |
| <i>Y. Iwata</i>  |  | (Tel:81-294-55-4433)  | 2004/12/28                                 | <input checked="" type="checkbox"/> yes <input type="checkbox"/> no |
| <p><b>S&amp;W Reply</b></p> <p><i>The starting current of motor rated 40Hp(0p11-p-5005A/B, 5009A/B &amp; 5010A/B) and 50Hp(5025A/B) are 290A &amp; 362.5A respectively. They are slightly higher than the specification requirements (6.45 x Ifc to 6 x Ifc). However, they comply with the section 12.35.1 of NEMA MG1. Therefore, Technical</i></p>  |  |   |  |   |
| Furnished by:  |  | Date  | acceptable.                                |   |
| <i>James Duang</i>   |  | <i>1/20/05</i>  |  |   |
| E& DCR Required <input type="checkbox"/> yes <input checked="" type="checkbox"/> no  |  | E & DCR Number  |  |   |

Specification No. 874-M0053  
Class R

Revision 0  
7<sup>th</sup> Aug, 2002

Vacuum Pumps

|        |   |  |
|--------|---|--|
| I.     | Pump Mark Numbers                                   | 0P11-EXH-5018 A/B  |
| II.    | Quantity  | 2  |
| III.   | Pump Nomenclature                                   | GEV 900B + 2 X LPH 65327   |
| IV.    | Design Criteria                                     | Liquid Ring Vacuum Pump  |
| V.     | Duty Alignment                                      | N/A  |
| VI.    | Pumped Fluid  | Air  |
| VII.   | Performance (Each Pump)                             |  |
|        | A. Design Flow, m <sup>3</sup> /h                   | As per attached curve (P15)<br>465 m <sup>3</sup> /hr @ 33 mbar @ 25C                        |
|        | B. Design Efficiency, %                             | N/A  |
|        | C. Best Efficiency Point flow, m <sup>3</sup> /h    | N/A  |
|        | D. Design Head, m (including pump losses)           | N/A  |
|        | E. Rated rpm  | 1750   |
|        | F. Min allowable continuous flow, m <sup>3</sup> /h | N/A  |
|        | G. NPSH <sub>R</sub> at design flow                 | N/A  |
|        | H. Total shutoff head, m                            | N/A  |
| VIII.  | Bhp at design flow, kW                              | 25   |
| IX.    | Bhp at run out flow, kW (@ m <sup>3</sup> /h)       | N/A  |
| X.     | Required motor size, kW                             | 30   |
| XI.    | Material (Use ASME/ASTM Spec No.s)                  |  |
|        | A. Casing   | ASTM A 296-75 Grade CF-8M  |
|        | B. Casing ring                                      | N/A  |
|        | C. Impellor   | CD4M Cu  |
|        | D. Base Plate                                       | A36  |
|        | E. Sleeves  | ACI-Type CF-8M   |
|        | F. Shaft<br>(not in contact with pumped fluid)      | ASTM equivalent not known.<br>Carbon Steel of composition;<br>C ~ 0.4%, P < 0.05%, S < 0.05% |
| XII.   | Shaft seal method (Stuffing box, mech seal)         |  |
|        | A. OEM  | Roten  |
|        | B. Flush Plan                                       | Internal (API 1)   |
|        | C. Performance                                      | Excellent  |
| XIII.  | Bearing   |  |
|        | A. Inboard type                                     | N/A  |
|        | B. Life   | N/A  |
|        | C. Outboard type                                    | Roller ball  |
|        | D. Life   | 50,000 hours   |
| XIV.   | Bearing Span, mm                                    | 950  |
| XV.    | Shaft OD (mm)                                       |  |
|        | A. at impellor                                      | 60   |
|        | B. at bearings                                      | 45/50  |
|        | C. at coupling                                      | 38   |
| XVI.   | Coupling type                                       | Flexible   |
| XVII.  | Coupling service factor                             | 2  |
| XVIII. | Baseplate width, mm                                 | 600  |
| XIX.   | Baseplate length, mm                                | 1,620  |
| XX.    | Weight of pump, kg                                  | 258  |
|        | A. motor, kg  | 203  |
|        | B. Baseplate, kg                                    | 125  |

Required piping forces and moments

| Axis  | Force, N | Moment, N-m |
|---|----------|-------------|
| <b>X, Horizontal</b><br>Perpendicular to pump shaft | 800      | 270         |
| <b>Y, Horizontal</b><br>Along pump shaft            | 800      | 270         |
| <b>Z, Vertical</b><br>Perpendicular to pump shaft   | 800      | 270         |



# Stückliste / Bauteilliste

parts list / component parts list  
nomenclature / liste de composants  
lista de piezas / lista de componentes

Benennung/Typ LPH 65327 / XBp / GEV900 / XCk65  
denomination/type  
designación/type  
denominación/tipo

Nr.: 15029619  
no.

Progr.-Nr. no. of progr.  
no. du progr. no. del progr.

