

**SECTION A. CONTROL PAGE**

# **QUALITY ASSURANCE MANUAL**

## **Southern Heat Exchanger Corporation**

**6100 Old Montgomery Highway  
Tuscaloosa, AL 35405**

**Mailing Address:**

**Post Office Box 1850  
Tuscaloosa, AL 35403**

**Phone: (205) 345-5335**

**Shop fabricated ASME Code Pressure Vessels to Section VIII, Division 1  
'U'**

**Shop and field alterations and repair to pressure vessels in accordance with  
National Board Inspection Code and Jurisdictional Authority.**

**'R'**

## **Southern Heat Exchanger Corporation - Plant # 2**

**600 Waco Road  
Tuscaloosa, AL 35405**

**Mailing Address:**

**Post Office Box 1850  
Tuscaloosa, AL 35403**

**Phone: (205) 345-5335**

**Shop fabricated ASME Code Pressure Vessels to Section VIII, Division 1  
'U'**

**Edition 6, Rev.0 dated 10/27/2011**

**Manual Control Number - 1**

**ANY PRINTED COPY OF THIS MANUAL IS CONSIDERED UNCONTROLLED**

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Rev. 0**

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NOTE: (1) All references to ASME 'Code' refers to Section VIII, Division I. All references to 'SHECO' refer to Southern Heat Exchanger Corporation. All references to NBIC refer to National Board Inspection Code.

This manual has been reviewed and accepted by:

QUALITY ASSURANCE MANAGER *David S. Adams* DATE 10/27/11

AUTHORIZED INSPECTOR *William Hunter* DATE 10/27/11

**SECTION 1. POLICY STATEMENT, AUTHORITY AND RESPONSIBILITY**

Southern Heat Exchanger Corporation is totally committed to this quality assurance system to assure compliance with the requirements of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code and National Board Inspection Code.

- A. Engineering, quality assurance, purchasing, and production report independently to Management at the General Management Level.
- B. The Quality Assurance Manager is responsible for writing, revising, and implementing the QA program. He is given the full support of management in matters of quality assurance and ASME Code related matters.
- C. The Quality Assurance Manager has the authority, responsibility and organizational freedom to identify quality assurance problems and to initiate, recommend, and provide solutions including stop work orders if further processing would result in non-conformance with the applicable Code section.
- D. Any problems relating to the Code requirements, which cannot be resolved by the QA Manager, will be brought to the attention of the General Manager for resolution without compromising the ASME Code, The National Board Inspection Code, or this program.
- E. Management / supervision referenced in this manual have the authority to delegate duties necessary to fulfill the requirements of the Quality Assurance Program, but retain full responsibility for their assignments.
- F. Any reference to a Dept. Head / Mgr. is understood it is either them or their designee. Responsibility will remain with the Dept. Head / Mgr.

SOUTHERN HEAT EXCHANGER CORPORATION

General Manager

DATE	SIGNATURE
10/27/11	<i>Keith Austin</i>

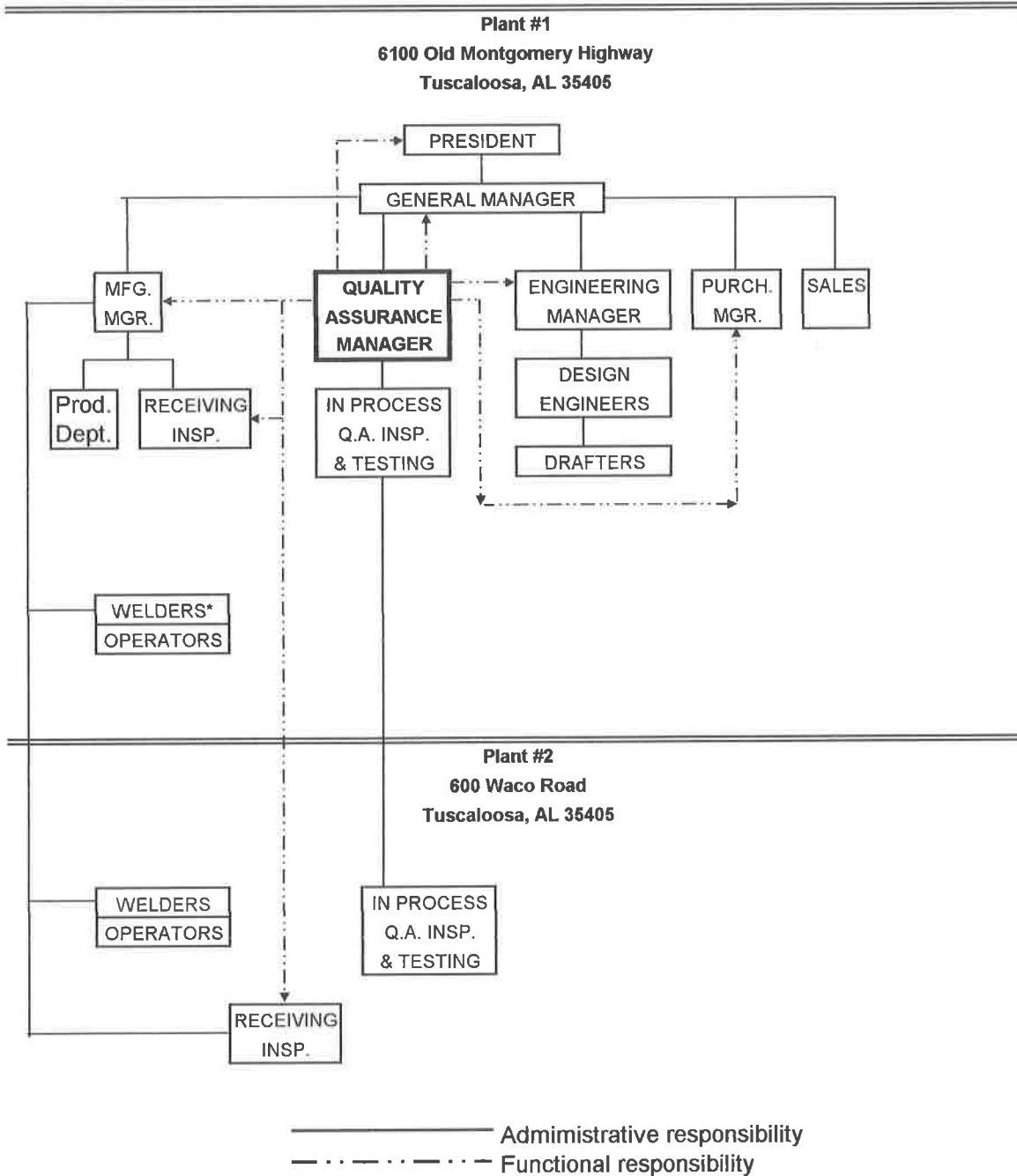
**SECTION 2. MANUAL CONTROL****A. GENERAL**

