






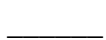





*** Please note: This page to be deleted prior to issuance of manual***

(1) This is a sample manual which includes requirements for the Codes shown below:

-  - Applicable to ASME B31.1 only
-  - Applicable to ASME B31.3 only
-  - Applicable to ASME B31.5 only
-  - Applicable to CSA Z7396.1 only
-  - Applicable to Repairs and Alterations only

(2) Other colour codes:

-  - For information only, to be deleted.
-  - Area requiring attention, company name or personnel titles
-  - No highlight, applicable to all standard *pip*ing manuals

(3) If a company is not applying for a certain Code, the other specified highlights in the manual are to be deleted (i.e., if only applying for ASME B31.1 and B31.3, the remainder of the highlighted areas , , &  are to be deleted).

(4) This manual does not include HRAI/ORAC/MCAO information. If used, the following notes may be added:

a) At the beginning of Section 2:

*“NOTE: **Company Name** may utilize **HRAI/ORAC/MCAO (Select Applicable Membership)** Registered P-Standard Drawings, following **HRAI/ORAC/MCAO** requirements.”*

b) At the beginning of Section 6:

*“NOTE: **Company Name** may utilize **HRAI/ORAC/MCAO (Select Applicable Membership)** Welding and Brazing Procedures, following **HRAI/ORAC/MCAO** requirements.”*

(5) Any sections not applicable can show (N/A) beside the title on the Table of Contents with the following note replacing the applicable sections:

*“At the present time, **Company Name** does not perform work requiring **Section Name**. In the future, should **Section Name** be required in the program, the manual shall be revised to include the requirements in accordance with Section 1 of this manual, and presented to a TSSA Representative for concurrence and signature.”*

****All highlights to be removed, and appropriate titles to be changed to reflect the actual titles in the company****

ABC Company

***1234 ABC Street
ABCTown, Ontario
N0G 1Y0***

Quality Control Manual for the Shop Fabrication, Field Installation and Erection of Piping Systems in accordance with:

- **CSA-B51 Boiler Pressure Vessel & Pressure Piping Code**
- **CSA B52 Mechanical Refrigeration Code**
- **ASME B31.1 Power Piping Code**
- **ASME B31.3 Process Piping Code**
- **ASME B31.5 Refrigeration Piping Code**
- **CSA Z7396.1 Medical Gas Pipeline Systems**

&

Repairs and Alterations of Boilers and Pressure Vessels, Piping, and Category A, B & H Type Fittings in accordance with:

- **CSA-B51 Boiler Pressure Vessel & Pressure Piping Code**
- **The National Board Inspection Code Part 3 Repairs & Alterations**
- **Original Code of Construction**

Controlled Manual # MASTER

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Rev 0

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| Authorized by (Project Manager): | | Date: |
| Accepted by (TSSA): | | Date: |

Company Logo/Company Name

This quality control manual contains the requirements deemed necessary by **Company Name** for the shop fabrication, field assembly and erection of piping systems in accordance with CSA-B51, **CSA-B52**, **ASME B31.1 Power Piping**, **ASME B31.3 Process Piping**, **ASME B31.5 Refrigeration Piping**, and **CSA Z7396.1 Medical Gas Pipeline** Codes.

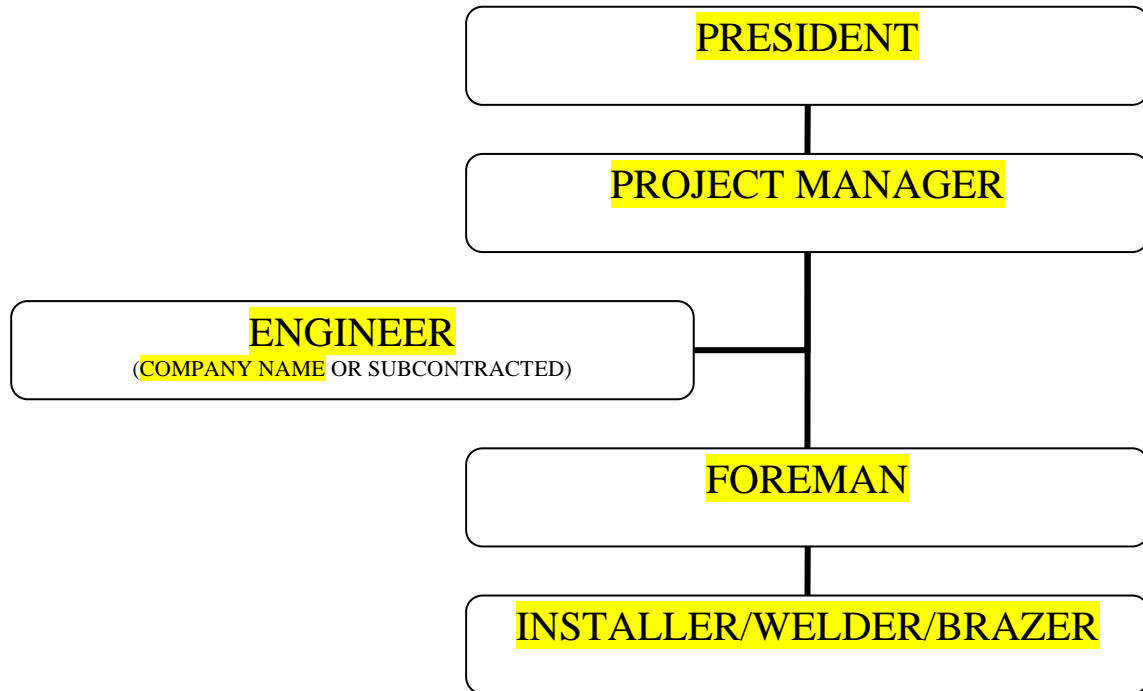
In addition, this quality control manual provides the requirements for the repair and alteration of boilers and pressure vessels, piping and category A, B, C, D, E, F & H type fittings in accordance with the requirements of CSA-B51, the National Board Inspection Code and the original Codes of construction.

Note: This quality control manual does not cover the requirements for boiler proper piping under the jurisdiction of ASME Section I for Power Boilers, or for piping Codes other than those listed above.

The **Project Manager** has the authority and responsibility for enforcing the quality control system described, and the organizational freedom to identify quality control problems and to initiate, recommend and provide solutions, including the authority to stop work when necessary.

In the event of conflict between the **Project Manager** and other personnel, problems shall be brought to the **President** for final resolution in accordance with the applicable Code and the requirements in this quality control manual.

| | |
|-------------|--|
| Print Name: | |
| Sign: | |
| Title: | |
| Date: | |



Due to the structure of the company, one person could complete more than one of these functions.

Any reference to **Foreman** or **Project Manager** throughout this manual includes shop and field as applicable.