Seite: 1  
page  
page  
página



Datum: 26.08.2003 D-25524 Iizehoe  
date  
date  
fecha

| Pos. Nr. no. | Benennung Fe St. designation denomination | Sach-Nr. ident n° d'article identificación | Sach-Nr. alt ident no. old ancien numéro no de ident antigua | ME unit unité unit. | Menge quantity quantité cantidad | Abmessung/Beschreibung dimension/description dimensión/descripción | [kg]  |
|--------------|---|--|--|---------------------|----------------------------------|--|-------|
| 0001         | 1 LPHA 65327 BN 135 42 4                  | 10004720                                   | 190056537-062  | PCE                 | 2,000                            | VENDOR   | 2x250 |
| 0002         | 1 coupling-half                           | 43021474                                   | 970204459-003  | PCE                 | 2,000                            | B140 - part 4 - ø=38 0.6025  | 2x4   |
| 0003         | 1 coupling-half                           | 43054871                                   | -003   | PCE                 | 2,000                            | B140 - part 1 - ø=53,98 0.6025                                     | 2x4   |
| 0004         | 1 coupling guard                          | 43042307                                   | 969821122-345  | PCE                 | 2,000                            | H225 L208/238 R105 2.0321  | 2x7   |
| 0005         | 1 base frame                              | 43054888                                   | -0810  | PCE                 | 1,000                            | 2800x2000x322 1.0038   | 1200  |
| 0006         | 1 liquid separator                        | 43055644                                   | 065_0172_-172  | PCE                 | 1,000                            | DIN/ANSI 1.4571  | 100   |
| 0007         | 1 pipeline                                | 35003226                                   | 914106518-172  | PCE                 | 2,000                            | DN 65 1.4571   | 2x7   |
| 0008         | 1 ball valve                              | 43054889                                   | -9990  | PCE                 | 2,000                            | DN 65 PN10/16  | 2x15  |
| 0009         | 1 pipeline                                | 20059742                                   | -1720  | PCE                 | 1,000                            | DN 65 1.4571   | 7     |
| 0010         | 1 pipeline                                | 20059743                                   | -1720  | PCE                 | 1,000                            | DN 65 1.4571   | 10    |
| 0011         | 1 pipeline                                | 20059744                                   | -1720  | PCE                 | 1,000                            | DN 25 1.4571   | 4     |
| 0012         | 1 pipeline                                | 20059745                                   | -1720  | PCE                 | 1,000                            | DN 65/100 1.4571   | 15    |
| 0013         | 1 ball type nonreturn valve               | 43039285                                   | 934006550-784  | PCE                 | 2,000                            | 122X135-XCK65 PTFE 1.4408  | 2x14  |
| 0014         | 1 GEVY 900B 4B 0 with 2.2 certificates    | 10100053                                   | 1901024  | PCE                 | 1,000                            | N1 = ANSI 150 LBS  | 42    |
| 0015         | 1 ball valve                              | 43055000                                   | -9990  | PCE                 | 3,000                            | DN25 PN10/16   | 3x7   |
| 0016         | 1 heat exchanger                          | 43056002                                   |  | PCE                 | 1,000                            | TYPE GC-12PK20   | 30    |
| 0017         | 1 pipeline                                | 35024242                                   | -172   | PCE                 | 1,000                            | DN25 1.4571  | 6     |
| 0018         | 1 el.motor 10F315X646H2                   | 43013255                                   | -1720  | PCE                 | 2,000                            | 40HP,1775RPM,324T,1248M,TEFC,F1                                    | 2x270 |
| 0019         | 1 pipeline                                | 20059746                                   | -1720  | PCE                 | 2,000                            | DN 32 / 1 1/2" ANSI 1.4571   | 2x3   |
| 0020         | 1 flow indicator                          | 43055641                                   |  | PCE                 | 1,000                            | DN25/PN40; 0.4...4 M³/H; BGF-220-25-4000-KEM2                      | 10    |
| 0021         | 1 switch board panel                      | 43055640                                   | -999   | PCE                 | 1,000                            | AHLF   | 15    |
| 0022         | 1 liquid level indicator                  | 43055642                                   |  | PCE                 | 1,000                            | 1.4571 BNA-25/16C-M-MRA-ZTSS 150                                   | 10    |
| 0023         | 1 pipeline                                | 20059747                                   | -1720  | PCE                 | 1,000                            | DN 25 / 32 1.4571  | 5     |
| 0024         | 1 solenoid valve                          | 43055643                                   |  | PCE                 | 1,000                            | DN25; 120V/50HZ 1.4408 MGNMF2232 48025                             | 5     |
| 0025         | 1 pipeline                                | 20059748                                   | -1720  | PCE                 | 2,000                            | DN25 DIN 2833 / DIN 2558 1.4571                                    | 7     |
| 0026         | 1 pipeline                                | 20059809                                   | -1720  | PCE                 | 1,000                            | DN 25 / 32 1.4571  | 4     |
| 0027         | 1 pipeline                                | 20059810                                   | -1720  | PCE                 | 2,000                            | DN25 DIN2633 - 1" ANSI,150 1.4571                                  | 4     |
| 9999         | 1 accessories                             | 20059820                                   |  | PCE                 | 1,000                            | for parts list 15029519  |       |