- 1. The Quality Assurance Manager shall maintain the master copy of the Quality Assurance Manual. A copy of the manual will be on the company server available to all SHECO personnel in a 'read only' format.**
- 2. Code edition, NBIC and addenda are reviewed upon issue by the Quality Assurance Manager to determine the need for revisions to the Quality Assurance Manual. Review by QA Manager will be indicated by signoff on inside cover of respective Code & NBIC section. Revisions will be implemented no later than six months from issue date. Acceptance of the Quality Assurance Manual will be indicated by signature and date of the Quality Assurance Manager and A.I. on the index page.**
- 3. Revisions to manual are made "per section" with each page of section carrying the same revision number. Revisions to exhibit pages will show the revision number directly below the exhibit number on the exhibit page, and are individually controlled by Exhibit Index.**
- 4. When special contract requirements include the mandatory use of a different authorized inspection agency other than that of record, the authorized inspection agency of record remains responsible for acceptance of revisions to the manual. Special requirements of the Code which may apply to such contracts shall be included in the manual as addenda for that contract, and are subject to the acceptance of the authorized inspection agency for that contract.**
- 5. Any hard copy of the Quality Assurance Manual will be considered 'uncontrolled'.**
- 6. The Edition level may be changed at the time of the Joint Review.**

**Holders of controlled copies:**

- (1) Quality Assurance Manager (Master copy)**

Organizational Chart



**SECTION 4. DRAWINGS, DESIGN CALCULATIONS, AND SPECIFICATION CONTROL****A. GENERAL**

- (1) Each order for vessels received by this Company is assigned a job (contract) number by the Sales Manager, which is used to identify all documents related to the vessel(s).
- (2) After the Engineering Manager has reviewed the contract file, he will select the Design Engineer for the specific contract.

**B. DESIGN**

- (1) On receipt of an order for a Code item to be designed, the customers' design specification is reviewed for adequacy and Code compliance by the Design Engineer. Any deficiencies are reconciled with the customer prior to starting design work.
- (2) Upon approval of the customers design specification, the Design Engineer will prepare the design sketches, calculations, and material specifications.
- (3) After the design is completed by the Design Engineer, the order is assigned by the Engineering Manager to a Drafter for the preparation of fabrication drawings.
- (4) When completed, the fabrication drawings and calculations are reviewed by the Design Engineer for compliance to the Code and customer specifications. The Design Engineer returns incorrect drawings to the Drafter for correction and re-submittal. When approved, the Design Engineer will initial and date each drawing. The Engineer's initials on the drawing certifies that he has reviewed all pertinent documents for compliance to Code. Latest approved calculations will be initialed and dated on the cover sheets by the Design Engineer and maintained in the contract file.
- (5) Revisions to the above design documents are handled and approved in same manner as originals.
- (6) After completion of the fabrication drawings, they are distributed as indicated in Paragraph F. of this section.

**C. DESIGN BY OTHERS**

- (1) When design drawings, calculations, and material specifications are provided by others, the Design Engineer reviews these documents for compliance to the Code. Any discrepancies are brought to the attention of the design concern for correction to meet Code requirements.

When the design meets the Code requirements, the documents are approved/ certified and distributed as described in Paragraphs B. & F. of this section.

**D. FABRICATION DRAWINGS**

- (1) Drawings shall contain all required fabrication, inspection, and testing information such as weld size, welding procedures, heat treatment, and NDE requirements.
- (2) Drawings shall list Code material per the requirements of the ASME Code approved material specification.

**E. CALCULATIONS**

- (1) All design calculations are executed on computer programs based on the ASME Code design methods.
- (2) The Design Engineer is responsible for verification of input/output data on all calculations.
- (3) The Engineering Manager is responsible for verification of changes to the computer program brought about by Code revisions. Documentation of this by manual verification shall be maintained by the Engineering Manager.
- (4) Verification of output will be provided when requested by the AI.

**F. DISTRIBUTION OF FABRICATION DRAWINGS, CALCULATIONS, AND SPECIFICATIONS**

- (1) Original fabrication drawings are filed in the Engineering Department.
- (2) Engineering releases the job to the shop and QA by hand carrying approved fabrication drawings to the Manufacturing Department and QA Manager. The drawings are reviewed with the General Manager at the weekly production meeting prior to start of fabrication to determine the scope of work. The Inspection Report Form (Exhibit 3) is filled out by the Quality Assurance Inspector and maintained in the Quality Assurance Department.
- (3) The Engineering Manager is responsible for making available to the Authorized Inspector all drawings, design calculations and material specifications for his review prior to the start of fabrication. The Authorized Inspector will initial and date the assigned area on the inspection report form. Copies of these documents are available to the Quality Assurance Manager in the job contract file.
- (4) Revisions to fabrication drawings are made, approved and distributed in the same manner as the originals. All recalled drawings are destroyed by the Engineering Manager. Drawings containing notes which require their retention will be marked 'void' by the Engineer and retained in the job contract file. Red-line corrections may be performed by the Design Engineer which shall be indicated by his initial and date by the correction.

**SECTION 5. MATERIAL CONTROL****A. PURCHASING**

- (1) **Material for ASME Code use will be purchased, for stock and specific jobs, to ASME Code specifications provided by the Engineering Manager on the drawing.**
- (2) **Purchase Orders (Exhibit 2) written by the Purchasing Manager for ASME Code materials will require Material Test Reports, Certificates of Compliance or other documentation required by the Bill of Material (Exhibit 7) for ASME Code compliance.**
- (3) **Copies of Purchase Orders are to be distributed by the Purchasing Manager to:**
  - a. **Job contract or stock materials files**
  - b. **Receiving department**
  - c. **Quality Assurance Manager**
- (4) **Material Test Reports, Certificates Of Compliance or other documentation required for incoming material will be approved by the Quality Assurance Manager when in compliance with ASME Code approved material specifications by initial and dating, and are available for AI review.**
- (5) **Welding materials will be ordered by the Purchasing Manager from the WPS information requirements.**

