出國報告（出國類別：開會）

赴英國 PARALLOY 製造廠參與離心鑄造匯集管之相關會同檢驗、ITP 文件審核及維修技術交流

服務機關：台灣中油桃園煉油廠
姓名職稱：陳璿哲/機械修理課工程師
派赴國家/地區：英國
出國期間：114/4/6~114/4/11
報告日期：

摘要

本次參訪行程之主要目的，係針對本廠採購案（案號 I8I12S015及I8I12S018）進行材料查驗、ITP（Inspection and Test Plan）文件審查，以及實地參訪製造廠，並就本廠近期遭遇之鑄造材料缺陷問題向製造廠技術人員諮詢。藉由於交貨前進行產品查驗，可有效降低於臨近氫氣工場停爐前才發現產品異常之風險，避免影響本廠生產調度，並預先掌握交貨產品之品質狀況，以確保後續製程順利進行。

本次現場查驗中，於案號 I8I12S015所採購之「項次1-Hot Collector 匯集管組」發現其騎接內孔孔徑過大，判定為一項無法修復之重大缺失。此缺陷若未即時處理，輕則造成流體操作時流量控制異常，重則可能導致設備承壓異常，產生工安風險。經與廠商協調，已要求其立即暫停該項目之出貨，並將查驗結果攜回廠內進行討論，後續處理方案將另行擬定與通知。

此外，透過實地參訪國外專業鑄造工廠，得以深入了解先進之鑄造技術與製程管理，亦針對本廠目前遭遇的鑄造缺陷與維修方法進行深入交流。此次觀摩經驗對於日後類似案件之承辦與規格制訂有重大助益，並促使我方認知到目前契約條款中對製造與驗收規範之描述仍有不足之處，雖未造成契約履行上的重大爭議，然未來仍可進一步強化相關技術與管理細節，以提升整體品質控管水準。

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壹 目的

「桃廠二氫重組爐匯集管組(I8I12S018)」及「桃廠三氫重組爐匯集管組(I8I12S015)」所採購之離心鑄造匯集管為本廠第二氫氣工場及第三氫氣工場之重組爐重要設備部位；為求設備之可靠性，擬前往製造廠「PARALLOY」參與相關會同檢驗及 ITP 文件審核，並參訪製造廠了解離心鑄造及靜態鑄造工藝，及諮詢本廠鑄造元件裂紋檢查及檢修技術。

職目前擔任桃園煉油廠修護組機械修理課機械工程師一職，業務工作上主要為檢修廠內設備如加熱爐、鍋爐及壓力容器等，該二案為職所經辦之採購案，為求貨品之可靠度，擬親自參與相關檢驗及 ITP 文件審查，期望能於交貨前避免相關製造層面的錯誤，針對品質及文件進行初步查驗，確保商品能於本廠例行性歲修前如期、如質的交貨完成；參訪製造廠及維修技術交流，並諮詢本廠鑄造元件之裂紋成因、檢查及檢修實務，期望更了解現今鑄造工藝技術及製造細節，以利日後於業務上遇到鑄造配件之合約編撰上更清楚箇中細節。

貳 過程

2.1 實際行程表

起迄日期	地點	詳細工作內容	
114年4月6日(日)	台灣→英國紐卡斯爾	22:50	從桃園機場出發
114年4月7日(一)	台灣→英國紐卡斯爾	07:40	抵達荷蘭阿姆斯特丹轉機
	台灣→英國紐卡斯爾	12:55	自荷蘭阿姆斯特丹出發前往英國
	台灣→英國紐卡斯爾	13:10	抵達英國紐卡斯爾
114年4月8日(二)	英國紐卡斯爾 PARALLOY 製造廠	09:00~16:00	參訪離心鑄造工場、靜態鑄造工場及鑄造後續加工工場；諮詢本廠鑄造件缺陷
114年4月9日(三)	英國紐卡斯爾 PARALLOY 製造廠	09:00~13:00	前往本廠採購之離心鑄造管後續加工工廠
	英國紐卡斯爾 PARALLOY 製造廠	13:00~17:00	查驗本廠採購之離心鑄造管材尺寸、討論缺失改善
	英國紐卡斯爾 PARALLOY 製造廠	17:00~20:00	返回飯店
114年4月10日(四)	英國紐卡斯爾→英國倫敦	07:00~11:00	從英國紐卡斯爾搭火車至英國倫敦
	英國倫敦→台灣	17:00	抵達英國希斯羅機場候機
		21:35	從倫敦希斯羅機場出發前往台灣桃園機場
114年4月11日(五)	英國倫敦→台灣	21:30	抵達台灣桃園機場

2.2 参訪 PARALLOY 離心鑄造工場、靜態鑄造工場及鑄造後續加工工場

本次前往離心鑄造工場進行實地參觀，主要原因在於台灣目前並無具備離心鑄造產線的鑄造廠，相關產業界普遍缺乏對此製程的直接認識與現場觀摩經驗。經訪談多家國內鑄造業者得知，離心鑄造所需之設備投入成本高，對應的市場需求卻相對有限，特別是在國內對於離心鑄造元件的使用量不高，使得投資建置離心鑄造產線在經濟效益上難以合理化。因此，台灣境內迄今尚未出現實際運作中的離心鑄造產線，使得業界對該製程的實務了解多半停留於理論層面或書面資料。

相較於靜態鑄造，離心鑄造在設備構成與操作程序上顯得更加複雜。除了基本的熔煉設備外，離心鑄造還需具備可高速旋轉的鑄模裝置、專用的金屬模具系統以及模具預熱與溫控設備等。此外，若應用於石化產業的管件生產，其所需機具的規模與精密度更遠勝於一般用於土木工程或玻璃製品之離心鑄造設備。此次所參訪之 PARALLOY 工廠，正是一座具備完整且高規格離心鑄造產線的專業製造據點，其生產設施從金屬原料的熔煉、鑄造、熱處理至後續加工皆採一體化設計，並透過自動化與標準化的流程，確保產品品質與生產效率。

該工廠之整體生產動線配置合理，工藝環節銜接順暢，從原料進廠到成品出貨皆展現出高度整合與管理效能。此種離心鑄造技術與設備的完整呈現，對於深入理解其實務操作流程及設備特性具有極高的參考價值，亦有助於補足國內在此領域的觀摩與學習資源之不足。因 PARALLOY 製造廠之資安相關規定，工場內不得拍照，故以下內容簡化後以文字及表格說明。

RECEPTION
PARALLOY
HI-TECH
A PARALLOY GROUP COMPANY

圖2.1 參觀 PARALLOY 製造廠

2.2.1 離心鑄造與靜態鑄造差異

離心鑄造是將液體金屬注入高速旋轉的鑄型內，使金屬液做離心運動充滿鑄型和形成鑄件的技術和方法，故主要用於圓柱形或中空結構如管件、襯套等。由於離心運動使液體金屬在徑向能很好地充滿鑄型並形成鑄件的自由表面；不用型芯能獲得圓柱形的內孔；有助於液體金屬中氣體和夾雜物的排除；影響金屬的結晶過程，從而改善鑄件的機械性能和物理性能。

表2.1 離心鑄造與靜態鑄造差異

項目	離心鑄造	靜態鑄造
原理	利用高速旋轉產生的離心力，將熔融金屬壓向模具內壁形成鑄件	利用重力將熔融金屬注入模具中，自然冷卻成形
鑄件形狀	適合圓柱形或中空結構，如管件、襯套等	適合多種形狀，從簡單到複雜皆可
金屬密度與組織	結構緻密，氣孔和夾雜物較少，機械性質較佳	易產生氣孔或縮孔，結構較疏鬆
模具使用方式	常用金屬模，可重複使用	常用砂模，多為一次性使用
成本與效率	初期設備投資高，但生產效率高，適合大量生產	製程簡單、成本低，適合小批量或單件生產
常見應用	高壓容器、軸套、汽車零件、飛機零件	引擎缸體、機械底座、雕塑品等

2.2.2 離心鑄造流程

準備模具

使用金屬模或砂模，通常為圓柱形，可以水平或垂直放置。模具內部會塗上塗料以防金屬黏附。

↓

預熱模具及熔融金屬材料

為了改善金屬流動性與鑄件品質，模具常被預熱至一定溫度。金屬材料被加熱至熔融狀態

↓

模具旋轉

模具開始高速旋轉（每分鐘數百至數千轉），旋轉軸可以是水平或垂直。此時模具維持加熱狀態。

↓

澆注金屬液

熔化的金屬液被澆入旋轉中的模具中，離心力會把金屬甩向模具內壁，形成密實的金屬層。

↓

冷卻與凝固

金屬液在離心力作用下均勻分佈並冷卻凝固。氣泡和雜質會集中在鑄件的內層（中間），易於機械加工去除。

↓

停機與取出鑄件

模具停轉，取出冷卻完成的鑄件，進行後續加工（如切割、車削）。

↓

後續加工

切割→水平矯直→車削→非破壞檢驗及破壞檢驗→試壓→銲接組裝

圖2.2 離心鑄造流程

2.3 諮詢本廠鑄造件缺陷

2.3.1 案例1：

職近日採購之加熱爐管夾，於鑄造完成後，表面經液滲探傷檢查後發現有細微裂紋，為探討其成因故請教 PARALLOY，PARALLOY 提供建議為要特別注意保護氣體，以下詳細說明：

50Cr-50Ni 材質因其高鉻與高鎳的成分特性，對鑄造過程中的氣氛條件高度敏感。此類合金廣泛應用於高溫環境，如熱處理設備、石化爐管或燃燒器結構，要求材料具備優異的高溫強度與抗氧化性。然而，該合金在鑄造過程中極易受到氧化、夾雜與熱裂的影響，因此需特別注意保護氣體的使用

- 鉻（Cr）與鎳（Ni）含量高，在高溫下易與氧氣、水蒸氣產生氧化反應。尤其鉻會形成穩定的氧化鉻（Cr_2O_3），若生成於晶粒邊界或金屬表面，將造成晶界脆化與潛在裂紋源。
- 氧化膜若殘留在熔湯中或模腔內部，將導致晶粒不連續、鑄件表面粗糙甚至產生微裂。
- 50Cr-50Ni 合金具有明顯的熱脆區，在凝固至高溫降溫區間容易產生熱裂紋（hot tears），特別是在晶粒邊界氧化或存在偏析時更容易誘發。故若熔煉或澆注過程未採用惰性氣體保護，會造成熔湯與空氣接

觸產生氧化，進一步惡化裂紋生成風險。

- 在熔煉、保溫與澆注階段使用氬氣或氮氣等惰性氣體，可有效隔絕氧氣與濕氣，防止合金成分氧化。可降低金屬表面張力，提升澆注流動性與填模能力，同時減少夾雜與氣孔生成。某些高端鑄造工藝（如真空鑄造、壓力鑄造）更會在模具內部或澆道系統中設計氣體導入通道，在澆注前或澆注同步導入保護氣體，以提升鑄件表面品質。

結論：PARALLOY 有提供如上相關技術說明，對於模具的設計以及實際細節均為各製造廠設計內容，無法提供確切幫助也涉及各製造廠內部機密，故建議我於未來設計契約上要特別注意得標廠商的製造能力，以及是否需要在特殊材質上要特別審核有關保護氣體方面的技術資訊。

2.3.2 案例2：

此案例為本廠某一加熱爐爐管管夾舊品(如圖2.3)，此座加熱爐於停爐開放後發現三組管夾出現斷裂的情況，其內部中空，可能為主要斷裂原因，為探討其成因故請教 PARALLOY，PARALLOY 表示此為 **標準鑄造瑕疵，模具設計不良**，以下詳細說明：

PARALLOY 的工程師表示在設計模具時，特別是形狀比較複雜的產品，要讓工件”從外面開始冷”，鑄造這門技術有一專有名詞稱”順序凝固(Directional Solidification)”，金屬冷卻順序無法控制進而導致熔湯在錯的地方先凝固，留下中空或縮孔在鑄件本體內部。金屬冷卻時會體積收縮，如果中間先冷，外層還是液態，中心就會「拉裂」或產生「縮孔」或「空腔」。

「順序凝固的原則是：從鑄件最遠離冒口的區域開始冷卻，逐步向冒口方向凝固，讓冒口成為最後凝固的區域」。這樣當內部金屬因凝固而收縮時，還有熔融金屬可以從冒口補進來填補體積，防止縮孔、疏鬆或空腔。

結論：此為標準鑄造瑕疵，為製造廠技術問題，模具設計不良導致產品缺陷。但成品檢查亦甚重要，射線檢查可以檢查出此缺陷，當初的採購及製造過程無從得知，但往後應注意於採購時，產品的檢查流程均應確實調查清楚並規範於契約中，並確實落實檢查程序。

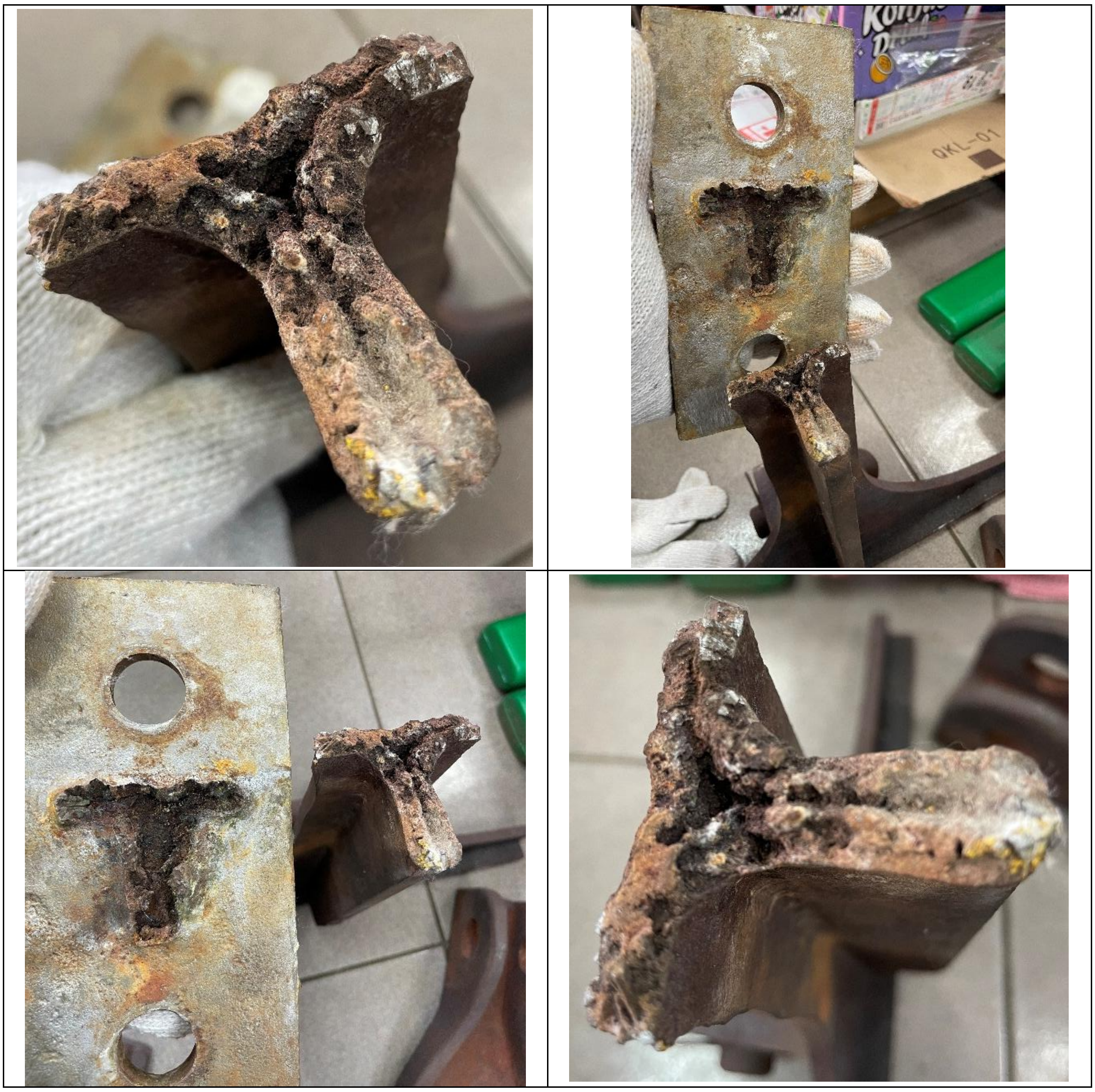
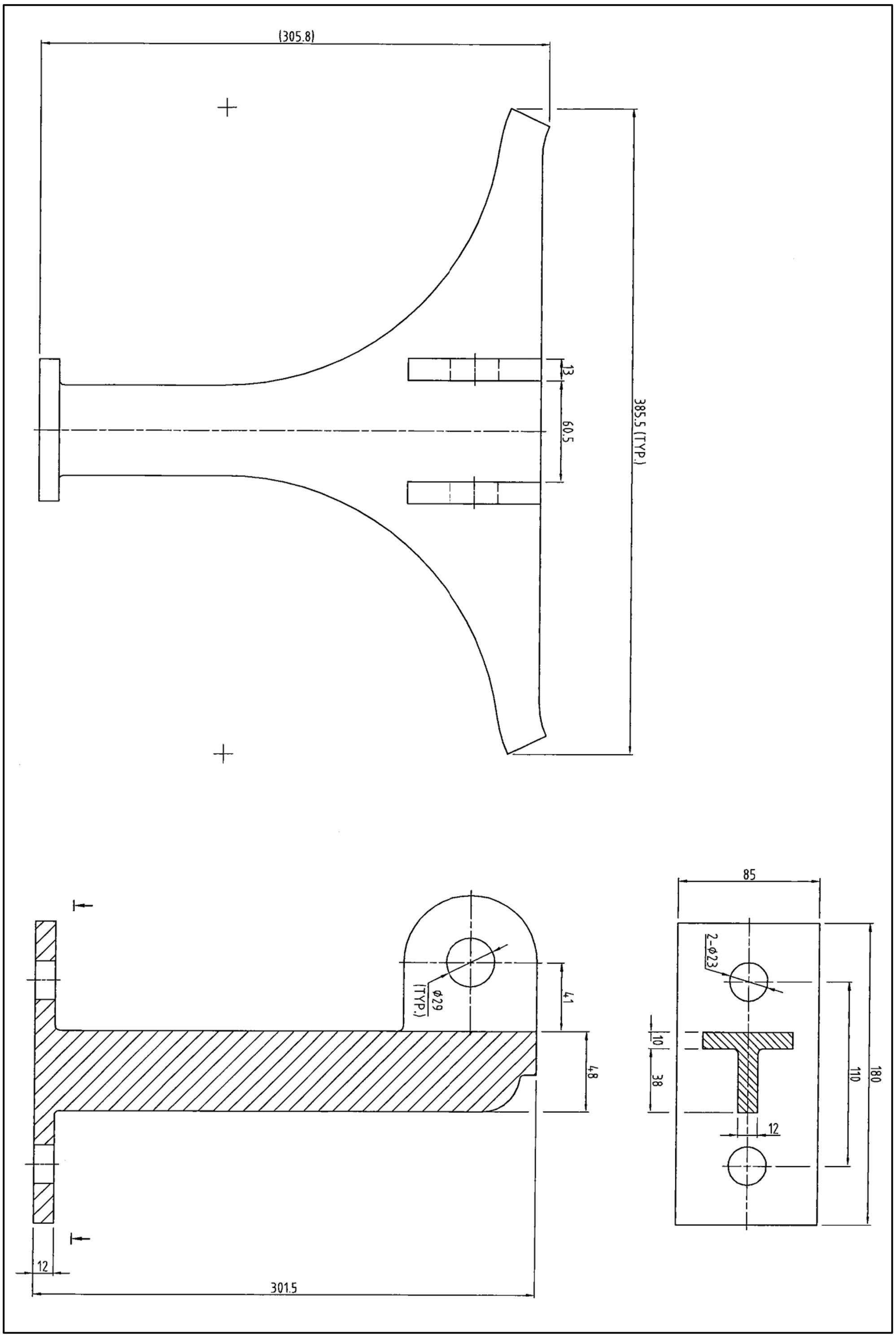


圖2.3 加熱爐管夾斷裂


(305.8)
13
60.5
385.5 (TYP.)
Φ29
(TYP.)
41
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12
301.5
85
2-Φ23
10
38
12
110
180

圖2.4 加熱爐管夾圖面

2.2.3 案例3：

本廠某一加熱爐於日前停爐檢查發現匯集管銲道表面出現細微裂紋(如圖2.5)，為探討其成因故請教 PARALLOY，PARALLOY 工程師表示無法從圖片就判斷成因為何，但是該設備如已操作逾40年，材質本來就會出現老化瑕疵，不建議進行檢修，無法確認材質可以被修補。如必須修補，入熱量必須小，磨修亦須選擇如鑽石成分的砂輪，才能不對材料本身過多的傷害。

