

DEPARTMENT OF TRANSPORTATION
 DIVISION OF ENGINEERING SERVICES
 Office of Structural Materials
 Quality Assurance and Source Inspection



Bay Area Branch
 690 Walnut Ave. St. 150
 Vallejo, CA 94592-1133
 (707) 649-5453
 (707) 649-5493

Contract #: 04-0120F4
 Cty: SF/ALA Rte: 80 PM: 13.2/13.9
 File #: 69.25B

QUALITY ASSURANCE -- NON-CONFORMANCE REPORT

Location: Changxing Island, Shanghai, P.R. China

Report No: NCR-000431

Prime Contractor: American Bridge/Fluor Enterprises, a JV

Date: 08-Sep-2009

Submitting Contractor: Zhenhua Port Machinery Company, Ltd (ZPMC), Changxing Island

NCR #: ZPMC-0405

Type of problem:

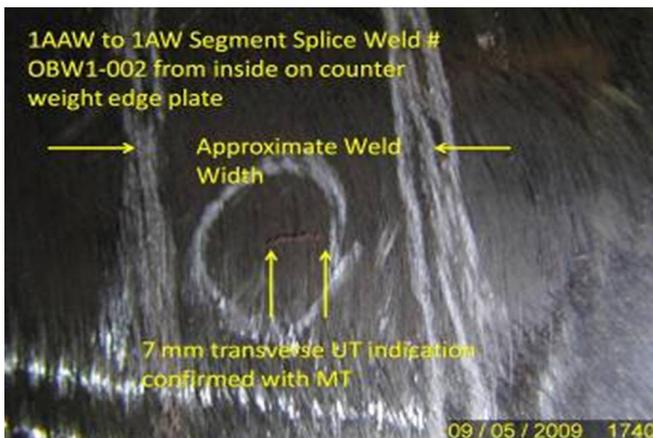
Welding	Concrete	Other	
Welding	Curing	Procedural	Bridge No: 34-0006
Joint fit-up	Coating	Other	Component: OBG 1AAW/1AW Transverse Splice
Procedural	Procedural	Description: Missed UT Transverse Indication	

Reference Description: Missed UT transverse indications by QC on 1AAW/1AW Segment Transverse Splice

Description of Non-Conformance:

Caltrans Quality Assurance Inspector (QA) discovered rejectable linear transverse indications during ultrasonic testing verification of OBG segment splice weld (1AAW/1AW) designated as OBW1-002 (Edge Panel CW side) utilizing scanning pattern "D". The indications exhibited planar characteristics with significant flaw height dimension as the search unit was moved toward and away from the indications and were not detectable during scanning patterns parallel to the weld axis. In addition, the search unit was rotated 360° around the indications in order to ascertain if they were spherical, cylindrical or linear in nature. No significant ultrasonic response was noted as the search unit was rotated around the indications with the exception of both transverse directions with the search unit located directly on top of the weld (scanning pattern "D"). In evidence of this information the indications were determined to be indicative of transverse indications. Due to the depth of one (1) indication being 21 mm which is near the inside surface, magnetic particle (MT) testing was performed and the transverse linear indication at Y=820mm was confirmed, see digital photos below.

NOTE: The Y locations were taken from the Deck Plate down on the Counter Weight side. (Y=820, 1170 and 1790mm)



QUALITY ASSURANCE -- NON-CONFORMANCE REPORT

(Continued Page 2 of 2)

Applicable reference:

1. AWS D1.5-02 Section 6.26.3.2 “Ultrasonically tested welds are evaluated on the basis of a discontinuity reflecting ultrasound in proportion to its effect on the integrity of the weld.

(1) Indications of discontinuities that remain on the screen as the search unit is moved towards and away from the discontinuity (scanning movement “B”) may be indicative of planar discontinuities with significant flaw height dimension.

(2) As the orientation of such discontinuities, relative to the sound beam, deviates from the perpendicular, dB ratings which do not allow direct reliable evaluation of the welded joint integrity may result.

(3) When indications that exhibit these planar characteristics are present at scanning sensitivity, a more detailed evaluation of the discontinuity by other means may be required (e.g., alternate UT techniques, RT, grinding, or gouging for visual inspection, etc.)”

2. AWS D1.5-02 Section 6.26.1.1 “The weld shall have no cracks.”

Who discovered the problem: Michael Foerder

Name of individual from Contractor notified: 1050 hours, Verbal

Time and method of notification: Larry Luo

Name of Caltrans Engineer notified: Bill Howe

Time and method of notification: 1220 hours, Verbal

QC Inspector's Name: Wang Lu

Was QC Inspector aware of the problem: Yes No

Contractor's proposal to correct the problem:

N/A

Comments:

This report is for the purpose of determining conformance with the contract documents and is not for the purpose of making repair or fit for purpose recommendations. Should you require recommendations concerning repairs or remedial efforts please contact Mazen Wahbeh, +(86) 134.7247.7571, who represents the Office of Structural Materials for your project.

Inspected By:	Tsang, Eric	SMR
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Reviewed By:	Wahbeh, Mazen	SMR
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DEPARTMENT OF TRANSPORTATION - District 4 Toll Bridge
666 Feng Bin Road Room 708, Changxing Island
Shanghai 201913 PR China
Tel: 021-56856666 ext 207061 Fax:

NON-CONFORMANCE REPORT TRANSMITTAL

To: AMERICAN BRIDGE/FLUOR, A JV
375 BURMA ROAD
OAKLAND CA 95607

Date: 28-Sep-2009

Contract No: 04-0120F4
04-SF-80-13.2 / 13.9

Dear: Mr. Charles Kanapicki

Job Name: SAS Superstructure

Attention: Mr. Thomas Nilsson Project/Fabrication Manager

Document No: 05.03.06-000394

Subject: NCR No. ZPMC-0405

Reference Description: Missed UT transverse indications by QC on 1AAW/1AW Segment Transverse Splice

The attached Non-Conformance Report describes an occurrence where the contractor did not comply with a requirement of the contract document as indicated below:

- Material or Workmanship not in conformance with contract documents.
- Quality Control (QC) not performed in conformance with contract documents.
- Recurring QC issue that constitutes a systematic problem in quality control.
- Non-Conformance Resolved.

Material Location: OBG **Lift:** 01

Remarks:

Caltrans Quality Assurance Inspector (QA) discovered rejectable linear transverse indications during ultrasonic testing verification of OBG segment splice weld (1AAW/1AW) designated as OBW1-002 (Edge Panel CW side) utilizing scanning pattern "D". The indications exhibited planar characteristics with significant flaw height dimension as the search unit was moved toward and away from the indications and were not detectable during scanning patterns parallel to the weld axis. In addition, the search unit was rotated 360° around the indications in order to ascertain if they were spherical, cylindrical or linear in nature. No significant ultrasonic response was noted as the search unit was rotated around the indications with the exception of both transverse directions with the search unit located directly on top of the weld (scanning pattern "D"). In evidence of this information the indications were determined to be indicative of transverse indications. Due to the depth of one (1) indication being 21 mm which is near the inside surface, magnetic particle (MT) testing was performed and the transverse linear indication at Y=820mm was confirmed, see digital photos below.

NOTE: The Y locations were taken from the Deck Plate down on the Counter Weight side. (Y=820, 1170 and 1790mm)

Please see the attached NCR No. ZPMC-405 for details.

Action Required and/or Action Taken:

Propose a resolution for the identified recurring non-conformance which constitutes a systematic problem on both materials/workmanship and quality control issues with revised procedures to remedy the defected work and to prevent future occurrences. A response for the resolution of this issue is expected within 14 days.

Transmitted by: Ching Chao

Attachments: ZPMC-0405

cc: Rick Morrow, Gary Pursell, Peter Siegenthaler, Stanley Ku, Brian Boal, Doug Coe, Jason Tom, Contract Files, Ching Chao, Bill Howe

File: 05.03.06

NCR PROPOSED RESOLUTION

To: CALTRANS - SAS Superstructure
333 Burma Road
Oakland CA 94607

Attention: Pursell, Gary
Resident Engineer

Ref: 05.03.06-000394

Subject: NCR No. ZPMC-0405

Dated: 16-Oct-2009

Contract No.: 04-0120F4
04-SF-80-13.2 / 13.9

Job Name: SAS Superstructure

Document No.: ABF-NPR-000393 Rev: 00

Contractor's Proposed Resolution:

Reference Resolution: ABFJV QCM has implemented training with ZPMC to improve the quality of inspections. ABFJV will provide documentation showing attendance by ZPMC QC inspectors and the subject of training.