**B. RECEIVING**

- (1) **Incoming materials will be examined by the Receiving Inspector for compliance with the purchase order for:**
  - a. **Dimensions, visual defects, and Code required identification.**
  - b. **Product form specifications:**
    - (1) **Plate - heat number, slab number, type, grade, manufacturer's symbol and thickness.**
    - (2) **Heads - manufacturer's identification, heat numbers, slab and/or test number, thickness, specification, grade, and contour.**
    - (3) **Tubes/Pipe - identification in accordance with the applicable part of Section II.**
    - (4) **Standard parts - identification to material specification.**
  - c. **Materials received in boxes or bundles will have material specification marked on box/bundle and stored in its shipping container until ready for use.**

- (2) The Receiving Inspector, using his copy of the Purchase Order, examines all Code material for dimensions, marking, condition, quantity, MTR's and/or lab test reports to verify any additional required testing was performed, and if not performed, the Quality Assurance Manager will be notified. When acceptable, he initials and dates the Purchase Order and marks the material with the job number, or stock order number, signs and dates the packing list and forwards it to the accounting department for log in. Unacceptable materials are handled in accordance with Section 7. Alloy parts will only be marked with red low-chloride markers.
- (3) Welding materials are received by the Receiving Inspector. The SFA / AWS marking will be checked at this time.
- (4) The Receiving Inspector will notify the Quality Assurance Manager of suspected non-conformances and handles in accordance with Section 7.

**C. STORAGE**

- (1) Accepted materials will be stored in locations for stock or specific jobs as assigned by the Production Manager. Welding materials will be stored as specified in Section 8.G. Incoming materials will remain in the Material Holding Area until accepted by the Receiving Inspector.

**D. ASSIGNMENT**

- (1) Job materials will be issued by the Production Manager with verification of the job number identified on the material.
- (2) The Production Manager will assign material for jobs in accordance with the drawings and / or Bill of Material generated by the Design Engineer and by purchase orders generated by the Purchasing Manager. The Design Engineer is responsible for verifying that any additional testing specific to that material is satisfied.

**Note 1.** The Bill of Material will specify ASME Code specifications for ASME Code use. Heat numbers and other identification, including job number for shell/nozzle pipe will be recorded by the Production Manager prior to removing from the cutting area and forwarded to the Quality Assurance Department for verification. Stock pipe material used for a specific job will have the stock order number listed on the Bill of Material.

**Note 2.** Alpha Code Register (Exhibit 10) for stock plate will be recorded in the same manner as Note 1 above. A pre-assigned list of Alpha codes is maintained by the Quality Assurance Manager, accepted by the A.I. and provided to the plate burning area for the purpose of assigning traceability to pieces removed from plate. The Alpha code is transferred to the unused portion of plate and follows it throughout its life until used up.

Other stock materials requiring traceability to the specification only will be color coded by the Receiving Inspector after acceptance in the manner listed below:

- SA-106 GR B SMLS Pipe.....continuous red stripe
- SA-36 Plate .....yellow spray paint
- Plate materials requiring MTRS.....Alpha code

**Note 3. Standard parts purchased in quantity, after proper receipt, will be stored in their designated bin and used as required. If, in the course of their use, the identification will be covered or obliterated in any way after welding, the identification shall be marked on the adjoining piece by production personnel and verified by QA.**

**E. MATERIAL CONTROL**

- (1) Material Test Reports or Certificates Of Compliance will be traceable to a job by a purchase order number.**
- (2) Only material that has been properly received, accepted, identified, and stored in the ASME material storage area will be released for Code fabrication.**
- (3) Items, which are fabricated by welding and are supplied by a subcontractor, will require a Partial Data Report which will be checked by the Quality Assurance Manager for Code compliance.**
- (4) The Purchasing Manager is responsible for maintaining a complete file of purchase orders for each Code item.**
- (5) The Quality Assurance Manager shall compare Material Test Reports to the applicable material specification, and initial and date the Material Test Reports if the material documentation meets requirements.**
- (6) When vessel shell sections, heads, or other parts of carbon or low alloy steel plate are cold formed by other than the manufacturer of the vessel, the required certification for the part shall indicate whether or not the requirements of UG-79 have been satisfied.**
- (7) Substitutions of material will only be made with the review and approval of the Engineering Manager and revision of any applicable design document.**
- (8) Formed heads shall be checked for dish and knuckle radii by use of templates, when Code conformance is questioned.**
- (9) Parts / material transferred between plants will be identified in such a manner that traceability to a job no. or stock order no. and/or heat no./alpha code/material specification is maintained. Bill of Material will be forwarded to the Quality Assurance Manager for retention in the document package.**
- (10) Temporary attachment lugs will be identified.**

**SECTION 6. EXAMINATION AND INSPECTION PROGRAM****A. QUALITY ASSURANCE RESPONSIBILITIES**

- (1) The Quality Assurance Manager shall be responsible for the following:
- a. Preparation, revision, approval, distribution, recall, and implementation of Quality Assurance Manuals.
  - b. Provide the Authorized Inspector with proposed revisions to the Quality Assurance System for acceptance prior to inclusion in the manual and implementation.
  - c. Provide the Authorized Inspector with access to the current Quality Assurance Manual.
  - d. Have custody and control of the use of the Code 'U' stamp and the National Board 'R' and 'NB' stamp.
  - e. Responsibility of the performance and completion of required examinations and tests and acceptance of production functions by signing and dating all pertinent documents.
  - f. Preparation of Manufacturer's Data Reports and Records Of Alterations and Repairs, review, signing and presenting to the Authorized Inspector.
  - g. The Quality Assurance Manager shall notify the Authorized Inspector of requested and required hold points.
  - h. Other responsibilities assigned by Management as designated in this manual.

**B. INSPECTION POINTS**

- (1) Hold points for the Authorized Inspector will be established at the Authorized Inspector's request at points specified by him. Hold points will be indicated on the Inspection Report Form (Exhibit 3). Production will not proceed until acceptance of the hold point by the Authorized Inspector.

**C. IDENTIFICATION OF SEAMS AND ATTACHMENTS**

(1) Weld seams and attachments will be identified on the Inspection Report Form as follows:

- a. Seams and attachments will be numbered 1, 2, 3, 4, etc. from left to right on the fabrication drawings. Nozzle seams and attachments will be numbered 1, 2, 3, 4, etc. starting at 0, and proceeding clockwise (90°, 180°, 270°) on orientation view, then reading left to right on the fabrication drawing.
- b. Seams and attachments will be designated on the Inspection Report Form as follows:

Long seams.....after fit-up approval, long seam inspections are initialed and dated on the Bill of Material and do not appear on the Inspection Report Form.