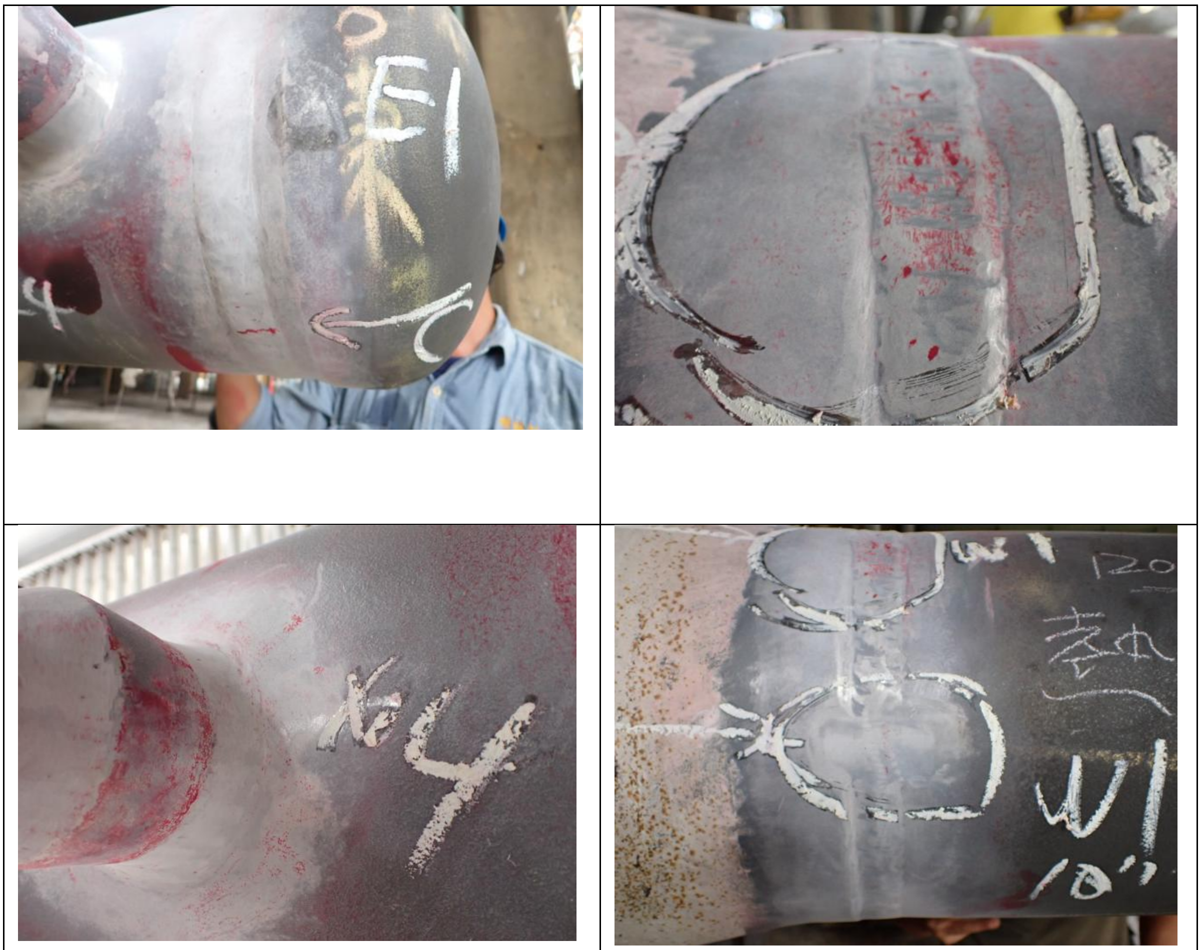


圖2.5 匯集管表面裂紋

2.4 查驗本廠採購之離心鑄造管材尺寸、討論缺失改善

職目前有經手二案之製造廠為本次行程目的地之製造廠-PARALLOY，相關契約資訊如下表。

案1	
案號	I8I12S015
案名	桃廠三氫重組爐匯集管組
本案用途	本廠第三氫氣工場 F-4201加熱爐爐外匯集管更新用
決標日期	2024/06/27
決標金額	12,880,875
得標廠商	松毓有限公司
交貨期限	決標次日起390日曆天 (即2025/07/23前交貨完成)
案2	
案號	I8I12S015
案名	桃廠二氫重組爐匯集管組
本案用途	本廠第二氫氣工場 F-2201加熱爐爐外匯集管更新用
決標日期	2024/08/07
決標金額	36,195,600
得標廠商	毓斌實業有限公司
交貨期限	須於2025年6月30日前交貨完成

表2.2 查驗二案之契約資訊

2.4.1 I8I12S015之查驗情形

此案之「採購項次1-Hot Collector 匯集管組」，目前於 PARALLOY 製造廠之進度為 **完成所有製造工作待出貨** ，故僅能對其尺寸及 ITP 文件進行檢驗及審查，但因當天早上當地路況延誤，導致到達製造廠的時間縮短，並且檢查到一重要尺寸與圖面不符之缺失，故與製造廠方討論此缺失改善亦占用不少時間，影響到製造廠方的下班時間情況下，無法對 ITP 文件進行審查，以下對查驗過程進行說明。

(1) 確認製造進度無明顯落後：

本案之「採購項次1-Hot Collector 匯集管組」確認已製造完成(圖2.6)，因已協調製造廠須待職完成查驗後，始得出貨，查詢預定進度表(圖2.7)後，無明顯落後。

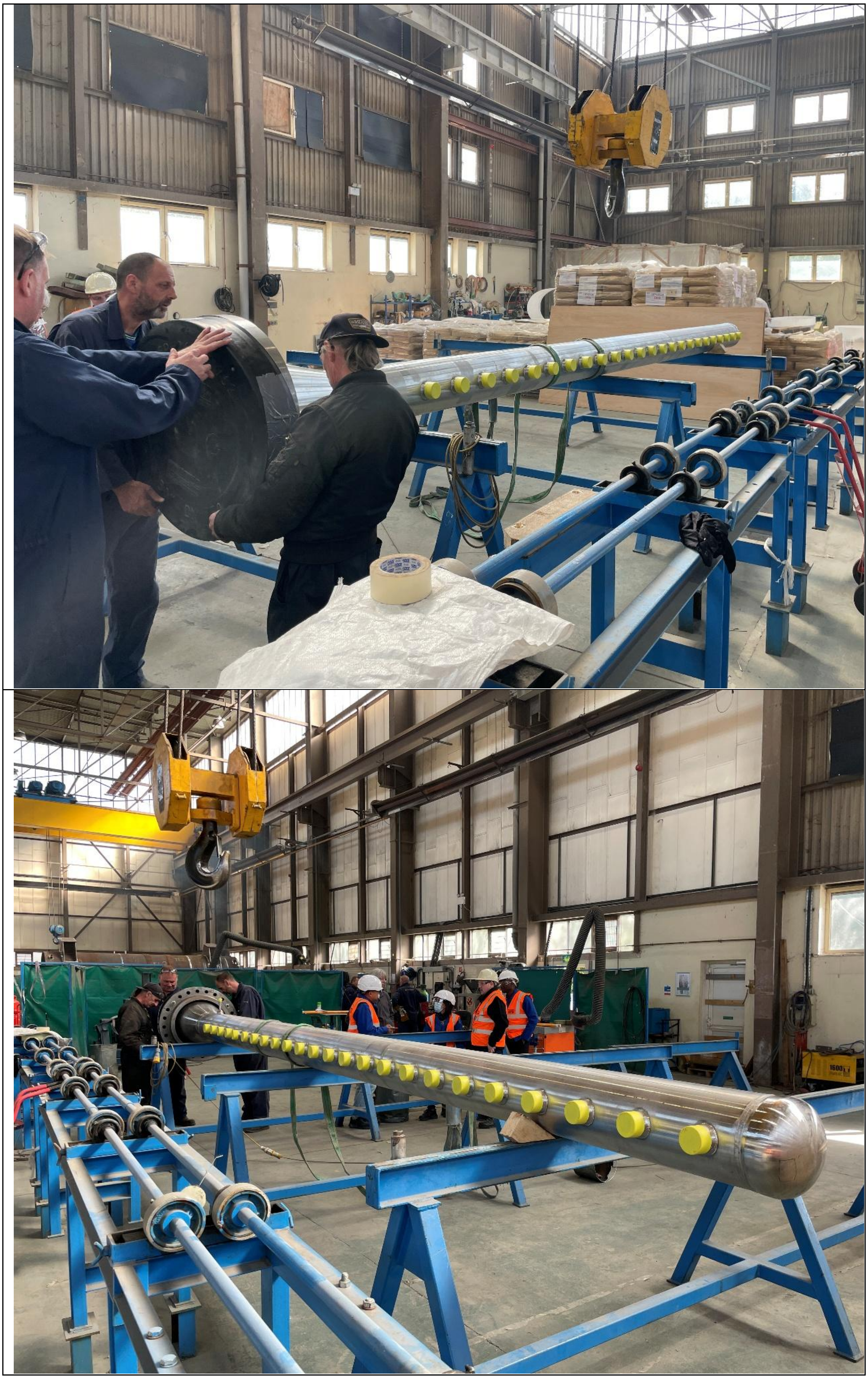
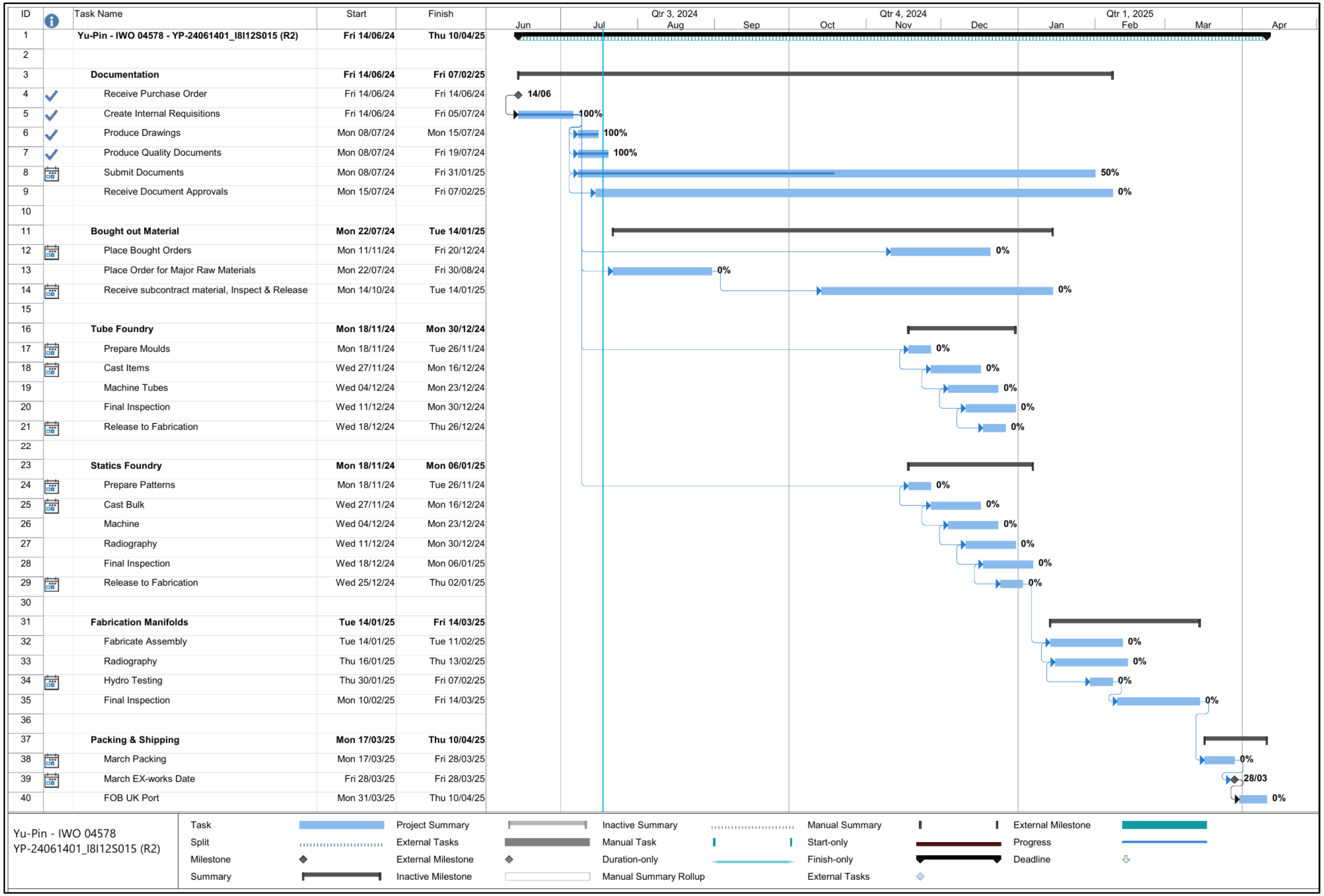


圖2.6 I8I12S015之採購項次1-Hot Collector 匯集管組



ID	ⓘ	Task Name	Start	Finish
1		**Yu-Pin - IWO 04578 - YP-24061401_I8I12S015 (R2)**	**Fri 14/06/24**	**Thu 10/04/25**
2				
3		**Documentation**	**Fri 14/06/24**	**Fri 07/02/25**
4	✓	Receive Purchase Order	Fri 14/06/24	Fri 14/06/24
5	✓	Create Internal Requisitions	Fri 14/06/24	Fri 05/07/24
6	✓	Produce Drawings	Mon 08/07/24	Mon 15/07/24
7	✓	Produce Quality Documents	Mon 08/07/24	Fri 19/07/24
8	📅	Submit Documents	Mon 08/07/24	Fri 31/01/25
9		Receive Document Approvals	Mon 15/07/24	Fri 07/02/25
10				
11		**Bought out Material**	**Mon 22/07/24**	**Tue 14/01/25**
12	📅	Place Bought Orders	Mon 11/11/24	Fri 20/12/24
13		Place Order for Major Raw Materials	Mon 22/07/24	Fri 30/08/24
14	📅	Receive subcontract material, Inspect & Release	Mon 14/10/24	Tue 14/01/25
15				
16		**Tube Foundry**	**Mon 18/11/24**	**Mon 30/12/24**
17	📅	Prepare Moulds	Mon 18/11/24	Tue 26/11/24
18	📅	Cast Items	Wed 27/11/24	Mon 16/12/24
19		Machine Tubes	Wed 04/12/24	Mon 23/12/24
20		Final Inspection	Wed 11/12/24	Mon 30/12/24
21	📅	Release to Fabrication	Wed 18/12/24	Thu 26/12/24
22				
23		**Statics Foundry**	**Mon 18/11/24**	**Mon 06/01/25**
24	📅	Prepare Patterns	Mon 18/11/24	Tue 26/11/24
25	📅	Cast Bulk	Wed 27/11/24	Mon 16/12/24
26		Machine	Wed 04/12/24	Mon 23/12/24
27		Radiography	Wed 11/12/24	Mon 30/12/24
28		Final Inspection	Wed 18/12/24	Mon 06/01/25
29	📅	Release to Fabrication	Wed 25/12/24	Thu 02/01/25
30				
31		**Fabrication Manifolds**	**Tue 14/01/25**	**Fri 14/03/25**
32		Fabricate Assembly	Tue 14/01/25	Tue 11/02/25
33		Radiography	Thu 16/01/25	Thu 13/02/25
34	📅	Hydro Testing	Thu 30/01/25	Fri 07/02/25
35		Final Inspection	Mon 10/02/25	Fri 14/03/25
36				
37		**Packing & Shipping**	**Mon 17/03/25**	**Thu 10/04/25**
38	📅	March Packing	Mon 17/03/25	Fri 28/03/25
39	📅	March EX-works Date	Fri 28/03/25	Fri 28/03/25
40		FOB UK Port	Mon 31/03/25	Thu 10/04/25

Yu-Pin - IWO 04578
YP-24061401_I8I12S015 (R2)

Qtr 3, 2024
Qtr 4, 2024
Qtr 1, 2025
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Jul
Aug
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Apr
14/06
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100%
100%
50%
0%
0%
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28/03
0%
Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Progress
Deadline

圖2.7 I8I12S015之預定進度表

(2) 尺寸檢驗：查驗到一尺寸與圖面不符，為「騎接孔內徑」，依照本案圖面規範為「34.0±0.5」，如圖2.8所示；實際量測到尺寸為36，詳如查驗紀錄(圖2.9)。當下即與製造廠進一步討論缺失改善，因此缺失為無法改善之缺失，且孔徑較大即影響流量，進而有可能影響轄區操作；另外一層面為厚度減少，進而影響設備承壓，考量設備常壓操作為 20 kg/cm^{2}G 左右，內容物含有氫氣，故此厚度減少對設備有一定影響。故經過與製造廠協調過後，把此情況帶回廠內與長官討論過後再回覆予製造廠後續如圖2.9。

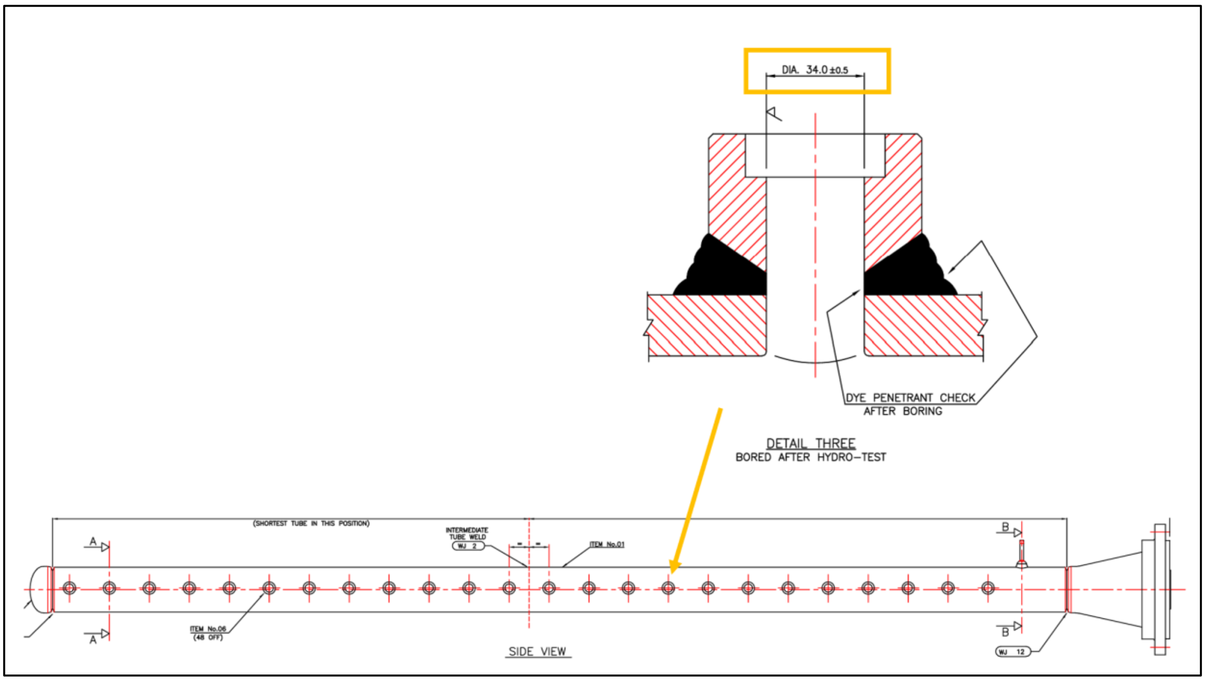
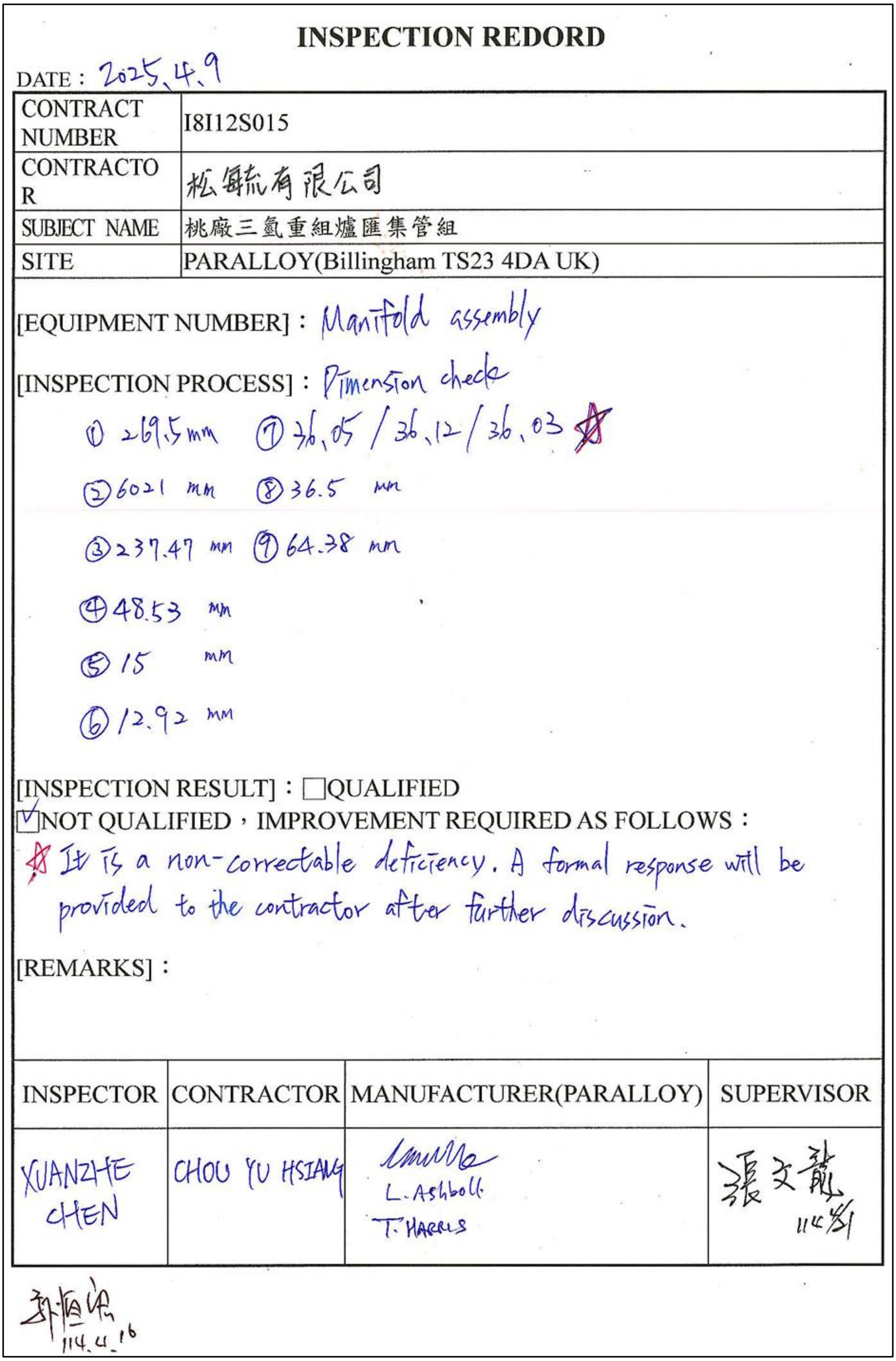

DIA. 34.0±0.5
DYE PENETRANT CHECK
AFTER BORING
DETAIL THREE
BORED AFTER HYDRO-TEST
(SHORTEST TUBE IN THIS POSITION)
INTERMEDIATE
TUBE WELD
WJ 2
ITEM No.01
A
A
B
B
ITEM No.06
(48 OFF)
SIDE VIEW
WJ 12

圖2.8 騎接孔內徑與圖面不符



INSPECTION REDORD

DATE：2025.4.9

CONTRACT NUMBER	I8I12S015
CONTRACTOR	松毓有限公司
SUBJECT NAME	桃廠三氫重組爐匯集管組
SITE	PARALLOY(Billingham TS23 4DA UK)

[EQUIPMENT NUMBER]：Manifold assembly

[INSPECTION PROCESS]：Dimension check

① 269.5mm ⑦ 36.05 / 36.12 / 36.03 ☆

② 6021 mm ⑧ 36.5 mm

③ 237.47 mm ⑨ 64.38 mm

④ 48.53 mm

⑤ 15 mm

⑥ 12.92 mm

[INSPECTION RESULT]：□QUALIFIED

☑NOT QUALIFIED，IMPROVEMENT REQUIRED AS FOLLOWS：

☆ It is a non-correctable deficiency. A formal response will be provided to the contractor after further discussion.