A delegate may be appointed to complete a task on behalf of the responsible person.

1.1 The **Project Manager** is responsible for the control, preparation, approval, revision, distribution and implementation of this quality control manual.

1.2 The **Project Manager** is responsible for reviewing and maintaining a current copy of the following:

- TSSA Code Adoption Document
- CSA-B51 Boiler Pressure Vessel & Pressure Piping Code
- CSA B52 Mechanical Refrigeration Code
- ASME B31.1 Power Piping Code
- ASME B31.3 Process Piping Code
- ASME B31.5 Refrigeration Piping Code
- CSA Z7396.1 Medical Gas Pipeline Systems
- NBIC Part 3 Repairs and Alterations

Any changes to these documents that affect the contents of this manual shall be addressed within 6 months of the issue date, and the manual revised per this section.

1.3 Revisions of this manual will be carried out by changing any affected sections, advancing the revision number on each page of that section, the Table of Contents (Section i), and **highlighting** all revised text. All revisions are to be recorded on the Revision Control Record (Section iii).

1.4 The **Project Manager** shall indicate acceptance of the revisions by signing the Table of Contents (Section i) and initialling the Revision Control Record (Section iii).

1.5 All proposed revisions shall be submitted to the TSSA Representative for acceptance prior to inclusion or implementation. This acceptance will be indicated by signing the Table of Contents and initialling the Revision Control Record.

1.6 All revised sections will revert back to zero at each tri-annual TSSA audit.

1.7 After acceptance by the TSSA Representative, a copy of this manual or revised sections will be re-distributed to all controlled manual holders. A distribution log will be maintained by the **Project Manager**. If uncontrolled copies of this manual are issued, they will be current at the time of issue, but will not be logged, nor will they be updated as new revisions are issued. Alternatively, a "Read Only" copy of this manual may be uploaded to the company intranet. If uncontrolled copies of the manual are issued, they will be current at the time of issue, but will not be logged nor will they be updated as new revisions are issued.

- 2.1 It is the responsibility of the **Project Manager** to ensure that all calculations, specifications, and drawings (as applicable), are prepared to the latest edition of the applicable Code of Construction. The **Project Manager** shall review and approve all required documents and submit to TSSA for registration.
- 2.2 If customer designs are to be utilized, the **Project Manager** shall review and approve calculations, specifications, and drawings (as applicable) to ensure Code compliance.
- 2.3 The drawing information shall contain as a minimum the following information:
- Code of construction (i.e., ASME B31.1, B31.3, etc.)
 - Design pressure (Maximum Allowable Working Pressure)
 - Design temperature
 - Safety valve or safety device setting and location
 - Service fluid
 - Refrigerant name, group number and total weight of charge (if applicable)
 - Refrigeration system capacity (i.e., tons, etc.)
 - Test pressure, type of test (i.e., hydrostatic, pneumatic, etc.) and duration
 - Statement describing only CRN registered fittings to be used
- 2.4 Specifications
- Pipe/tube size and schedule (i.e., 1" Sch.40, etc.)
 - Pipe/tube material specifications (i.e., SA-53B, ASTM B280, etc.)
 - Fitting material specifications (i.e., SA-234, etc.)
 - Pipe joining methods (welded, brazed, etc.)
 - Non-destructive examination (if applicable)
 - Statement describing maximum support spacing, type and anchor location
 - Fluid service category for ASME B31.3. **NOTE:** is the owner's responsibility to specify the category of piping system as required by the ASME B31.3 Process Piping Code. The B31.3 Fluid Service Category shall be defined in the design as:
 - Normal Fluid Service
 - Category "D" Service
 - Category "M" Service
 - High Pressure Fluid Service (Category "K" Service)
 - Elevated Temperature Fluid Service
 - High Purity Fluid Service
 - Severe Cyclic Conditions
- 2.5 Construction of a pressure piping system may commence prior to the P-Number registration from TSSA provided that the company assumes all risks related to the construction. The Authorized Inspector shall be notified prior to the job start.
- 2.6 When required, sufficient calculations shall be provided to the TSSA Engineering department for registration of repairs or alterations to piping, boilers or pressure vessels.
- 2.7 When calculations are required, the **Engineer** shall ensure the correct computer aided design output has been obtained. All computer program revisions must be made within 6 months of the new Code Edition issue and shall be verified by the **Engineer**.

- 3.1 The **Project Manager** shall ensure that all material is ordered based upon the information provided on the registered drawing bill of materials.
- 3.2 The **Project Manager** will ensure that all material is ordered to the correct ASME or ASTM specification as shown in the registered design. No substitution of material shall be permitted without the approval of an engineer, the **Project Manager** and the concurrence of the Authorized Inspector.
- 3.3 All Purchase Orders (Exhibit #1a) or Material Lists (Exhibit #1b) are prepared by the **Project Manager** using the information provided on the registered drawing, and shall include the following as a minimum:
- (a) Purchase Order Number/Job reference number.
 - (b) Date.
 - (c) Material description, identification and specification.
 - (d) Requirements for copies of mill test reports or certificates of compliance when specified by the Code.
 - (e) Requirements for statutory declarations for fittings, including flexible hoses.
 - (f) Partial Data Reports for parts manufactured by others.
 - (g) Any other supplementary Code and/or quality requirements.
 - (h) Documentation to satisfy UG and UCS 79 when shells, heads or other pressure boundary parts formed from plate are ordered for repairs and alterations.
- 3.4 Distribution of Purchase Order/Material List is as follows: Supplier, **Project Manager**, job file.

RECEIVING INSPECTION

- 3.5 Upon receipt the **Foreman** shall check the material and quantity received after unloading in the receiving area, and if satisfied signs the shipping notice/bill of lading, indicating the number of pieces received.
- 3.6 The **Foreman** is responsible for conducting a visual and dimensional inspection of all incoming material to assure compliance with the Purchase Order/Material List requirements and will use the packing slip to record the results and proof of the inspection operation. Proof of Inspection shall be by signature and date on the packing slip. The actual word “*INSPECTED*” shall be used.
- 3.7 For plate, piping/tubing and fittings the **Foreman** will ensure that the identification marking is traceable to the ASME or ASTM specifications.
- 3.8 When pipe or plate is cut into pieces for or during fabrication, the **Foreman** shall ensure that the material specification is transferred to each cut piece to maintain traceability or a Coded marking system can be used if acceptable to the Authorized Inspector. Heat numbers may also be added. The use of Heat Numbers only is acceptable only if Mill Test Reports are available.
- (a) If unlisted material is used, the material must be traceable to a specification and mill test reports are mandatory. Unlisted material may only be used when accepted by TSSA and allowed by the Code of construction.
- 3.9 Items too small to accommodate markings, will be suitably bundled or boxed with required markings on the box.