ABFJV QCM has implemented training with ZPMC to improve the quality of inspections. ABFJV will provide documentation showing attendance by ZPMC QC inspectors and the subject of training. Topics to be covered during the instruction are: inspection of equipment prior to use, proper conditions for inspection, proper technique for MT, and UT. In addition, ABFJV has committed to perform overchecks in both the Tower and OBG. This will serve two purposes, first to monitor if the training is effective at reducing the number of missed indications and second to ensure missed indications are prevented.

Documentation of repairs and subsequent NDT specific to this report will be transmitted through Daily Welding Reports and will be available in the documentation data base. Based on this course of action, ZPMC is requesting that this proposed resolution be approved with action pending. Once training records are available to be transmitted, ZPMC will request closure of this NCR.

Submitted by:

Attachment(s): ABF-NPR-000393R00

Caltrans' comments:

Status: REJ

Date: 19-Oct-2009

The proposed resolution for training the QC inspectors is acceptable. However, documentation of repairs and subsequent NDT specific to this NCR should be submitted, along with the training records, for the Department's review prior to closure of the NCR.

Submitted by: Chao, Ching

Date: 19-Oct-2009

Attachment(s):

NCR PROPOSED RESOLUTION

To: CALTRANS - SAS Superstructure
333 Burma Road
Oakland CA 94607

Attention: Pursell, Gary
Resident Engineer

Ref: 05.03.06-000394

Subject: NCR No. ZPMC-0405

Dated: 02-Dec-2009

Contract No.: 04-0120F4
04-SF-80-13.2 / 13.9

Job Name: SAS Superstructure

Document No.: ABF-NPR-000393 Rev: 01

Contractor's Proposed Resolution:

Reference Resolution: ZPMC has repaired the indications documented in the NCR. ABFJV and Caltrans has conducted the NDT and found that the welds are acceptable which is included in the attached documents.

ZPMC has repaired the indications documented in the NCR. ABFJV and Caltrans has conducted the NDT and found that the welds are acceptable which is included in the attached documents. Based on this ZPMC is requesting closure of this NCR.

Submitted by: Ishibashi, Joshua

Attachment(s): ABF-NPR-000393R01;

Caltrans' comments:

Status: CLO

Date: 09-Dec-2009

The documentation submitted has been reviewed by the Engineer and is considered acceptable.

Submitted by: Chao, Ching

Attachment(s):

Date: 09-Dec-2009

DEPARTMENT OF TRANSPORTATION

CHINA FABRICATION TEAM

666 Feng Bin Road

Changxing Island, Shanghai, PRC



REVIEW OF CONTRACTOR'S SUBMITTAL

To: Thomas Nilsson, American Bridge/Fluor, a Joint Venture
Gary Pursell, Resident Engineer

Review Date: Oct-27-2009From: Eric Tsang, Structural Materials RepresentativeContract No.: 04-0120F4Date/Time Submittal Received: Oct-27-2009/ 9:20
 China Standard Time
 (GMT+08:00)
Contractor's Transmittal #: AFC-CAL-TRN-004415Rev. # 0

<input type="checkbox"/>	substantially complies with contract requirements and is approved		
<input checked="" type="checkbox"/>	substantially complies with contract requirements and is approved as noted.		
<input type="checkbox"/>	Lacks sufficient information and/or contains unacceptable items that must be corrected or prior to resubmittal		
Verbal Notification		<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes	Date: <u>10-26-09</u> Time: <u>20:00</u>
Name of individual from Contractor Notified: <u>Gang Jiao</u>			
This submittal is a:	<input type="checkbox"/> Welding Report	<input checked="" type="checkbox"/> Critical Weld Repair	
	<input type="checkbox"/> Request for Information	<input type="checkbox"/> Heat Straightening Request	
	<input type="checkbox"/> Fabrication Procedures	<input type="checkbox"/> Other: _____	
Submitting Contractor: <u>American Bridge – Fluor, a Joint Venture</u>			
ITEMS REVIEWED		COMPLIES	COMMENTS
1.	B-CWR876 R0	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Multiple Repairs to Transverse Segment Splice, IAAW – 1AW

Remarks:

Please provide notification to CT prior to laying out repair areas or performing repairs to ensure that the repairs are being performed at the appropriate locations.

In the Description section, remove the statement indicating that “*but some*” of the indications were determined to be cracks and other defects by further investigation.

Item K of Option 1 shall specify the maximum cooling rate to be no more than 50°C per hour.

Item a.vii of Option 2 shall specify the maximum cooling rate to be no more than 50°C per hour.

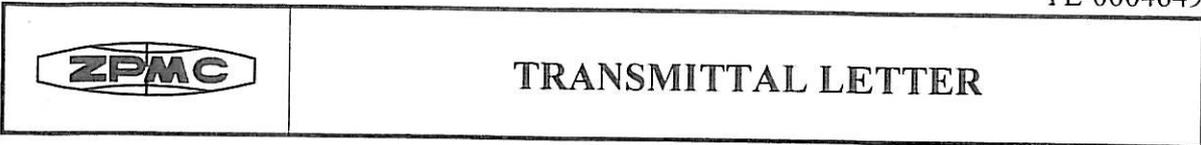
Item b.vii of Option 2 shall specify the maximum cooling rate to be no more than 50°C per hour.

Item e under the Welding section shall specify that ALL starts and stops shall be ground smooth and have the section specifying removing only the starts and stops “*which has bad formation*” shall be removed.

Item c under PWHT section shall specify the maximum cooling rate to be no more than 50°C per hour.

Please update Table 1 to incorporate a preheat/postheat for plates over 50mm of 225°C.

Reviewer: Jim SimonisDate: Oct-27-2009
 Construction Concurrence: SJE Initial 10/28/09 Date
Received by (ABFJV): RosanaDate: 10/28/09 Time: 9:30



PROJECT: SAN FRANCISCO OAKLAND BAY BRIDGE

DATE: 10/26/09

TO: ROSEMARY/ ABFJV QA DEPARTMENT

FROM: ZPMC QA DEPARTMENT

SUBJECT: OBG CWR

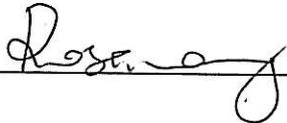
SUBMITTED FOR YOUR APPROVAL AND SUBMITTAL TO CALTRANS.

ENCLOSED WITH THIS TRANSMITTAL IS ONE COPY OF

(1) B-CWR876, REV.0

PLEASE SIGN THIS TRANSMITTAL AND RETURN TO ME

ACKNOWLEDGEMENT:



 PLAN HOLDER

9:00
 RECEIVED 27 OCT 2009

 DATE

 COMPANY

 PHONE NO.

PLAN NUMBER: N/A
 #R787-QCP-102



关键焊缝返修报告

Critical Welding Repair Report (CWR)

版本
Rev. No.:

0

Description:
描述:

Per the AWS D1.5 paragraph 6.26.3.2 (1), (2) & (3), ABF and Caltrans performed the Re-Ultrasonic inspection and revealed planar linear indications by scanning pattern D. The red point means the rejected discontinuity base on the AWS D 1.5 table 6.4, the blue point means that the acceptable with the criteria of the AWS, ~~but some~~ e indications in the 2E were further evaluated by excavation and were determined by ZPMC, ABFJV and CT to be th e defects of porosity /slag and also include transverse cracks etc. The detail of the location and finding please find from the attached report and draft.

ABF和加州依据AWS D1.5第6.26.3.3(1), (2), (3)条规定的要求重新对焊缝进行UT的D向扫查时,发现有部分不连续的存在,其中包括超标点和不超标点。这些不连续通过进一步碳刨等挖开方式验证,存在各种内部缺陷,包括裂纹。具体的缺陷位置和描述详见附件报告和下述草图。

This procedure applies to the repair of all defects and other planar defects that are found by UT.
此返修程序适用于所有UT发现的超标点和不超标点的返修。

WJ No. 焊缝编号: OBW1A-004/OBW1A-005//OBW1A-003/OBW1-001/OBW1-002/OBW1-003

Location位置: 1G/2G/3G/4G

Welding process焊接方法: SMAW/SAW

检验员 (Inspector): Li Liming 日期 (Date): 2009.10.26

10-27-09

10.26

焊缝返修位置示意图:
Draft of Welding Discontinuity:

(“E” LINE SIMILAR, ALL “Y” DIRECTION) CLOCKWISE.)
(“W” LINE SECTION TYPE 1A SHOWN)
SECTION AT FLOORBEAM (LOOKING EAST)

从小节段往大节段方向看

APPROVED

APPROVED AS NOTED

RETURNED FOR CORRECTION

Pursuant to Section 5-1.02
of the Standard Specifications
State of California

DEPARTMENT OF TRANSPORTATION
Division of Engineering Services
Office of Structure Construction

SJE for RM 10/28/09

Structure Representative Date

Cause:

原因:

1. Most of these welds are designated as Non-SPCM, so ZPMC did not control these welding according to the SPCM requirements. The importance of this weld has not been aware during the welding.
大部分焊缝图纸要求为非SPCM, 因此焊接过程中没有按照SPCM 的控制要求来进行, 焊缝的重要性没能得到足够的体现
2. Some welder did not pay attention and weld complied with all requirements from the approved WPS..
个别焊工操作质量差, 未能符合批准WPS上所有的要求。
3. It is not fully controlled during the welding, especially there is not enough interpass cleaning.
焊缝烧焊过程中局部监控不到位。层间清理不彻底。

车间负责人 (Foreman):

Guojun

日期 (Date):

10-26

<input type="checkbox"/>	APPROVED
<input checked="" type="checkbox"/>	APPROVED AS NOTED
<input type="checkbox"/>	RETURNED FOR CORRECTION
Pursuant to Section 5-1.02 of the Standard Specifications State of California	
DEPARTMENT OF TRANSPORTATION Division of Engineering Services Office of Structure Construction	
<i>SJE for RM</i>	<i>10/28/09</i>
Structure Representative	Date

Disposition:

PROVIDE NOTIFICATION TO CT PRIOR TO LAYING OUT REPAIR AREAS OR PERFORMING REPAIRS

处理方法:

1. Successful repairs are achievable only when careful application of *all* of the following process steps are carried out in sequence without variation.