[REMARKS]：

INSPECTOR	CONTRACTOR	MANUFACTURER(PARALLOY)	SUPERVISOR
XUANZHE CHEN	CHOU YU HSIANG	L. Ashboll T. HARRIS	張文龍 114/5/1

郭恒[illegible]
114.4.16

圖2.9 I8I12S015之查驗紀錄封面

2.4.2 I8I12S018之查驗情形

此案之「採購項次1-Hot Collector 匯集管組」，目前於 PARALLOY 製造廠之進度為 **進行組裝** ，鑄造工作及相關零件採購均已完成，但因當天早上當地路況延誤，導致到達製造廠的時間縮短，並且案 I8I12S015檢查到一重要尺寸與圖面不符之缺失(詳2.4.1)，故與製造廠方討論此缺失改善亦占用不少時間，影響到製造廠方的下班時間情況下，無法對 ITP 文件進行審查，以下對查驗過程進行說明。

(1) 確認製造進度無明顯落後：

本案之「採購項次1-Hot Collector 匯集管組」目前正在組裝階段(圖2.10)；查詢預定進度表(圖2.11)後，無明顯落後。

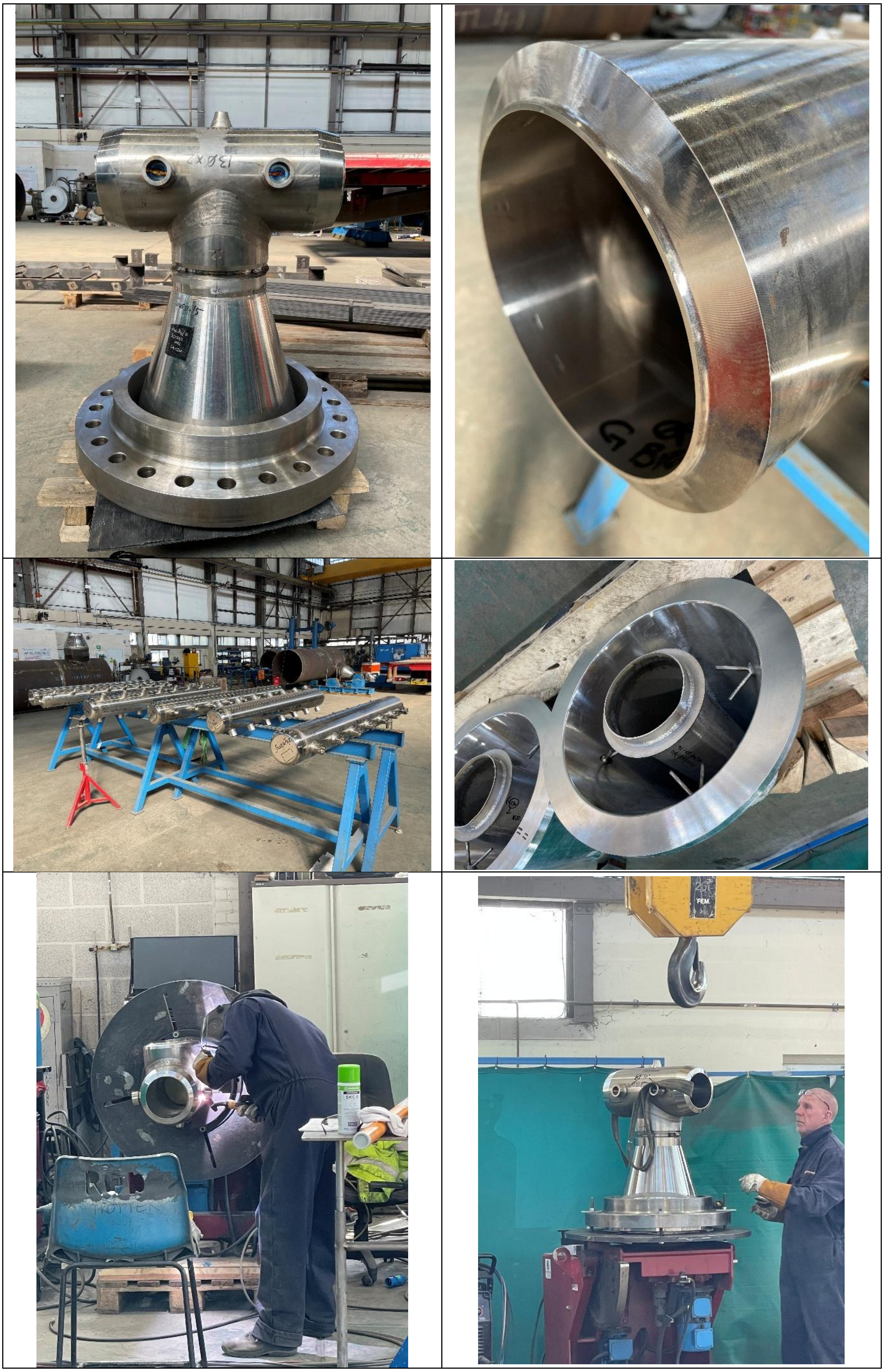
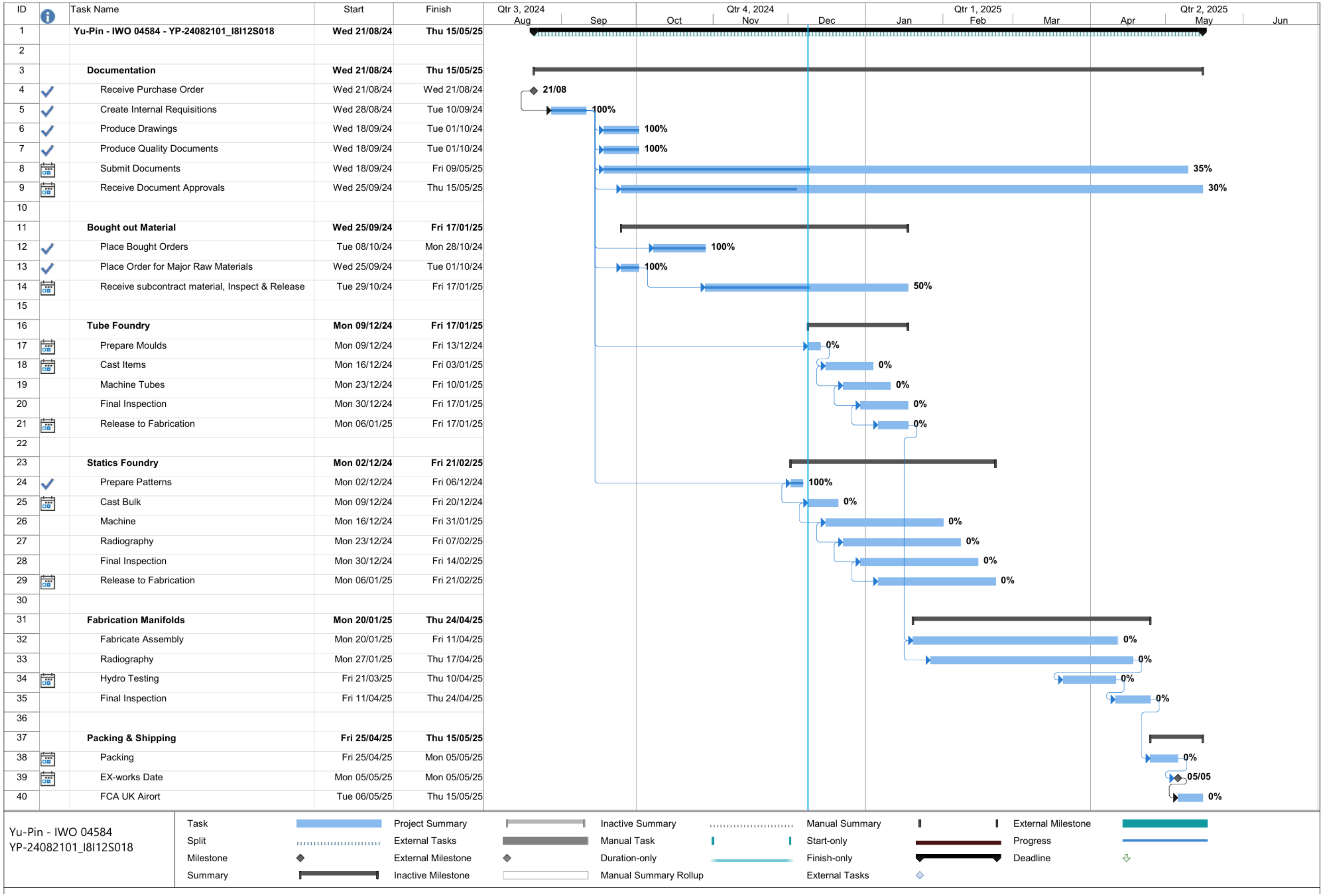


圖2.10 匯集管組裝過程



ID		Task Name	Start	Finish
1		**Yu-Pin - IWO 04584 - YP-24082101_I8I12S018**	**Wed 21/08/24**	**Thu 15/05/25**
2				
3		**Documentation**	**Wed 21/08/24**	**Thu 15/05/25**
4	✓	Receive Purchase Order	Wed 21/08/24	Wed 21/08/24
5	✓	Create Internal Requisitions	Wed 28/08/24	Tue 10/09/24
6	✓	Produce Drawings	Wed 18/09/24	Tue 01/10/24
7	✓	Produce Quality Documents	Wed 18/09/24	Tue 01/10/24
8	📅	Submit Documents	Wed 18/09/24	Fri 09/05/25
9	📅	Receive Document Approvals	Wed 25/09/24	Thu 15/05/25
10				
11		**Bought out Material**	**Wed 25/09/24**	**Fri 17/01/25**
12	✓	Place Bought Orders	Tue 08/10/24	Mon 28/10/24
13	✓	Place Order for Major Raw Materials	Wed 25/09/24	Tue 01/10/24
14	📅	Receive subcontract material, Inspect & Release	Tue 29/10/24	Fri 17/01/25
15				
16		**Tube Foundry**	**Mon 09/12/24**	**Fri 17/01/25**
17	📅	Prepare Moulds	Mon 09/12/24	Fri 13/12/24
18	📅	Cast Items	Mon 16/12/24	Fri 03/01/25
19		Machine Tubes	Mon 23/12/24	Fri 10/01/25
20		Final Inspection	Mon 30/12/24	Fri 17/01/25
21	📅	Release to Fabrication	Mon 06/01/25	Fri 17/01/25
22				
23		**Statics Foundry**	**Mon 02/12/24**	**Fri 21/02/25**
24	✓	Prepare Patterns	Mon 02/12/24	Fri 06/12/24
25	📅	Cast Bulk	Mon 09/12/24	Fri 20/12/24
26		Machine	Mon 16/12/24	Fri 31/01/25
27		Radiography	Mon 23/12/24	Fri 07/02/25
28		Final Inspection	Mon 30/12/24	Fri 14/02/25
29	📅	Release to Fabrication	Mon 06/01/25	Fri 21/02/25
30				
31		**Fabrication Manifolds**	**Mon 20/01/25**	**Thu 24/04/25**
32		Fabricate Assembly	Mon 20/01/25	Fri 11/04/25
33		Radiography	Mon 27/01/25	Thu 17/04/25
34	📅	Hydro Testing	Fri 21/03/25	Thu 10/04/25
35		Final Inspection	Fri 11/04/25	Thu 24/04/25
36				
37		**Packing & Shipping**	**Fri 25/04/25**	**Thu 15/05/25**
38	📅	Packing	Fri 25/04/25	Mon 05/05/25
39	📅	EX-works Date	Mon 05/05/25	Mon 05/05/25
40		FCA UK Airort	Tue 06/05/25	Thu 15/05/25

Qtr 3, 2024
Aug
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Qtr 1, 2025
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Apr
Qtr 2, 2025
May
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21/08
100%
100%
100%
35%
30%
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50%
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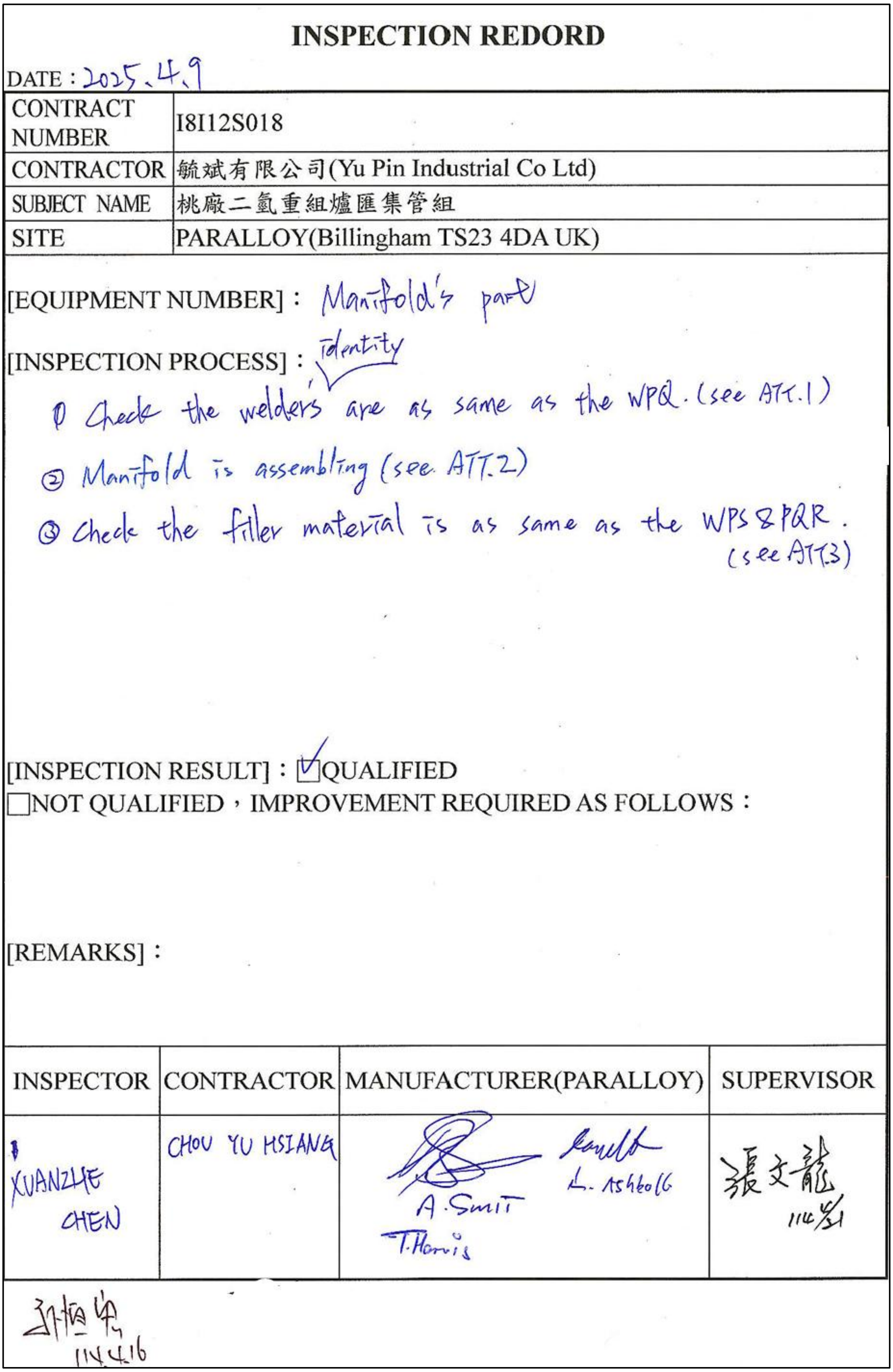
Yu-Pin - IWO 04584
YP-24082101_I8I12S018
Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Progress
Deadline

圖2.11 I8I12S018之預定進度表□



INSPECTION REDORD

DATE：2025.4.9

CONTRACT NUMBER	I8I12S018
CONTRACTOR	毓斌有限公司(Yu Pin Industrial Co Ltd)
SUBJECT NAME	桃廠二氫重組爐匯集管組
SITE	PARALLOY(Billingham TS23 4DA UK)

[EQUIPMENT NUMBER]： Manifold's part

[INSPECTION PROCESS]：

① Check the welders' Identity are as same as the WPQ. (see ATT.1)

② Manifold is assembling (see ATT.2)

③ Check the filler material is as same as the WPS & PQR. (see ATT.3)

[INSPECTION RESULT]：☑QUALIFIED

☐NOT QUALIFIED，IMPROVEMENT REQUIRED AS FOLLOWS：

[REMARKS]：

INSPECTOR	CONTRACTOR	MANUFACTURER(PARALLOY)	SUPERVISOR
XUANZHE CHEN	CHOU YU HSIANG	A. SMIT L. Ashbolt T. Harris	張文龍 114 4/21

孫恒中

114.4.16

圖2.12 I8I12S018之查驗紀錄-1封面

(2) 查驗施作之銲工符合提審之 WPQ。WPQ 詳如附錄2。

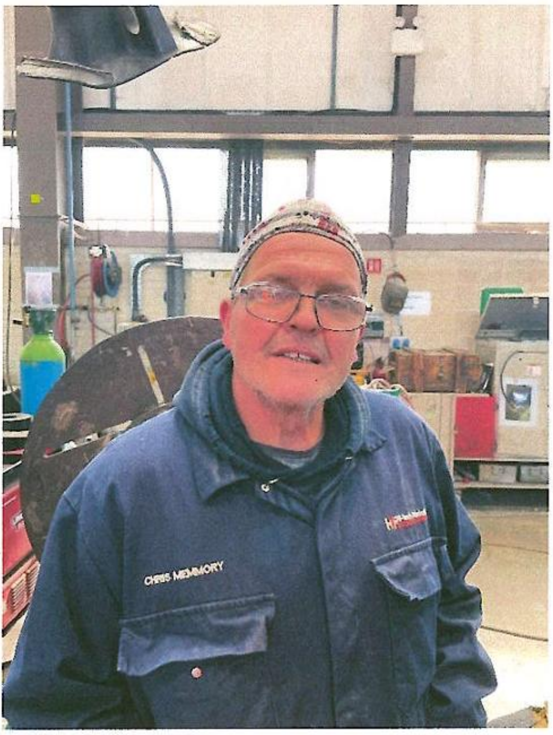
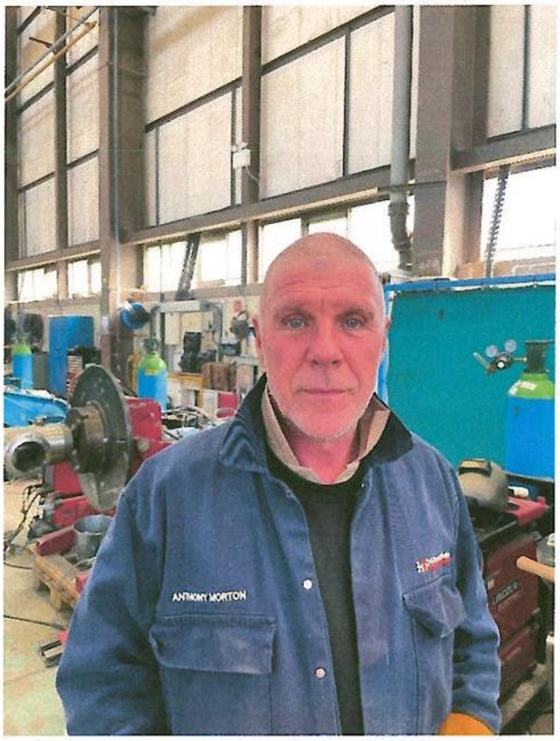
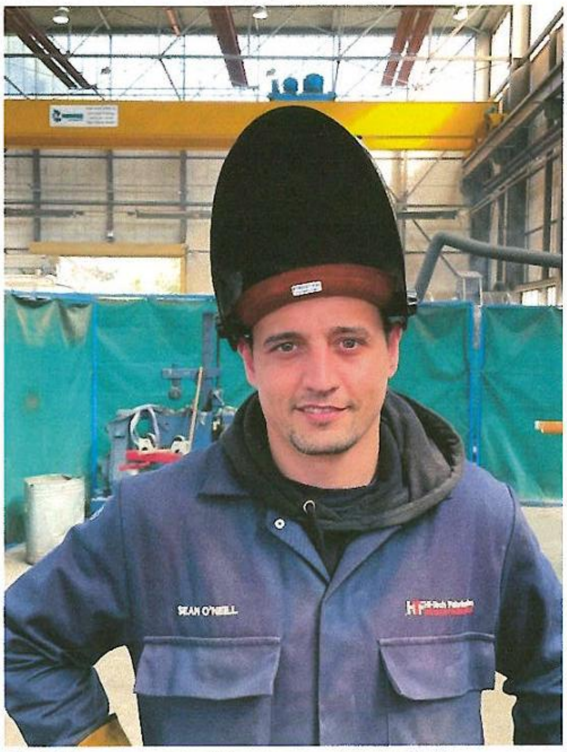
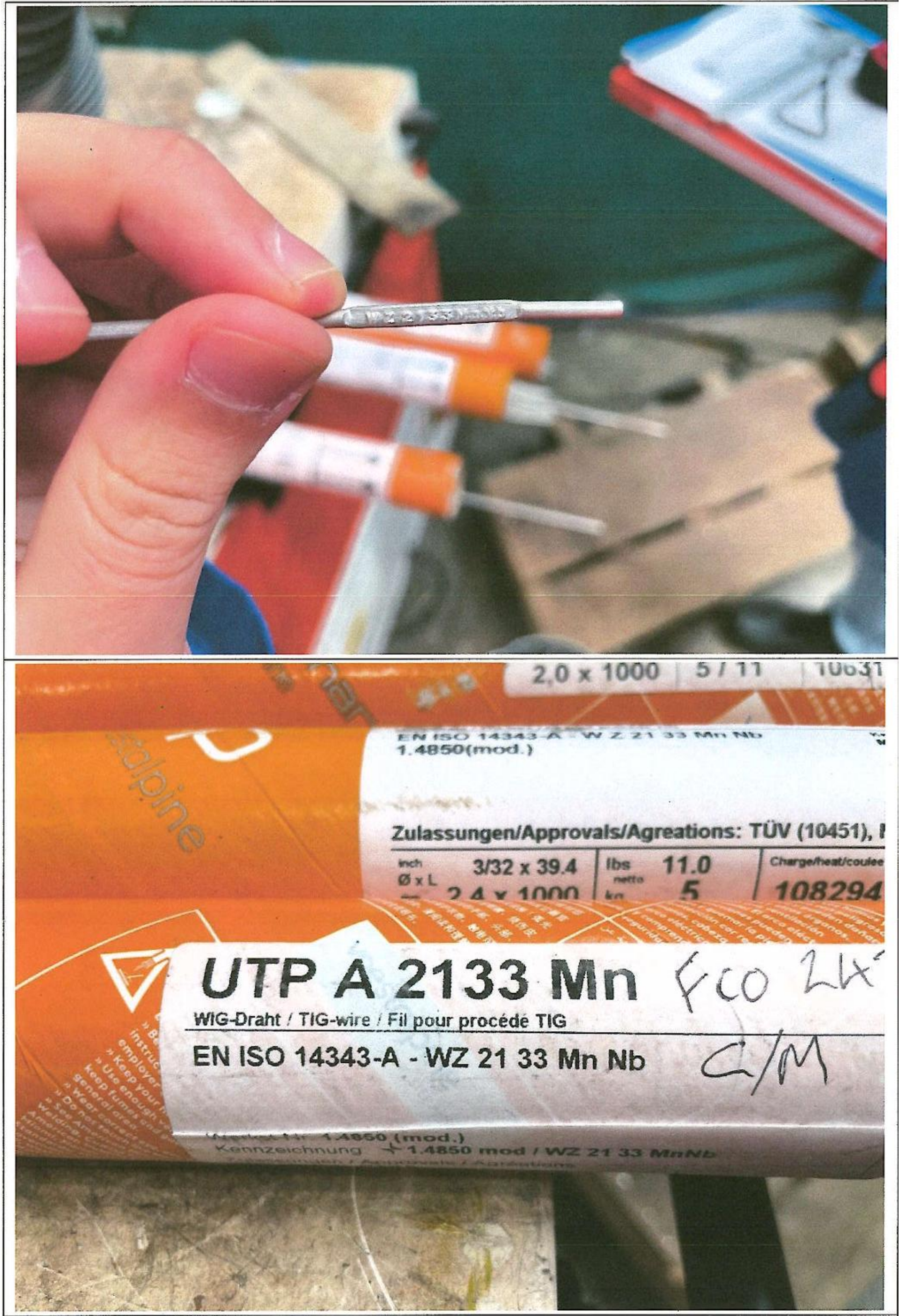
 CHRIS MEMMORY	 ANTHONY MORTON
WELDER NAME：C.MEMMORY	WELDER NAME：A.MORTON
 SEAN O'NEILL	
WELDER NAME：S.O'NEIL	