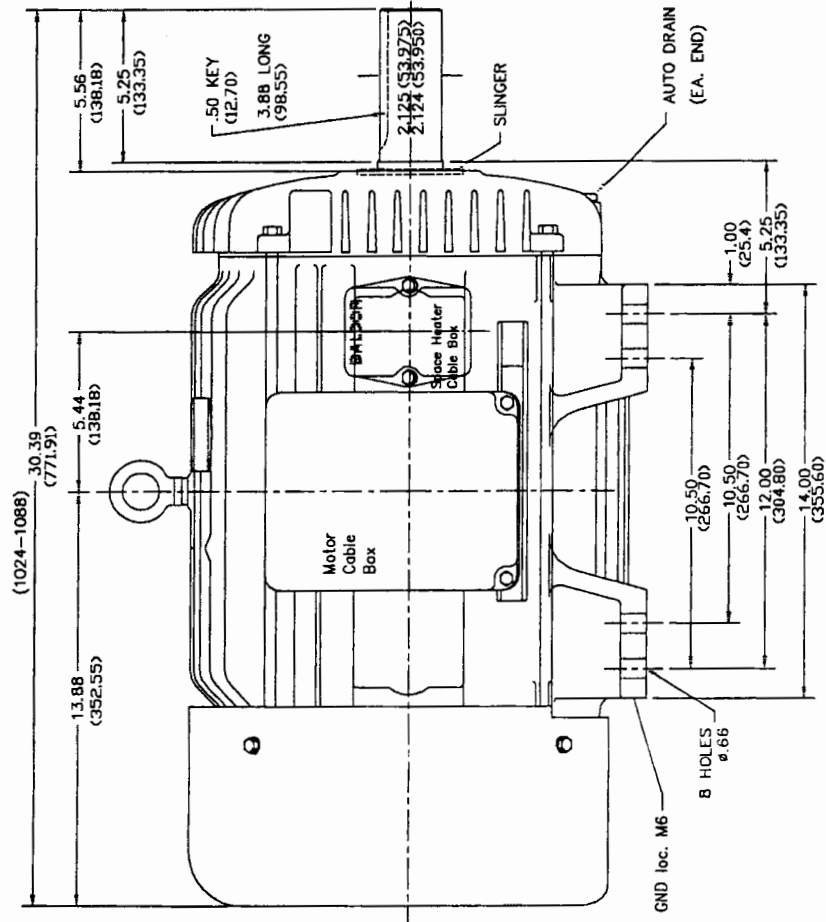
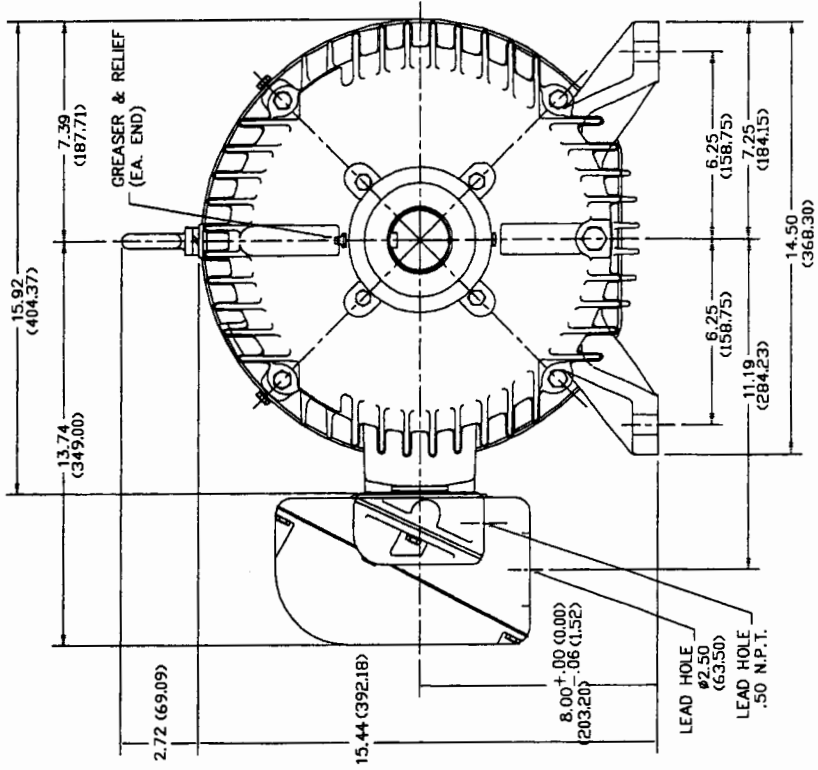
Specification No. 874-M0053  
Class R

Revision 2

VACUUM PUMPS

| INDUCTION MOTOR DATA                                    |  |
|---|--|
| FURNISHED BY: Sterling SIHI GmbH                        | DATE                                       |
| MARK OR ITEM NO.: 0P11-EXH-5018A/B                      |  |
| PURCHASER'S REQUIREMENTS                                | DATA FURNISHED BY SUPPLIER                 |
| SERVICE: VACUUM PUMP                                    | Design                                     |
| TYPE:   | FRAME NO. 324T                             |
| NO. OF UNITS: 2   | HORSEPOWER: 40                             |
| MOUNTING: F1 horizontal                                 | SERVICE FACTOR: 1,15                       |
| ELEC. CHARACTERISTICS: 460 V 3 PH 60 CT                 | FULL LOAD RPM 1765                         |
| SYNCH. SPEED, RPM: 1765                                 | FULL LOAD AMP: 48@460                      |
| HORSEPOWER: 40  | LOCKED ROTOR AMP 306/308@460               |
| SERVICE FACTOR 1,15                                     | STARTING TORQUE, % FL: 160,5               |
| ENCLOSURE: TEFC   | PULL-OUT TORQUE, %FL: 295                  |
| INSULATION CLASS: F                                     | EFF-FULL LOAD, 93%                         |
| INSULATION TREATMENT:                                   | EFF-3/4 LOAD, 93,2%                        |
| AMBIENT TEMP: 40  | EFF-1/2 LOAD, 92,4%                        |
| STATOR TEMP RISE: 70                                    | P.F.-FULL LOAD, 85%                        |
| BEARING TYPE: Ball                                      | P.F.-3/4 LOAD, 81%                         |
| BEARING TEMP RELAY: NO                                  | P.F.-1/2 LOAD, 72%                         |
| BEARING THERMOCOUPLE: NO                                | P.F. AT STARTING, %                        |
| HALF COUPLOR SHEAVE MTD BY:                             | SHORT CIRCUIT A-C TIME CONSTANT, SEC       |
| ROTATION*: CW   | X/R RATIO                                  |
| WK <sup>2</sup> OF DRIVEN EQUIP. (LB-FT <sup>2</sup> ): | SPACE HTRS. TOTAL WATTS: 30                |
| BRKWY. TORQ. DRVN. EQUIP.:                              | RADIAL-BEARING TYPE: Ball                  |
| OVERSIZE COND. BOX:                                     | THRUST-BEARING TYPE                        |
| COND. BOX LOCATION*: Left facing shaft                  | BEARING SERVICE - HR: 30000                |
| SPACE HEATERS, VOLTAGE PHASE: 240 V/ 1 PH               | NORMAL ERG OPER. TEMP.                     |
| SPLIT END BELLS:  | NEW WEIGHT - N: 203 Kg                     |
| TERMINAL LUGS, TYPE:                                    | OIL COOL SYS. REQ'D                        |
| STATOR HIGH TEMP DEVICE:                                | BRG OIL PRESS. RANGE, PSI                  |
| ADJUSTABLE SLIDE RAILS:                                 | BRG OIL REQ'D EA. BRG GPM                  |
| SOLEPLATES:   | NAMEPLATE CODE LETTER G                    |
| PROJECT ELEV., FT.:                                     | PERMISSIBLE STARTS PER HR WITH:            |
| SHAFT (HOLLOW, SOLID):                                  | MOTOR AT AMBIENT TEMP. 50                  |
| COUPLING (SELF-RELEASE)                                 | MOTOR AT RATED TOTAL TEMP. 25              |
| SOLID, NONREVERSING                                     | TYPE SEALED INSUL SYS.                     |
| ADJUSTABLE, FLEXIBLE)                                   | DESCRIPTION OF INSUL SYS.                  |
| DOWNTHRUST - CONTINUOUS                                 | MAX. STALL 11MB WITH LR. AMPS, SEC.        |
| UPTHRUST - CONTINUOUS                                   | ACCBL TIME, FULLY LOADED                   |
| UPTHRUST - MOMENTARY                                    | * WITH 100% V. SEC.                        |
| DOWNTHRUST - MOMENTARY                                  | * WITH 80% V. SEC.                         |
|   | * WITH % V. SEC.                           |
| SIDE THRUST   |  |
| MAX REVERSE SPEED:                                      |  |
| DRAIN PLUG AND VENT:                                    |  |
| AIR INTAKE AND DISCHARGE SCREENS:                       |  |
| TYPE INSULATION**:                                      | WK <sup>2</sup> OF ROTOR, N-M <sup>2</sup> |
| SURGE CAPACITORS:                                       |  |
| ANTI-FRICT. BRG SERVICE HR                              |  |
| MINIMUM STARTING VOLTAGE: %                             |  |
| REMARKS:  | REMARKS:                                   |
| ALL PERFORMANCE DATA BASED ON NORMAL RATED              | ALL PERFORMANCE DATA BASED ON NORMAL RATED |
| VOLTAGE AND FREQUENCY                                   | VOLTAGE AND FREQUENCY                      |
| ITEMS 34-44 APPLY TO VERTICAL MOTORS ONLY               |  |
| ** BY SUPPLIER  |  |
| VIEWED FROM END OPPOSITE COUPLING END                   |  |