只有当采用了如下所有的方法并按照顺序正确执行后，才可以成功得进行返修。

- a. Careful excavation of all defects and preparation of the repair site are paramount to a successful repair, and the grinding should be continuous unless a long portion of weld is removed
对超标和不超标的缺陷进行仔细得挖掘和焊接前对返修区域很好的处理是对成功得返修极为关键的。
- b. Provide positive controls and MT tests to ensure the complete removal of the defects.
提供正确得控制和MT检测，以确保缺陷完全被清除干净。
- c. Clean the repair site to remove foreign matter and debris before the start of any work.
在进行任何工作前，对返修区域清理干净。
- d. Apply preheat of at least 160°C to the repair and insure that the preheat covers a sufficient area of the repair.
对返修区域进行预热，并确保在足够的区域内达到足够的预热温度。
- e. Weld the repair in accordance to an approved welding procedure.
根据批准的WPS进行返修。
- f. Apply postheat blankets and heaters to maintain the proper postweld heat (at least one hour at 160 °C) for the required time.
对返修后进行足够时间的后热处理，并使用电加热板进行。至少保证160°C一小时。
- g. Allow parts to cool to ambient temperature and wait the required time (48 hours minimum) before performing nondestructive evaluation of the repair site.
等构件冷却到室温并等待48小时后才能对返修区域进行NDT检测。

2. Excavation of the defect.

缺陷的挖掘清除

- b. Any contaminants present in the area to be repaired, such as rust, paint, UT gel etc, shall be removed before any gouging or grinding to remove the weld defect is done.
任何返修区域内的杂物，比如锈迹，油漆，UT的浆糊等，都应在对焊缝缺陷进行碳刨和打磨前清理干净。
- c. Using air-arc gouging or grinding to remove the weld defect including the material above and to either side of the defect to the prescribed limits. Removal shall be witnessed by the CWI and MT verify that the defect was located and totally removed.
使用碳刨或者打磨的方法对焊缝的缺陷清除，包括缺陷上面和左右的材料。
碳刨过程需有CWI见证，确保缺陷的位置和缺陷完全被清除。之后MT确认。
- d. Preheat to 65° C before performing any gouging to remove weld metal defects.
在开始对焊缝缺陷进行碳刨，对焊缝预热到 65° C.

- e. Excavation shall be as long as necessary to remove any defects that are extend 50mm by each side.
碳刨应去除缺陷并左右延伸各50mm的区域。
- f. All excavations shall be ground to bright metal and 100% MT verify that no indication prior to doing any welding.
在进行焊接前对碳刨区域打磨出金属光泽。100%MT确认无缺陷。
- g. Excavation of material shall be limited to no more than 4 mm per pass and the depth of excavation shall not exceed 2/3T ± 2mm.
每层碳刨深度不能大于4mm。碳刨的总深度不能大于2/3的板厚±2mm。
- h. When a crack is still present and excavations have reached the 2/3T +2mm maximum, and repair work shall proceed in accordance with one of the following procedures:
如果，当碳刨深度已经达到了2/3的板厚±2mm，但MT显示缺陷仍存在，则返修工作需要按照下述的两条要求进行：
 1. repair both sides of excavation
两面进行碳刨和返修
 - a. preheat repair area to 65°C prior to performing any gouging. 碳刨前预热至65度。

APPROVED
 APPROVED AS NOTED
 RETURNED FOR CORRECTION
 Pursuant to Section 5-1.02
 of the Standard Specifications
 State of California
 DEPARTMENT OF TRANSPORTATION
 Division of Engineering Services
 Office of Structure Construction
 State Representative
 SAE for RM
 10/28/05
 Date

Disposition:

处理方法:

- b. specify limit that the excavation to no more than 4mm per pass
每一道碳刨量深度不能大于4mm.
- c. prepare excavation such that all metal is ground clean to a smooth, shiny metal finish and starts and stops are tapered to a 1:1 slope.
碳刨后将坡口打磨平滑, 且挖出的凹槽部分两个端头要有 1:1 的斜式过渡。
- d. preheat to 160°C in accordance with table 1 and maintain this temperature throughout the entire repair procedure, including backgouging and welding of opposite side.
按照表一的要求预热到 160 度, 并且该温度要求持续整个焊接过程, 包括反面清根和反面的焊接。
- e. weld first side of repair in accordance with the approved WPS.
按照批准的 WPS 进行第一个面的焊接。
- f. excavate from the opposite side until sound weld metal is reached.
从反面进行碳刨和打磨直至露出金属光泽。
- g. perform 100% MT of excavation to ensure crack has been removed entirely.
对碳刨出的坡口位置进行 100% 的 MT 检测, 确保裂纹清除干净。
- h. prepare excavation such that all metal is ground clean to a smooth, shiny metal finish and starts and stops are tapered to a 1:1 slope.
对碳刨出的坡口要进行打磨平滑, 确保连个端头有 1:1 的斜式过渡。
- i. weld opposite side of repair in accordance with the approved WPS.
按照 WPS 的要求进行反面的焊接。
- j. after weld has been completed, apply post weld heat treatment (PWHT) in accordance with the temperature requirements of table 1 for a minimum of one hour.
焊接完成后, 按照表 1 的要求对焊缝进行后热处理, 处理时间至少 1 小时。
- k. once repair has undergone the required PWHT, allow weld to cool gradually by automatic control of the heat machine. (50°C PER HOUR)
后热结束后, 需要对焊缝进行保温, 进行缓冷处理。

2. repairing in two stages 第 2 种返修方案

- a. initial excavation 初步碳刨
 - i preheat repair area to 65°C prior to performing any gouging .
碳刨前加热到 65 度。
 - ii excavation of material shall be limited to no more than 4mm per pass.
碳刨的过程要注意每层刨除掉的焊缝厚度不能大于 4mm。
 - iii prepare excavation such that all metal is ground clean to a smooth, shiny metal finish and starts and stops are tapered to a 1:1 slope.
碳刨出的坡口要进行打磨平滑, 确保连个端头有 1:1 的斜式过渡。
 - iv preheat to 160°C in accordance with table 1 and maintain this temperature throughout the entire repair procedure.
按照表一的要求预热到 160 度, 并且该温度要求持续整个焊接过程。
 - v weld first side of repair in accordance with the approved WPS.
按照批准的 WPS 进行第一个面的焊接。
 - vi after weld has been completed, apply PWHT in accordance with the temperature requirements of table 1 for a minimum of one hour
焊接完成后, 按照表 1 的要求对焊缝进行后热处理, 处理时间至少 1 小时。
 - vii once repair has undergone the required PWHT, allow weld to cool gradually by automatic control of the heat machine. (50°C PER HOUR)
后热结束后, 需要对焊缝进行保温, 进行缓冷处理。

DEPARTMENT OF TRANSPORTATION
Division of Engineering Services
Office of Structure Construction
State of California
Pursuant to Section 5-1.02
of the Standard Specifications

APPROVED
 APPROVED AS NOTED
 RETURNED FOR CORRECTION

Structure Representative: SJE for RM
Date: 10/28/09

[Handwritten signature] 10-27-09

b. repair of opposite side 反面的返修

i preheat repair area to 65°C prior to performing any gouging .

碳刨前加热到 65 度。

ii excavation of material shall be limited to no more than 4mm per pass.

碳刨的过程要注意每层刨除掉的焊缝厚度不能大于 4mm。

iii prepare excavation such that all metal is ground clean to a smooth, shiny metal finish and starts and stops are tapered to a 1:1 slope.