圖2.13 現場施作之銲工

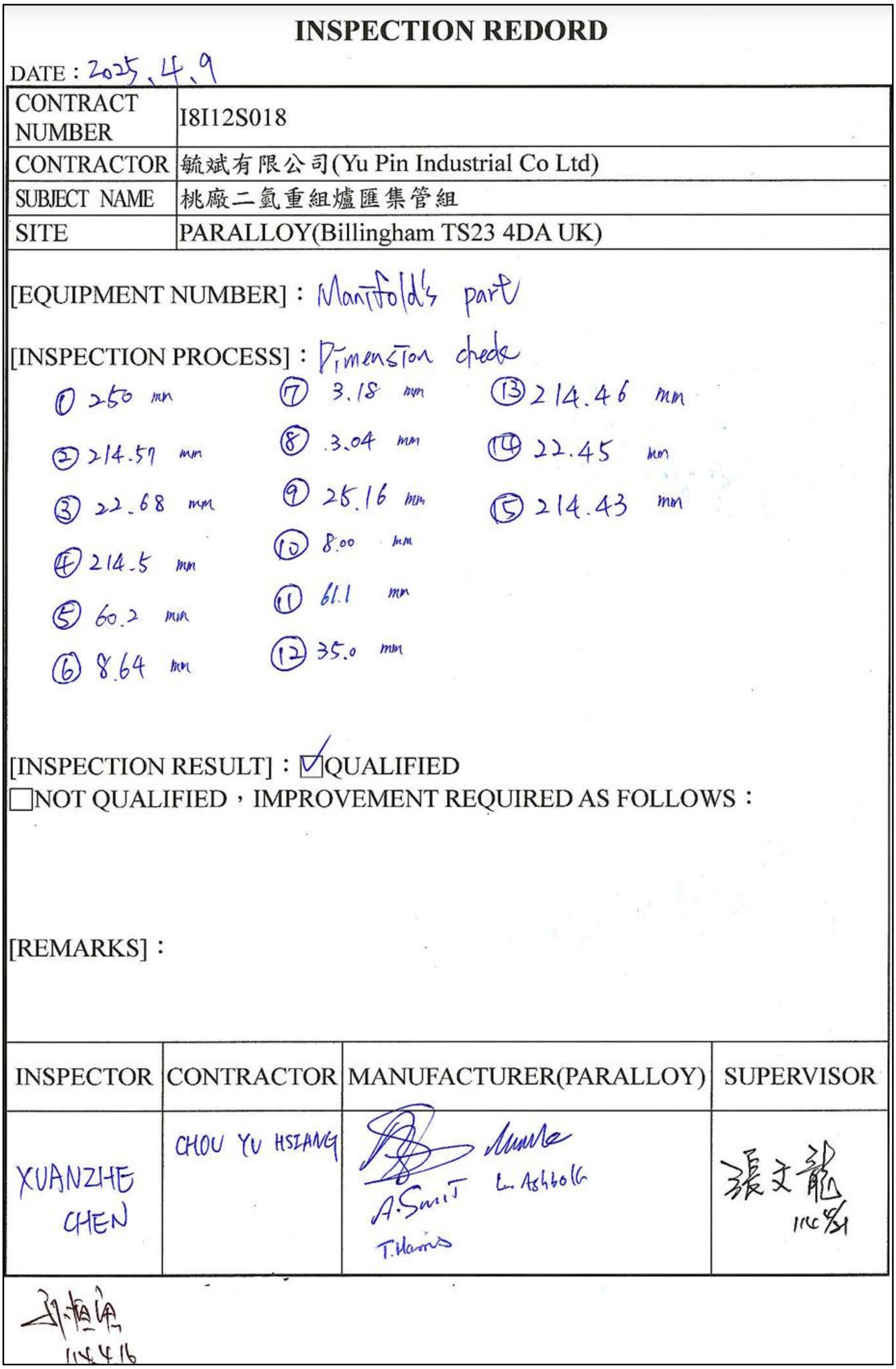
(3) 查驗施作之銲條符合 WPS 及 PQR。


2,0 x 1000
5 / 11
EN ISO 14343-A - W Z 21 33 Mn Nb
1.4850(mod.)
Zulassungen/Approvals/Agreations: TÜV (10451),
3/32 x 39.4
2.4 x 1000
11.0
5
108294
UTP A 2133 Mn
WIG-Draht / TIG-wire / Fil pour procédé TIG
EN ISO 14343-A - WZ 21 33 Mn Nb
Kennzeichnung 1.4850 mod / WZ 21 33 MnNb

FILLER MATERIAL：UTP A21/33Mn

圖2.14 現場使用之銲條

(4) 查驗部件尺寸符合圖面規範詳如查驗紀錄(圖2.X)。



INSPECTION REDORD

DATE：2025.4.9

CONTRACT NUMBER	I8I12S018
CONTRACTOR	毓斌有限公司(Yu Pin Industrial Co Ltd)
SUBJECT NAME	桃廠二氫重組爐匯集管組
SITE	PARALLOY(Billingham TS23 4DA UK)

[EQUIPMENT NUMBER]：Manifold's part

[INSPECTION PROCESS]：Dimension check

① 250 mm
② 214.57 mm
③ 22.68 mm
④ 214.5 mm
⑤ 60.2 mm
⑥ 8.64 mm
⑦ 3.18 mm
⑧ 3.04 mm
⑨ 25.16 mm
⑩ 8.00 mm
⑪ 61.1 mm
⑫ 35.0 mm
⑬ 214.46 mm
⑭ 22.45 mm
⑮ 214.43 mm

[INSPECTION RESULT]：☑QUALIFIED

☐NOT QUALIFIED，IMPROVEMENT REQUIRED AS FOLLOWS：

[REMARKS]：

INSPECTOR	CONTRACTOR	MANUFACTURER(PARALLOY)	SUPERVISOR
XUANZHE CHEN	CHOU YU HSIANG	A.Smit L. Ashbolt T.Harris	張文龍 114 4/21

114.4.16

圖2.15 I8I12S018之查驗紀錄-2封面

參 具體成效

- 「了解離心鑄造與靜態鑄造之差異」：

目前台灣的鑄造廠多以靜態鑄造技術為主，市場上幾乎未見具規模的離心鑄造生產線。經實際探訪多家國內廠商後，普遍反映離心鑄造產品在台灣市場需求有限，若投入相關設備與生產線，恐難以達到經濟規模與效益，因此未見有業者積極發展該項技術。過去在處理鑄造相關業務時，僅能透過書籍資料、前輩的實務經驗，以及網路上的影片來輔助了解離心鑄造的運作方式與細節。然而，這些二手資料所能傳遞的資訊有限，無法完整呈現實際製程中的關鍵環節與操作原則。

此次實地參訪國外離心鑄造工廠的經驗，讓我有機會深入觀察整個製程，從金屬原料的熔煉、模具設置、旋轉鑄造過程到後續的加工與品質控管，每一階段都有其獨特技術與管理重點。透過第一線的觀察與與技術人員的直接交流，使我對離心鑄造有了更完整且具體的認識。

這次參訪對我未來在承辦涉及鑄造技術的案件將提供極大助益，讓我在技術判斷與契約條文撰寫上更具準確性與信心。同時，也計劃將此次參訪所獲得的寶貴經驗整理並分享給課內其他同仁，作為內部知識傳承與技術提升的參考資料。

- 「提前於新品交貨前查驗到瑕疵」:

本次行程中，我們於現場查驗過程中發現一項新品存在製造上的重大瑕疵，且經初步判斷屬於無法透過後續加工或修正方式改善的不可逆缺陷。所幸該問題得以在正式交貨前即被發現，讓我們能夠及時將資訊帶回廠內進行技術評估與跨部門討論，避免日後於停爐作業前最後階段才發現問題，進而延誤停爐進程，造成整體工程時程的重大影響。

此次提前查驗不僅有效降低專案風險，亦為本廠爭取寶貴的應變時間，使相關單位得以預先針對潛在風險進行因應方案的規劃與準備。同時，我們也得以及早與得標廠商展開後續契約處理與修正的討論，包括是否需更換產品、補償條件或調整交貨內容等，避免因臨時協商而影響整體合作關係與工程進度，充分展現預先查驗制度在實務執行上的關鍵價值。

肆 心得及建議

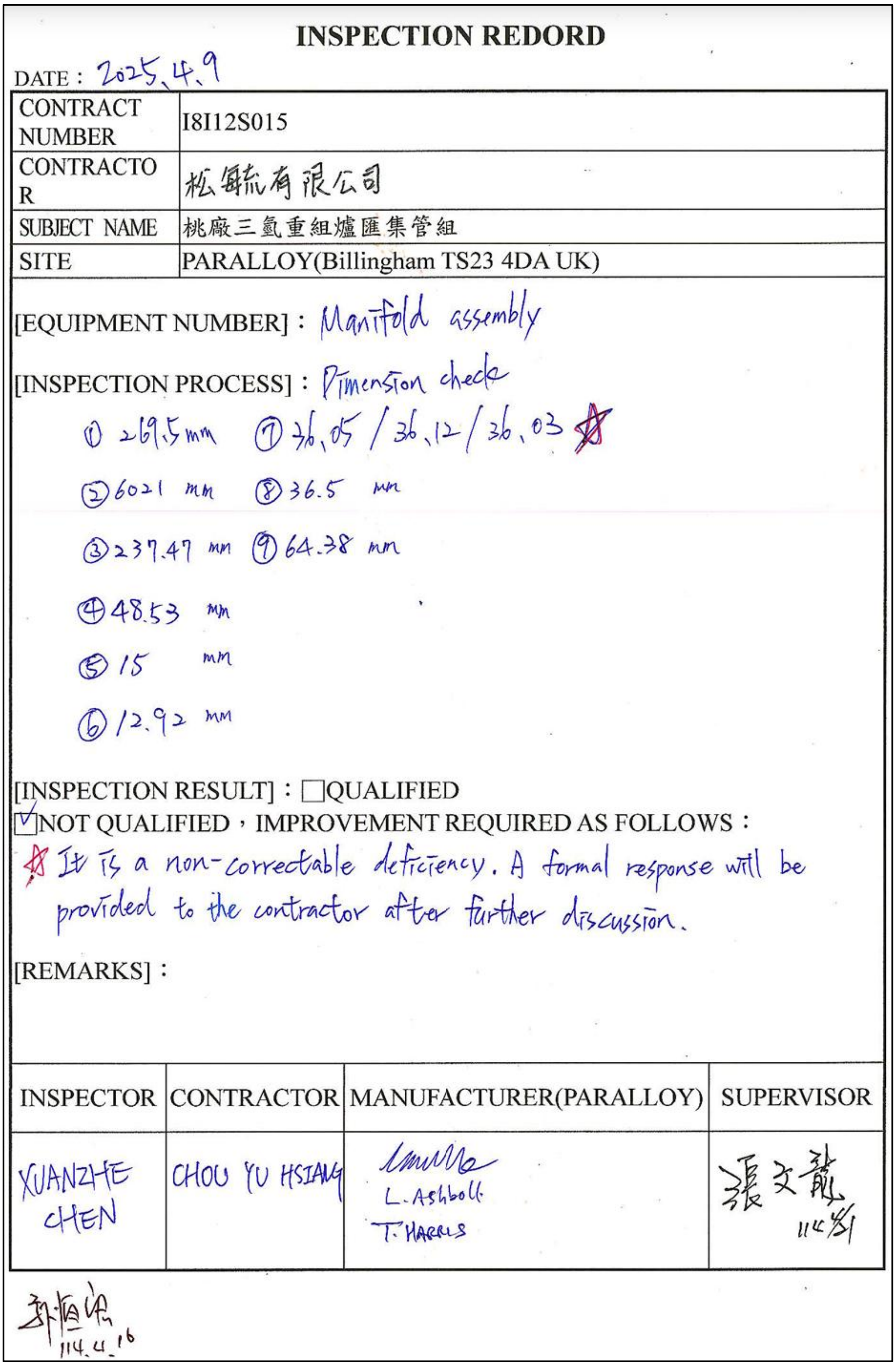
此次的參訪與產品查驗雖然行程僅安排兩天，整體節奏相當緊湊，且因當地不可預期的因素影響，導致第二天部分原訂行程未能如期進行，未能完成部分相關文件的查驗，實屬遺憾。然而，本次實地參訪PARALLOY 製造廠的離心鑄造工廠，仍帶來極為豐富的收穫。過往在編撰契約條文時，為了掌握離心鑄造相關製程的差異性，我們僅能依賴書籍資料、資深同仁的經驗傳承及網路上的影片資源，對此工藝建立初步認識。雖然這些資訊提供了基本概念，但面對契約中諸多細節條款時，仍無法確認是否準確或適切地反映實際製造流程。

透過此次實地走訪，得以全面了解離心鑄造自金屬熔煉、成型、冷卻直至後續加工的完整生產流程，進一步掌握其中各個環節的技術細節與品管要點，這些關鍵知識若非親身觀察，難以僅從文獻或影片中獲得。此次經驗不僅提升了我對離心鑄造的專業理解，也有助於未來契約條文的擬定更貼近實際製造情況。

此外，針對產品尺寸與文件的提前查驗亦具高度價值。能在正式交貨前數月即發現潛在問題，讓本廠有更充裕的時間進行內部應變，不但能充分評估此類缺失對工場實際操作的影響程度，也能有效爭取時間處理契約後續的修正與協調，進而提升整體專案執行的效率與穩定性。

附錄

附錄1：I8I12S015之查驗紀錄



INSPECTION REDORD

DATE：2025.4.9

CONTRACT NUMBER	I8I12S015
CONTRACTOR	松毓有限公司
SUBJECT NAME	桃廠三氫重組爐匯集管組
SITE	PARALLOY(Billingham TS23 4DA UK)

[EQUIPMENT NUMBER]：Manifold assembly

[INSPECTION PROCESS]：Dimension check

① 269.5mm ⑦ 36.05 / 36.12 / 36.03 ✩

② 6021 mm ⑧ 36.5 mm

③ 237.47 mm ⑨ 64.38 mm

④ 48.53 mm

⑤ 15 mm

⑥ 12.92 mm

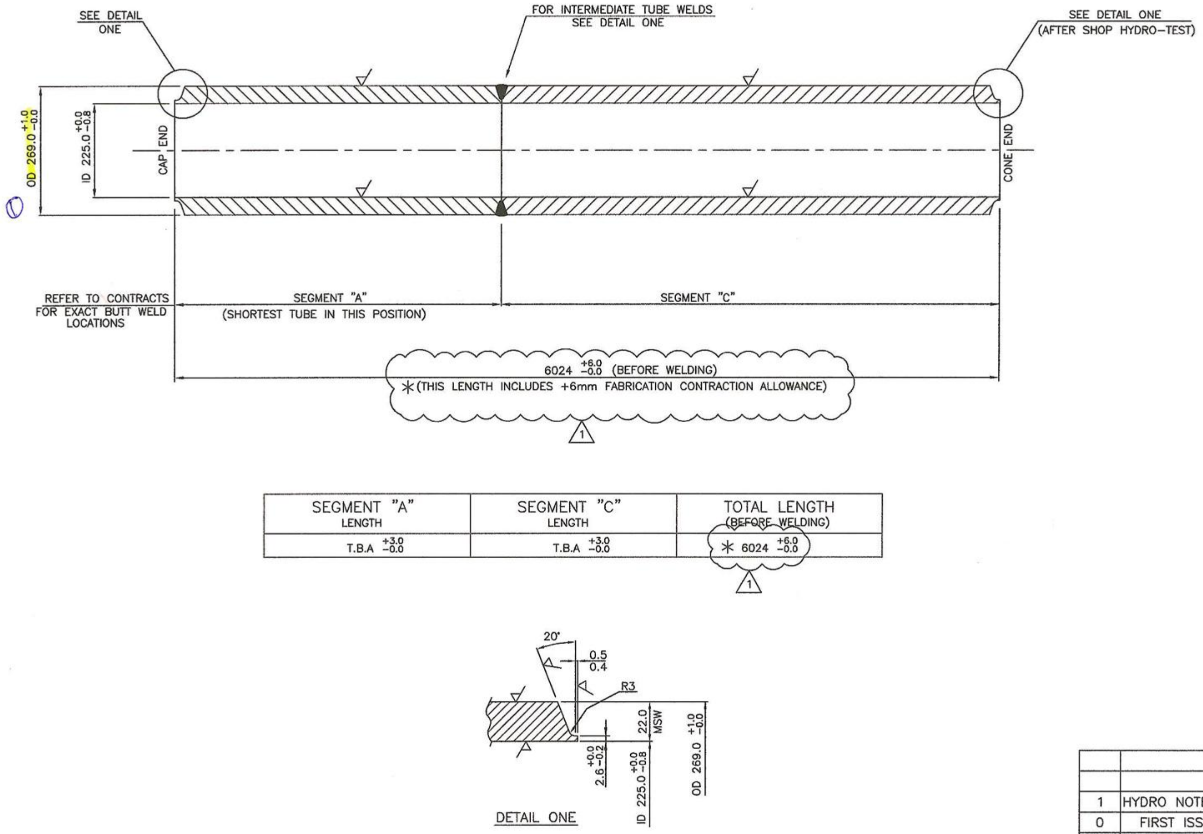
[INSPECTION RESULT]：☐QUALIFIED
☑NOT QUALIFIED，IMPROVEMENT REQUIRED AS FOLLOWS：

✩ It is a non-correctable deficiency. A formal response will be provided to the contractor after further discussion.