- 3.10 The **Project Manager** shall ensure that all Code material (including welding/brazing material) is clearly identified and suitable stored.
- 3.11 The **Foreman** is responsible to ensure that all documentation received with the material is forwarded to the **Project Manager** for placement in the job file.
- 3.12 For plate material or heads made from plate material used for repairs or alterations of boilers or pressure vessels, the mill test reports and/or Partial Data Reports shall be obtained and reviewed, and the physical and mechanical properties shall be verified to ASME Section II. The mill test report shall be initialled and dated by the **Project Manager** to indicate acceptance.
- 3.13 If material is found non-conforming it shall be identified with a Hold Tag (Exhibit #2) and handled in accordance with Section 5 of this Manual.

CUSTOMER SUPPLIED MATERIAL

- 3.14 Material for Code work supplied by the Customer will be subject to the same incoming inspection requirements as material ordered by the company and must be accepted in the same way before being released for fabrication. Proof of material inspection will be by signing the applicable Inspection and Test Checklist (Exhibit #3a or 3b) for Customer Supplied Material.

WELDING/BRAZING MATERIAL

- 3.15 The **Project Manager** is responsible for ordering welding material in accordance with the Welding Procedure Specification (WPS) or Brazing Procedure Specification (BPS). This shall include the AWS Specification & Classification number.
- 3.16 The **Project Manager** will be responsible for checking and accepting the incoming welding/brazing material and verify its compliance with the purchase order/material list and ASME requirements.
- 3.17 Any damaged or nonconforming welding/brazing material will be rejected and returned to the supplier.

- 4.1 When piping or repair and alterations work is scheduled for production, the **Project Manager** shall be responsible for ensuring that it is in strict accordance with **ASME B31.1**, **ASME B31.3**, **ASME B31.5**, **CSA Z7396.1** or **NBIC**, the original Code of Construction and, the latest revision of the accepted drawings, jurisdiction and customer requirements.
- 4.2 The **Foreman** will prepare the applicable Inspection and Test Checklist which will list all the important stages of fabrication that require examination and will provide columns for initial and date of inspections performed by the **Foreman**. No work shall proceed past these inspection points until they have been signed off by the **Foreman**.
- 4.3 The Inspection and Test Checklist will also list any other required inspections pertaining to the fabrication or testing of the piping, or the repair or alteration of the boiler or pressure vessel. The checklist will also provide columns for hold points, and initial and date of inspections performed by the Authorized Inspector.
- 4.4 Prior to the start of fabrication, the **Foreman** will notify the Authorized Inspector, and make available the Inspection and Test Checklist, latest revised drawings, design calculations (if applicable) and all job-related documents required by the Authorized Inspector, for initial review and designation of hold points on the Inspection and Test Checklist.
- 4.5 No work shall proceed past these hold points until signed off by the Authorized Inspector. The **Foreman** shall give the Authorized Inspector sufficient notice of upcoming hold points to permit the required inspections to be carried out.
- 4.6 The **Foreman** shall be responsible for the examination and testing of parts before, during and after fabrication, ensuring that all required inspection points are signed off and accepted before the next step of fabrication proceeds. Parts and/or workmanship that fail to meet any of the requirements will be identified as non-conforming per Section 5.
- 4.7 The **Installer/Welder/Brazer** will only acquire materials which have been released for fabrication.
- 4.8 Traceability of the material to the original identification markings shall in accordance with Section 3 and by one or more of the following methods:
- Transfer of the original identification markings to a location where the markings will be visible on the completed item,
 - identification by a coded marking system traceable to the original required marking,
 - recording the required markings using methods such as material tabulations or as-built sketches which shall assure identification of each piece of material during fabrication and subsequent identification on the completed item, or
 - as agreed upon between the **Foreman** and the Authorized Inspector.
- 4.9 In addition to the inspection functions detailed on the Inspection and Test Checklist, the **Foreman** shall ensure that:
- Welding/brazing is completed as per the WPS/BPS.
 - Only BCuP-5 is to be used in medical gas piping installations per CSA Z7396.1.**
 - NDE is carried out when required, and any subsequent repairs are completed satisfactorily.
 - Welds are ground if required, nozzles radiused and a full dimensional check made on weld reinforcements, fillet welds, etc., to ensure design and Code conformity.

- (e) Heat treatment charts, radiographs and NDE reports are reviewed and accepted prior to the pressure test.
 - (f) Adequate supports are provided, properly installed and fastened.
 - (g) All fittings have CRN's and are of the correct pressure/temperature rating and type for the service.
- 4.10 No welding repairs are to be made to material without a repair procedure and concurrence with the Authorized Inspector.
- 4.11 The **Foreman** will be responsible for performing the final inspection and monitoring of the final pressure test, which shall also be witnessed by the Authorized Inspector.
- 4.12 If the Authorized Inspector is unable to witness the pressure test (*for piping only*), a representative of the client may witness the test on behalf of the Authorized Inspector if specifically agreed upon between the Authorized Inspector and the **Foreman**. The "Client Pressure Test Witness" portion of the Piping Inspection and Test Checklist shall be completed.
- 4.13 The hydrostatic test procedure shall be in compliance with the requirements of the applicable ASME Code and contractual requirements, if any, and shall include the following:
- (a) All repairs must be completed before testing.
 - (b) Suitable means shall be provided to ensure the exclusion of air within the piping, boiler or pressure vessel.
 - (c) The piping, boiler or pressure vessel, and water temperatures shall be approximately the same temperature before applying the test pressure, and all exterior surfaces must be dry. Testing will not be carried out if the item is "sweating" due to humid conditions.
 - (d) For boilers and pressure vessels, the vessel temperature shall not be below 70°F, and all surfaces shall be dry. All reinforcing pad weep holes shall be open during the test.
 - (e) A calibrated pressure gauge shall be attached to the highest point on the piping, boiler, or pressure vessel. The pressure gauge shall be graduated to not less than 1-1/2 times, and approximately twice but not more than 4 times the test pressure.
 - (f) For brazed refrigeration piping only, two gauges mounted on a common manifold may be used for the pressure test. Prior to the application of the full test pressure, the accuracy of the gauges shall be tested at approximately one-half of the specified test pressure to ensure that the gauges are indicating properly, and the readings are within 5% (full scale) of each other. If the two gauges do not give readings within these tolerances, they shall be replaced with other gauges and the accuracy checked again until a properly indicating pair of gauges are in place.
 - (g) The test pressure shall be as per the accepted drawing and applicable Code requirements, held for approximately 15 minutes with sufficient time to allow for a complete visual examination of the piping, boiler or pressure vessel.
- 4.14 For hydrostatic and pneumatic testing of piping, the requirements shall be implemented as described in the design, applicable Code, or TSSA Code Adoption Document. For pressure testing of ASME B31.5 refrigeration systems, refer to Section 14.
- 4.15 Should a pneumatic test be permitted (*for piping or pressure vessels only*), special precautions must be taken to ensure personnel safety and the provisions of the applicable Code section/s adhered to. Pneumatic tests are not permitted on Boilers.