Girth seams.....G1, G2, G3, G4, etc.

Attachments .....A1, A2, A3, A4, etc.


Nozzle long seams.....NL1, NL2, NL3, NL4, etc.

Nozzle girth seams.....NG1, NG2, NG3, NG4, etc.

Nozzle attachments.....A, B, C, D, F1, S2, etc.

**D. APPROVAL OF FABRICATION**

(1) Approved fabrication will be marked on the piece as follows:

 .....Fit-up

 .....Internal

(2) Acceptable testing, ASME Code stamping and AI inspections will be recorded on the Inspection Report Form (see notes 1 & 2).

**E. HYDROSTATIC TESTING**

- (1) All tests will be conducted by shop personnel using two calibrated gauges or one calibrated gauge and chart recorder at a pressure as indicated on the fabrication drawing.
- (2) The test will be witnessed and accepted by the Quality Assurance Inspector. The Authorized Inspector will be given advance notice so he may witness the test.

**F. DOCUMENTATION**

The Quality Assurance Manager will assemble all documentation required for review by the authorized inspector prior to signoff of the Manufacturer's Data Report.

**Note 1:** Dial range of indicating pressure gauges will be graduated over a range of about double the intended test pressure but not less than 1 ½ times the test pressure, nor more than 4 times that pressure.

**Note 2.** Prior to completion of the vessel, the Quality Assurance Manager will prepare the ASME "U" Code nameplate , assign and stamp the National Board number (if applicable), and then apply the ASME Code stamp to the nameplate. The completed nameplate will then be forwarded to the Production Manager for attachment to a bracket and then applied to the vessel prior to the final hydrostatic test only if it is to be welded to the vessel.

At the time of the final test, the Quality Assurance Inspector and the Authorized Inspector shall verify attachment of the nameplate to the proper vessel before final approval of the hydrostatic test. Any non-conformance found during the hydrostatic test which cannot be corrected shall require the removal of the Code nameplate by the Quality Assurance Manager.

**SECTION 7. CORRECTION OF NON-CONFORMITIES****A. IDENTIFICATION OF NON-CONFORMITIES**

1. A non-conformity is any condition which does not comply with the applicable rules of the Code, QA Manual, design documents or other specified requirements.

**B. TYPES OF DISPOSITIONS**

1. 'Use-as-is' - requires acceptance by Engineering, Quality Assurance and the Authorized Inspector (where Code issues are involved).
2. 'Repair' - requires acceptance by Engineering, Quality Assurance, and the Authorized Inspector. Dispositions requiring repair may be made using Southern Heat Exchanger Corporation's "Standard Repair Procedures" or special procedures approved by the Quality Assurance Manager with acceptance by the Authorized Inspector (when required).

**Note: Weld metal repairs of nozzles or other attachments that are a routine part of the fab. process will be corrected using Southern Heat Exchanger's "Standard Repair Procedures" and are not subject to reporting as a "non-conformance". These procedures require acceptance by the Authorized Inspector as noted in 2 above.**

3. 'Return-to-vendor/scrap'- requires acceptance by Quality Assurance and others as necessary.

**C. DISPOSITION**

1. At first evidence of a non-conformance, Quality Assurance will verify the condition, mark the piece "HOLD", and complete a NON-CONFORMANCE REPORT (Exhibit 4). The part may be marked or tagged. Any marking or tagging on alloy parts will be with red duct tape or red low-chloride markers. The NCR will be numbered with job number and a sequential numbering system (1, 2, etc.). The material will remain in the Material Holding Area until released to the shop.
2. The NON-CONFORMANCE REPORT, signed by the Quality Assurance Manager, together with his recommended disposition is forwarded to the Authorized Inspector (when Code issues are involved) who will review and accept the method of correction, and add hold points when required.
3. After the non-conformance has been corrected and accepted by the Quality Assurance Manager, the Authorized Inspector will re-inspect the item and if satisfied that it meets Code requirements, the Quality Assurance Manager will remove the "HOLD" markings and allow the piece to return to the fabrication stream.

**D. RECORDS**

1. NON-CONFORMANCE REPORTS will be attached to the Inspection Report Form and maintained in the job file until closed. The Quality Assurance Manager will maintain a file of completed NCRs.
2. All records of non-conformances are available to the Authorized Inspector for his review and acceptance.

**SECTION 8. WELDING CONTROL****A. GENERAL**

- (1) All welding (including tack welds) shall conform to requirements of Section IX with additional requirements of the applicable Code section to which work is performed, and using welding procedure specifications and welders or welding operators qualified in accordance with the above Code sections.

**B. WELDING PROCEDURE SPECIFICATIONS - WPS**

- (1) WPS's are written by the Quality Assurance Manager ensuring all essential, supplementary essential (when required) and non-essential variables are listed.
- (2) The Quality Assurance Manager supervises the welding of test welds. Preparation and testing of the required specimens are performed to Section IX requirements by Southern Heat Exchanger Corporation, or a qualified testing laboratory. The results of tests are reviewed by the Quality Assurance Manager, and if acceptable, he prepares and certifies by signature and date the Procedure Qualification Record (PQR).
- (3) Copies of qualified WPS and PQR are provided to the Production Manager for use by production welders. The Quality Assurance Manager maintains the WPS and PQR file.
- (4) WPS and PQR's are available for review by the Authorized Inspector.
- (5) WPS are revised when there is a change in nonessential variables.
- (6) Welding procedures will be controlled by number, date and revision.

**C. QUALIFICATION OF WELDERS AND WELDING OPERATORS**

- (1) All welders and welding operators to be used for Code welding are qualified to Section IX and the Code of construction under the supervision of the Production Manager or Quality Assurance Manager. The preparation and testing of the required specimens are performed by Southern Heat Exchanger Corporation or a qualified testing laboratory. The results of tests are reviewed by the Quality Assurance Manager, and if acceptable, he prepares and certifies by signature and date the Manufacturers Record of Welder and Welding Operator Qualifications Test Form (WPQ / WOPQ).

- (2) Copies of the WPQ Report (Exhibit 8) forms are provided to the Production Manager for his respective qualified welders. The original welder qualification test forms are maintained in the Quality Assurance Manager's file.