[REMARKS]：

INSPECTOR	CONTRACTOR	MANUFACTURER(PARALLOY)	SUPERVISOR
XUANZHE CHEN	CHOU YU HSIANG	L.Ashbolt T.HARRIS	張文龍 114 4/1

郭恒[illegible]
114.4.16


SEE DETAIL ONE
FOR INTERMEDIATE TUBE WELDS SEE DETAIL ONE
SEE DETAIL ONE (AFTER SHOP HYDRO–TEST)
OD 269.0 +1.0 −0.0
ID 225.0 +0.0 −0.8
CAP END
CONE END
REFER TO CONTRACTS FOR EXACT BUTT WELD LOCATIONS
SEGMENT "A" (SHORTEST TUBE IN THIS POSITION)
SEGMENT "C"
6024 +6.0 −0.0 (BEFORE WELDING)
✳(THIS LENGTH INCLUDES +6mm FABRICATION CONTRACTION ALLOWANCE)
1
20°
0.5
0.4
R3
22.0
MSW
2.6 +0.0 −0.2
ID 225.0 +0.0 −0.8
OD 269.0 +1.0 −0.0
DETAIL ONE

SEGMENT "A" LENGTH	SEGMENT "C" LENGTH	TOTAL LENGTH (BEFORE WELDING)
T.B.A $^{+3.0}_{-0.0}$	T.B.A $^{+3.0}_{-0.0}$	✳ 6024 $^{+6.0}_{-0.0}$

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:–04578/010
2. FABRICATION, INSPECTION AND TESTING TO BE IN ACCORDANCE WITH CUSTOMER SPECIFICATIONS AND PARALLOY QUALITY PLANS:– 04578T 04578F
3. MAX TUBES PER ASSEMBLY = 3
4. ESTIMATED WEIGHT PER ASSEMBLY = 808 Kg
5. QUANTITY REQUIRED = ONE OFF

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
1	HYDRO NOTE AND LENGTH REV.D	27/08/24	CTR	AH	LA
0	FIRST ISSUE FOR APPROVAL	08/07/24	CTR	AH	LA

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP–24061401_I8I 12S015 (R2)

ALL DIMENSIONS IN mm

MATERIAL: PARALLOY CR32W

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL –––±1.5mm
ANGULAR –––––±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

CAST TUBE
ITEM No.01

PARALLOY

REF. DWG. No.
A 4936 REV. B

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

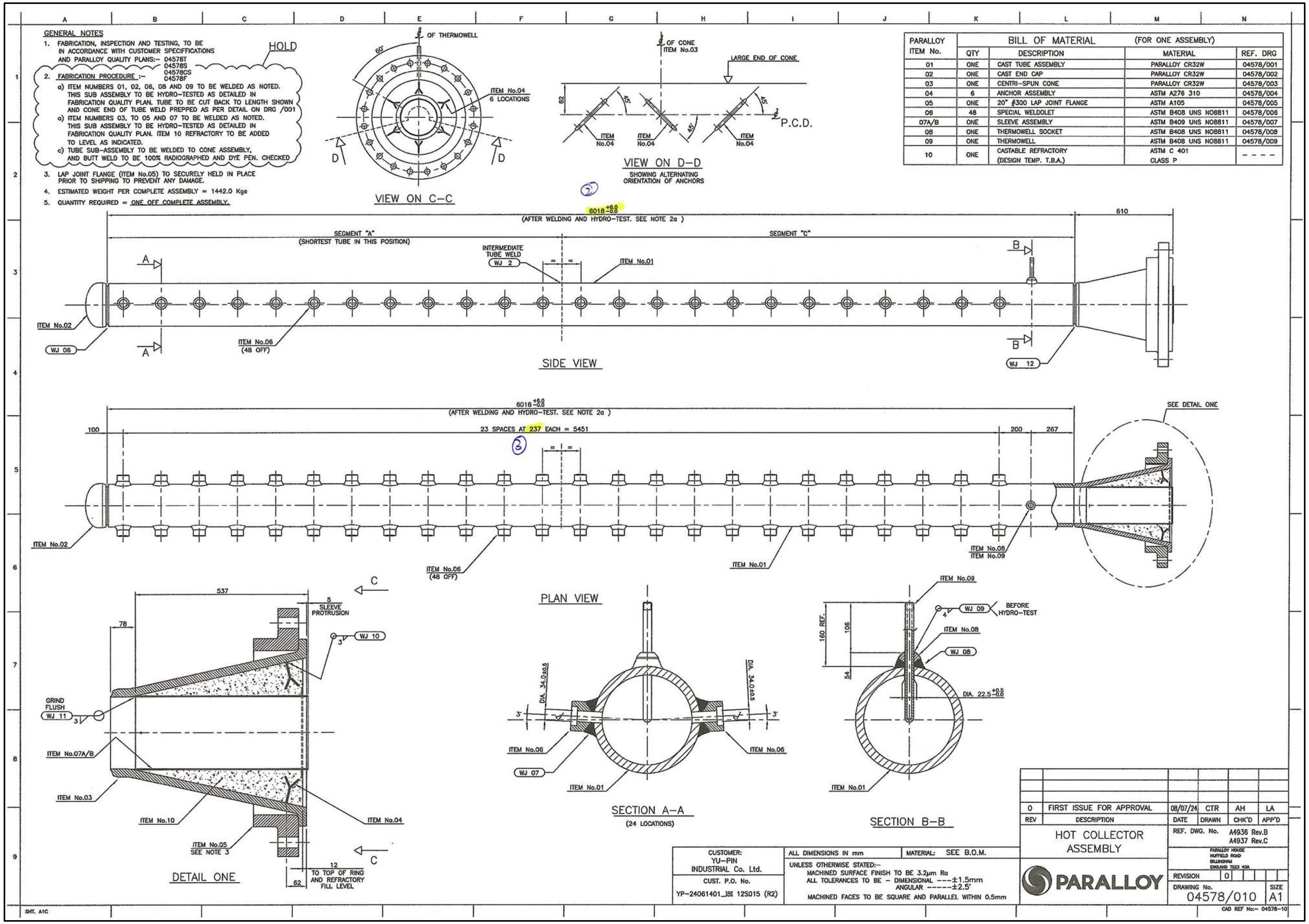
REVISION 0 1

DRAWING No. 04578/001

SIZE A2

SHT. A2B

CAD REF No:– 04578–1


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
HOLD
℄ OF THERMOWELL
60°
ITEM No.04
6 LOCATIONS
D
D
VIEW ON C–C
℄ OF CONE
ITEM No.03
LARGE END OF CONE
62
45°
45°
45°
℄ P.C.D.
ITEM No.04
ITEM No.04
ITEM No.04
VIEW ON D–D
SHOWING ALTERNATING ORIENTATION OF ANCHORS
②
6018 +8.0 −0.0
(AFTER WELDING AND HYDRO–TEST. SEE NOTE 2a)
610
SEGMENT "A"
(SHORTEST TUBE IN THIS POSITION)
SEGMENT "C"
INTERMEDIATE TUBE WELD
WJ 2
=
=
ITEM No.01
A
A
B
B
ITEM No.02
WJ 06
ITEM No.06
(48 OFF)
WJ 12
SIDE VIEW
6018 +8.0 −0.0
(AFTER WELDING AND HYDRO–TEST. SEE NOTE 2a)
100
23 SPACES AT 237 EACH = 5451
③
200
267
SEE DETAIL ONE
ITEM No.02
ITEM No.06
(48 OFF)
ITEM No.01
ITEM No.08
ITEM No.09
PLAN VIEW
537
78
5
SLEEVE PROTRUSION
C
C
WJ 10
3
GRIND FLUSH
WJ 11
3
ITEM No.07A/B
ITEM No.03
ITEM No.10
ITEM No.05
SEE NOTE 3
ITEM No.04
12
TO TOP OF RING AND REFRACTORY FILL LEVEL
62
DETAIL ONE
DIA. 34.0±0.5
DIA. 34.0±0.5
3°
3°
ITEM No.06
ITEM No.06
WJ 07
ITEM No.01
SECTION A–A
(24 LOCATIONS)
ITEM No.09
WJ 09
4
BEFORE HYDRO–TEST
160 REF.
106
54
ITEM No.08
WJ 08
DIA. 22.5 +0.5 −0.0
ITEM No.01
SECTION B–B
SHT. A1C

GENERAL NOTES

1. FABRICATION, INSPECTION AND TESTING, TO BE IN ACCORDANCE WITH CUSTOMER SPECIFFICATIONS AND PARALLOY QUALITY PLANS:– 04578T
04578S
04578CS
04578F
2. FABRICATION PROCEDURE :–
   a) ITEM NUMBERS 01, 02, 06, 08 AND 09 TO BE WELDED AS NOTED. THIS SUB ASSEMBLY TO BE HYDRO–TESTED AS DETAILED IN FABRICATION QUALITY PLAN. TUBE TO BE CUT BACK TO LENGTH SHOWN AND CONE END OF TUBE WELD PREPPED AS PER DETAIL ON DRG /001
   a) ITEM NUMBERS 03, TO 05 AND 07 TO BE WELDED AS NOTED. THIS SUB ASSEMBLY TO BE HYDRO–TESTED AS DETAILED IN FABRICATION QUALITY PLAN. ITEM 10 REFRACTORY TO BE ADDED TO LEVEL AS INDICATED.
   c) TUBE SUB–ASSEMBLY TO BE WELDED TO CONE ASSEMBLY, AND BUTT WELD TO BE 100% RADIOGRAPHED AND DYE PEN. CHECKED
3. LAP JOINT FLANGE (ITEM No.05) TO SECURELY HELD IN PLACE PRIOR TO SHIPPING TO PREVENT ANY DAMAGE.
4. ESTIMATED WEIGHT PER COMPLETE ASSEMBLY = 1442.0 Kgs
5. QUANTITY REQUIRED = ONE OFF COMPLETE ASSEMBLY.

PARALLOY ITEM No.	BILL OF MATERIAL		(FOR ONE ASSEMBLY)	
	QTY	DESCRIPTION	MATERIAL	REF. DRG
01	ONE	CAST TUBE ASSEMBLY	PARALLOY CR32W	04578/001
02	ONE	CAST END CAP	PARALLOY CR32W	04578/002
03	ONE	CENTRI–SPUN CONE	PARALLOY CR32W	04578/003
04	6	ANCHOR ASSEMBLY	ASTM A276 310	04578/004
05	ONE	20" #300 LAP JOINT FLANGE	ASTM A105	04578/005
06	48	SPECIAL WELDOLET	ASTM B408 UNS N08811	04578/006
07A/B	ONE	SLEEVE ASSEMBLY	ASTM B409 UNS N08811	04578/007
08	ONE	THERMOWELL SOCKET	ASTM B408 UNS N08811	04578/008
09	ONE	THERMOWELL	ASTM B408 UNS N08811	04578/009
10	ONE	CASTABLE REFRACTORY (DESIGN TEMP. T.B.A.)	ASTM C 401 CLASS P	– – – –

0	FIRST ISSUE FOR APPROVAL	08/07/24	CTR	AH	LA
REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.
CUST. P.O. No.
YP–24061401_J8I 12S015 (R2)

ALL DIMENSIONS IN mm
MATERIAL: SEE B.O.M.

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL –––±1.5mm
ANGULAR –––––±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

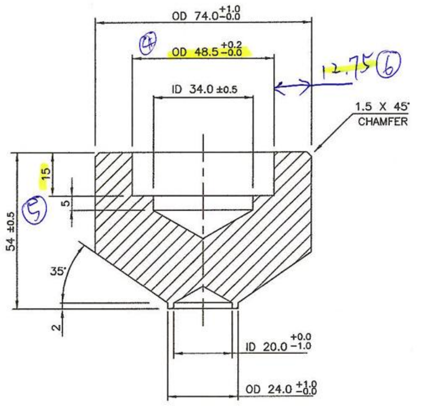
HOT COLLECTOR
ASSEMBLY

PARALLOY

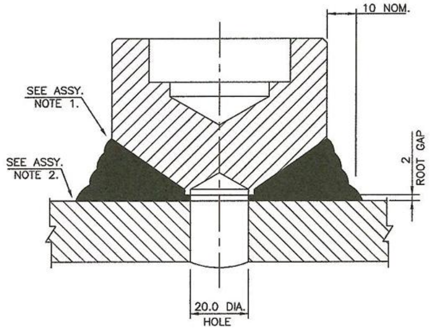
REF. DWG. No. A4936 Rev.B
A4937 Rev.C

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

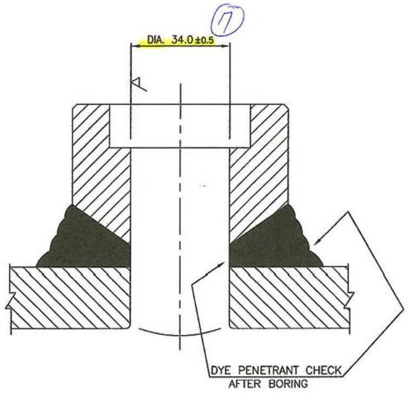
REVISION 0
DRAWING No. 04578/010
SIZE A1
CAD REF No:– 04578–10


OD 74.0 +1.0 −0.0
④
OD 48.5 +0.2 −0.0
12.75 ⑥
ID 34.0 ±0.5
1.5 X 45°
CHAMFER
15
⑤
5
54 ±0.5
35°
2
ID 20.0 +0.0 −1.0
OD 24.0 +1.0 −0.0

DETAIL ONE
AS SUPPLIED


10 NOM.
SEE ASSY. NOTE 1.
SEE ASSY. NOTE 2.
2
ROOT GAP
20.0 DIA. HOLE

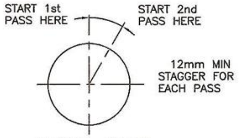
DETAIL TWO
AFTER WELDING


⑦
DIA. 34.0 ±0.5
DYE PENETRANT CHECK
AFTER BORING

DETAIL THREE
BORED AFTER HYDRO-TEST

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:-04578/010
2. EACH ITEM TO BE VIBRO-ETCHED WITH THE FOLLOWING:-
    a) PARALLOY ITEM NUMBER "04578/B06"
    b) MATERIAL HEAT NUMBER
    c) UNIQUE SERIAL NUMBER 1 TO 48
3. THIS ITEM TO BE FULLY MACHINED.
4. WELD SIZE TO BE IN ACCORDANCE WITH ASME B31.3 SECTION 328.5.2.
5. APPROX WEIGHT PER ITEM = 0.5 Kgs
6. QUANTITY REQUIRED = 48 OFF


START 1st PASS HERE
START 2nd PASS HERE
12mm MIN STAGGER FOR EACH PASS

DETAIL FOUR
WELD PASS DIAGRAM

ASSEMBLY NOTES

1. THE WELD MUST CONSIST OF CONTINUOUS LAYERS. EACH PASS WILL BE STAGGERED AT THE START AND STOP POINTS A MINIMUM OF 12mm. COMPLETION OF WELDING ON ONE SIDE OF COUPLING PRIOR TO WELDING THE OTHER SIDE WILL NOT BE PERMITTED (SEE DETAIL FOUR).
2. WELD TO BE LAYERED SMOOTHLY INTO BASE METAL NUMBER OF RUNS MAY VARY. NO UNDERCUTTING PERMITTED.

CUSTOMER:
YU-PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP-24061401_I8I 12S015 (R2)

ALL DIMENSIONS IN mm

MATERIAL: ASTM B408 UNS N08811

UNLESS OTHERWISE STATED:-
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE - DIMENSIONAL ---±0.5mm
ANGULAR -----±1.0°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	08/07/24	CTR	AH	LA

SPECIAL WELDOLET
ITEM No.06

PARALLOY

REF. DWG. No.
A 4937 REV.C

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

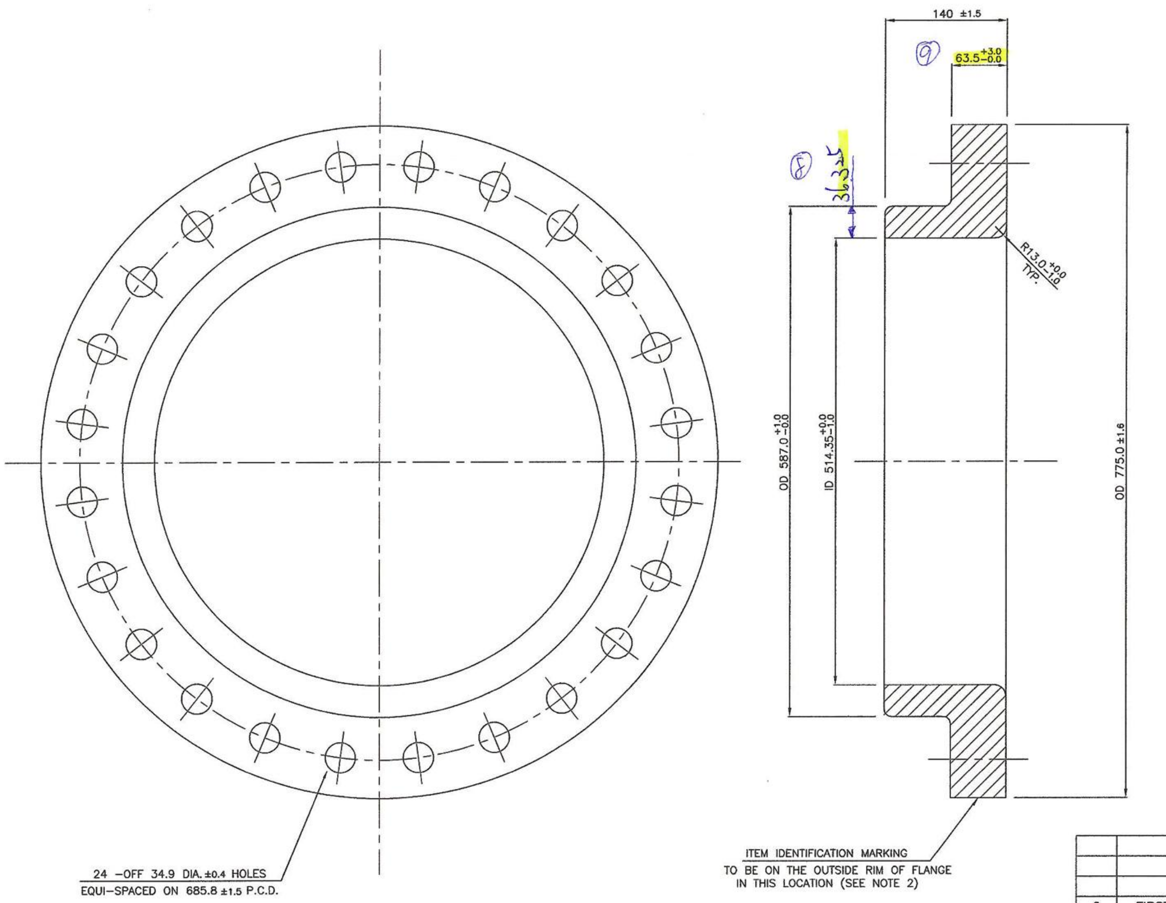
REVISION 0

DRAWING No. 04578/006

SIZE A2

CAD REF No:- 04578-6

SHT. A2B


A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6
7
140 ±1.5
⑨
63.5 +3.0 −0.0
⑧
36.325
R13.0 +0.0 −1.0 TYP.
OD 587.0 +1.0 −0.0
ID 514.35 +0.0 −1.0
OD 775.0 ±1.6
24 -OFF 34.9 DIA. ±0.4 HOLES
EQUI-SPACED ON 685.8 ±1.5 P.C.D.
ITEM IDENTIFICATION MARKING
TO BE ON THE OUTSIDE RIM OF FLANGE
IN THIS LOCATION (SEE NOTE 2)

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:– 04578/010
2. THIS ITEM TO BE FULLY MACHINED.
3. DIMENSIONS AND TOLERANCES NOT NOTED ARE TO SUIT 20" #300 LAP JOINT FLANGE TO ASME B16.5
4. EACH ITE TO BE CLEARLY MARKED BY VIBRO-ETCHING WITH THE FOLLOWING:–
   a) PARALLOY ITEM NUMBER "04578/B05"
   b) MATERIAL HEAT NUMBER
   c) UNIQUE SERIAL-NUMBER "1"
5. ESTIMATED WEIGHT PER ITEM = 170.0 Kgs
6. QUANTITY REQUIRED = ONE OFF

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	08/07/24	CTR	AH	LA

CUSTOMER:
YU-PIN
INDUSTRIAL Co. Ltd.
CUST. P.O. No.
YP-24061401_I8I 12S015 (R2)

ALL DIMENSIONS IN mm
MATERIAL: ASTM A105
UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL ---±1.5mm
ANGULAR -----±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

20" #300 LAP JOINT
FLANGE ITEM No.05

PARALLOY

REF. DWG. No.
A 4936 REV. B

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

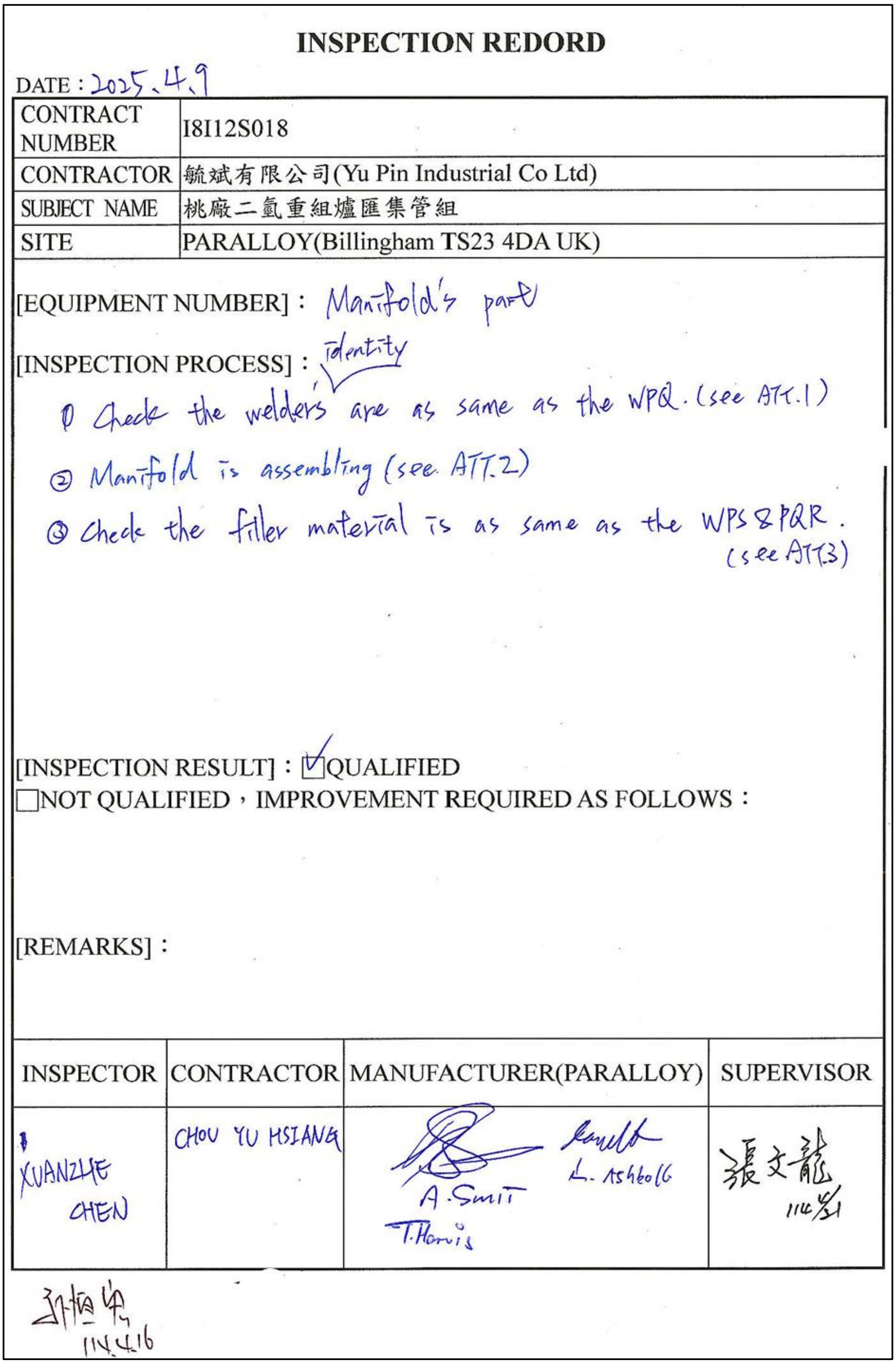
REVISION 0

DRAWING No. 04578/005
SIZE A2

CAD REF No:– 04578-5

SHT. A2B

附錄2：I8I12S018之查驗紀錄-1



INSPECTION REDORD

DATE：2025.4.9

CONTRACT NUMBER	I8I12S018
CONTRACTOR	毓斌有限公司(Yu Pin Industrial Co Ltd)
SUBJECT NAME	桃廠二氫重組爐匯集管組
SITE	PARALLOY(Billingham TS23 4DA UK)