- 4.16 The **Foreman** shall ensure that all required examinations and tests have been witnessed and signed off on the Inspection and Test Checklist. As well, the **Foreman** shall verify that all job file documentation, such as material certification, partial data reports, NDE reports, heat treatment charts, etc., have been accepted and signed off as applicable.
- 4.17 When the company is responsible for the installation of a new or used boiler or pressure vessel, the **Foreman** shall inform the Authorized Inspector prior to the system pressure test. The **Foreman** shall complete the TSSA Boiler or Pressure Vessel First Data Report and present it to the Authorized Inspector for signature and date.
- 4.18 For piping systems or piping repairs or alterations, the **Foreman** shall complete and certify the TSSA Piping Systems Installation and Test Data Report and present it to the Authorized Inspector for signature and date.
- 4.19 For repairs or alterations to boilers or pressure vessels, the **Foreman** shall complete and certify the TSSA Report of Repair or Alteration and present it to the Authorized Inspector for signature and date.
- 4.20 Distribution of the Data Reports shall be per Section 10.

- 5.1 A non-conformance is any condition that fails to meet the applicable rules of the Code, Regulation or this Manual. Non-conformances that require special consideration and the Authorized Inspector involvement, shall be documented using the Non-conformance Report (Exhibit #4). Examples of this may include but are not limited to:
- (a) Different materials used other than indicated on the registered design (when requested to maintain in the system),
 - (b) Fittings installed without CRN Registration (when requested to maintain in the system),
 - (c) Inadequate design.
- 5.2 Non-conformances that can be easily rectified prior to the Authorized Inspector involvement are not required to be documented on a Non-Conformance Report (NCR). This does not prohibit the Company from utilizing the NCR as they are required to control the process.
- 5.3 When a non-conforming condition is discovered that cannot be readily corrected, it shall be identified as non-conforming by the **Foreman**. The **Project Manager** shall be informed of all non-conforming conditions.
- 5.4 The **Project Manager** shall be responsible for reviewing the non-conforming condition, and preparing an NCR. This shall be done by entering the description of the non-conformance in Section 1 of the NCR.
- 5.5 The **Project Manager** shall be responsible to enter the recommended disposition in Section 2 of the NCR. No work shall proceed on the item until the disposition has been reviewed and accepted.
- 5.6 The disposition of an NCR shall be described as: Use-as-is, Repair, or Reject.
- 5.7 The **Project Manager** shall be responsible to review and approve the disposition by signing and dating the NCR in Section 2.
- 5.8 The NCR shall then be presented to the Authorized Inspector for acceptance of the disposition by signing and dating Section 2.
- 5.9 Items dispositioned as “Use-As-Is” may require an evaluation by the **Engineer**. When satisfied, the **Engineer** shall sign and date Section 2 of the NCR.
- 5.10 Items dispositioned as “Rejected” may be disposed of without further input from the Authorized Inspector.
- 5.11 The **Project Manager** is responsible to sign and date the NCR in Section 3 when the disposition has been completed.
- 5.12 The NCR shall then be presented to the Authorized Inspector for signature and date in Section 3. When completed, the **Project Manager** shall remove items off hold and all NCR’s shall be placed in the applicable job file. Any NCR’s shall be addressed on the Inspection and Test Checklist.

NOTE: All Non-Conformances must be corrected or eliminated before the repaired or altered item can be considered in compliance with the Code.

WELDING CONTROL

- 6.1 All welding, including tack welding, shall be performed by welders/welding operators qualified to Welding Procedure Specifications (WPS) that have been written and subsequently qualified to ASME Section IX, plus any additional requirements of the applicable Code Sections to which the work is being performed. It is the responsibility of the **Project Manager** to review the welding requirements in the applicable Code to ensure that the construction Codes do not take exception to what is permitted by ASME Section IX.
- 6.2 All documentation and records of qualified welding procedures and personnel shall be maintained by the **Project Manager** and kept on file.

WELDING PROCEDURES AND PERSONNEL QUALIFICATIONS

- 6.3 The **Project Manager** is responsible for developing the welding parameters required by the ASME Code and customer contract and will liaise with the **Foreman** in preparation of the WPS's to be used for production.
- 6.4 WPS's will consider the process to be used, type of material, qualification limits etc., required by the applicable specifications. They will be documented on a WPS sheet which will list the essential, non-essential and where necessary, supplementary essential variables within the process to be used.
- 6.5 Any revisions of the WPS's will be the responsibility of the **Project Manager**. The **Project Manager** will also be responsible for the disposal of voided procedures.
- 6.6 The **Project Manager** will conduct qualification tests for each procedure to be utilized, which will also be witnessed by the Authorized Inspector. The weldments to be tested for qualification of procedures shall be welded either by direct employees or by individuals engaged by contract for their services as welder or welding operator under the full supervision and control of **Company Name**.
- 6.7 All variables, if recorded, shall be the actual variables (including ranges) used during the welding of the test coupon. If variables are not monitored during welding, they shall not be recorded.
- 6.8 It is permissible to subcontract any or all the work of preparation of test metal for welding and subsequent work on preparation of test specimens from the completed weldment, performance of non-destructive examination and mechanical tests, provided that **Company Name** accepts the responsibility for any such work.
- 6.9 When the welding specimen has been accepted, in accordance with the ASME Code requirements, the results will be documented on a Procedure Qualification Record (PQR) by the **Project Manager** who will date and certify this document on behalf of the Company.
- 6.10 Copies of the WPS and PQR will be submitted to the relevant jurisdiction for registration by the **Project Manager**. The **Project Manager** will liaise with the subcontracted test laboratory and keep all the test results on file.
- 6.11 The **Project Manager** will conduct and/or supervise the welder/welding operator performance qualification tests in accordance with the qualified welding procedures. These tests will also be

witnessed by the Authorized Inspector. The welders/welding operators used to produce the test weldments shall be under the full supervision and control of **Company Name** during the production of these test weldments.

- 6.12 The **Project Manager** will be responsible for documenting and certifying the Welder/Welding Operator Certificate on behalf of the company. The Certificate shall be presented to the Authorized Inspector for signature and date.
- 6.13 A welder/welding operator must be requalified when one of the following conditions occurs:
- (a) When they have not welded with a process for 12 months or more, their qualifications for that process shall expire.
 - (b) When there is a specific reason to question their ability to make welds that meet the specification, the qualifications which support the welding they are doing shall be revoked. All other qualifications not questioned remain in effect.
 - (c) All welders/welding operators shall be requalified every 12 months by the TSSA for each WPS they are working with.
 - (d) The Authorized Inspector shall have the right to require requalification of any WPS. The **Project Manager** will make available all documentation and records pertaining to welding for the Authorized Inspector's review.