10LYF584



10LYF584

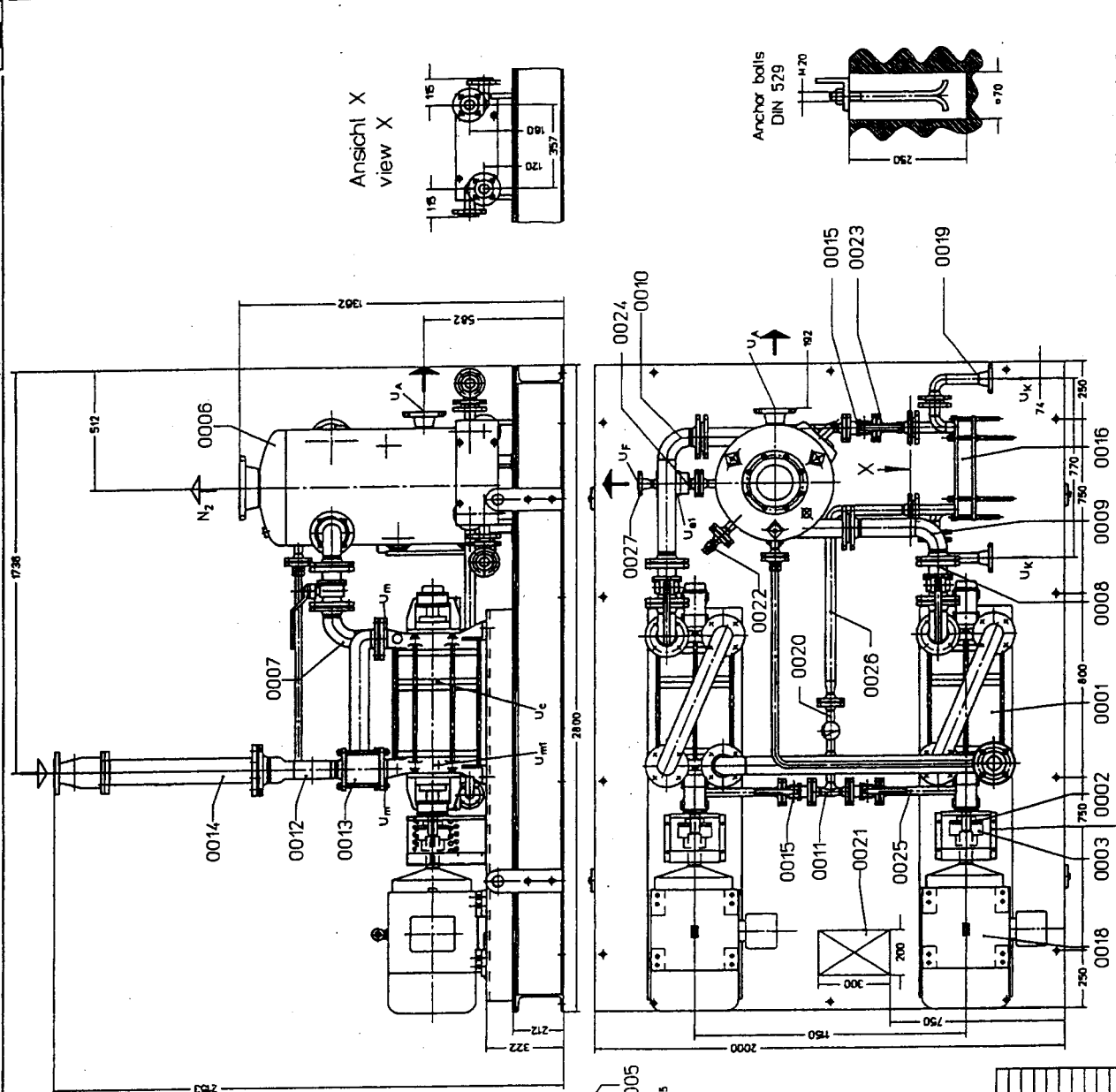
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.