#### **D. REQUALIFICATION OF WELDERS, OPERATORS AND WELDING PROCEDURE SPECIFICATIONS**

- (1) Welders and welding operators shall be requalified when:
  - a. A change in performance essential variable occurs.
  - b. They have not welded in the specific process for six months or more.
  - c. When there is reason to question their ability to make sound welds that meet the specification and Code.
  - d. Renewal of qualification under (a), or (c) above to be in accordance with QW-301 and QW-302. Renewal of qualification under (b) shall be in accordance with QW-322(a).
- (2) Welding procedure specifications shall be requalified when:
  - a. A change in procedure essential or supplementary essential variable occurs.
  - b. Whenever there is reason to question welds welded in accordance with the WPS.
- (3) The A.I. may request requalification of WPS's and WPQ's for cause.

#### **E. MAINTENANCE OF WELDER QUALIFICATION**

- (1) Each qualified welder is listed on a Welder's Continuity Log (Exhibit 1) maintained by the Quality Assurance Manager. He will make entries into the log indicated by date no longer than six months apart that the welder has maintained his qualification for that specific process. The Quality Assurance Manager determines from the log when a welder's qualification is expiring, to insure that he performs production welding or is properly requalified.

#### **F. PRODUCTION WELDING**

- (1) The Production Manager is responsible for verifying that all production welders are qualified, and for instructing each welder in the WPS he is to use, as listed on the drawing for each weld.
- (2) Each qualified welder is issued a unique stamp by the Quality Assurance Mgr. with which to identify each weld he makes in accordance with Code.

**G. WELDING MATERIAL**

- (1) All welding materials are purchased as described in Section 5.
- (2) All welding materials are received as described in Section 5.
- (3) Welding material used for ASME Code work is acquired by the fitter/welder based on the WPS shown on the fabrication drawing for the specific joint he is working on. The fitter writes the proper procedure numbers on the work piece which is checked for accuracy by the Quality Assurance Inspector at the time of fit-up inspection. The welder who is welding the joint acquires the welding material from the storage area and then enters the required information and signs the Weld Materials Signout Sheet maintained in that area by the Quality Assurance Manager.
- (4) Low hydrogen coated electrodes will be received and stored in sealed containers. When opened, the electrodes will be placed in a heated oven maintained at the temperature specified by Section II, Part C of the ASME Code or as recommended by the manufacturer.
- (5) Low hydrogen coated electrodes are acquired only in a quantity sufficient to complete the weld or a shift, whichever is less. At this time the welder will make an entry on the Low Hydrogen Signoff Sheet (Exhibit 6).
- (6) Un-consumed low hydrogen coated electrodes returned are examined by fitter/welder for condition, cleanliness, and identification prior to returning to the return area of the oven. Damaged electrodes are scrapped. At this time the fitter/welder will make an entry on the low hydrogen signoff sheet.
- (7) All other materials are stored in a heated room.

**H. WELD RECORDS**

- (1) All records referenced in this section are available for review by the Authorized Inspector.

**I. TACK WELDS**

- (1) Tack welds are made by qualified welders using qualified WPS as designated on the drawing.
- (2) When tack welds are left in place, they are prepared to ensure complete fusion prior to inclusion into the final weld.
- (3) Each tack weld is visually examined, and if defective or cracked, is completely removed.

**SECTION 9. NONDESTRUCTIVE EXAMINATION - NDE****A. GENERAL**

- (1) All NDE requirements such as written practice, procedures, personnel qualification, examinations, and records, shall meet all requirements of Section VIII Div. 1.
- (2) NDE required by the Code is specified on the drawing and may be performed by a qualified NDE subcontractor whose written practice, procedures, personnel qualifications and equipment calibration have been reviewed and approved for Code compliance by the Quality Assurance Manager. Company personnel are certified and qualified to Section VIII, Division I, to perform PT examination.

**B. NDE PROCEDURES**

- (1) All subcontracted NDE will be performed using written procedures that have been approved by a Level III appointed and accepted by letter by the Quality Assurance Manager of the Company. The procedures shall be detailed enough to insure the technique to be used meets all Code requirements and must be accepted by the Quality Assurance Manager. For in-house PT, the procedure shall be certified By the Quality Assurance Mgr. In accordance with App. 8, Sect. VIII, Div. 1.
- (2) All NDE procedures will be submitted to the Authorized Inspector for his review. Written procedures for ultrasonic, liquid penetrant and magnetic particle examinations required by the Code shall be certified by the Level III.
- (3) All NDE procedures shall be demonstrated as being capable of producing meaningful results to the satisfaction of the Authorized Inspector.
- (4) The AI may request re-qualification of an NDE exam or procedure for cause.

**C. NDE PERSONNEL**

- (1) The Quality Assurance Manager shall verify that all subcontractor's NDE personnel are properly qualified and certified in accordance with the employer's written practice, (the employer's written practice shall be written using SNT-TC-IA, latest Code accepted edition/addenda as a guide) and any additional requirements as required by the applicable Code section.
- (2) When the company's in-house nondestructive examiners are used in penetrant processes, they may be certified as competent in performing examinations and interpreting results by the Quality Assurance Manager, and they are required an annual eye test to the Jaeger type number 2 standard chart, at a distance of not less than 12 inches, and are capable of distinguishing and differentiating contrast between color used. Certification will be in accordance with Southern Heat Exchanger Corporation's written procedures which meets as a minimum, the criteria of ASME Section VIII, Div.1, Appendix 8.

- (3) NDE personnel qualification records are available for review by the Authorized Inspector, who may request requalification if he has reason to question their ability to perform the examination.**
- (4) The required documentation for NDE personnel will be on file by the Quality Assurance Manager.**

**D. NDE REPORTS**

- (1) All reports of NDE, including radiographic film, shall be interpreted by a Level II or III and reviewed by the Quality Assurance Manager prior to submittal to the Authorized Inspector for his review.**
- (2) All NDE reports are filed by the Quality Assurance Manager for retention as described in Section 12.**
- (3) Upon completion, all NDE meeting Code requirements will be recorded (signed & dated) on the applicable inspection document.**

**SECTION 10. HEAT TREATMENT****A. GENERAL**

- (1) If heat treatment is required by Code, or determined by the Engineering Manager, it will be performed by a qualified contractor using this company's written procedures, and using calibrated equipment.**
- (2) The Quality Assurance Manager will review and approve heat treatment subcontractors controls, equipment, and calibration records.**