PRODUCTION WELDING

- 6.14 The **Foreman** shall have control over production welding and will be responsible for:
- (a) Ensuring that all welders are provided with and are qualified to the applicable WPS required for the job and that correct instructions are given in the use of the WPS.
 - (b) Verifying that the copies of the WPS to be used in fabrication are specified on the shop drawings and are available to the welders in the weld area.
- 6.15 All qualified welders/welding operators will be issued with an identification number to be used for stamping adjacent to any welded joints made by them at intervals of not greater than three feet. When this stamping is not feasible, the **Project Manager** shall keep a weld map which will record the welders used on each joint.
- 6.16 A log of the welder numbers will be maintained by the **Project Manager**. Should a welder/welding operators employment be terminated, their identification number will not be re-used for a period of twelve months minimum.
- 6.17 Tack welding will only be performed by qualified welders to qualified welding procedures. Tack welds shall be removed or properly prepared for inclusion in the final weld. They will be visually inspected for cracks by the welder/welding operator prior to welding and if found defective, will be completely removed.

CLEANING OF SURFACES TO BE WELDED

- 6.18 The surfaces to be welded shall be clean and free of scale, rust, oil, grease, slag, detrimental oxides and other deleterious foreign material. The method and extent of cleaning should be determined based on the material to be welded and the contaminant to be removed. When weld metal is to be deposited over a previously welded surface, all slag shall be removed by a roughing tool, chisel, chipping hammer or other suitable means to prevent inclusion of impurities in the weld metal.

- 6.19 Cast surfaces to be welded shall be machined, chipped, or ground to remove foundry scale and to expose sound metal.

REPAIR OF WELD DEFECTS

- 6.20 Defects such as cracks, pinholes and incomplete fusion, detected visually or during the hydrostatic or pneumatic test or by the examinations required by the Code of construction, shall be removed by mechanical means or by thermal gouging processes, after which the joint shall be rewelded.

WELDING MATERIAL

- 6.21 The **Foreman** is responsible for systematically checking welding material in storage and in use for proper handling, application, protection and distribution. Welding material will be stored in designated clean, dry areas and stainless-steel material will be separated from carbon steel material.
- 6.22 Bare rods and welding wire will be kept in individual containers according to size and type and these containers will be properly marked for identification. Flux material will be stored in individually identified bins in a clean dry storage area.
- 6.23 Low hydrogen electrodes will be purchased, received and stored in hermetically sealed containers. When the containers are opened the electrodes will immediately be placed in a heated holding oven. This oven will be maintained at a temperature recommended by the electrode manufacturer.
- 6.24 The **Foreman** will control the issue and return of low hydrogen electrodes. Low hydrogen electrodes will be issued only in sufficient quantity to complete a weld or for a four-hour period, whichever is less, after which unconsumed electrodes will be examined by the **Foreman** for condition, cleanliness and identification prior to returning them to the heated holding oven.
- 6.25 Damaged electrodes will be scrapped, and a bin will be provided in the weld area for rod end disposal.
- 6.26 Welding gases will be subjected to the same control as other welding materials and the **Foreman** will ensure that welding gas cylinders and supply piping are properly identified before use.

BRAZING CONTROL

- 6.27 All Brazing shall be performed by Brazer/Brazing Operators qualified to Brazing Procedure Specifications (BPS) that have been written and subsequently qualified to Section IX of the ASME Code, plus any additional requirements of the applicable Code section to which the work is being performed. It is the responsibility of the **Project Manager** to review the Brazing requirements in the applicable Codes of construction to ensure that the construction Codes does not take exception to what is permitted by ASME Section IX.
- 6.28 All documentation and records of BPS's and personnel shall be maintained by the **Project Manager** and kept on file.

BRAZING PROCEDURES AND PERSONNEL QUALIFICATIONS

- 6.29 The **Project Manager** is responsible for developing the brazing parameters required by the ASME Code and customer contract and will liaise with the **Foreman** in preparation of the BPS's to be used for production.
- 6.30 BPS's will consider the process to be used, type of material, qualification limits etc., required by the applicable specifications. They will be documented on a BPS sheet which will list the essential, non-essential and where necessary, supplementary essential variables within the process to be used.
- 6.31 Any revisions and/or updating of brazing procedures will be the responsibility of the **Project Manager** and will be responsible for the disposal of voided procedures.
- 6.32 The **Project Manager** will conduct qualification tests for each procedure to be utilized, which will also be witnessed by the Authorized Inspector. The brazed specimen to be tested for qualification of procedures shall be brazed either by direct employees or by individuals engaged by contract for their services as brazers/brazing operators under the full supervision and control of **Company Name**.
- 6.33 All variables, if recorded, shall be the actual variables (including ranges) used during the brazing of the test coupon. If variables are not monitored during brazing, they shall not be recorded.
- 6.34 It is permissible to subcontract any or all the work of preparation of test material for brazing and subsequent work on preparation of test specimens from the completed brazed specimen, performance of non-destructive examination and mechanical tests provided that **Company Name** accepts the responsibility for any such work.
- 6.35 When the brazing specimen has been accepted, in accordance with the ASME Code requirements, the results will be documented on a Procedure Qualification Record (PQR) by the **Project Manager** who will date and certify this document on behalf of the Company.
- 6.36 Copies of the BPS and PQR will be submitted to the relevant jurisdiction for registration by the **Project Manager**. The **Project Manager** will liaise with the subcontracted test laboratory and keep all the test results on file.
- 6.37 The **Foreman** will conduct and/or supervise the brazer performance qualification tests in accordance with qualified brazing procedures. These tests will also be witnessed by the Authorized Inspector. The brazers/brazing operators used to produce test coupons shall be under the full supervision and control of **Company Name** during the production of these test coupons.
- 6.38 The **Project Manager** will be responsible for documenting and certifying the Brazer/Brazer Operator Certificate on behalf of the company. The Certificate shall be presented to the Authorized Inspector for signature and date.
- 6.39 **For refrigeration brazers only: A Brazer Record Log (Exhibit #5) shall be maintained by the Foreman which will list the process(es) for which each brazer is qualified. This will be recorded at least every six months as evidence that the brazer has maintained their qualifications on each process as per Section 14.**

- 6.40 All other brazer/brazing operators shall be retested annually.
- 6.41 All brazers/brazing operators must be requalified when one of the following conditions occurs:
- (a) When they have not brazed with a process for 12 months or more, their qualifications for that process shall expire.
 - (b) When there is a specific reason to question their ability to braze that meet the specification, the qualifications which support the brazing they are doing shall be revoked. All other qualifications not questioned remain in effect.
 - (c) All brazers/brazing operators shall be requalified every 12 months by the TSSA for each BPS they are working with.
 - (d) The Authorized Inspector shall have the right to require requalification of any BPS. The **Project Manager** will make available all documentation and records pertaining to welding for the Authorized Inspector's review.