[EQUIPMENT NUMBER]：Manifold's part

[INSPECTION PROCESS]：

① Check the welders' identity are as same as the WPQ. (see ATT.1)

② Manifold is assembling (see. ATT.2)

③ Check the filler material is as same as the WPS & PQR. (see ATT.3)

[INSPECTION RESULT]：☑QUALIFIED

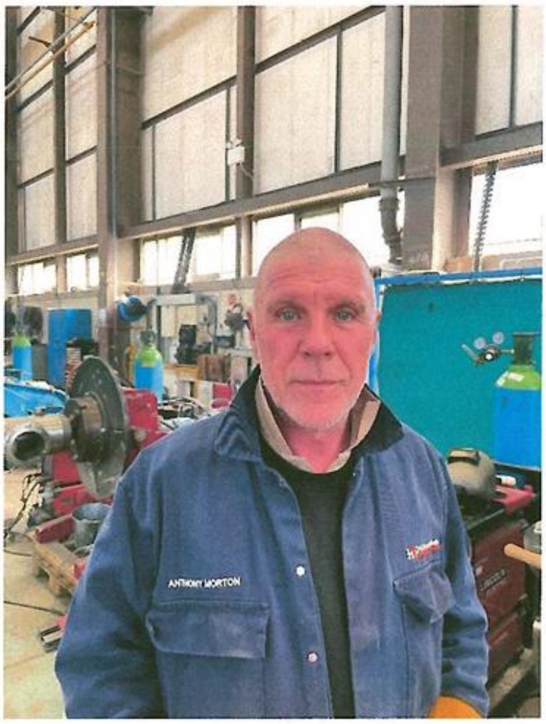
☐NOT QUALIFIED，IMPROVEMENT REQUIRED AS FOLLOWS：

[REMARKS]：

INSPECTOR	CONTRACTOR	MANUFACTURER(PARALLOY)	SUPERVISOR
XUANZHE CHEN	CHOU YU HSIANG	A. Smit T. Harris L. Ashbolt	張文龍 114 4/21

孫恒宇
114.4.16

INSPECTION REDORD ATTACHMENT 1

	
WELDER NAME：C.MEMMORY	WELDER NAME：A.MORTON
WELDER NAME：S.O'NEIL	

Certificate no: **COV 1830091/130**
Page 1 of 2

Welder Performance Qualification (WPQ) ASME IX

Welder's Name **C.Memmory** Identification No. **42**

Test Description

Identification no. of WPS followed	**2018/072 (PQR 305)**	☐ Test coupon	☒ Production weld
Specification type/grade or UNS of base	**Manoir 900 (P45)**	Thickness	**16mm**

Testing Conditions And Qualification Limits

Welding Variables (QW-350)	Actual Values	Range Qualified
Welding process(es)	**GTAW**	**GTAW**
Type (i.e.; manual, semi-auto) used	**Manual**	**Manual**
Backing (with/without)	**Without**	**With/Without**
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	**232mm**	**Plate, Pipe 73mm & over**
Base Metal P-Number to P-Number	**P45 - P45**	**P1-15F, P34, P41-P49**
Filler metal or electrode specification(s) (SFA) (info. only)	**N/A**	**-**
Filler metal or electrode classification(s) (info. only)	**21Cr33NiMnNb**	**21Cr35NiMnNb**
Filler metal F-Number(s)	**N/A**	**N/A**
Consumable insert (GTAW or PAW)	**N/A**	**N/A**
Filler metal product form (solid/metal or flux corded/powder) (GTAW or PAW)	**Wire**	**Solid Wire**
Deposited thickness for each process		
Process 1: **GTAW** 3 layers minimum ☒ Yes ☐ No	**16.0mm**	**Maximum to be welded**
Process 2: 3 layers minimum ☐ Yes ☐ No		
Position qualified (2G, 6G, 3F, etc.)	**3G**	**1G, 3G All Fillets**
Vertical progression (uphill or downhill)	**Uphill**	**-**
Type of fuel gas (OFW)	**N/A**	**-**
nert gas backing (GTAW, PAW, GMAW)	**SingleAr**	**With**
Transfer mode (spray/globular or pulse to short circuit – GMAW)	**N/A**	**N/A**
GTAW current type/polarity (AC, DCEP, DCEN)	**DCEN**	**DCEN**

Results

Visual Examination of Completed Weld (QW-302.4) **Satisfactory**

☐ Transverse bends root and face [QW-462.3(a)]; ☐ Longitudinal bends root and face [QW-462.3(b)]; ☐ Side bends (QW-462.2);
☐ Pipe bend specimen, Macro test for fusion [QW-462.5(b)] ☐ Plate bend specimen, Macro test for fusion [QW462.5(e)]
☐ Pipe specimen Macro test for fusion [QW-462.5(b)]: ☐ Plate specimen Macro test for fusion [QW-462.5(e)]

ype	Result	Type	Result	Type	Result

Alternative volumetric examination results (QW-191) Report Q1643 RT ☒ UT ☐ (check one)
illet weld – fracture test (QW 181.2) Length and percent of defects x
☐ Fillet welds in plate (QW- ☐ Fillet welds in pipe (QW-462.4(c))
Macro xamination QW-184) Fillet size (in/mm) x Concavity/convexity (in/mm.)
Other tests

ilm or specimens evaluated by **R.Staley** Company **Hi Tech Fabrication**
Mechanical tests conducted by **N/A** Laboratory test no. **-**
Welding supervised by **J.Broughton**

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the equirements of Section IX of the ASME Code Ed. .

Date issued **18 July 2018**

Birmingham
Lloyd's Register EMEA

Manufacturer's Representative Matt Jones
Manufacturer **A.Willcocks** Surveyor to Lloyd's Register EMEA

A subsidiary of Lloyd's Register Group Limited

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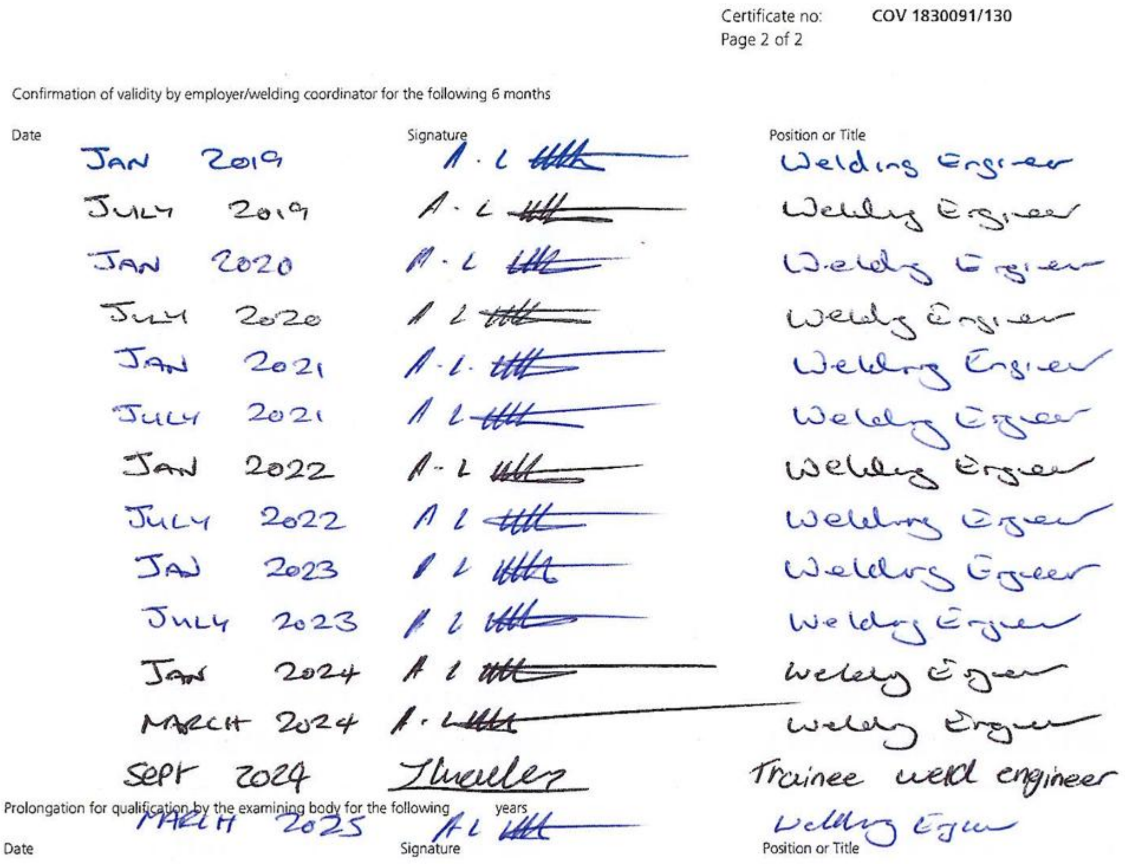


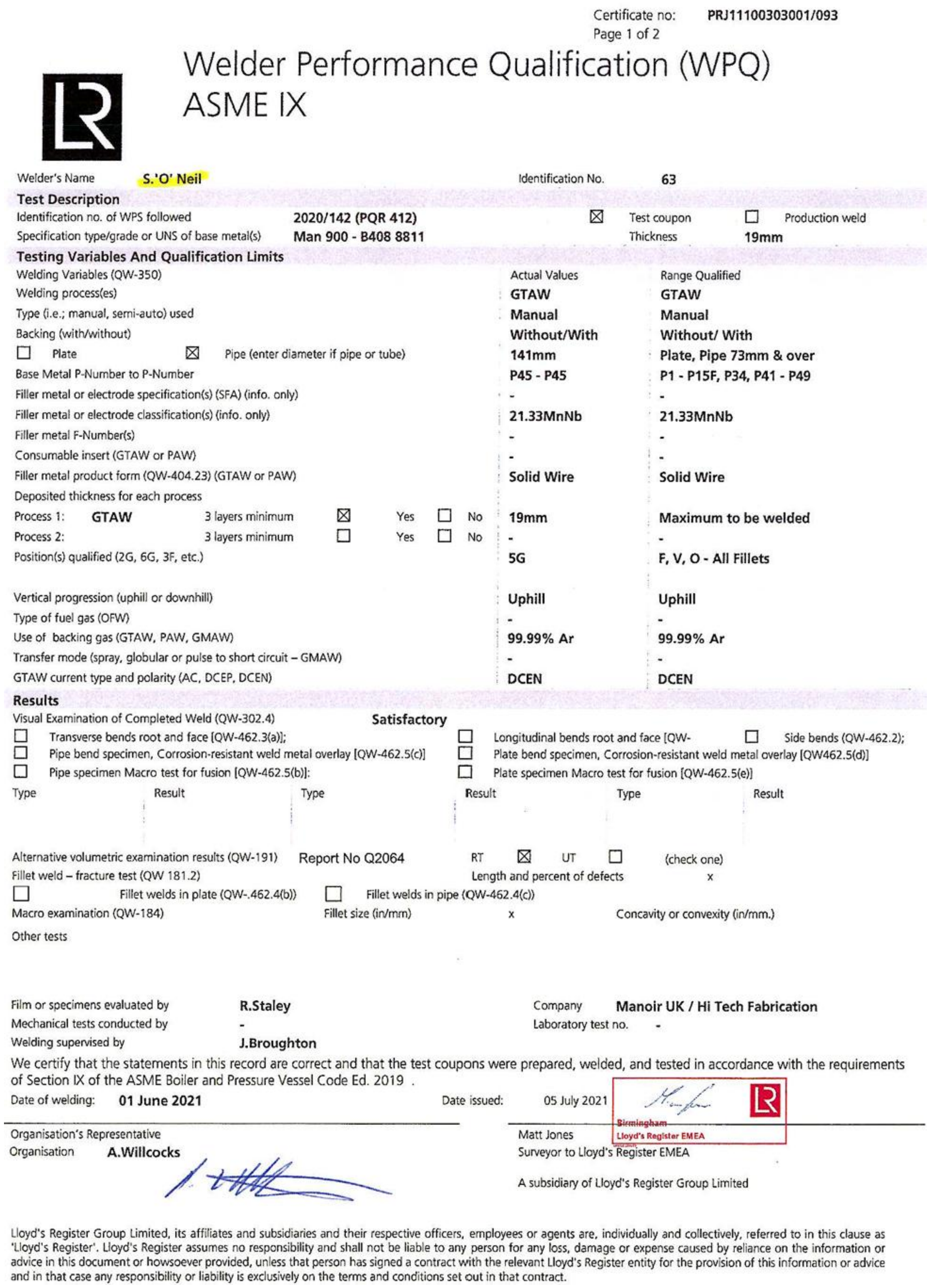
Certificate no: **COV 1830091/130**
Page 2 of 2

Confirmation of validity by employer/welding coordinator for the following 6 months

Date	Signature	Position or Title
JAN 2019	A · L	Welding Engineer
JULY 2019	A · L	Welding Engineer
JAN 2020	A · L	Welding Engineer
JULY 2020	A L	Welding Engineer
JAN 2021	A · L ·	Welding Engineer
JULY 2021	A L	Welding Engineer
JAN 2022	A · L	Welding Engineer
JULY 2022	A L	Welding Engineer
JAN 2023	A L	Welding Engineer
JULY 2023	A L	Welding Engineer
JAN 2024	A L	Welding Engineer
MARCH 2024	A · L	Welding Engineer
SEPT 2024	J Wheeler	Trainee weld engineer

Prolongation for qualification by the examining body for the following years

Date	Signature	Position or Title
MARCH 2025	A L	Welding Engineer



Certificate no: **PRJ11100303001/093**
Page 1 of 2

Welder Performance Qualification (WPQ) ASME IX

Welder's Name **S.'O' Neil** Identification No. **63**

Test Description

Identification no. of WPS followed **2020/142 (PQR 412)** ☒ Test coupon ☐ Production weld
Specification type/grade or UNS of base metal(s) **Man 900 - B408 8811** Thickness **19mm**

Testing Variables And Qualification Limits

Welding Variables (QW-350)	Actual Values	Range Qualified
Welding process(es)	**GTAW**	**GTAW**
Type (i.e.; manual, semi-auto) used	**Manual**	**Manual**
Backing (with/without)	**Without/With**	**Without/ With**
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	**141mm**	**Plate, Pipe 73mm & over**
Base Metal P-Number to P-Number	**P45 - P45**	**P1 - P15F, P34, P41 - P49**
Filler metal or electrode specification(s) (SFA) (info. only)	**-**	**-**
Filler metal or electrode classification(s) (info. only)	**21.33MnNb**	**21.33MnNb**
Filler metal F-Number(s)	**-**	**-**
Consumable insert (GTAW or PAW)	**-**	**-**
Filler metal product form (QW-404.23) (GTAW or PAW)	**Solid Wire**	**Solid Wire**
Deposited thickness for each process		
Process 1: **GTAW** 3 layers minimum ☒ Yes ☐ No	**19mm**	**Maximum to be welded**
Process 2: 3 layers minimum ☐ Yes ☐ No	**-**	**-**
Position(s) qualified (2G, 6G, 3F, etc.)	**5G**	**F, V, O - All Fillets**
Vertical progression (uphill or downhill)	**Uphill**	**Uphill**
Type of fuel gas (OFW)	**-**	**-**
Use of backing gas (GTAW, PAW, GMAW)	**99.99% Ar**	**99.99% Ar**
Transfer mode (spray, globular or pulse to short circuit – GMAW)	**-**	**-**
GTAW current type and polarity (AC, DCEP, DCEN)	**DCEN**	**DCEN**

Results

Visual Examination of Completed Weld (QW-302.4) **Satisfactory**

☐ Transverse bends root and face [QW-462.3(a)]; ☐ Longitudinal bends root and face [QW- ☐ Side bends (QW-462.2);
☐ Pipe bend specimen, Corrosion-resistant weld metal overlay [QW-462.5(c)] ☐ Plate bend specimen, Corrosion-resistant weld metal overlay [QW462.5(d)]
☐ Pipe specimen Macro test for fusion [QW-462.5(b)]: ☐ Plate specimen Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative volumetric examination results (QW-191) Report No Q2064 RT ☒ UT ☐ (check one)
Fillet weld – fracture test (QW 181.2) Length and percent of defects x
☐ Fillet welds in plate (QW-.462.4(b)) ☐ Fillet welds in pipe (QW-462.4(c))
Macro examination (QW-184) Fillet size (in/mm) x Concavity or convexity (in/mm.)
Other tests

Film or specimens evaluated by **R.Staley** Company **Manoir UK / Hi Tech Fabrication**
Mechanical tests conducted by **-** Laboratory test no. **-**
Welding supervised by **J.Broughton**

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code Ed. 2019 .

Date of welding: **01 June 2021** Date issued: 05 July 2021

Birmingham
Lloyd's Register EMEA

Organisation's Representative
Organisation **A.Willcocks**

Matt Jones
Surveyor to Lloyd's Register EMEA

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Confirmation of validity by employer/welding coordinator for the following 6 months

Date	Signature	Position or Title
Dec 2021	A.L	Welding Engineer
June 2022	A L	Welding Engineer
Dec 2022	A L	Welding Engineer
Jan 2024	A L	Welding Engineer
July 2024		Trainee weld engineer
January 2025		Trainee weld eng
July 2025		

Prolongation for qualification by the examining body for the following years

Date	Signature	Position or Title

Certificate no: **PRJ11100303001/173**
Page 1 of 2

Welder Performance Qualification (WPQ)
ASME IX

Welder's Name **A.Morton** Identification No. **41**

Test Description

Identification no. of WPS followed **2020/142 (PQR 412)** ☒ Test coupon ☐ Production weld
Specification type/grade or UNS of base metal(s) **Man 900 - B408 8811** Thickness **13mm**

Testing Variables And Qualification Limits

Welding Variables (QW-350)	Actual Values	Range Qualified
Welding process(es)	**GTAW**	**GTAW**
Type (i.e.; manual, semi-auto) used	**Manual**	**Manual**
Backing (with/without)	**Without/With**	**Without/ With**
☐ Plate ☒ Pipe (enter diameter if pipe or tube)	**73mm**	**Plate, Pipe 25mm & over**
Base Metal P-Number to P-Number	**P45 - P45**	**P1 - P15F, P34, P41 - P49**
Filler metal or electrode specification(s) (SFA) (info. only)	-	-
Filler metal or electrode classification(s) (info. only)	**21.33MnNb**	**21.33MnNb**
Filler metal F-Number(s)	-	-
Consumable insert (GTAW or PAW)	-	-
Filler metal product form (QW-404.23) (GTAW or PAW)	**Solid Wire**	**Solid Wire**
Deposited thickness for each process		
Process 1: **GTAW** 3 layers minimum ☒ Yes ☐ No	**13mm**	**Maximum to be welded**
Process 2: 3 layers minimum ☐ Yes ☐ No	-	-
Position(s) qualified (2G, 6G, 3F, etc.)	**5G**	**F, V, O - All Fillets**
Vertical progression (uphill or downhill)	**Uphill**	**Uphill**
Type of fuel gas (OFW)	-	-
Use of backing gas (GTAW, PAW, GMAW)	**99.99% Ar**	**99.99% Ar**
Transfer mode (spray, globular or pulse to short circuit – GMAW)	-	-
GTAW current type and polarity (AC, DCEP, DCEN)	**DCEN**	**DCEN**

Results

Visual Examination of Completed Weld (QW-302.4) **Satisfactory**

☐ Transverse bends root and face [QW-462.3(a)]; ☐ Longitudinal bends root and face [QW- ☐ Side bends (QW-462.2);
☐ Pipe bend specimen, Corrosion-resistant weld metal overlay [QW-462.5(c)] ☐ Plate bend specimen, Corrosion-resistant weld metal overlay [QW462.5(d)]
☐ Pipe specimen Macro test for fusion [QW-462.5(b)]: ☐ Plate specimen Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative volumetric examination results (QW-191) Report No Q2150 RT ☒ UT ☐ (check one)
Fillet weld – fracture test (QW 181.2) Length and percent of defects x
☐ Fillet welds in plate (QW-.462.4(b)) ☐ Fillet welds in pipe (QW-462.4(c))
Macro examination (QW-184) Fillet size (in/mm) x Concavity or convexity (in/mm.)
Other tests

Film or specimens evaluated by **R.Staley** Company **Manoir UK / Hi Tech Fabrication**
Mechanical tests conducted by **-** Laboratory test no. **-**
Welding supervised by **J.Broughton**

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code Ed. 2019 .