**B. HEAT TREATMENT PROCEDURES**

- (1) All heat treatment will be performed in accordance with a post weld heat treatment procedure (SHECO HT-1 / HT-2) (Exhibit 5A / B) prepared by the General Manager and approved by the Quality Assurance Manager.**

**C. HEAT TREATMENT RECORDS**

- (1) All heat treatment records submitted by the subcontractor shall be reviewed and approved as meeting Code and procedure requirements by the Quality Assurance Manager and shall include as a minimum:
  - (a) Southern Heat Exchanger procedure number, with revision.**
  - (b) Unit identification.**
  - (c) Signature and date by a responsible individual of the heat treating facility.****
- (2) Approved heat treatment records shall be submitted to the Authorized Inspector for review and acceptance.**

**D. RECEIVING INSPECTION**

- (1) When heat treated items are returned from the subcontractors facility, the Quality Assurance Inspector examines each item for damage and loss of identification.**

**SECTION 11. CALIBRATION OF TEST/MEASUREMENT EQUIPMENT****A. GENERAL**

- (1) All measurement and test equipment used for final acceptance of Code items shall be calibrated in accordance with this section and approved by the Quality Assurance Manager.

**B. PROCEDURE**

- (1) Each item of measurement, test, and examination equipment which requires calibration shall be identified by marking with a unique serial number.
- (2) The Quality Assurance Inspector is responsible for seeing that pressure gauges used for Code activities are maintained in calibration, unless out of use.
- (3) Calibration may be performed by a qualified testing lab having adequate standards traceable to a national standard and providing certified records of calibration.
- (4) Pressure gauges used for hydrostatic testing shall be calibrated against a dead weight tester every six months or whenever there is reason to question their accuracy.
- (5) All pressure gauges within current calibration will be hung on the pressure gauge rack provided in the testing areas.
- (6) Micrometers/calipers used in measuring Code items/materials are checked daily with calibration gages kept by the Quality Assurance Dept. and logged monthly on the Micrometer/Caliper Calibration Form (see Exhibit 11).

**C. RECORDS**

- (1) Pressure gauges shall have a calibration control file maintained by the Quality Assurance Manager.
- (2) Pressure gauges shall be identified through use of a calibration sticker. This sticker will indicate instrument serial number, date of calibration, person who performed calibration, and date of next calibration. Serial number of pressure gauge used will be recorded on the inspection report form. This same information including the gauge range is shown on the calibration control file, along with the calibration tolerance based on the manufacturers standards for the gauge class.
- (3) Calibration records shall be available for review by the Authorized Inspector.

**D. DISCREPANT EQUIPMENT**

- (1) Vessels checked with discrepant equipment will be handled in accordance with Section 7.

**SECTION 12. RECORDS RETENTION****A. GENERAL**

- (1) All records described in this manual are collected prior to the completion of the job by the Quality Assurance Manager and reviewed for completeness and correctness, before preparation of the Manufacturer's Data Report. These records are available for review throughout the fabrication process and maintained for 3 years.**
  
- (2) Manufacturer's Data Reports, after certification by the Quality Assurance Manager and the signature and date of the Authorized Inspector, are filed with the purchaser and manufacturer as required by the Code.**
  
- (3) A copy of all Manufacturer's Data Reports will be maintained in the company's storage files for at least three (3) years unless registered with the National Board, and are available for review by the Authorized Inspector.**
  
- (4) Radiographic film are maintained until the AI signs and dates the Manufacturer's Data Report form.**
  
- (5) National Board serial numbers shall be controlled and issued consecutively, starting with 1, by the Quality Assurance Manager. He shall maintain a record of issuance showing date of issue, purchasers name, and manufacturer's serial number. The Quality Assurance Manager shall submit to the National Board the original of all data reports for vessels that are registered with National Board within 60 days of AI Certification.**

**SECTION 13. AUTHORIZED INSPECTOR**

- (1) The Authorized Inspector is the third-party inspector required by Code who is employed by an ASME / National Board accredited Authorized Inspection Agency with whom we have a contract to provide inspection services, and holds a valid and current National Board Commission with an "A" endorsement.**
- (2) When requested by the Authorized Inspector, inspection hold points will be inserted on the Inspection Report Form for those operations he wishes to witness or verify before fabrication proceeds.**
- (3) The Quality Assurance Manager is the liaison with the Authorized Inspector, and is responsible for keeping him advised of the progress of the work so he may make his designated inspections.**
- (4) The Authorized Inspector shall have access to and be furnished with all drawings, calculations, specifications, procedures, process sheets, repair procedures, records, test results, and any other documents as required to perform his duties.**
- (5) The Quality Assurance Manager will notify the Authorized Inspector sufficiently in advance of his designated hold points and hydrostatic tests so he may be present to witness them.**
- (6) The final records, together with the completed Manufacturer's Data Report signed by the Quality Assurance Manager, will be submitted to the Authorized Inspector for his review and signature when he has satisfied himself that all Code requirements have been met.**
- (7) A controlled copy of the Quality Assurance Manual is available to the Authorized Inspector.**
- (8) The Authorized Inspector will review and accept all changes to the Quality Assurance Manual.**
- (9) The Quality Assurance Manager provides for the Authorized Inspector access to the plant when Code work is being performed, and to such parts of all plants that are concerned with the manufacture and supply of materials for the vessel, when requested.**
- (10) The Quality Assurance Manager will provide any assistance requested by the Authorized Inspector Supervisor during his audits, and by the Authorized Inspector during his required monitoring of the Quality Assurance System.**

**SECTION 14. REPAIRS / ALTERATIONS TO PRESSURE VESSELS****A. GENERAL**

- (1) Shop or field repairs or alterations to Code vessels when required by the owner, Jurisdiction, or the customer will be made in accordance with the requirements of the National Board Inspection Code, ASME Code of Construction, and this Quality Assurance Manual as applicable to each vessel.**
- (2) For repairs and alterations at field sites all design, fabrication, examination and inspections shall be controlled as stated in this Quality Assurance Manual. The Quality Assurance Manager shall have the responsibility to see that all field personnel are aware of the requirements of this Manual and all areas are followed.**
- (3) A 'repair' is defined as the work necessary to restore pressure retaining items to a safe and satisfactory operation condition. (Routine repairs are limited to those listed in the NBIC)**
- (4) An 'alteration' is defined as any change in the item described on the original Manufacturers' Data Report which affects the pressure containing capability of the pressure retaining item. Non-physical changes such as an increase in the maximum allowable working pressure (internal or external) or design temperature of a pressure retaining item shall be considered an alteration. A reduction in minimum temperature shall also be considered an alteration.**