PRODUCTION BRAZING

- 6.42 The **Foreman** shall have control over production brazing and will be responsible for:
- (a) Ensuring that all brazers are provided with and are qualified to the applicable BPS required for the job and that correct instructions are given in the use of the BPS.
 - (b) Verifying that the copies of the BPS to be used in fabrication are specified on the shop drawings and are available to the brazers in the brazing area.
- 6.43 All qualified brazers/brazing operators will be issued with an identification number to be used for stamping adjacent to any brazed joints made by them at intervals of not greater than three feet. When this stamping is not feasible, the **Foreman** shall keep a brazing map which will record the brazers used on each particular joint.
- 6.44 A log of the brazer numbers will be maintained by the **Project Manager**. Should a brazer/brazing operators employment be terminated, their identification number will not be re-used for a period of twelve months minimum.

CLEANING OF SURFACES TO BE BRAZED

- 6.45 The surfaces to be brazed shall be clean and free of scale, rust, oil, grease, slag, detrimental oxides and other deleterious foreign material. The method and extent of cleaning should be determined based on the material to be brazed and the contaminant to be removed.

BRAZING MATERIAL

- 6.46 The **Project Manager** is responsible for systematically checking brazing material in storage and in use for proper handling, application, protection and distribution.
- 6.47 Brazing rod will be kept in individual containers according to size and type and these containers will be properly marked for identification.
- 6.48 Brazing gases will be subjected to the same control as other brazing materials and the **Foreman** will ensure that the brazing gas cylinders and supply piping are properly identified before use.

SOLDERING

- 6.49 Soldered joints are not permitted for new construction or repairs of refrigeration pressure piping systems subject to the requirements of the CSA B52 Mechanical Refrigeration Piping Code.

WELDING/BRAZING SUB-CONTRACTORS

- 6.50 When welding or brazing is sub-contracted, the **Project Manager** shall ensure the sub-contractor provides all required paperwork for the welding/brazing to be performed.
- 6.51 If at any time welding or brazing is required by a sub-contractor, only acceptable TSSA Certificate of Authorization holders will be sub-contracted to provide the welding or brazing service. The welding/brazing organization shall complete and supply the following:
- (a) Sub-contractor contacts TSSA Inspector, informing them of the job;
 - (b) Sub-contractor reviews design and verifies materials;
 - (c) Sub-contractor completes the paperwork as required by their quality program;
 - (d) Sub-contractor forwards a copy of the following as required:
 - i. Inspection and Test Checklist or Test Plan
 - ii. Copy of WPS or BPS
 - iii. Copy of PQR
 - iv. Copy of Welder/Brazer Certifications
 - v. NDE Reports (if applicable)
 - vi. PWHT Reports (if applicable)
 - vii. Piping Systems Installation and Test Data Report for portion of work.

BONDING OF NON-METALLIC JOINTS

- 6.52 Bonding of non-metallic joints shall be performed in accordance with the applicable code of construction. Bonding procedure specifications, procedures qualifications and performance qualifications shall be established and approved by the **Project Manager** and submitted to the Authorized Inspector for acceptance.

- 7.1 All non-destructive examinations (NDE) and procedures will be made in accordance with ASME Section V and the requirements of the applicable Code section to which the work is being performed. The responsibility for determining NDE requirements rests with the **Project Manager**. The NDE service performed for the Company shall be by an approved sub-contractor employing a qualified Level III CGSB Examiner.
- 7.2 The **Project Manager** will review the qualification records of the sub-contractor and ensure that the Level III Examiner and personnel supervised by him are properly qualified and certified in accordance with CGSB requirements.
- 7.3 The sub-contractor's Level III shall be responsible for the preparation of any required written NDE procedures.
- 7.4 A documented record of qualification levels, training, examinations and past experience shall be maintained by the Subcontractor for each NDE technician employed by the sub-contractor performing ASME Code NDE examinations for the Company. Calibration records of NDE equipment shall be maintained by the subcontractor and made available to the **Project Manager** or Authorized Inspector when requested.
- 7.5 All NDE procedures shall be demonstrated as being capable of producing meaningful results to the satisfaction of the Authorized Inspector. The sub-contractor's written procedures and all personnel qualification records will be made available to the Authorized Inspector for review. The Authorized Inspector has the right to request re-demonstration of any NDE procedures or personnel for just cause.
- 7.6 All radiographs shall be interpreted by a Level II or III Examiner before presenting the film and Radiography Report to the **Project Manager**, who will review and accept these reports and any other NDE reports (Ultrasonic, Liquid Penetrant, Magnetic Particle, or Visual Inspection), on behalf of the Company. All NDE reports shall be signed and dated by the **Project Manager** prior to presenting them to the Authorized Inspector for review and acceptance. All NDE Reports shall be retained in accordance with the applicable Code.
- 7.7 All visual weld examinations required by the applicable ASME Code shall be by a member of **Company Name**, appointed by the **Project Manager**.
- 7.8 The **Project Manager** shall be responsible for certifying a Visual Examination Procedure in accordance with ASME Section V Article 9 and Personnel that meets the requirements of **ASME B31.1 Visual Examination** as a minimum.
- 7.9 The **Project Manager** shall be responsible to appoint visual examiners and review their qualifications on an annual basis. This shall be recorded on a Visual Personnel Certification Record (Exhibit #6).
- 7.10 Weld examination interpretation shall be accordance with the applicable Code of construction.
- 7.11 Visual weld examination may be sub-contracted to a qualified company employing an SNT-1C-1A Visual Weld Examiner or CWB Level 1 Weld Examiner. Results of visual weld examination shall be documented on a visual inspection report by the sub-contractor. This report shall be reviewed and accepted by the **Project Manager** and included in the job file.

- 8.1 The **Project Manager** shall be responsible to ensure Post Weld Heat Treatment (PWHT) is completed as required by the Code and engineering design.
- 8.2 The **Project Manager** is responsible to review and accept any procedures regarding PWHT, including proper placement of thermocouples.
- 8.3 The **Project Manager** shall review the calibration records from the PWHT Facility/ Contractor.
- 8.4 All time/temperature charts or chronological temperature lists will be required. These shall be reviewed and accepted by the **Project Manager** to ensure conformance to written procedures and applicable ASME Code section requirements.
- 8.5 All documentation shall be made available to the Authorized Inspector for review and acceptance.