对碳刨出的坡口要进行打磨平滑，确保连个端头有 1:1 的斜式过渡。

iv preheat to 160°C in accordance with table 1 and maintain this temperature throughout the entire repair procedure.

按照表一的要求预热到 160 度，并且该温度要求持续整个焊接过程。

v perform 100% MT of excavation to ensure crack has been removed entirely.

100%MT 确保所有的裂纹已经彻底移除干净。

vi weld opposite side of repair in accordance with the approved WPS.

按照 WPS 的要求进行反面的焊接。

vii after weld has been completed, apply PWHT in accordance with the temperature requirements of table 1 for a minimum of one hour.

焊接完成后，按照表 1 的要求对焊缝进行后热处理，处理时间至少 1 小时。

viii once repair has undergone the required PWHT, allow weld to cool gradually by automatic control of the heat machine. (50°C PER HOUR)

后热结束后，需要对焊缝进行保温，进行缓冷处理。

10-27-09

h. When the weld defect appears to have been removed the groove shall be ground clean to bright metal and the excavation shall be tested for complete defect removal using 100% MT per approved procedure. 当缺陷看似被清理后，对清理区域进行打磨到金属光泽并使用 100%MT 确认缺陷移除干净。

i. If all indications are removed, the weld defect is considered to have been removed. No welding shall begin except on two sided repairs until all 100% MT indications have been removed. 如果所有的 MT 指示均被移除，则认为所有的缺陷均被移除。在 MT 指示均被移除之前，不得进行任何焊接。除非是双面返修。

j. Once the proper depth is reached, the groove shall be tapered to the surface of the existing weld by grinding at a slope of 1 to 1. The excavation of the defect shall extend a minimum of 50mm beyond each end of the defect including the taper.

当碳刨达完成后，碳刨表面应打磨成 1:1 的斜势。而且碳刨应在缺陷位置向两边各延伸 50mm，包括斜势。

When all grinding is completed in the area to be repaired, a final 100%MT test will be run by QC personnel to verify that all indications have been removed.

返修区域打磨完成后，应有 QC 进行 100%MT，以确认所有的指示都已清除。

After the gouge is accepted by QC, the entire area shall be cleaned to remove all traces of loose debris and MT powder.

碳刨得到 QC 的验收后，整个范围内的杂物比如小碎片和 MT 干磁粉等均需清理干净。

Welding.

焊接

a. Preheat shall be applied to the repair area in such a way that the entire area to be repaired and all adjacent material out to a distance of 75mm in all directions of excavation, heated to the higher of the appropriate value shown in Table 1. Preheat application is always stated as a minimum value. Higher preheat values may be required if the joint has too high a degree of restraint.

必须对返修区域，包括返修点周边 75mm 范围内进行预热，预热温度应高于下面表 1 中的规定温度。预热温度要求始终只是一个最低值。如果接头的拘束应力很大的话，也可以要求更高的预热温度值。

APPROVED
 APPROVED AS NOTED
 RETURNED FOR CORRECTION
 Pursuant to Section 5-1.02
 of the Standard Specifications
 State of California
DEPARTMENT OF TRANSPORTATION
 Division of Engineering Services
 Office of Structure Construction
 State of California
 Structure Representative: Site for RV
 Date: 10/28/09

Disposition:

处理方法:

- b. SMAW filler metal shall be rated to a hydrogen level of H4 or better.
SMAW焊材的扩散氢等级必须等于或低于H4。
- c. The groove shall be filled using the approved SMAW or SAW filler metal in accordance with an approved WPS.
坡口应使用并根据批准的 SMAW 或者 SAW 进行焊接。
- d. Once the preheating process is started the repair area shall be maintained at this preheat level until all welding is completed. This includes any additional time to remove the defect from the second side gouge.
当预热开始直到焊接结束，返修区域的温度应始终维持。这也包括从反面碳刨将缺陷移除的预热时间。
- e. The CWI shall verify that the welder understands all starts and stops ~~which has bad formation~~ are to be ground before an arc is struck on them to provide a means to tie the next weld pass into the end of the weld.
CWI应该确保焊工在层间清理时能对层间成型不好的位置进行适当的打磨，以使下一道焊接能融合到前一道。
- f. Before welding over previously deposited metal, all slag shall be removed and the weld and adjacent base metal shall be brushed clean.
开始下一道焊接前，所有的焊渣必须清理，而且焊道和周边母材必须刷干净。
- g. Preheat shall be maintained on the repair continuously once it is first applied until the weld is complete and the postweld heating phase begins at once.
预热温度在整个返修过程中必须维持好，直到焊接结束。结束后，立即就开始后热处理。

4. Postweld Heat Treatment.

后热处理

- a. After welding is completed but before the temperature falls below that of the preheat value from Table 1, it shall be maintained at the post heat temperature shown in Table 1.
当焊接结束后，等温度降到表1规定的最低预热温度前，后热温度必须保持在表1中的规定温度。
- b. Post weld heating shall be maintained for a minimum of 1 hour.
后热处理至少进行1小时。
- c. After the post weld heating time has been reached the repair shall be cooled by removing the heating source and leaving the blankets in place or by another method that will insure the temperature is cooling down gradually. *(50°C TEE Hour)*
后热结束后，通过移除加热源并用保温毯放在焊缝上或者其他方法，使焊缝能够缓冷。
- d. Per the specification require performing the Final UT, MT and Visual inspections, which shall be done at least after 48 hours have passed after the weld repair area has cooled to ambient temperature.
只有当焊缝冷却到室温后的48小时之后，才能开始最终的UT, MT和VT检测。
- e. Perform all NDT in accordance with contract plans as well as ABF approved procedure by ABF/CT, ZPMC will coordinate.
返修结束之后，ABF和CT 按照标书要求和ABF批准的工艺对焊缝进行NDT检测，ZPMC进行配合。
- f. All inspection activities shall be documented which includes backgouge inspections.
所有的检验工作均应被记录成文件，也包括碳刨的检验。

10-27-09

APPROVED
 APPROVED AS NOTED
 RETURNED FOR CORRECTION

Pursuant to Section 5-1.02
of the Standard Specifications
State of California

DEPARTMENT OF TRANSPORTATION
Division of Engineering Services
Office of Structure Construction

Structure Representative: *SJC for RM*
Date: *10/28/09*

工艺: *Mintre Teng*
Technical Engineer:

10/26

审核: *(Signature)*
Approved By:

日期: *10/26*
Date:



关键焊缝返修报告

版本
Rev. No.:

Critical Welding Repair Report (CWR)

0

项目名称 Project Name:	美国海湾大桥 SFOBB	部件图号 Drawing No.:	Lift 2E 1W	报告编号 Report No.:	876 B-CWR859-
合同号 Contract No.:	04-0120F4	部件名称 Item Name:	IAAW-1AW 2AE+2BE transvers e splice weld	NDT 报告编号 NDT Report No.:	NA
项目编号 Project No.:	ZP06-787				

纠正措施:

Corrective Action to Prevent Re-occurrence:

- All new segments splice welds shall be strictly controlled by the Lead CWI
所有新的箱体拼缝的焊接应有LEAD CWI严格监控。
- All welding parameters shall be verified and recorded.
所有的焊接参数应被确认并记录成报告。
- Welds shall be made using SMAW (H4) and / or SAW only. FCAW WPS using Supercored 71H shall be approved by ABF JV prior to use. Elevated preheats and postheats may be required by this procedure above what is required for normal SMAW or SAW welding.
必须只能使用SMAW (H4) 和/或SAW进行焊接。FCAW的方法必须通过ABF的审核后才能使用。而且, FCAW的预热温度和后热温度可能相对普通的SMAW和SAW情况时, 需要适当提高。
- ZPMC shall document and provide results of all the inspections conducted
ZPMC必须记录所有的检验, 并将所有检验报告提交。
 - 100%VT of excavation and 50mm either side of the weld excavation.
对碳刨区域和两边50mm范围内碳刨后进行100%VT
 - 100%MT of excavation and 50mm either side of the weld excavation.
对碳刨区域和两边 50mm 范围内碳刨后进行 100%MT
 - Interpass cleaning.
层间清理
 - VT of repaired area.
返修区域返修后的VT
 - MT of repaired area.
返修区域返修后的MT
 - UT of repaired area.
返修区域返修后的UT
- All the new segment splice weld joint shall be under the fabrication and control according to the revised welding procedure which all agreed by three parties.
以后环缝烧焊要按照三方同意的最新的焊接工艺的要求进行生产和监控。

<input type="checkbox"/> APPROVED
<input checked="" type="checkbox"/> APPROVED AS NOTED
<input type="checkbox"/> RETURNED FOR CORRECTION
Pursuant to Section 6-1.02 of the Standard Specifications State of California
DEPARTMENT OF TRANSPORTATION Division of Engineering Services Office of Structure Construction
SJE for RM 10/28/09 Structure Representative Date