REV. DESC: CHGD THRU BOLT "HA3113A11" TO "HA3113A15"  
 REV. LTR: B BY: NGH REVISED: 14:29:33 11/14/2003 TDR: 317757  
 FILE: AAA00106377 REF: 10LYF584  
 MTL: -

BALDOR ELECTRIC Co.

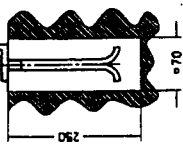
HORZ TEFC 324-6T W/AUX KOBX & HTRS W/TBOLT DESIGN

MASSZEICHNUNG  
 PAPIER LPH 83327 / XBP 1720 / DEVA 808B



Ansicht X  
 view X

Anchor bolts  
 DIN 529



total weight (no water): 2650 kg  
 operation weight (incl. water): 2800 kg

| U.c. | ANS      | ANS      | ANS      | ANS      | ANS      | ANS      | ANS      | ANS      | ANS      | ANS      |
|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| U.c. | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   | 1 1/2"   |
| U.c. | 150 lb   | 150 lb   | 150 lb   | 150 lb   | 150 lb   | 150 lb   | 150 lb   | 150 lb   | 150 lb   | 150 lb   |
| U.c. | 1.77     | 1.77     | 1.77     | 1.77     | 1.77     | 1.77     | 1.77     | 1.77     | 1.77     | 1.77     |
| U.c. | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   | 2 1/2"   |
| U.c. | 300 lb   | 300 lb   | 300 lb   | 300 lb   | 300 lb   | 300 lb   | 300 lb   | 300 lb   | 300 lb   | 300 lb   |
| U.c. | 2.17     | 2.17     | 2.17     | 2.17     | 2.17     | 2.17     | 2.17     | 2.17     | 2.17     | 2.17     |
| U.c. | 450 lb   | 450 lb   | 450 lb   | 450 lb   | 450 lb   | 450 lb   | 450 lb   | 450 lb   | 450 lb   | 450 lb   |
| U.c. | 3.44     | 3.44     | 3.44     | 3.44     | 3.44     | 3.44     | 3.44     | 3.44     | 3.44     | 3.44     |
| U.c. | 600 lb   | 600 lb   | 600 lb   | 600 lb   | 600 lb   | 600 lb   | 600 lb   | 600 lb   | 600 lb   | 600 lb   |
| U.c. | 4.54     | 4.54     | 4.54     | 4.54     | 4.54     | 4.54     | 4.54     | 4.54     | 4.54     | 4.54     |
| U.c. | 750 lb   | 750 lb   | 750 lb   | 750 lb   | 750 lb   | 750 lb   | 750 lb   | 750 lb   | 750 lb   | 750 lb   |
| U.c. | 6.45     | 6.45     | 6.45     | 6.45     | 6.45     | 6.45     | 6.45     | 6.45     | 6.45     | 6.45     |
| U.c. | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  | 1050 lb  |
| U.c. | 10.22    | 10.22    | 10.22    | 10.22    | 10.22    | 10.22    | 10.22    | 10.22    | 10.22    | 10.22    |
| U.c. | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  | 1500 lb  |
| U.c. | 14.75    | 14.75    | 14.75    | 14.75    | 14.75    | 14.75    | 14.75    | 14.75    | 14.75    | 14.75    |
| U.c. | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  | 2100 lb  |
| U.c. | 20.78    | 20.78    | 20.78    | 20.78    | 20.78    | 20.78    | 20.78    | 20.78    | 20.78    | 20.78    |
| U.c. | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  | 3000 lb  |
| U.c. | 29.84    | 29.84    | 29.84    | 29.84    | 29.84    | 29.84    | 29.84    | 29.84    | 29.84    | 29.84    |
| U.c. | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  | 4500 lb  |
| U.c. | 44.58    | 44.58    | 44.58    | 44.58    | 44.58    | 44.58    | 44.58    | 44.58    | 44.58    | 44.58    |
| U.c. | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  | 6750 lb  |
| U.c. | 66.87    | 66.87    | 66.87    | 66.87    | 66.87    | 66.87    | 66.87    | 66.87    | 66.87    | 66.87    |
| U.c. | 10125 lb | 10125 lb | 10125 lb | 10125 lb | 10125 lb | 10125 lb | 10125 lb | 10125 lb | 10125 lb | 10125 lb |
| U.c. | 100.31   | 100.31   | 100.31   | 100.31   | 100.31   | 100.31   | 100.31   | 100.31   | 100.31   | 100.31   |