Date of welding: **09 August 2021** Date issued: 12 October 2021

Birmingham
Lloyd's Register EMEA

Organisation's Representative
Organisation **A.Willcocks**

Matt Jones
Surveyor to Lloyd's Register EMEA

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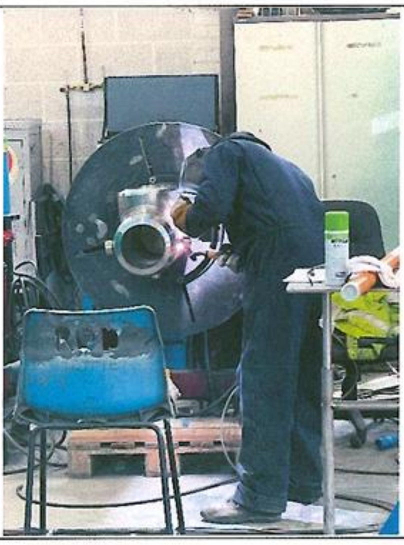
Confirmation of validity by employer/welding coordinator for the following 6 months

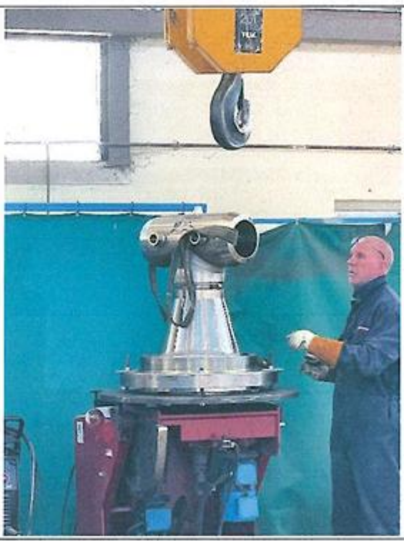
Date		Signature	Position or Title
FEB	2022		Welding Engineer
AUG	2022		Welding Engineer
FEB	2023		Welding Engineer
AUG	2023		Welding Engineer
FEB	2024		Welding Engineer
MARCH	2024		Welding Engineer
SEPT	2024		Trainee weld engineer
MARCH	2025		Welding Engineer

Prolongation for qualification by the examining body for the following years

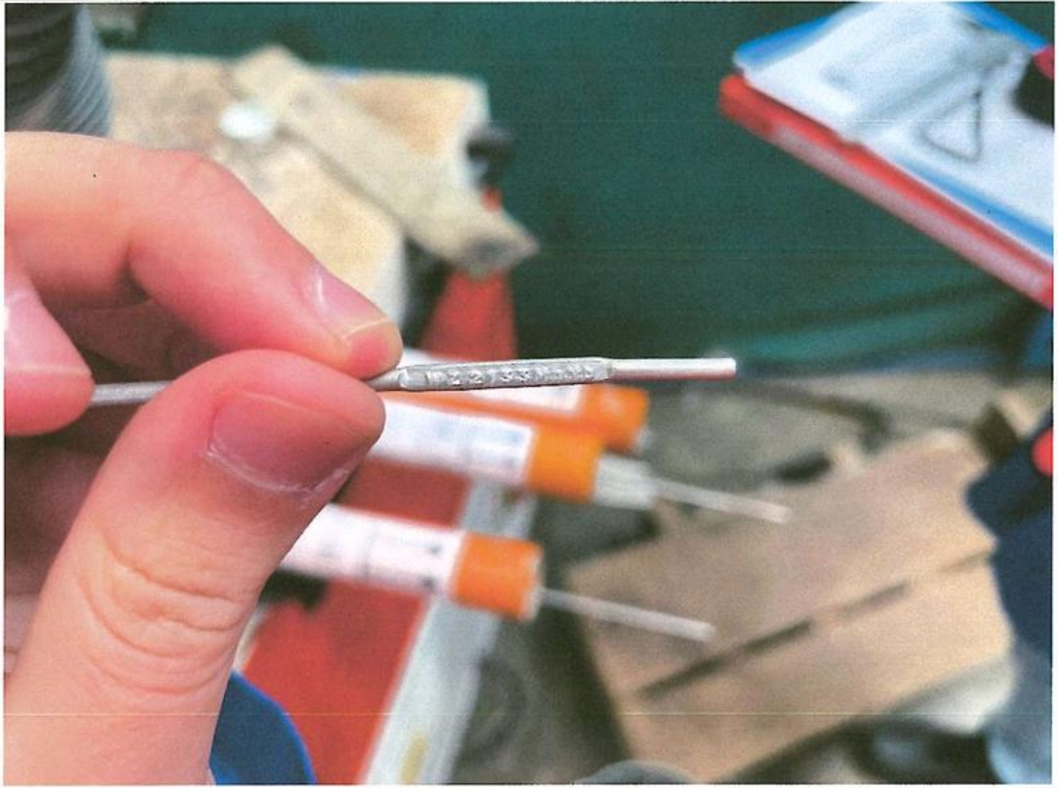
Date	Signature	Position or Title

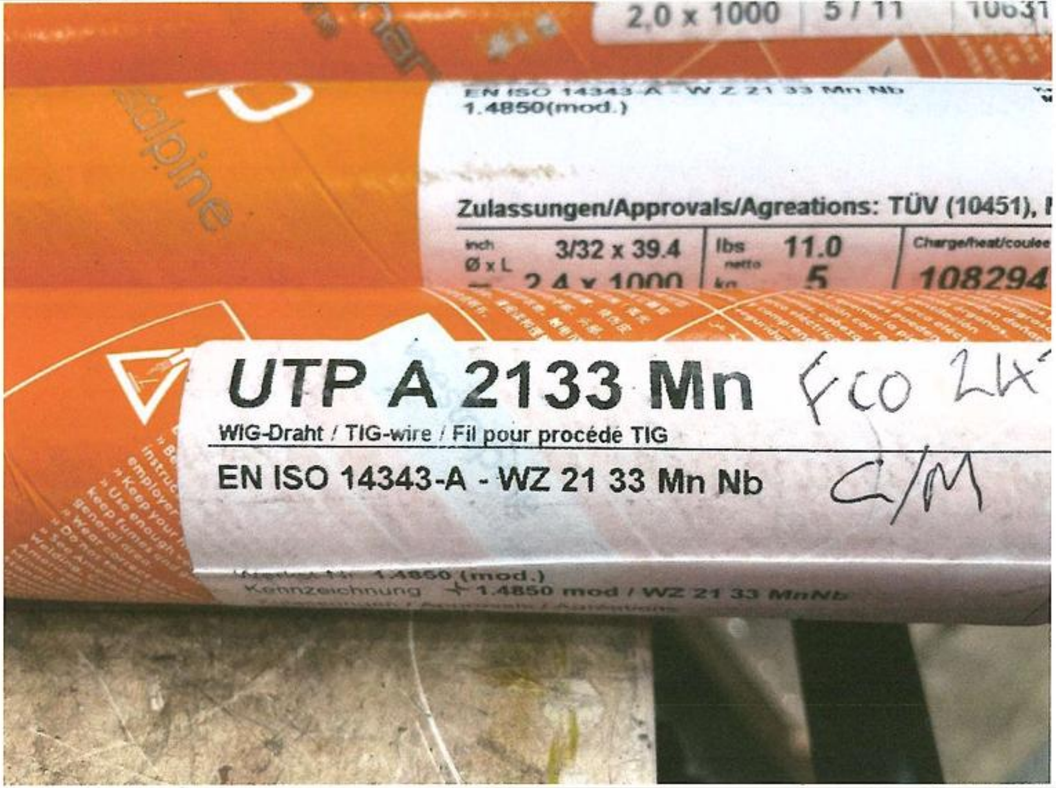
INSPECTION REDORD ATTACHMENT 2





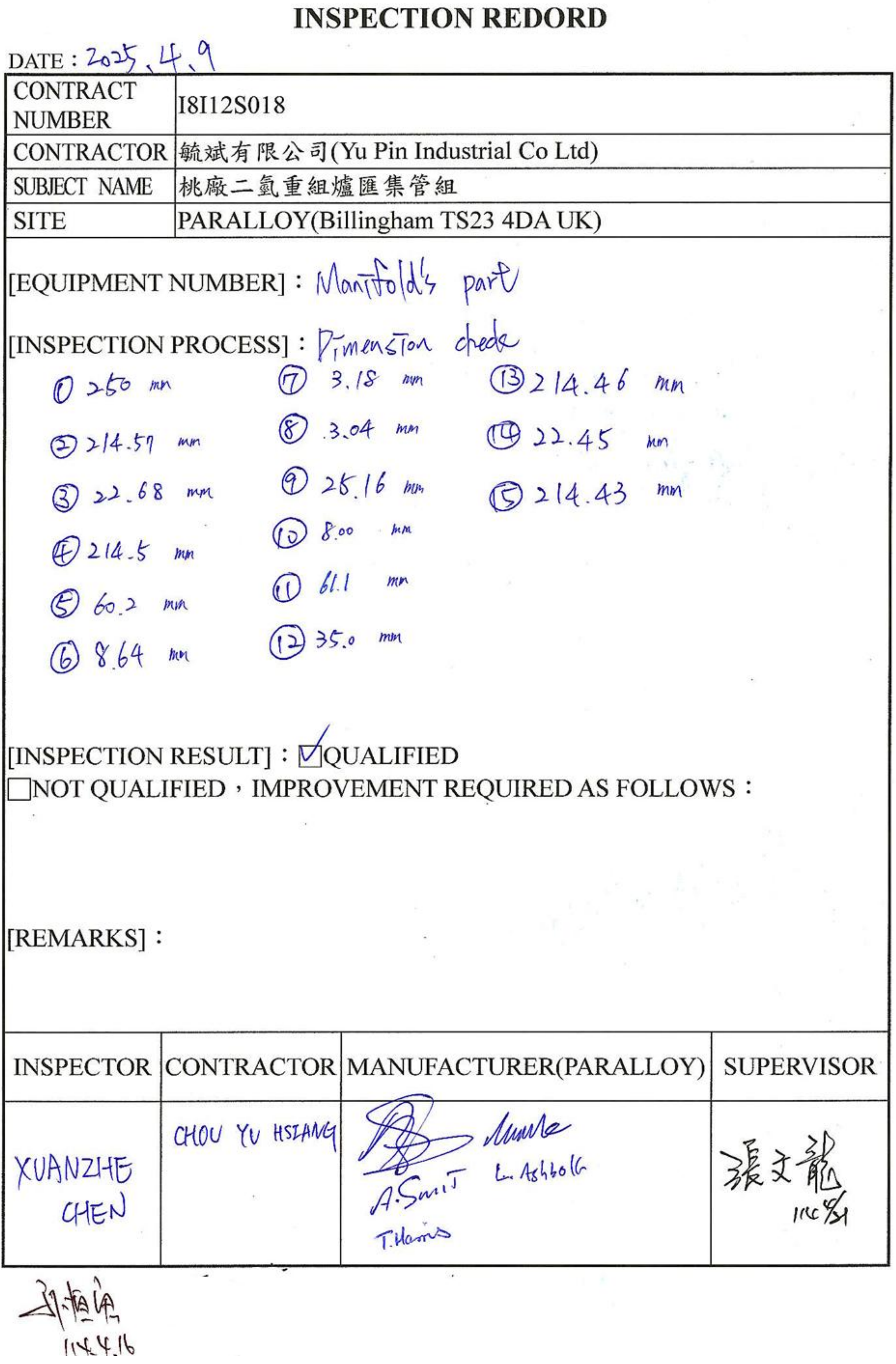
INSPECTION REDORD ATTACHMENT 3




2,0 x 1000
5 / 11
10631
EN ISO 14343-A - W Z 21 33 Mn Nb
1.4850(mod.)
Zulassungen/Approvals/Agreations: TÜV (10451),
inch Ø x L
3/32 x 39.4
2,4 x 1000
lbs netto
11.0
kg
5
Charge/heat/coulee
108294
UTP A 2133 Mn
WIG-Draht / TIG-wire / Fil pour procédé TIG
EN ISO 14343-A - WZ 21 33 Mn Nb
1.4850 (mod.)
Kennzeichnung 1.4850 mod / WZ 21 33 MnNb
FCO
C/M

FILLER MATERIAL：UTP A21/33Mn

附錄3：I8I12S018之查驗紀錄-2



INSPECTION REDORD

DATE：2025.4.9

CONTRACT NUMBER	I8I12S018
CONTRACTOR	毓斌有限公司(Yu Pin Industrial Co Ltd)
SUBJECT NAME	桃廠二氫重組爐匯集管組
SITE	PARALLOY(Billingham TS23 4DA UK)

[EQUIPMENT NUMBER]：Manifold's part

[INSPECTION PROCESS]：Dimension check

① 250 mm
② 214.57 mm
③ 22.68 mm
④ 214.5 mm
⑤ 60.2 mm
⑥ 8.64 mm
⑦ 3.18 mm
⑧ 3.04 mm
⑨ 25.16 mm
⑩ 8.00 mm
⑪ 61.1 mm
⑫ 35.0 mm
⑬ 214.46 mm
⑭ 22.45 mm
⑮ 214.43 mm

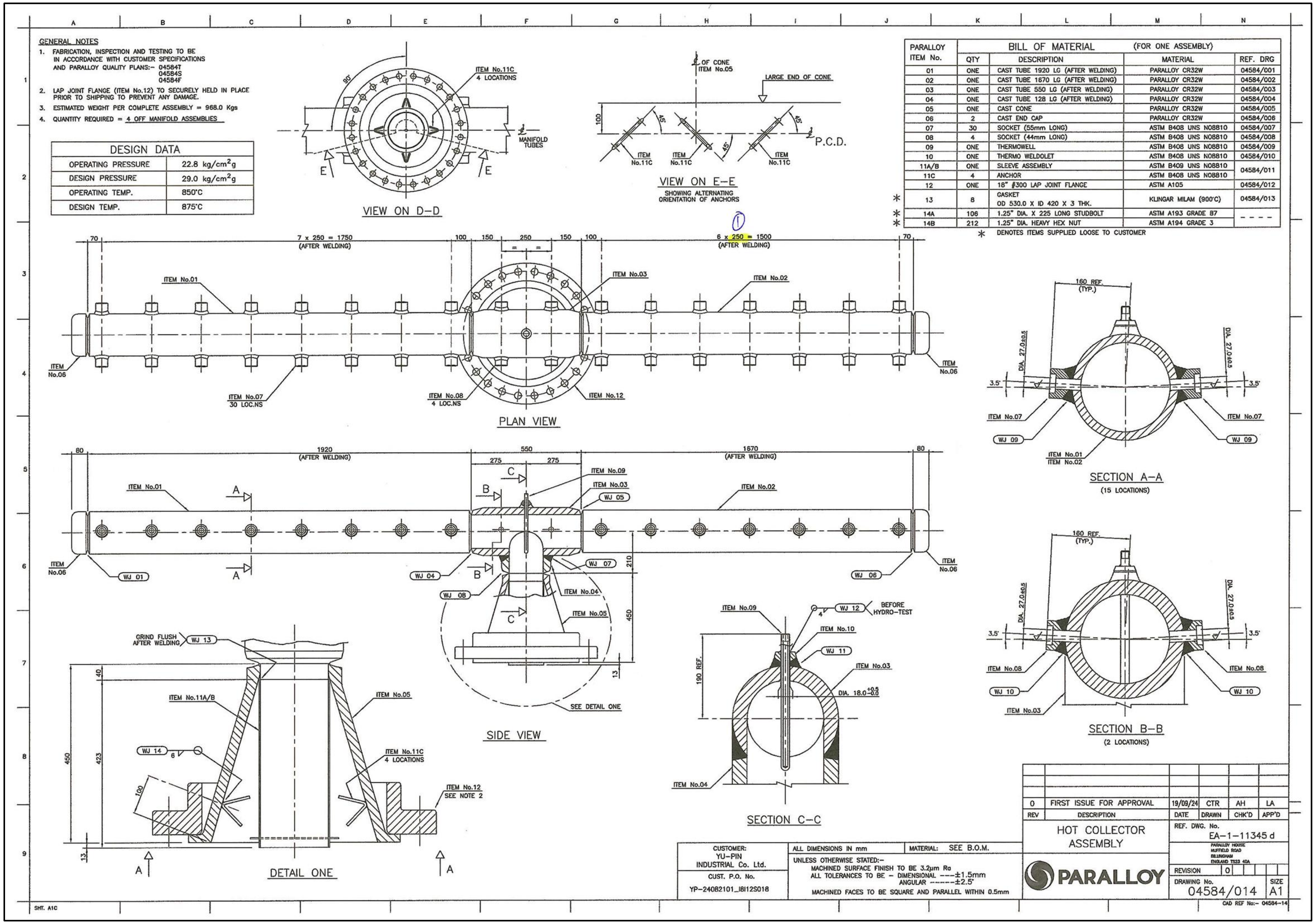
[INSPECTION RESULT]：☑QUALIFIED

☐NOT QUALIFIED，IMPROVEMENT REQUIRED AS FOLLOWS：

[REMARKS]：

INSPECTOR	CONTRACTOR	MANUFACTURER(PARALLOY)	SUPERVISOR
XUANZHE CHEN	CHOU YU HSIANG	A.Smit L. Ashbolt T.Harris	張文龍 114 4/21

孫恒渝
114.4.16


VIEW ON D–D
ITEM No.11C 4 LOCATIONS
MANIFOLD TUBES
90°
E
E
VIEW ON E–E
SHOWING ALTERNATING ORIENTATION OF ANCHORS
OF CONE ITEM No.05
LARGE END OF CONE
P.C.D.
100
45°
ITEM No.11C
7 x 250 = 1750 (AFTER WELDING)
6 x 250 = 1500 (AFTER WELDING)
①
70
100
150
250
PLAN VIEW
ITEM No.01
ITEM No.02
ITEM No.03
ITEM No.06
ITEM No.07 30 LOC.NS
ITEM No.08 4 LOC.NS
ITEM No.12
1920 (AFTER WELDING)
1670 (AFTER WELDING)
550
275
80
ITEM No.09
ITEM No.04
ITEM No.05
WJ 01
WJ 04
WJ 05
WJ 06
WJ 07
WJ 08
210
450
13
SIDE VIEW
SEE DETAIL ONE
SECTION A–A
(15 LOCATIONS)
SECTION B–B
(2 LOCATIONS)
160 REF. (TYP.)
DIA. 27.0±0.5
3.5°
WJ 09
WJ 10
SECTION C–C
190 REF.
ITEM No.10
WJ 11
WJ 12
BEFORE HYDRO-TEST
DIA. 18.0 +0.5 -0.0
DETAIL ONE
GRIND FLUSH AFTER WELDING
WJ 13
WJ 14
ITEM No.11A/B
ITEM No.11C 4 LOCATIONS
ITEM No.12 SEE NOTE 2
450
423
40
100
SHT. A1C

GENERAL NOTES

1. FABRICATION, INSPECTION AND TESTING TO BE IN ACCORDANCE WITH CUSTOMER SPECIFICATIONS AND PARALLOY QUALITY PLANS:- 04584T
   04584S
   04584F
2. LAP JOINT FLANGE (ITEM No.12) TO SECURELY HELD IN PLACE PRIOR TO SHIPPING TO PREVENT ANY DAMAGE.
3. ESTIMATED WEIGHT PER COMPLETE ASSEMBLY = 968.0 Kgs
4. QUANTITY REQUIRED = 4 OFF MANIFOLD ASSEMBLIES

DESIGN DATA	
OPERATING PRESSURE	22.8 kg/cm²g
DESIGN PRESSURE	29.0 kg/cm²g
OPERATING TEMP.	850°C
DESIGN TEMP.	875°C

	PARALLOY ITEM No.	BILL OF MATERIAL (FOR ONE ASSEMBLY)			
		QTY	DESCRIPTION	MATERIAL	REF. DRG
	01	ONE	CAST TUBE 1920 LG (AFTER WELDING)	PARALLOY CR32W	04584/001
	02	ONE	CAST TUBE 1670 LG (AFTER WELDING)	PARALLOY CR32W	04584/002
	03	ONE	CAST TUBE 550 LG (AFTER WELDING)	PARALLOY CR32W	04584/003
	04	ONE	CAST TUBE 128 LG (AFTER WELDING)	PARALLOY CR32W	04584/004
	05	ONE	CAST CONE	PARALLOY CR32W	04584/005
	06	2	CAST END CAP	PARALLOY CR32W	04584/006
	07	30	SOCKET (55mm LONG)	ASTM B408 UNS N08810	04584/007
	08	4	SOCKET (44mm LONG)	ASTM B408 UNS N08810	04584/008
	09	ONE	THERMOWELL	ASTM B408 UNS N08810	04584/009
	10	ONE	THERMO WELDOLET	ASTM B408 UNS N08810	04584/010
	11A/B	ONE	SLEEVE ASSEMBLY	ASTM B409 UNS N08810	04584/011
	11C	4	ANCHOR	ASTM B408 UNS N08810	
	12	ONE	18" #300 LAP JOINT FLANGE	ASTM A105	04584/012
*	13	8	GASKET OD 530.0 X ID 420 X 3 THK.	KLINGAR MILAM (900°C)	04584/013
*	14A	106	1.25" DIA. X 225 LONG STUDBOLT	ASTM A193 GRADE B7	– – – –
*	14B	212	1.25" DIA. HEAVY HEX NUT	ASTM A194 GRADE 3	

* DENOTES ITEMS SUPPLIED LOOSE TO CUSTOMER

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA

CUSTOMER:
YU-PIN
INDUSTRIAL Co. Ltd.
CUST. P.O. No.
YP-24082101_I8I12S018

ALL DIMENSIONS IN mm
MATERIAL: SEE B.O.M.
UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL ---±1.5mm
ANGULAR ------±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

HOT COLLECTOR
ASSEMBLY

PARALLOY

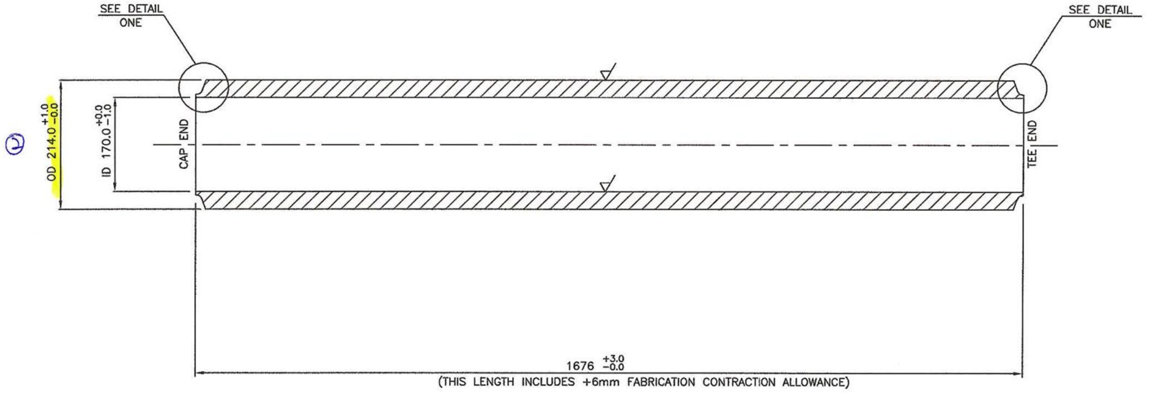
REF. DWG. No.
EA–1–11345 d

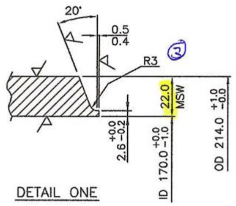
PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

REVISION 0
DRAWING No.
04584/014
SIZE
A1
CAD REF No:– 04584–14

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:–04584/014
2. INSPECTION, TESTING AND MARKING TO BE IN ACCORDANCE WITH CUSTOMER SPECIFICATIONS AND PARALLOY QUALITY PLANS:– 04584T
3. ESTIMATED WEIGHT PER ITEM = 183.0 Kg
4. QUANTITY REQUIRED = 4 OFF


SEE DETAIL ONE
SEE DETAIL ONE
②
OD 214.0 +1.0 −0.0
ID 170.0 +0.0 −1.0
CAP END
TEE END
1676 +3.0 −0.0
(THIS LENGTH INCLUDES +6mm FABRICATION CONTRACTION ALLOWANCE)


20°
0.5
0.4
R3
③
22.0
MSW
2.6 +0.0 −0.2
ID 170.0 +0.0 −1.0
OD 214.0 +1.0 −0.0

DETAIL ONE

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP–24082101_I8I12S018

ALL DIMENSIONS IN mm

MATERIAL: PARALLOY CR32W

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL –––±1.5mm
ANGULAR –––––±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