Table 1: Preheat & Postheat Requirements for Various Metal Thicknesses

表1 预热和后热温度表

Base Metal Thickness 母材厚度	Minimum Preheat 最低预热温度	Minimum Postheat 最低后热温度
T ≤ 40mm	160°C	160°C
40mm ≤ T < 50mm	200°C	200°C

T ≥ 50mm
车间负责人 (Foreman):

275°C
Gao Jun

275°C
日期 (Date): 10.26

10-27-09

参照的WPS编号 Repair WPS No.:		WPS-345-SAW-1G (1F)-FCM-Repair-1 WPS-345-SMAW-1 G(1F)-FCM-Repair-1 WPS-345-SMAW-3 G(3F)-FCM-Repair-1 WPS-345-SMAW-4 G(4F)-FCM-Repair-1		工艺员 Technologist:		 10.76	
返修（碳刨）前预热温度 Preheat Temperature Before Gouging:				返修的缺陷 Description of Discontinuity:			
焊前处理检查 Inspection Before Welding:				焊前预热温度 Preheat Temperature Before Welding:			
最大碳刨深度 Max. Depth of Gouge:				碳刨总长 Total Length of Gouge:			
焊工 Welder:		焊接类型 Welding Type:		焊接位置 Position:			
焊接电流 Current:		焊接电压 Voltage:		焊接速度 Speed:			
返修后检查 Inspection After Repair:							
外观检查 VT Result:		检验员 Inspector:		日期 Date:			
NDT复检 NDT Result:		探伤员 NDT Person:		日期 Date:			
见证： Witness/Review:							
备注： Remark:							

#R787-QCP-900

<input type="checkbox"/> APPROVED <input checked="" type="checkbox"/> APPROVED AS NOTED <input type="checkbox"/> RETURNED FOR CORRECTION Pursuant to Section 5-1.02 of the Standard Specifications State of California DEPARTMENT OF TRANSPORTATION Division of Engineering Services Office of Structure Construction SJE for RM Structure Representative	10/28/07 Date
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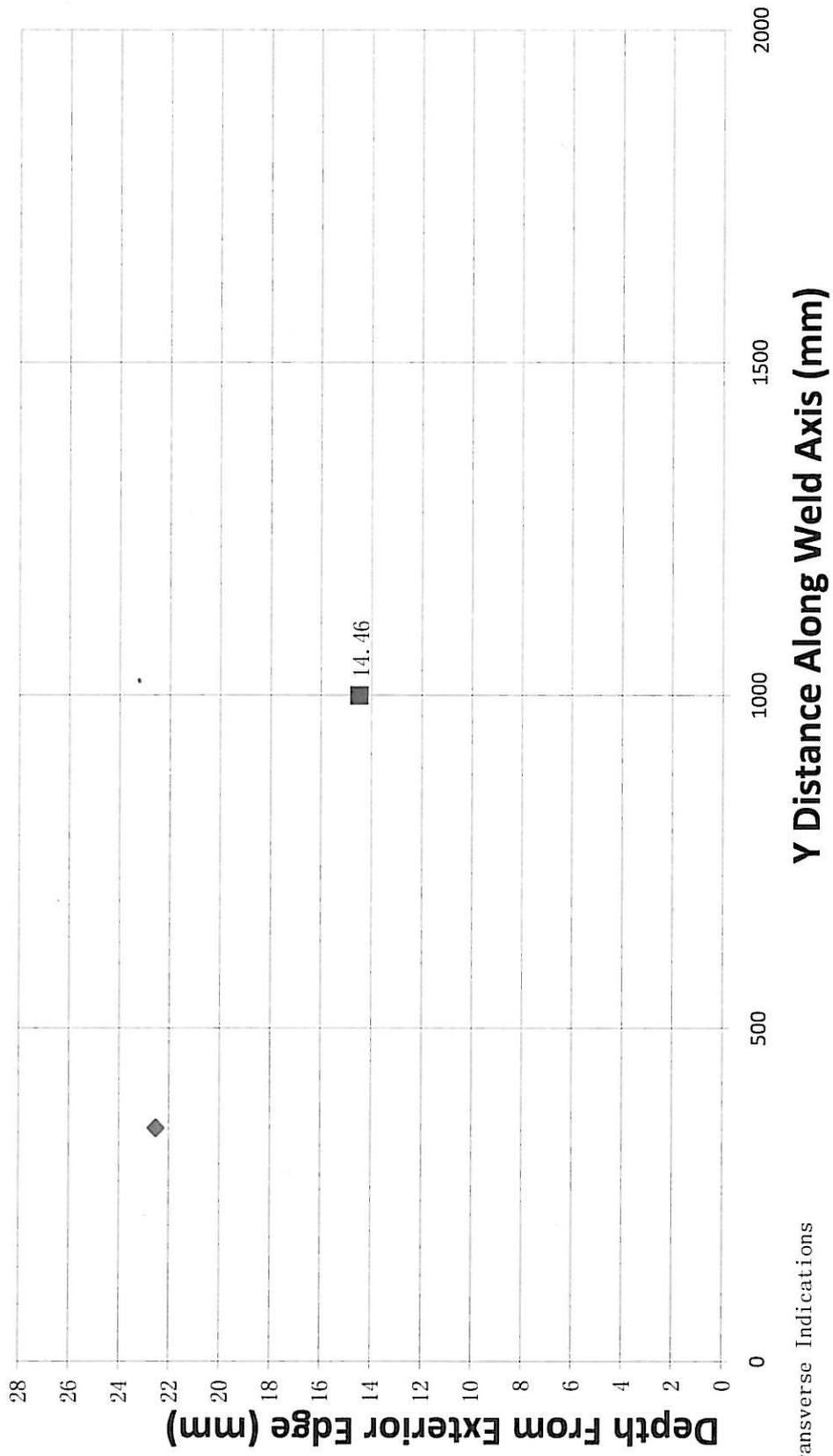
0070C0ULTRASONIC TRANSVERSE INDICATION EVALUATION

SEGMENT
WELD No.
LOCATION

LAW to1AAW
OBW1-003
Edge Panel (Cross Beam Side)

Ind. No.	Date	Lot #	Scanning Pattern	Angle in Deg.	Sound Path(mm)	Depth (mm)	A	B	C	D	Class	Thickenss (mm)	Length (mm)	REJ.	Distance From X (mm)	Distance From Y (mm)	Indication Orientation
1	21-Oct-09	B288	D	70	65.79	22.5	77.5	58.8	3	16		28	39		0	350	T
2	21-Oct-09	B288	B	70	42.3	14.46	81.9	58.8	1	22		28	25		0	1000	L