REMARKS



|  |                                |  |  |
|--|--------------------------------|--|--|
| TPC<br>DNS<br>NOTICE OF UNSATISFACTORY CONDITION   |                                | NUC No. <i>DNS-01</i>                                  |  |
| CLIENT:  | TAIWAN POWER COMPANY           | P. O. NUMBER : 874 011 M03400                          |  |
| PROJECT:   | LUNG MEN NUCLEAR POWER PROJECT | Item No : Makeup Water Treatment System                |  |
| LOCATION:  |                                |  |  |
| VENDOR: <i>Sterling SIHI GmbH.</i>   |                                | VENDOR LOCATION<br><i>Itzehoe, Germany</i>             |  |
| UNSATISFACTORY CONDITION: (Described in Detail)  |                                |  |  |
| <p>After reviewing the QRP (QA Record File), We have some comments as following<br/>                 Please Clarify.</p> <ol style="list-style-type: none"> <li>1. The performance test records for Sterling SIHI GmbH Vacuum Pumps have not been submitted to TPC/S&amp;W for review and approval.</li> <li>2. The TPC Accepted Drawing (No. MZ15615) of the QRP didn't meet the approved Operation, Installation, Maintenance and Design Manuals (Project Document No. 06537-OP11-0039, Rev.1).</li> </ol> |                                |  |  |
| ORIGINATOR: (TPC Inspection REP.)<br><i>Shyh-Kwei Lo</i>   | DATE:<br><i>Nov. 2, 2006</i>   | VENDOR RECEIPT: <i>Attach NDA</i><br><i>J. Michino</i> | DATE:<br><i>Nov. 02, 2006</i>          |
| CORRECTIVE ACTION: (Completed By Vendor's Representative)  |                                |  |  |
| VENDOR'S REPRESENTATIVE:   | DATE:                          | VERIFICATION: (TPC Auditor)                            | ___ SATISFACTORY<br>___ UNSATISFACTORY |
|  |                                |  |  |

PACKING LIST

Contract No.: 8749011M03400  
 Shipment No.: LUN-MUWT-F-027  
 Packing List No.: STS-PL-01  
 Date: 9-Nov-06  
 SEA /  AIR

| Case No<br>(Pkg Style) | Wt of each pkg |         | Measurement<br>(M3) | Reference<br>Drawing No. | Project<br>Drawing No. | Part No. | Description  | Qty | Storage<br>Level | Remarks |
|------------------------|----------------|---------|---------------------|--------------------------|------------------------|----------|--|-----|------------------|---------|
|                        | Net            | Gross   |                     |                          |                        |          |  |     |                  |         |
| 1 of 1<br><br>(Crate)  | 2510 Kg        | 3055 Kg | 12.700              |                          |                        |          | SHIPPING MARK:<br>CARGO DESCRIPTION: VACUUM PUMP<br>STORAGE LEVEL: LEVEL B<br>CONTRACT NO: 8749011M03400<br>PORT OF DESTINATION: KEELUNG, TAIWAN<br>CONSIGNEE: TAIWAN POWER COMPANY,<br>DEPARTMENT OF NUCLEAR AND FOSSIL<br>POWER PROJECTS.<br>CASE NO: 1 OF 1 FOR LUN-MUWT-F-027<br>GROSS WEIGHT: 3055 KG<br>NET WEIGHT: 2510 KG<br>DIMENSIONS(L/W/H): 305 x 220 x 190 CM<br>TOTAL VOLUME: 12.7 M3<br>CONSIGNOR: Sterling SIHI GmbH<br>ON BEHALF OF HITACHI, LTD. JAPAN<br>Lindenstraße 170 ,25524 Itzehoe ,Germany | 1   | B                |         |
|                        |                |         |                     |                          |                        |          | Vacuum Pump System, with accessory including:<br>Vacuum Pumps(OP11-EXH-5018A/B),<br>Water Separator(OP11-WS-5001),<br>Water Cooler(OP11-WC-5001),<br>Solenoid Valve(OP11-SBV-5877A),<br>Flow Indicator(OP11-FS-5099),<br>Level Indicator(OP11-LIS-5090),<br>Level Indicator(OP11-LIS-5091) ,<br>Ejector,Suction Non-return Valve, Ball Valves<br>and Switch Board Panel  |     |                  |         |

**Packing Check Sheet**  
(Makeup Water Treatment System Equipment)

ATTACHMENT 6 (1/2)

Stage:  Packing Inspection  Shipping Release

| No. | 1 | 2 | 3 | 4 | 5 | Remarks |
|-----|---|---|---|---|---|---------|
| 1   | ✓ |   |   |   |   |         |
| 2   | ✓ |   |   |   |   |         |
| 3   | ✓ |   |   |   |   |         |
| 4   | ✓ |   |   |   |   |         |
| 5   | ✓ |   |   |   |   |         |
| 6   | ✓ |   |   |   |   |         |
| 7   | ✓ |   |   |   |   |         |
| 8   | ✓ |   |   |   |   |         |
| 9   | ✓ |   |   |   |   |         |
| 10  | ✓ |   |   |   |   |         |
| 11  | ✓ |   |   |   |   |         |
| 12  | ✓ |   |   |   |   |         |
| 13  | ✓ |   |   |   |   |         |
| 14  | ✓ |   |   |   |   |         |
| 15  | ✓ |   |   |   |   |         |
| 16  | ✓ |   |   |   |   |         |
| 17  | ✓ |   |   |   |   |         |
| 18  | ✓ |   |   |   |   |         |
| 19  | ✓ |   |   |   |   |         |
| 20  | ✓ |   |   |   |   |         |
| 21  | ✓ |   |   |   |   |         |
| 22  | ✓ |   |   |   |   |         |
| 23  | ✓ |   |   |   |   |         |
| 24  | ✓ |   |   |   |   |         |
| 25  | ✓ |   |   |   |   |         |
| 26  | ✓ |   |   |   |   |         |
| 27  | ✓ |   |   |   |   |         |
| 28  | ✓ |   |   |   |   |         |
| 29  | ✓ |   |   |   |   |         |
| 30  | ✓ |   |   |   |   |         |
| 31  | ✓ |   |   |   |   |         |
| 32  | ✓ |   |   |   |   |         |
| 33  | ✓ |   |   |   |   |         |