**B. PROCEDURE**

- (1) It is the responsibility of the Quality Assurance Manager to assure compliance with the Quality Assurance Manual for repair and/or alteration to Code vessels.**
- (2) All repairs, routine repairs or alterations of Code vessels are subject to the acceptance of the Inspector, who may require that evidence of prior acceptance of the method and extent of repair by the Jurisdiction and insurance carrier be provided by the owner or user.**
- (3) The Engineering Manager shall, prior to the start of work, provide the Inspector with drawings, calculations, procedures, inspection report form and any other documents, including a copy of the original Manufacturers' Data Report for the vessel necessary for the Inspector to accept the repair, routine repair or alteration and designate his required inspection points. The Inspector may waive in process inspections for routine repairs.**
- (4) The Quality Assurance Manager shall, if requested by the Inspector, arrange for his access to make such inspections of the vessel as he deems necessary in order to accept the repair or alteration.**
- (5) The Quality Assurance Manager keeps the Inspector advised of the progress and completion of the work so he may make his designated inspections and accept the repair or alteration after his final inspection of the completed work.**

- (6) All inspections and tests required by the Code on the original construction of the vessel, shall be required on the repair or alteration, unless alternate tests are acceptable to the Inspector and Jurisdiction.
- (7) Pressure testing shall meet the requirements found in Section 6, Part E of this manual.
- (8) Alterations will be performed in accordance with the National Board Inspection Code.

**C. RECORDS**

- (1) The repair and/or alteration including description of relocation of stamping or nameplate will be documented on the applicable current National Board Form (s):

**Form R-1 Report of Repair**  
**Form R-2 Report of Alteration**  
**Form R-3 Report of Parts Fabricated by Welding**  
**Form R-4 Report Supplementary Sheet**

The report will be completed by the company and signed by the Quality Assurance Manager.

- (2) The final records together with the completed applicable National Board R form(s) will be presented to the Inspector for his review and certification when he is satisfied all National Board Inspection Code requirements have been met.

**D. DISTRIBUTION OF FORMS**

- (1) Legible copies of the completed Form R-1, together with attachments, shall be distributed to the owner or user, the Inspector, the Jurisdiction if required, and the Authorized Inspection Agency responsible for inservice inspection. A copy is retained in the job file. Routine repairs are documented on Form R-1 with "Routine Repair" in remarks.
- (2) Legible copies of the completed Form R-2, together with attachments, shall be distributed by the 'R' Certificate Holder performing the alteration, to the Inspector, the Authorized Inspection Agency responsible for the inservice inspection of the pressure retaining item, the owner or user, and the Jurisdiction, if required. A copy is retained in the job file.
  - (a) If the item is registered with National Board, the original R form shall be registered with the National Board.
  - (b) If the item is not registered with National Board, the R form shall be maintained for a minimum of 5 years.
  - (c) A single, sequential log will be kept of R Form numbers assigned for NBIC Report Forms that are registered with the National Board.

**E. STAMPING**

- (1) If during the repair or alteration of a vessel, it is necessary to remove the original stamping or nameplate, the Inspector, subject to the approval of the Jurisdiction, if applicable, will witness the making of a facsimile or rubbing of the stamping, obliteration of the old stamping and transfer of stamping to the new part, less the Code symbol.**
  - (2) When the stamping is on a nameplate, the Inspector witnesses the transfer of the nameplate to the new part.**
  - (3) When authorized and witnessed by the Inspector, the stamping or attachment of a National Board Nameplate (Exhibit 10) to a repaired or altered vessel adjacent to the original manufacturers' stamping or nameplate shall comply with the National Board Inspection Code. The Inspector may waive the stamping for Routine Repairs.**
  - (4) The Quality Assurance Manager retains custody, control, and use of the National Board 'R' stamp.**
- F. An Inspector is one who holds a valid and current "IS" National Board Commission or a National Board Commission with an "AR" endorsement.**

**SECTION 15. EXHIBITS INDEX**

		<u>PAGE</u>	<u>REV #</u>	<u>DATE</u>
EXHIBIT 1.	WELDERS CONTINUITY LOG	2	0	10/27/11
EXHIBIT 2	PURCHASE ORDER	3	0	10/27/11
EXHIBIT 3	INSPECTION REPORT FORM	4	0	10/27/11
EXHIBIT 4	NON-CONFORMANCE REPORT	5	0	10/27/11
EXHIBIT 5	POST WELD HEAT TREAT PROCEDURE	6, 7	0	10/27/11
EXHIBIT 6	LOW HYDROGEN SIGNOFF SHEET	8	0	10/27/11
EXHIBIT 7	BILL OF MATERIAL	9	0	10/27/11
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EXHIBIT 9	NATIONAL BOARD NAMEPLATES	11	0	10/27/11
EXHIBIT 10	ALPHA CODE REGISTER	12	0	10/27/11
EXHIBIT 11	MICROMETER / CALIPER CALIBRATION RECORD	13	0	10/27/11



EXHIBIT 2.

REV. 0

---P U R C H A S E O R D E R ---

<b>SOUTHERN HEAT EXCHANGER CORP.</b>	
<b>MAIL TO:</b> P. O. BOX 1850 TUSCALOOSA, AL 35403	<b>SHIP TO:</b> 6100 OLD MONTGOMERY HWY. TUSCALOOSA, AL 35405
TELEPHONE: (205) 345-5335	FACSIMILE: (205) 345-0009

**PURCHASE ORDER NUMBER**

THIS NUMBER MUST APPEAR ON ALL INVOICES, B/L, BUNDLES, CASE PACKING LIST AND ALL OTHER CORRESPONDENCE.