1AAW- 1AW Edge Panel CB Side



◆ Transverse Indications

■ Longitudinal Indications

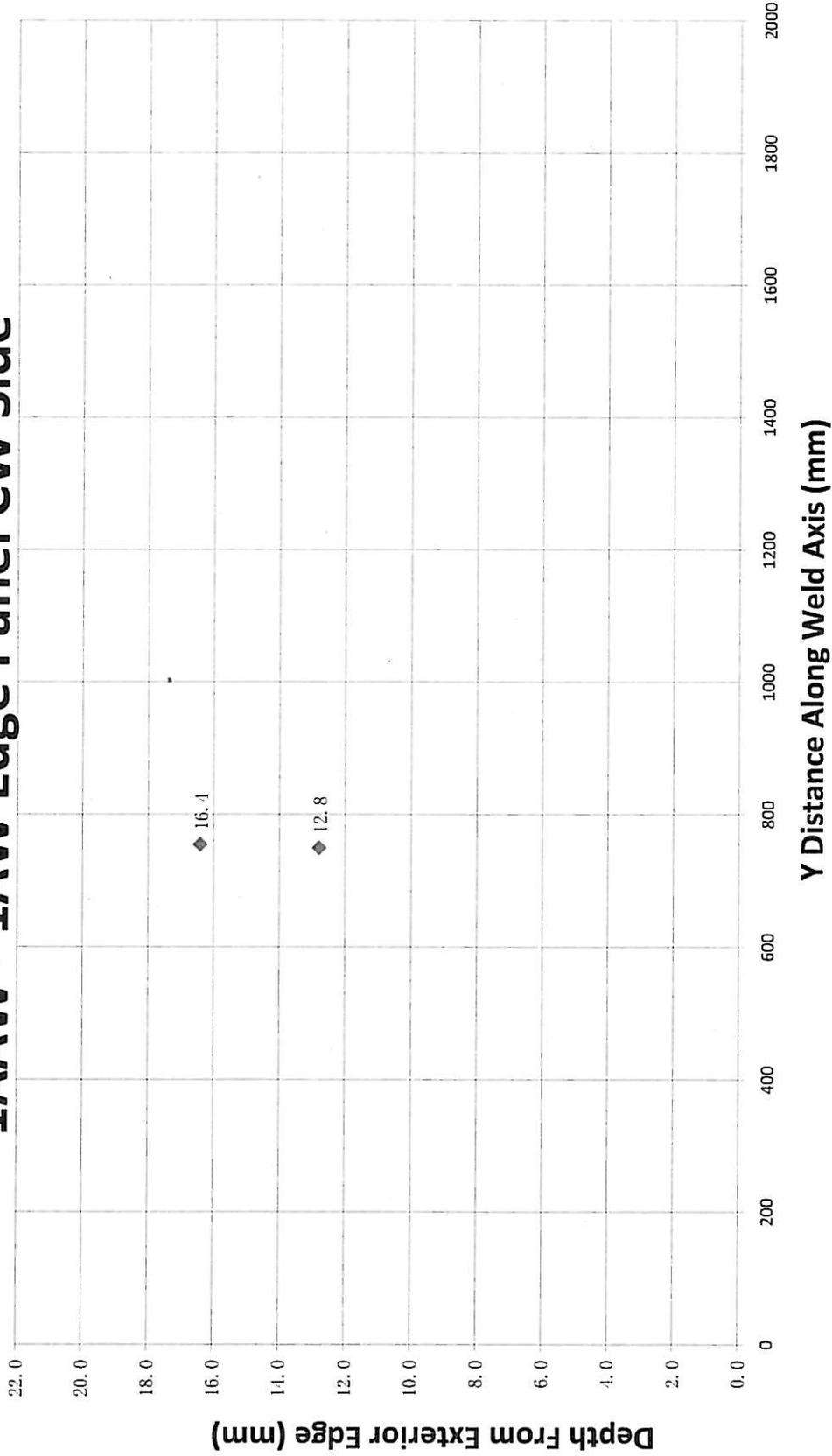
0070C0ULTRASONIC TRANSVERSE INDICATION EVALUATION

SEGMENT
WELD No.
LOCATION

IAW toIAAW
OBWI-002
Edge Panel (Counter Weight Side)

Ind. No.	Date	Lot #	Scanning Pattern	Angle	Sound Path	Depth	A	B	C	D	Class	Thk. (mm)	Length	REJ.	Distance From X	Distance From Y	Indication Orientation	Comments (Surface and Ecl.)	
1	19-Oct-09	B277	D	70	37.4	12.8	64	53	1	10	D	22	8		0	750			
2	19-Oct-09	B277	D	70	47.93	16.4	69	53	1.8	14	D	22	6		0	755			

1AAW - 1AW Edge Panel CW Side



◆ Transverse Indications

0070C0ULTRASONIC TRANSVERSE INDICATION EVALUATION

SEGMENT 1AW to1AAW
 WELD No. OBW1-001, OBW1-009 and OBW-01
 LOCATION Deck Panel

Ind. No.	Date	Lot #	Scanning Pattern	Angle in Deg.	Sound Path(mm)	Depth (mm)	A	B	C	D	Class	Thickenss (mm)	Length (mm)	REF.	Distance From X (mm)	Distance From Y (mm)	Indication Orientation
1	21-Oct-09	B205	D	70	56	18	58	51	3	4	A	28	30		0	240	Trans.
2	21-Oct-09	B205	D	70	40	13	74	51	1	22		28	10		0	670	Trans.
3	21-Oct-09	B205	D	70	62	20	61	51	3	7	A	28	10		0	2630	Long.
4	21-Oct-09	B205	D	70	48	15	75	51	2	22		28	10		0	6120	Trans.
5	21-Oct-09	B205	D	70	45	15	76	51	2	23		28	10		0	6140	Trans.
6	21-Oct-09	B205	D	70	42	13	72	51	1	20		28	310		0	6750	Trans.
7	21-Oct-09	B282	D	70	41	13	81	58	1	21		28	10		0	7160	Trans.
8	21-Oct-09	B282	D	70	66	22	71	58	3	9	B	28	65		0	8110	Trans.
9	21-Oct-09	B282	D	70	45	15	81	60	2	19		28	8		0	13340	Trans.
10	21-Oct-09	B282	D	70	47	15	80	58	2	20		28	10		0	13470	Trans.
11	21-Oct-09	B282	D	70	45	14	83	58	2	23		28	6		0	13550	Trans.
12	21-Oct-09	B282	D	70	51	16	82	58	2	22		28	8		0	13780	Trans.
13	21-Oct-09	B282	D	70	63	20	79	58	3	18		28	10		0	17040	Trans.
14	21-Oct-09	B282	D	70	47	15	78	58	2	18		28	10		0	17050	Trans.
15	21-Oct-09	B282	D	70	55	18	79	58	2	19		28	10		0	17120	Trans.
16	21-Oct-09	B282	D	70	58	19	82	58	3	21		28	8		0	17150	Trans.
17	21-Oct-09	B205	D	70	48	16	83	51	2	30		28	10		0	17830	Trans.

0070C0ULTRASONIC TRANSVERSE INDICATION EVALUATION

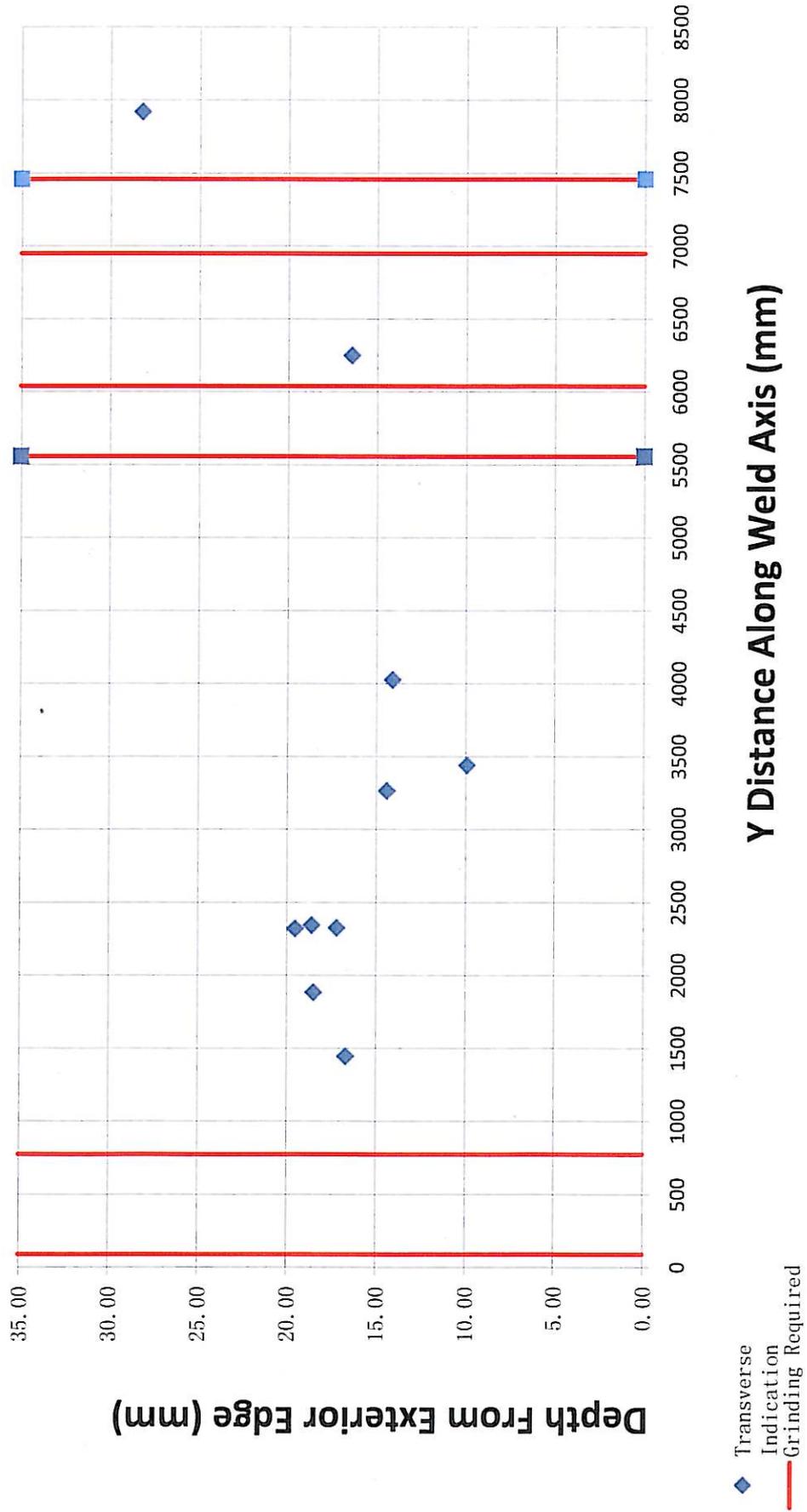
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18	21-Oct-09	B282	D	70	46	15	85	58	2	25		28	8		0	17900	Trans.
19	21-Oct-09	B282	D	70	63	20	83	60	3	20		28	8		0	18180	Trans.
20	21-Oct-09	B282	D	70	43	14	84	60	1	23		28	8		0	18200	Trans.
21	21-Oct-09	B282	D	70	41	13	81	60	1	20		28	8		0	18220	Trans.
22	21-Oct-09	B282	D	70	91	29	82	60	5	17		28	8		0	18250	Trans.
23	21-Oct-09	B282	D	70	41	13	79	60	1	18		28	8		0	18280	Trans.
24	21-Oct-09	B282	D	70	37	12	83	60	1	22		28	10		0	18670	Trans.
25	21-Oct-09	B282	D	70	37	12	80	60	1	19		28	10		0	18800	Trans.
26	20-Oct-09	B282	A, B, D, E	70	44	15	80	58	1	21	D	28	8		0	22540	Trans.