**Checking Items**

- 1 Check that equipments are dry, clean and free from any defect and damage.
- 2 All openings shall be sealed, plugged or covered.
- 3 Flanged openings are blinded with plywood or metal flange sealed with blind rubber.
- 4 The joint surfaces of the carbon steel flange are sealed with waterproof adhesive tapes.
- 5 All expendable materials shall not contribute to corrosion during the storage.
- 6 Pipe ends shall be capped, blinded or covered.
- 7 The holes bon Equipment for pipe connection shall be plugged or capped before shipment.
- 8 Non-metallic caps or plug may be used to seal openings and securely hold in place to prevent dislodging by rough handling.
- 9 All threaded pipe ends or coupling are protected with proper plastic / rubber plugs or caps.
- 10 In above case, warning mark is attached on the component.
- 11 All connection, terminal point, weld preparation and machined surface are protected against mechanical damage and corrosion during shipping and storage.
- 12 But welded end connections are suitably closed with plywood, plastic cap or metal covers sealed with rubber gaskets.
- 13 All exterior machined carbon steel surface, machined hole and threaded portion are protected against corrosion with a liberal coating if an acceptable easily removed compound.
- 14 Above compound is such that it will remain on the surface at the temperature to which the parts may be exposed during shipment and storage.
- 15 Above seal of wrapping is wrapped with adhesive tapes or heat sealed.
- 16 The design and fabrication of packing are easy handling, protected sealing construction, and to be minimum size as much as possible.
- 17 For special shape such as gaskets, pins, anchor bolts, nuts and the others are packed with polyethylene sock, which is sealed and labeled or tagged in accordance with procedure.
- 18 Pumps will not be shipped with their seals installed (either mechanical or packing).
- 19 All electrical and instrumentation Equipment shall be wrapped in polyethylene or polypropylene plastic sheet, in addition to normal packing, for protection against moisture.
- 20 Openings in electric motors, generators and other electrical Equipment shall be sealed with waterproof tape.
- 21 A protective grease-proof paper shall be inserted between the brushes and armature of motors and generators.
- 22 Fragile items shall be wrapped in crepe-cellulose wadding or equally effective cushioning material and floated in excelsior.
- 23 Fragile articles shall be packed in substantial wooden cases with special precaution against risk of breakage, and shall be clearly marked on the outside of boxes.
- 24 Heavy machinery shall be mounted and bolted to skids of sufficient strength to prevent distortion of the machine.
- 25 The equipment is mounted on skids fixed at saddle base plate or proper areas of the equipment.
- 26 Areas where the sling rope comes into contact with body are covered and protected with wooden slabs to prevent damage by handling.
- 27 Fixing contents in position is held by chocks, bracing and/or packing or by combination of these and bolts, straps and/or corners.
- 28 Fixing method of contents are that the contents with stands against horizontal, axial and vertical vibration.
- 29 Skid is applied to large components. And the structure of base is designed according to the shape, size and weight of the components.
- 30 Lumber is Birch tree, silver fir, hemlock spruce, Douglas fir or equivalent.
- 31 Knots are not over one-third width of the board, and not be crossing two faces of lumber, interfering with nailing nor locating at bolt-hole nor both cut-ends.
- 32 Board and lumber are not have insect holes, or dead knots, and no cracks longer than 20% of the length of the board. Crack of board and lumber is joint with corrugated nail.
- 33 Moisture contents are less than 80%.

Sterling Fluid Systems  
Sterling Fluid GmbH  
25994 Norderhörn, 17931 M.06

SIGNATURE/DATE  
*Z. Pichler*  
Nov. 03, 2006  
NUCLEAR PLANT QA & INSPECTION SEC., HITACHI

SIGNATURE/DATE  
*Shylo Kwan Lo*  
E&C  
10/24/06

(No.1-7 Check before packing)  
All equipments are packed in accordance with "Packing Procedure"(No.H3226-PACK-05)  
And, it is confirmed that the packing is completed by witness inspection among TPC&W, E&C and Hitachi.

SIGNATURE/DATE  
*Shylo Kwan Lo*  
TPC&W  
Nov 3, 2006

**Shipping-Check Sheet**  
(Makeup Water Treatment System Equipment)

ATTACHMENT 6 (2/2)

| No. | 1  | 2 | 3 | 4 | 5 | Remarks |
|-----|----|---|---|---|---|---------|
| 1   | ✓  |   |   |   |   |         |
| 2   | ✓  |   |   |   |   |         |
| 3   | ✓  |   |   |   |   |         |
| 4   | ✓  |   |   |   |   |         |
| 5   | ✓  |   |   |   |   |         |
| 6   | ✓  |   |   |   |   |         |
| 7   | ✓  |   |   |   |   |         |
| 8   | ✓  |   |   |   |   |         |
| 9   | NA |   |   |   |   |         |
| 10  | NA |   |   |   |   |         |
| 11  | ✓  |   |   |   |   |         |
| 12  | ✓  |   |   |   |   |         |

Sterling Fluid Systems  
Sterling SHI GmbH  
25324 Hildesheim, Industriestr. 170  
All Equipments 03-1106

All equipments are packed in accordance with "Packing Procedure"(No.H3226-PACK-05)  
And, it is confirmed that the packing is completed by witness inspection among TPCS&W, E&C and Hitachi.