TO:

P. O. DATE:  
DATE WANTED:

TERMS:  
F. O. B.:  
SHIP VIA:

SHIP TO:

CONFIRMING TO:

**DO NOT DUPLICATE**

QUANTITY	DESCRIPTION	PRICE	UNIT
----------	-------------	-------	------

Q. C. APPROVAL

**ALABAMA TAX EXEMPTION #63-5465 / FED. I. D. #63-0455815**

BY: \_\_\_\_\_  
**MICHAEL S. FOLKER**

---P U R C H A S E O R D E R ---



Southern Heat Exchanger Corporation  
Non-Conformance Report

Date: \_\_\_\_\_

NCR type:

- Materials \_\_\_\_\_
- Workmanship / Fabrication \_\_\_\_\_
- Quality System \_\_\_\_\_ Section \_\_\_\_\_
- Customer Complaint \_\_\_\_\_

SHECO order no.: \_\_\_\_\_

Drawing no.: \_\_\_\_\_

NCR no.: \_\_\_\_\_

Condition discovered by: \_\_\_\_\_

Description of non-conformance: \_\_\_\_\_

Cause of non-conformance: \_\_\_\_\_

Proposed corrective action: \_\_\_\_\_

Approved: \_\_\_\_\_  
Quality Assurance Manager/Responsible Engineer

Accepted: \_\_\_\_\_  
Authorized Inspector

Corrective action taken: \_\_\_\_\_

Examination / Inspection points- \_\_\_\_\_

Approved: \_\_\_\_\_  
Quality Assurance Manager

Accepted: \_\_\_\_\_  
Authorized Inspector

Completed: \_\_\_\_\_  
Q.A. Mgr.

Preventive action: \_\_\_\_\_

\_\_\_\_\_  
Individual / Department head

\_\_\_\_\_  
Quality Assurance Manager

Final Disposition: Use as is \_\_\_\_\_ Repair / rework \_\_\_\_\_ Return to vendor \_\_\_\_\_ Scrap \_\_\_\_\_

**SOUTHERN HEAT EXCHANGER CORPORATION**  
**POSTWELD HEAT TREATMENT PROCEDURE (SHECOHT-1)**

**Re:    UW-40, UCS-56**  
**ASME Code, Section VIII, Division 1**

**P No.:** \_\_\_\_\_

1. Heat vessel as a whole in an enclosed furnace [UW-40 (A)(1)].
2. A thermocouple shall be placed at each end of the vessel to insure proper and uniform heating of the entire vessel. **No attachment of thermocouple or thermocouple clips by welding.**
3. The temperature of the furnace shall not exceed 800° F. at the time the vessel is placed in it.
4. Above 800° F., the rate of heating shall not exceed 400° / hour.
5. During the heating period the temperature variation shall not exceed more than 250° F. within any 15 feet interval of length.
6. For the specific items shown on the purchase order, hold at a MINIMUM temperature of \_\_\_\_\_ ° F. for \_\_\_\_\_ hours during the holding period. There shall not be a greater difference than 150° F. between the highest and lowest temperature throughout the portion of the vessel being heated.
7. Above 800°F., cooling shall be done in a closed furnace or cooling chamber at a rate not greater than 500° F. / hour. From 800° F. the vessel may be cooled in still air.
8. One (1) copy of each furnace chart is required with the following information:
  - a. Reference to SHECOHT-1 postweld heat treating procedure.
  - b. SHECO order no..
  - c. Signature and date by a responsible individual of your facility.

**SHECO ORDER NO.:** \_\_\_\_\_

**SOUTHERN HEAT EXCHANGER CORPORATION**  
**POSTWELD HEAT TREATMENT PROCEDURE (SHECOHT-2)**

**Re:    UW-40, UCS-56**  
**ASME Code, Section VIII, Division 1**

**P No.:** \_\_\_\_\_

1. Wrap part to be heat treated in accordance with sub-contractors' practice.
2. Thermocouples shall be placed in accordance with sub-contractors' practice to insure proper and uniform heating of the entire section being heated.  
**No attachment of thermocouple or thermocouple clips by welding.**
3. Above 800° F., the rate of heating shall not exceed 400° / hour.
4. During the heating period the temperature variation shall not exceed more than 250° F. within any 15 feet interval of length.
5. For the specific items shown on the purchase order, hold at a MINIMUM temperature of \_\_\_\_\_ ° F. for \_\_\_\_\_ hours during the holding period. There shall not be a greater difference than 150° F. between the highest and lowest temperature throughout the portion of the vessel being heated.
7. Above 800°F., cooling shall be done at a rate not greater than 500° F. / hour. From 800° F. the vessel may be cooled in still air.
8. One (1) copy of each furnace chart is required with the following information:
  - a. Reference to SHECOHT-2 postweld heat treating procedure.
  - b. SHECO order no..
  - c. Signature and date by a responsible individual of your facility.

**SHECO ORDER NO.:** \_\_\_\_\_





Southern Heat Exchanger Corporation  
 WPQ REPORT

Stamp WPS Number Position	Welder Name P-Num Range Progr.	Weld Deposit	Joint Pipe Diameter	ID No. Process Backing	F Number
<b>2</b>	<b>Ray Cooley</b>			<b>1865</b>	
# W-156 Flat only	P-1 thru P-11,P-34 & P-4X n.a.	0.7500" max.	Grv & Fi 2.875" min.	SMAW/manual With	F 34 & F 4X
# W-18 F&V(Fi-F,H,V)	P-1 thru P-11,P-34 & P-4X Up	0.7500" max.	Grv & Fi 2.875" min. (n1)	GTAW/manual With	F 34 & F 4X
# W-226 Flat only	P-1 thru P-11,P-34 & P-4X n.a.	0.5000" max.	Grv & Fi 2.875" min.	GTAW/manual With	WPQ filler
# W-2A Flat only	P-1 thru P-11,P-34 & P-4X n.a.	0.7500" max.	Grv & Fi 2.875" min.	SMAW/manual With	F 5 and F 1
# W-42 Flat only	P-1 thru P-11,P-34 & P-4X n.a.	0.7500" max.	Grv & Fi 2.875" min.	SMAW/manu With	F 1 to F 4

NATIONAL BOARD NAMEPLATES

REPAIRED BY R  44	<b>SOUTHERN HEAT EXCHANGER CORPORATION</b> TUSCALOOSA, ALABAMA		
SHECO SER. NO.	<input type="text"/>	YEAR	<input type="text"/>
CUST. ORDER	<input type="text"/>		
<input type="text"/>			
<input type="text"/>			

ALTERED BY R  44	<b>SOUTHERN HEAT EXCHANGER CORPORATION</b> TUSCALOOSA, ALABAMA		
SHECO SER. NO.	<input type="text"/>	YEAR	<input type="text"/>
CUST. ORDER	<input type="text"/>		
MAWP	PSI AT	° F.	
<input type="text"/>			

REPERATED BY R  44	<b>SOUTHERN HEAT EXCHANGER CORPORATION</b> TUSCALOOSA, ALABAMA		
SHECO SER. NO.	<input type="text"/>	YEAR	<input type="text"/>
CUST. ORDER	<input type="text"/>		
MAWP	PSI AT	° F.	
<input type="text"/>			