- 9.1 Examination, Measuring and Test equipment not required to be calibrated, such as linear scales, steel tapes, rules, squares, levels, etc. used for non-precision measurement or layout, will be examined at regular intervals by the **Project Manager** who will be responsible for ensuring that they are kept in good condition. Any such equipment found worn or damaged will be replaced.
- 9.2 Examination, Measuring and Test equipment, including pressure gauges, requiring calibration shall be under the control of the **Project Manager** who shall be responsible for:
- (a) Ensuring that all items are maintained in good condition and checked for signs of damage before use.
 - (b) Removal from service of any such equipment found to be defective or suspected to be so.
 - (c) Ensuring only equipment currently in calibration is used.
 - (d) Performing, or arranging for, calibration of measuring and test equipment, the results of which shall be traceable to National Standards (NIST).
 - (e) Establishing and maintaining a calibration frequency schedule for the type of equipment and its corresponding amount of use.
- 9.3 All calibrated items shall be permanently identified with an identification or serial number and shall have a label or sticker affixed, showing the identification or serial number, date calibrated and due calibration date.
- 9.4 The **Project Manager** will maintain a Record of Calibration for each piece of measuring and test equipment showing:
- (a) Type of equipment
 - (b) Identification and serial numbers
 - (c) Calibration frequency
 - (d) Check method and tolerance
 - (e) Date of calibration and next due date
 - (f) Result of calibration and person or organization performing the calibration
- 9.5 Pressure gauges shall be sent to a calibration facility for calibration or purchased new with calibration certification. All calibration records shall be traceable to National Standards. All Calibration Reports shall be maintained by the **Project Manager** and made available to the AI for review.
- 9.6 Pressure test gauges shall be calibrated every year, when error is suspected, or prior to planned pressure test. **Alternatively, two gauges may be used as described in Section 4.**
- 9.7 Parts checked since the previous calibration with equipment found to be in error, or out of calibration, shall be considered unacceptable until it can be determined that all requirements have been met.
- 9.8 Examination, Measuring and testing equipment found defective will be immediately withdrawn from service by the **Project Manager** and tagged as such, until it has been repaired or replaced in accordance with this section.
- 9.9 All measuring and test equipment records will be kept on file and maintained by the **Project Manager** who will make these records available for review by the Authorized Inspector.

- 10.1 All records and documentation accumulated during the course of a job will be the responsibility of the **Project Manager** and will be maintained for all manufactured parts as required by the applicable ASME Code and customer contract.
- 10.2 These records will be made available to the Authorized Inspector for review and analysis prior to certification of the TSSA Data Report
- 10.3 Distribution of TSSA Data Reports shall be as follows:
- Original to TSSA
 - Copy to Owner/Client
 - Copy to Job File
- 10.4 NDE examination reports, data reports and job file documentation shall be retained for the period of time required by the applicable Code of construction.
- 10.5 The following documents shall be maintained for a minimum of 3 years, and made available for each tri-annual TSSA audit:
- (a) Piping Systems Installation and Test Data Report **or Report of Repair or Alteration**
 - (b) Manufacturer's Partial Data Reports
 - (c) Inspection and Test Checklist
 - (d) Registered Design Drawings
 - (e) Welding/Brazing Procedure Specification
 - (f) Procedure Qualification Record
 - (g) Welder/Brazer Qualification
 - (h) Material Test Reports/Material Certification
 - (i) Statutory Declarations/Proof of CRN Registered Fittings
 - (j) Proof of material receiving & inspection
 - (k) NDE Reports (if applicable)
 - (l) Heat Treatment Reports (if applicable)
 - (m) Non-Conformance Reports (if applicable)
 - (n) **Copy or photograph of repair or alteration nameplate (if applicable)**

- 11.1 The Authorized Inspector (AI) is a representative of the Authorized Inspection Agency and carries out inspections on all Code items built by the Company.
- 11.2 The Authorized Inspection Agency in Ontario is The Technical Standards and Safety Authority, Boilers and Pressure Vessels Safety Program.
- 11.3 For repairs of boilers and pressure vessels that are insured, the inspection may be performed by an Inspector from the Insurance Company who holds a Certificate of Competency or by a TSSA Inspector.
- 11.4 The AI shall have been qualified by written examination under the rules of any state in the USA or any Province of Canada which has adopted the ASME Boiler and Pressure Vessel Code.
- 11.5 A current copy of this Quality Control Manual shall be provided to the AI for use at the plant or field site.
- 11.6 The **Project Manager** shall be responsible for liaison with the AI and will furnish all drawings, calculations, specifications, checklists, repair procedures, records and any other documentation required by the AI.
- 11.7 Prior to commencement of fabrication, **repair or alteration** the AI shall be given the opportunity to designate mandatory hold points and to also designate additional hold points at any time.
- 11.8 The AI and Authorized Inspector Supervisor (AIS) shall have free access to such parts of all plants as are concerned with the supply or manufacture of material when requested. The AI and AIS shall be permitted access while work is being performed, to all parts of the manufacturing plant that concern the construction of the items and to the site.
- 11.9 The AI shall be kept informed of work progress and shall be given reasonable notice, by the **Foreman** of upcoming inspection hold points or tests.
- 11.10 The AI will be informed of all nonconformities and the **Project Manager** shall obtain the AI's concurrence prior to corrective action being implemented.
- 11.11 Prior to any repairs made by welding to pressure retaining material, **including those for boilers where the customer's agreement is required**, the concurrence of the AI must be obtained for the proposed method of repair.
- 11.12 The AI has the right to request requalification of any welder, welding operator, re-demonstrations of NDE procedure, and has the right to make any inspections the AI feels are necessary, to certify that all piping, repairs or alterations are in strict compliance with the applicable ASME Code requirements.
- 11.11 The **Project Manager** will provide assistance to the AI during the required inspection surveillance monitoring of the Quality Control system, and to the AIS or TSSA Representative during audits.

PIPING REPAIRS

- 12.1 Mechanically assembled like for like repairs per TSSA Safety Bulletin SB 05-01 may be completed as required.
- 12.2 Welded or brazed like for like replacement shall be as followed:
- (a) All requirements of this manual shall be followed by when carrying out like for like repairs.
 - (b) The **Project Manager** is responsible for the preparation of the repair procedure and the selection of techniques to be used (i.e. selection of proper welding procedure specification, materials required, NDE methods, etc.).
 - (c) The Repair procedure and the method used shall be presented to the Authorized Inspector by the **Project Manager** for acceptance prior to commencing the work.
 - (d) A Piping Inspection and Test Checklist (Exhibit #3a) will be prepared for each repair and presented to the Authorized Inspector for the insertion of hold points as detailed in Section 4 of this manual.
 - (e) Pressure testing will be in accordance with the applicable Code and Section 4 of this manual.
 - (f) Upon completion of a piping repair or alteration, the **Project Manager** shall prepare and certify the TSSA Piping Systems Installation and Test Data Report and submit it to the Authorized Inspector for review and signature.