SIGNATURE/DATE  
*Sylvester Lo*  
TPCS&W  
TPC/DMS Nov. 3, 2006

SIGNATURE/DATE  
*Cheng...*  
E&C  
11/07/06

SIGNATURE/DATE  
*Z. J. ...*  
Nov. 03, 2006  
NUCLEAR PLANT QA & INSPECTION SEC. HITACHI





**LUNG MEN PROJECT  
RELEASE FOR SHIPMENT  
Product Quality Certificate**

| <b>CLIENT :Taiwan Power Company</b>  |  | <b>TPC CONTRACT.NO.</b><br>8749011M03400  | <b>SHIPMENT.NO.</b><br>LUN-MUWT-F-027 |                 |  |  |   |       |   |  |  |
|--|--|---|---------------------------------------|-----------------|--|--|---|-------|---|--|--|
| <b>TPC SPECIFICATION NO.</b> 874-MS-034  |  | <b>REV.</b> 0   | <b>ADDENDA</b> N/A                    |                 |  |  |   |       |   |  |  |
| <b>SUPPLIER</b> Sterling SIHI GmbH   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <b>PRODUCT DESCRIPTION</b> Vacuum Pump   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <u>SUPPLIER'S CERTIFICATION</u>  |  |   |                                       |                 |  |  |   |       |   |  |  |
| I HEREBY CERTIFY THAT THE PRODUCT(S) IDENTIFIED HEREIN HAVE BEEN MANUFACTURED UNDER A CONTROLLED PROGRAM AND ARE IN COMPLIANCE WITH THE APPLICABLE CODES, STANDARDS AND SPECIFICATIONS LISTED IN TPC PURCHASE SPECIFICATION REQUIREMENT.   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <table border="0"> <thead> <tr> <th style="text-align: left;"><u>ITEM NO.</u></th> <th style="text-align: left;"><u>QUANTITY</u></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1 SET</td> <td>Vacuum Pump (0P11-EXH-5018A/B) with Water Separator (0P11-WS-5001), Water Cooler (0P11-WC-5001), Solenoid Valve (0P11-SBV-5877A), Flow Indicator (0P11-FS-5099), Level Indicator (0P11-LIS-5090), Level Indicator (0P11-LIS-5091), Ejector, Suction Non-Return Valves, Ball Valves and Switch Board Panel</td> </tr> </tbody> </table> |  |   |                                       | <u>ITEM NO.</u> | <u>QUANTITY</u>  |  | 1 | 1 SET | Vacuum Pump (0P11-EXH-5018A/B) with Water Separator (0P11-WS-5001), Water Cooler (0P11-WC-5001), Solenoid Valve (0P11-SBV-5877A), Flow Indicator (0P11-FS-5099), Level Indicator (0P11-LIS-5090), Level Indicator (0P11-LIS-5091), Ejector, Suction Non-Return Valves, Ball Valves and Switch Board Panel |  |  |
| <u>ITEM NO.</u>  | <u>QUANTITY</u>  |   |                                       |                 |  |  |   |       |   |  |  |
| 1  | 1 SET  | Vacuum Pump (0P11-EXH-5018A/B) with Water Separator (0P11-WS-5001), Water Cooler (0P11-WC-5001), Solenoid Valve (0P11-SBV-5877A), Flow Indicator (0P11-FS-5099), Level Indicator (0P11-LIS-5090), Level Indicator (0P11-LIS-5091), Ejector, Suction Non-Return Valves, Ball Valves and Switch Board Panel |                                       |                 |  |  |   |       |   |  |  |
| ALL SUPPORTING DOCUMENTATION REQUIRED BY THE ABOVE REFERENCED DOCUMENTS HAVE BEEN ISSUED TO TPC  |  |   |                                       |                 |  |  |   |       |   |  |  |
| <b>AUTHORIZED REPRESENTATIVE.</b> <i>Released for job</i><br><i>M.H. Chung / SAC</i>   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <b>SIGNED</b> <i>Gustav Trenckner</i>  |  | <b>DATE</b> 02.11.2006  |                                       |                 |  |  |   |       |   |  |  |
| <b>TITLE</b> Dipl. Ing. Gustav Trenckner   |  | <b>SUPPLIER</b> Sterling SIHI GmbH  |                                       |                 |  |  |   |       |   |  |  |
| <u>TPC REPRESENTATIVE CERTIFICATION</u>  |  |   |                                       |                 |  |  |   |       |   |  |  |
| THIS IS TO CERTIFY THAT EVIDENCE SUPPORTING THE ABOVE SUPPLIERS' CERTIFICATION STATEMENT HAS BEEN REVIEWED AND THAT NO DEVIATIONS FROM QUALITY ASSURANCE REQUIREMENTS HAVE BEEN FOUND UNLESS NOTED BELOW."   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <b>AS APPLICABLE</b>   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <table border="1"> <tr> <td style="width: 50px; height: 20px;"></td> <td>AUTHORIZED DEVIATIONS AND NONCONFORMANCES HAVE BEEN NOTED BELOW.</td> </tr> <tr> <td style="width: 50px; height: 20px;"></td> <td></td> </tr> <tr> <td style="width: 50px; height: 20px;"></td> <td></td> </tr> <tr> <td style="width: 50px; height: 20px;"></td> <td></td> </tr> </table>  |  |   |                                       |                 | AUTHORIZED DEVIATIONS AND NONCONFORMANCES HAVE BEEN NOTED BELOW. |  |   |       |   |  |  |
|  | AUTHORIZED DEVIATIONS AND NONCONFORMANCES HAVE BEEN NOTED BELOW. |   |                                       |                 |  |  |   |       |   |  |  |
|  |  |   |                                       |                 |  |  |   |       |   |  |  |
|  |  |   |                                       |                 |  |  |   |       |   |  |  |
|  |  |   |                                       |                 |  |  |   |       |   |  |  |
| <b>SIGNED</b> <i>Shyh-Kwei Lo</i>  |  | <b>DATE</b> Nov. 2, 2006  |                                       |                 |  |  |   |       |   |  |  |
| <b>TITLE</b> <i>QA Engineer TPC/DN'S</i>   |  | <b>RFA NO.</b> —  |                                       |                 |  |  |   |       |   |  |  |
| <b>DEVIATIONS/NONCONFORMANCES FROM PURCHASE ORDER REQUIREMENTS</b>   |  |   |                                       |                 |  |  |   |       |   |  |  |
| <del>NA</del> * Take Exception:<br><i>Don't be delivered before NUC No. DNS-01 closed.</i>   |  |   |                                       |                 |  |  |   |       |   |  |  |

Vacuum Pump Final/Packing Inspection