SEGMENT
WELD No.
LOCATION

1AW to 1AAW
OBWIA-003
Bottom Panel

Ind. No.	Date	Lot #	Scanning Pattern	Angle in Deg.	Sound Path (mm)	Depth (mm)	A	B	C	D	Class	Thickenss (mm)	Length (mm)	REF.	Distance From X (mm)	Distance From Y (mm)	Indication Orientation	Comments (Surface Condition and Ect.)
1	23-Oct-09	B264	D	70	48.8	16.69	76.00	51	1.90	23		35	10			1446	T	
2	23-Oct-09	B205	D	70	54.1	18.50	76.00	51	2.33	23		35	8			1885	T	
3	23-Oct-09	B205	D	70	57.1	19.53	77.00	51	2.57	23		35	10			2320	T	
4	23-Oct-09	B205	D	70	50.3	17.20	77.00	51	2.02	24		35	10			2325	T	
5	23-Oct-09	B205	D	70	54.4	18.60	76.00	51	2.35	23		35	8			2345	T	
6	23-Oct-09	B264	D	70	42.1	14.40	76.00	51	1.37	24		35	10			3265	T	
7	23-Oct-09	B205	D	70	28.97	9.91	74.00	51	0.32	23		35	8			3440	T	
8	23-Oct-09	B205	D	70	41.2	14.09	73.00	51	1.30	21		35	10			4025	T	
9	23-Oct-09	B264	D	70	48.1	16.45	75.00	51	1.85	22		35	10			6250	T	
10	23-Oct-09	B205	D	70	82.5	28.22	76.00	51	4.60	20		35	8			7920	T	

1AAW - 1AW Bottom Plate

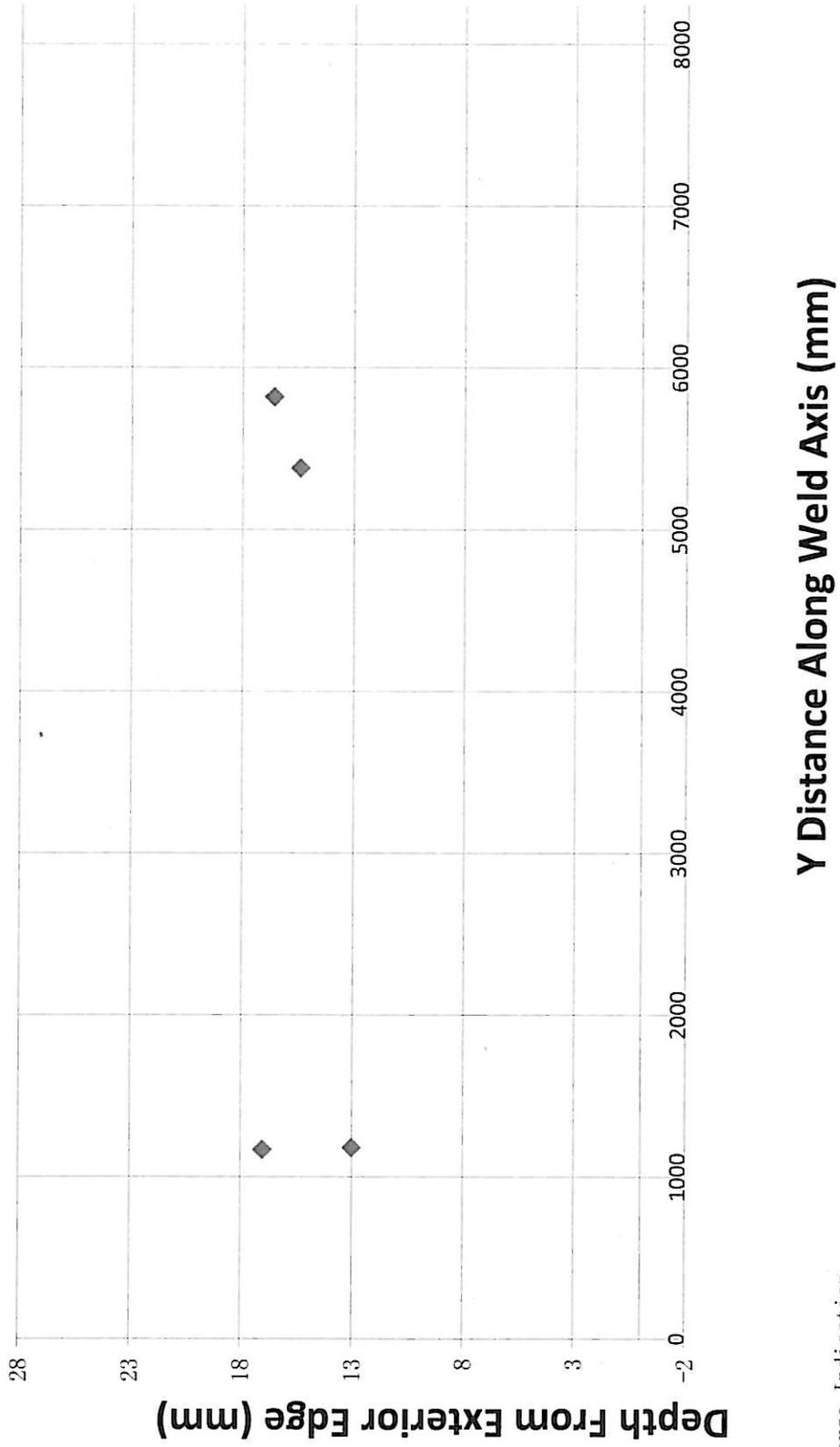


SEGMENT
WELD No.
LOCATION

IAW to IAAW
OBWIA-002 and OBWIA-001
Side Panel (Counter Weight Side)

Ind. No.	Weld ID	Date	Lot #	Scanning Pattern	Angle in Deg.	Sound Path (mm)	Depth (mm)	A	B	C	D	Class	Thickenss (mm)	Length (mm)	REJ.	Distance From X (mm)	Distance From Y (mm)	Indication Orientation	Comments (Surface Condition and Ecl.)
1	OBWIA-001	19-Oct-09	B277	D	70	-	-	-	-	-	-	-	22						ACC
4	OBWIA-002	19-Oct-09	S004	D	70	51.3	17	68	50	2	16	D	28	5			1168	Trans.	-
5	OBWIA-002	19-Oct-09	S004	D	70	39.8	13	61.6	50	1	11	D	28	6			1182	Trans.	-
2	OBWIA-002	19-Oct-09	S003	D	70	41	15	74.8	54	1	20	D	28	4			5380	Trans.	-
3	OBWIA-002	19-Oct-09	S003	D	70	44	17	74.7	54	2	19	D	28	5			5820	Trans.	-