CAST TUBE
ITEM No.02

PARALLOY

REF. DWG. No.
EA–1–11345 d

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

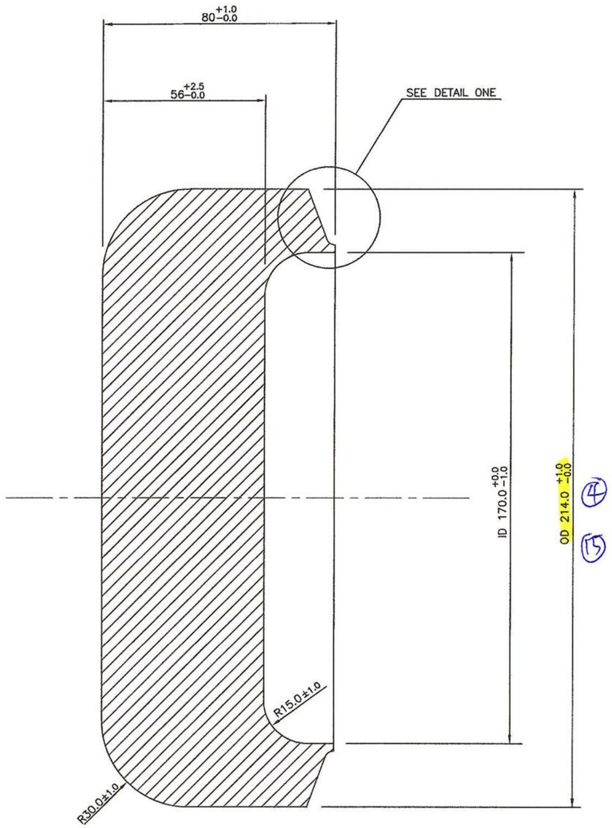
REVISION 0

DRAWING No. 04584/002

SIZE A2

CAD REF No:– 04584–2

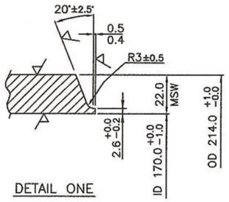
SHT. A2B


$80^{+1.0}_{-0.0}$
$56^{+2.5}_{-0.0}$
SEE DETAIL ONE
ID $170.0^{+0.0}_{-1.0}$
OD $214.0^{+1.0}_{-0.0}$
R15.0±1.0
R30.0±1.0

④ short one
⑮ long one

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:–04584/014
2. INSPECTION, TESTING AND MARKING, TO BE IN ACCORDANCE WITH CUSTOMER SPECIFICATIONS AND PARALLOY QUALITY PLANS:– 04584S
3. THIS ITEM TO BE FULLY MACHINED.
4. QUANTITY REQUIRED = 8 OFF


20°±2.5°
$\frac{0.5}{0.4}$
R3±0.5
22.0
MSW
$2.6^{+0.0}_{-0.2}$
ID $170.0^{+0.0}_{-1.0}$
OD $214.0^{+1.0}_{-0.0}$

DETAIL ONE

PATTERN NUMBER :– M2018

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP–24082101_I8I12S018

ALL DIMENSIONS IN mm

MATERIAL: PARALLOY CR32W

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL UNTOLERANCED DIMENSIONS TO BE IN ACCORDANCE WITH :– BS EN ISO 8062–3:2007 DCT12 AND TABLE 2
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

CAST END CAP
ITEM No.06

PARALLOY

REF. DWG. No.
EA–1–11345d

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

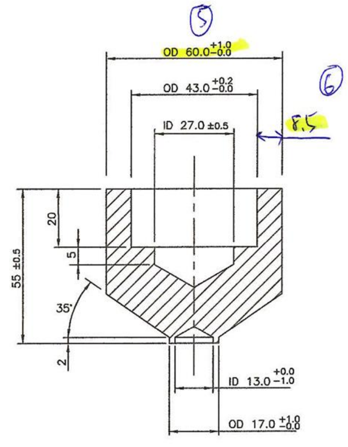
REVISION 0

DRAWING No. 04584/006

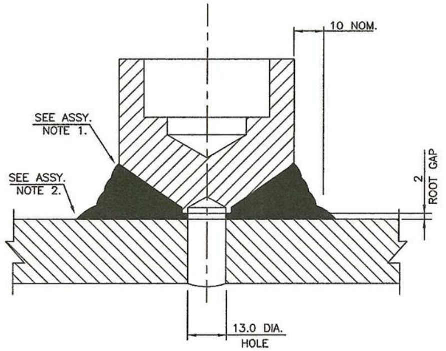
SIZE A2

CAD REF No:– 04584–6

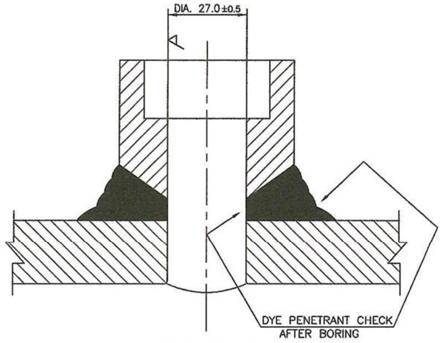
SHT. A2B


⑤
OD 60.0 +1.0 −0.0
⑥
OD 43.0 +0.2 −0.0
ID 27.0 ±0.5
8.5
20
5
55 ±0.5
35°
2
ID 13.0 +0.0 −1.0
OD 17.0 +1.0 −0.0

DETAIL ONE
AS SUPPLIED


10 NOM.
SEE ASSY. NOTE 1.
SEE ASSY. NOTE 2.
2
ROOT GAP
13.0 DIA. HOLE

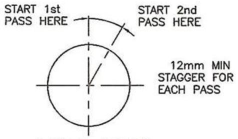
DETAIL TWO
AFTER WELDING


DIA. 27.0±0.5
A
DYE PENETRANT CHECK
AFTER BORING

DETAIL THREE
BORED AFTER HYDRO-TEST

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:-04584/014
2. EACH ITEM TO BE VIBRO-ETCHED WITH THE FOLLOWING:-
    - a) PARALLOY ITEM NUMBER "04584/B07"
    - b) MATERIAL HEAT NUMBER
    - c) UNIQUE SERIAL NUMBER 1 TO 120
3. THIS ITEM TO BE FULLY MACHINED.
4. WELD SIZE TO BE IN ACCORDANCE WITH ASME B31.3 SECTION 328.5.2.
5. APPROX WEIGHT PER ITEM = 0.5 Kgs
6. QUANTITY REQUIRED = 120 OFF


START 1st PASS HERE
START 2nd PASS HERE
12mm MIN STAGGER FOR EACH PASS

DETAIL FOUR
WELD PASS DIAGRAM

ASSEMBLY NOTES

1. THE WELD MUST CONSIST OF CONTINUOUS LAYERS. EACH PASS WILL BE STAGGERED AT THE START AND STOP POINTS A MINIMUM OF 12mm. COMPLETION OF WELDING ON ONE SIDE OF COUPLING PRIOR TO WELDING THE OTHER SIDE WILL NOT BE PERMITTED (SEE DETAIL FOUR).
2. WELD TO BE LAYERED SMOOTHLY INTO BASE METAL NUMBER OF RUNS MAY VARY. NO UNDERCUTTING PERMITTED.

CUSTOMER:
YU-PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP-24082101_I8I12S018

ALL DIMENSIONS IN mm

MATERIAL: ASTM B408 UNS N08810

UNLESS OTHERWISE STATED:-
MACHINED SURFACE FINISH TO BE 3.2µm Ra
ALL TOLERANCES TO BE - DIMENSIONAL ---±0.5mm
ANGULAR -----±1.0°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA

SOCKET
ITEM No.07

PARALLOY

REF. DWG. No.
EA-1-11345 d

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

REVISION 0

DRAWING No. 04584/007

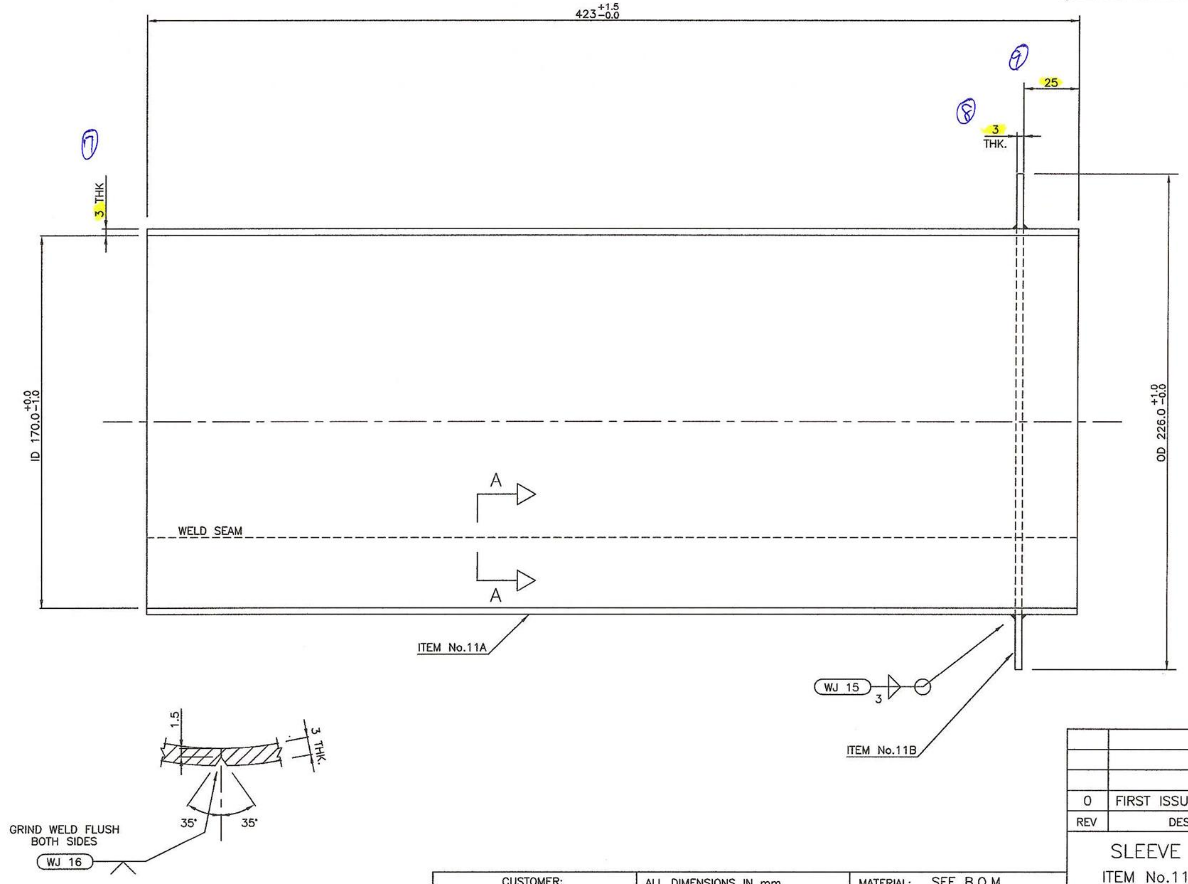
SIZE A2

CAD REF No:- 04584-7

SHT. A2B

PARALLOY ITEM No.	QTY	DESCRIPTION	MATERIAL
		BILL OF MATERIAL (FOR ONE ASSEMBLY)	
11A	ONE	ID 170.0 X 3 THK. X 423 LG ROLLED SLEEVE	ASTM B409 UNS N08810
11B	ONE	OD 226.0 X ID 176 X 3 THK. OUTER RING	ASTM B409 UNS N08810
* 11C	4	OD 6.0 SOLID BAR ANCHOR 141 LG (DEVELOPED)	ASTM B408 UNS N08810

* DENOTES ITEM SUPPLIED LOOSE TO PARALLOY

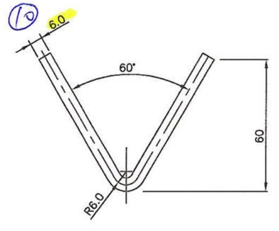


$423^{+1.5}_{-0.0}$
⑦
3 THK
⑧
3
THK.
⑨
25
ID $170.0^{+0.0}_{-1.0}$
OD $226.0^{+1.0}_{-0.0}$
WELD SEAM
A
A
ITEM No.11A
WJ 15
3
ITEM No.11B
1.5
3 THK.
35°
35°
GRIND WELD FLUSH
BOTH SIDES
WJ 16

VIEW ON A–A

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:– 04584/014
2. ALL WELDS TO BE 100% DYE PENETRANT CHECKED.
3. EACH ITEM TO BE CLEARLY MARKED BY VIBRO–ETCHING WITH THE FOLLOWING:–
   - a) PARALLOY ITEM NUMBER "04584/B11"
   - b) MATERIAL HEAT NUMBER
   - c) UNIQUE SERIAL NUMBER "1 TO 4" (ITEM No.11B)
     UNIQUE SERIAL NUMBER "1 TO 16" (ITEM No.11C)
4. ESTIMATED WEIGHT PER ASSEMBLY = 6.0 Kgs
5. QUANTITY REQUIRED = 4 OFF ASSEMBLIES



⑩
6.0
60°
60
R6.0

ITEM No.11C

0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA
REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP–24082101_I8I12S018

ALL DIMENSIONS IN mm

MATERIAL: SEE B.O.M.

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2µm Ra
ALL TOLERANCES TO BE – DIMENSIONAL ---±1.5mm
ANGULAR -----±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

SLEEVE ASSEMBLY
ITEM No.11A/11B & 11C

REF. DWG. No.
EA–1–11345 d

PARALLOY

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

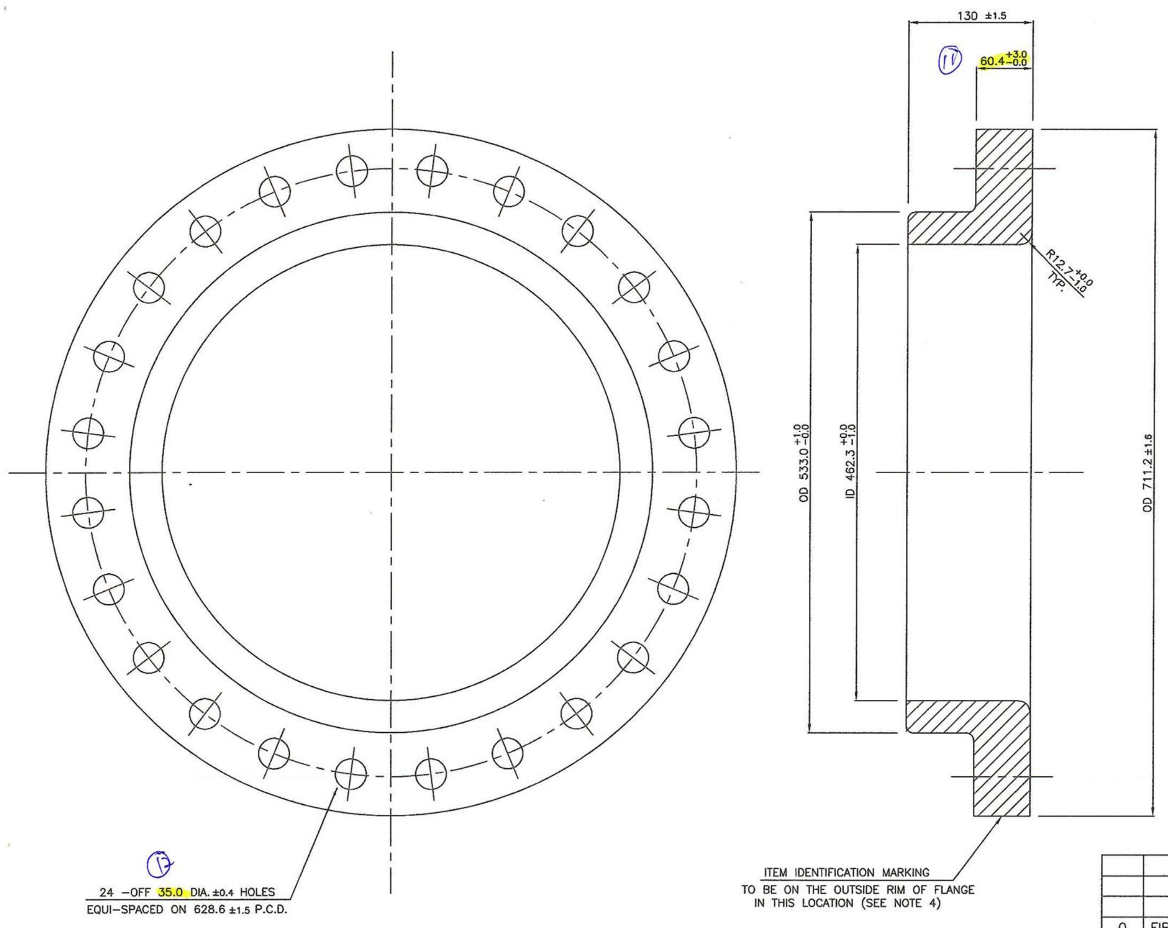
REVISION 0

DRAWING No. 04584/011

SIZE A2

SHT. A2B

CAD REF No:– 04584–11


130 ±1.5
⑪
60.4 +3.0 −0.0
R12.7 +0.0 −1.0 TYP.
OD 533.0 +1.0 −0.0
ID 462.3 +0.0 −1.0
OD 711.2 ±1.6
⑫
24 −OFF 35.0 DIA. ±0.4 HOLES
EQUI−SPACED ON 628.6 ±1.5 P.C.D.
ITEM IDENTIFICATION MARKING
TO BE ON THE OUTSIDE RIM OF FLANGE
IN THIS LOCATION (SEE NOTE 4)

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:– 04584/014
2. THIS ITEM TO BE FULLY MACHINED.
3. DIMENSIONS AND TOLERANCES NOT NOTED ARE TO SUIT 18" #300 LAP JOINT FLANGE TO ASME B16.5
4. EACH ITEM TO BE CLEARLY MARKED BY VIBRO–ETCHING WITH THE FOLLOWING:–
    a) PARALLOY ITEM NUMBER "04584/B12"
    b) MATERIAL HEAT NUMBER
    c) UNIQUE SERIAL–NUMBER "1 to 4"
5. ESTIMATED WEIGHT PER ITEM = 138.0 Kgs
6. QUANTITY REQUIRED = 4 OFF

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP–24082101_I8I12S018

ALL DIMENSIONS IN mm

MATERIAL: ASTM A105

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL ---±1.5mm
ANGULAR -----±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

18" #300 LAP JOINT
FLANGE ITEM No.12

PARALLOY

REF. DWG. No.
EA–1–11345 d

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

REVISION 0

DRAWING No. 04584/012

SIZE A2

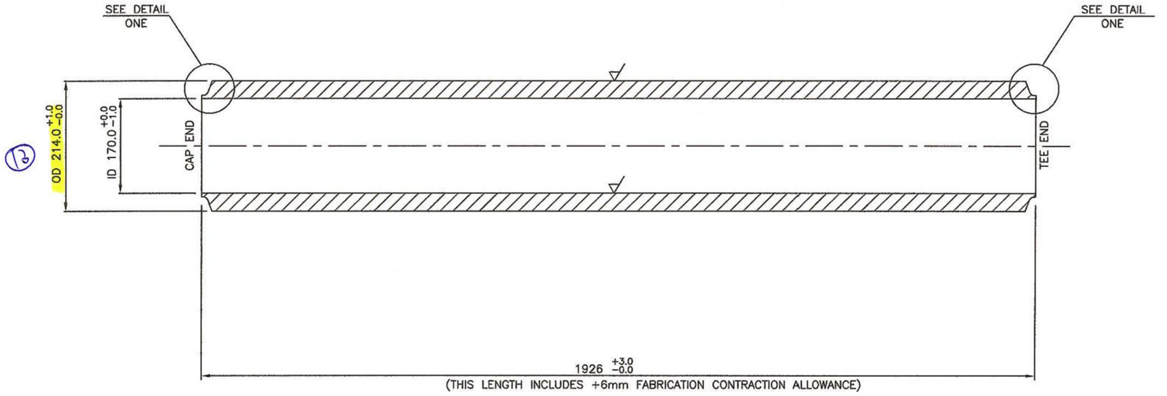
SHT. A2B

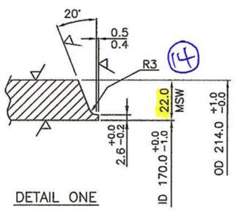
CAD REF No:– 04584–12

A
B
C
D
E
F
G
H
I
J
K
L
M
7
6
5
4
3
2
1

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH PARALLOY DRAWING:–04584/014
2. INSPECTION, TESTING AND MARKING TO BE IN ACCORDANCE WITH CUSTOMER SPECIFICATIONS AND PARALLOY QUALITY PLANS:– 04584T
3. ESTIMATED WEIGHT PER ITEM = 211.0 Kg
4. QUANTITY REQUIRED = 4 OFF


SEE DETAIL ONE
SEE DETAIL ONE
⑫
OD 214.0 +1.0 −0.0
ID 170.0 +0.0 −1.0
CAP END
TEE END
1926 +3.0 −0.0
(THIS LENGTH INCLUDES +6mm FABRICATION CONTRACTION ALLOWANCE)


20°
0.5
0.4
R3
⑭
22.0
MSW
2.6 +0.0 −0.2
ID 170.0 +0.0 −1.0
OD 214.0 +1.0 −0.0

DETAIL ONE

CUSTOMER:
YU–PIN
INDUSTRIAL Co. Ltd.

CUST. P.O. No.
YP–24082101_I8I12S018

ALL DIMENSIONS IN mm

MATERIAL: PARALLOY CR32W

UNLESS OTHERWISE STATED:–
MACHINED SURFACE FINISH TO BE 3.2μm Ra
ALL TOLERANCES TO BE – DIMENSIONAL –––±1.5mm
ANGULAR –––––±2.5°
MACHINED FACES TO BE SQUARE AND PARALLEL WITHIN 0.5mm

REV	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
0	FIRST ISSUE FOR APPROVAL	19/09/24	CTR	AH	LA

CAST TUBE
ITEM No.01

REF. DWG. No.
EA–1–11345 d

PARALLOY

PARALLOY HOUSE
NUFFIELD ROAD
BILLINGHAM
ENGLAND TS23 4DA

REVISION 0

DRAWING No. 04584/001

SIZE A2

SHT. A2B

CAD REF No:– 04584–1