1AAW - 1AW Side Panel CW Side



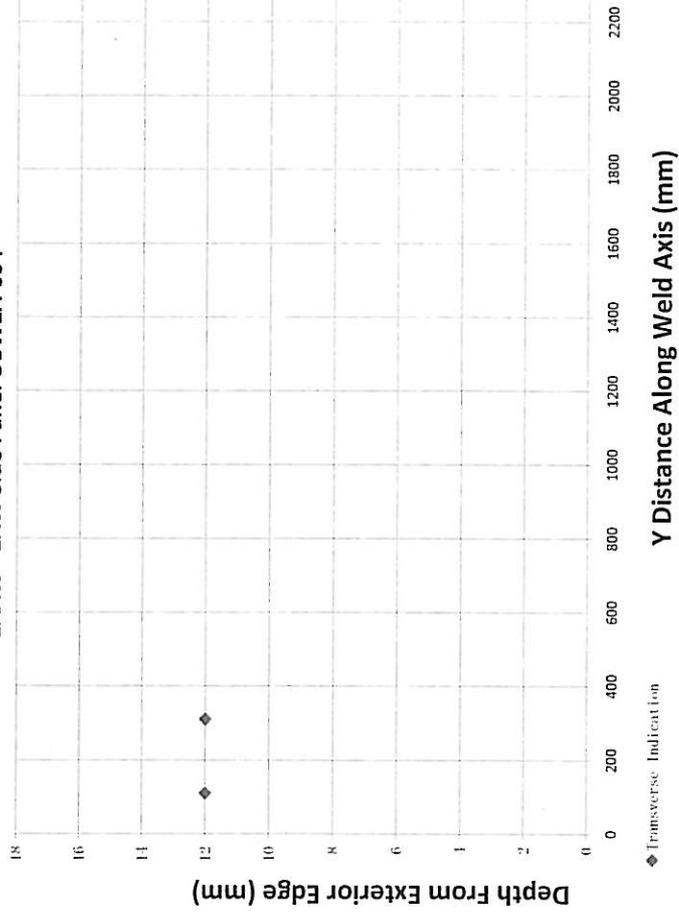
◆ Transverse Indication

0070C0ULTRASONIC TRANSVERSE INDICATION EVALUATION

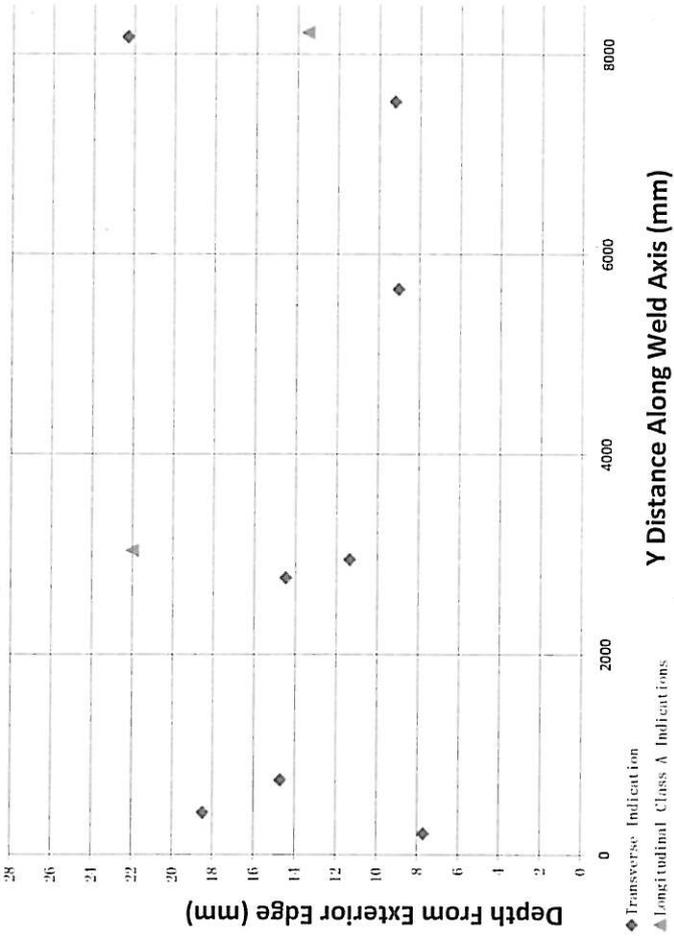
SEGMENT IAAW to IAW
 WELD No. OBWIA-004, 005
 LOCATION Side Panel (Crossbeam side)

Ind. No.	Weld ID	Date	Weld No.	Lot #	Scanning Pattern	Angle in Deg.	Sound Path (mm)	Depth (mm)	A	B	C	D	Class	Thickenss (mm)	Length (mm)	REJ.	Distance From X (mm)	Distance From Y (mm)	Indication Orientation
1	OBWIA-005	22-Oct-09	OBWIA-005	B264	D	70	37	12	69	51	1	17		18	10			111	Trans.
2	OBWIA-005	22-Oct-09	OBWIA-005	B264	D	70	37	12	73	51	1	21		18	10			310	Trans.
1	OBWIA-004	23-Oct-09	OBWIA-004	B205	D	70	26.5	9	71	51	0	20	D	28	8		0	5650	Trans.
2	OBWIA-004	23-Oct-09	OBWIA-004	B205	D	70	26.9	9	69	51	0	18	D	28	9		0	7525	Trans.
3	OBWIA-004	23-Oct-09	OBWIA-004	B205	D	70	65.4	22	73	51	3	19	D	28	10		0	8175	Trans.
4	OBWIA-004	23-Oct-09	OBWIA-004	B205	B	70	39.4	13	58	51	1	6	A	28	10	REJ	0	8220	Long.
5	OBWIA-004	22-Oct-09	OBWIA-004	B205	D	70	23.7	8	69	51	0	18		28	10			210	Trans.
6	OBWIA-004	22-Oct-09	OBWIA-004	B205	D	70	57.0	18	75	51	3	21		28	5			420	Trans.
7	OBWIA-004	22-Oct-09	OBWIA-004	B205	D	70	45.3	15	75	51	2	22		28	8			745	Trans.
8	OBWIA-004	22-Oct-09	OBWIA-004	B205	D	70	44.6	14	76	51	2	23		28	8			2765	Trans.
9	OBWIA-004	22-Oct-09	OBWIA-004	B205	D	70	35.0	11	66	51	1	14		28	10			2945	Trans.
10	OBWIA-004	22-Oct-09	OBWIA-004	B205	B	70	67.8	22	61	51	3	7	A	28	15	REJ		3035	Long.

1AAW - 1AW Side Panel OBW1A-004



1AAW - 1AW Side Panel OBW1A-005



DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

Office of Structural Materials

Quality Assurance and Source Inspection



Bay Area Branch
690 Walnut Ave. St. 150
Vallejo, CA 94592-1133
(707) 649-5453
(707) 649-5493

Contract #: 04-0120F4Cty: SF/ALA Rte: 80 PM: 13.2/13.9File #: xx.25A**QUALITY ASSURANCE -- NON-CONFORMANCE RESOLUTION****Location:** Changxing Island, Shanghai, P.R. China**Report No:** NCS-000401**Prime Contractor:** American Bridge/Fluor Enterprises, a JV**Date:** 25-Dec-2009**Submitting Contractor:** Zhenhua Port Machinery Company, Ltd (ZPMC), Changxing Island **NCR #:** ZPMC-0405**Type of problem:**

Welding	Concrete	Other	
Welding	Curing	Procedural	Bridge No: 34-0006
Joint fit-up	Coating	Other	Component:
Procedural	Procedural	Descriptor:	

Date the Non-Conformance Report was written: 08-Sep-2009**Description of Non-Conformance:**

Caltrans Quality Assurance Inspector (QA) discovered rejectable linear transverse indications during ultrasonic testing verification of OBG segment splice weld (1AAW/1AW) designated as OBW1-002 (Edge Panel CW side) utilizing scanning pattern "D". The indications exhibited planar characteristics with significant flaw height dimension as the search unit was moved toward and away from the indications and were not detectable during scanning patterns parallel to the weld axis. In addition, the search unit was rotated 360° around the indications in order to ascertain if they were spherical, cylindrical or linear in nature. No significant ultrasonic response was noted as the search unit was rotated around the indications with the exception of both transverse directions with the search unit located directly on top of the weld (scanning pattern "D"). In evidence of this information the indications were determined to be indicative of transverse indications. Due to the depth of one (1) indication being 21 mm which is near the inside surface, magnetic particle (MT) testing was performed and the transverse linear indication at Y=820mm was confirmed, see digital photos below.

NOTE: The Y locations were taken from the Deck Plate down on the Counter Weight side. (Y=820, 1170 and 1790mm)

Contractor's proposal to correct the problem:

The contractor will repair the weld and perform NDT to verify that the weld is acceptable.

Corrective action taken:

ZPMC has repaired the indications documented in the NCR. ABFJV has conducted the NDT and found that the weld is acceptable.

Did corrective action require Engineer's approval? Yes No**If so, name of Engineer providing approval:****Date:****Is Engineer's approval attached?** Yes No**Comments:**

This report is for the purpose of determining conformance with the contract documents and is not for the purpose of making repair or fit for purpose recommendations. Should you require recommendations concerning repairs or remedial efforts please contact Mazen Wahbeh, +(86) 134.7247.7571, who represents the

QUALITY ASSURANCE -- NON-CONFORMANCE RESOLUTION

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Office of Structural Materials for your project.

Inspected By: Tsang, Eric

Quality Assurance Inspector

Reviewed By: Wahbeh, Mazen

QA Reviewer