BOILERS AND PRESSURE VESSELS

- 12.3 All requirements of this Manual shall be followed when carrying out repairs or alterations in accordance with TSSA and the National Board Inspection Code requirements.
- 12.4 The **Project Manager** is responsible for the preparation of the repair or alteration procedure and the selection of techniques to be used:
- (a) Selection of proper welding procedure specification,
 - (b) Section of appropriate materials required,
 - (c) NDE methods,
 - (d) Preheat requirement,
 - (e) Post weld heat treatment.
- 12.5 The **Project Manager** shall obtain a copy of the original Manufacturer's Data Report (if available) for use in the design of the repair or alteration. When the original Manufacturer's Data Report is not available, agreement of the method of the repair or alteration shall be obtained by the Authorized Inspector.
- 12.6 The repair or alteration procedure shall be presented to the Authorized Inspector for acceptance prior to commencing the work.
- 12.7 For alterations to boilers or pressure vessels, calculations by a professional engineer may be required to support the change as required by the TSSA Boilers and Pressure Vessel regulation. The **Project Manager** shall obtain and approve all required calculations and submit to TSSA for registration of the alteration.
- 12.8 Welded and non-welded boiler tube replacements are treated as repairs and require inspection.

- 12.9 The materials used in making repairs or alterations shall conform insofar as possible to the original Code of Construction. Carbon or alloy steel having a carbon content of more than 0.35% shall not be welded unless permitted by the original Code of Construction. The **Project Manager** is responsible for verifying identification of existing materials from the original Manufacturer's Data Report. Consideration shall be given to the condition of the existing material, especially in the weld preparation area. If the existing material cannot be verified (unknown), the **Project Manager** shall perform a chemical analysis and hardness testing, as a minimum, of the unknown material to verify its weldability and strength or may elect to qualify a weld procedure. If there is a question with regard to the weldability characteristics of the material, then competent technical advice should be obtained.
- 12.10 A Repair/Alteration Inspection and Test Checklist (Exhibit #3b) will be prepared for each repair and presented to the Authorized Inspector for the insertion of hold points as detailed in Section 4 of this manual.
- 12.11 Pressure tests will be carried out in accordance with the National Board Inspection Code and Section 4 of this manual.
- 12.12 Upon completion of a repair or alteration, the **Project Manager** shall prepare and certify the TSSA Report of Repair or Alteration and submit it to the Authorized Inspector for review and signature.
- 12.13 Distribution of the completed forms will be in accordance with Section 10 of this manual.
- 12.14 The applicable nameplate (Exhibit #7) shall be permanently attached to the boiler or pressure vessel as close as possible to the original nameplate, or at a location agreed up by the **Project Manager** and the AI. An alteration or re-rating nameplate is required for all alterations or re-ratings to a boiler or pressure vessel. The need for a repair nameplate shall be determined by the AI.

- 13.1 All requirements of this manual shall apply, in addition to this section which details the methods used by **Company Name** for field assembly of piping systems controlled from **Company Address**.
- 13.2 The **Foreman** is responsible for all quality control activities on the field site.
- 13.3 The **Foreman** is responsible for assembly, welding and any other construction activities on the field site.
- 13.4 The Inspection and Test Checklist (Exhibit #3a) will be prepared by the **Foreman** and submitted to the field site Authorized Inspector for review and insertion of hold points prior to the field site work commencing.
- 13.5 Receiving inspection at the field site will be carried out in accordance with Section 3 of this manual and all documentation will be made available to the field site Authorized Inspector.
- 13.6 Welded parts that are shop fabricated and shipped to the field site require the applicable marking and completed partial data reports signed by the manufacturing shop Authorized Inspector. The marking and partial data reports will be used as the basis for acceptance of welded parts by the field site Authorized Inspector.
- 13.7 The **Foreman** is responsible for preparing and certifying the Piping Systems Installation and Test Data Report.
- 13.8 The **Foreman** shall submit the Piping Systems Installation and Test Data Report to the field site Authorized Inspector for review and signature.
- 13.9 The **Foreman** shall collect all required records and return them to the **Project Manager** in accordance with Section 10 of this manual.

PRESSURE TESTING

- 14.1 A pressure test and leak test of refrigerant pressure piping shall be conducted as follows:
- (a) Piping shall be examined before the pressure is applied to ensure that it is tightly connected.
 - (b) All items not subject to the pressure test shall be disconnected or isolated by valves, blanks or other suitable means.
 - (c) The company shall take measures to protect personnel from the potential rupture of piping components during pneumatic testing of systems.
 - (d) The means used to build up the test pressure shall have either a pressure limiting device or a pressure reducing device and a pressure relief device and gauge on the outlet side.
 - (e) The pressure relief device shall be set above the test pressure but low enough to prevent permanent distortion of any of the piping system components.
 - (f) Testing of refrigeration pressure piping shall be performed with dry nitrogen or another non-flammable gas.
 - (g) The high and low sides of each system shall be tested and proven tight at not less than the pressure specified on the registered drawing.
 - (h) For large systems that are not completely visible to the testing operator, the pressure in the system should be gradually increased to one-half of the test pressure, after which the pressure shall be increased in steps of approximately one-tenth of the test pressure until the required test pressure has been reached.
 - (i) The pressure test shall be continuously maintained for at least two (2) hours.
- 14.2 After the pressure test is completed, a leak test shall be performed as follows:
- (a) The test pressure for the leak test shall be the lesser of the design pressure or the safety valve set pressure for the leak test.
 - (b) Examination for leaks shall be by the soap suds test or electronic leak detection or by other methods of equal sensitivity.
 - (c) Examination shall be made of all joints and connections.
 - (d) The piping system shall show no evidence of leaking.
 - (e) Refrigerant vapour detection methods shall be used when refrigerant is used as the testing medium. Environmental regulations shall be complied with when testing with refrigerants.

BRAZING CONTROL

- 14.3 The Brazers Log shall be used to maintain brazers qualification in the following manner:
- (a) The **Project Manager** is responsible to confirm that each Brazer has used the brazing process at least once every 6 months.
 - (b) If a brazer has used the brazing process within each 6-month period, the **Project Manager** shall document this by initialling and dating the Brazers Log in the appropriate column.
 - (c) Renewal of a brazer performance qualification for refrigeration pressure piping is required when one of the following conditions occurs:
 - i. When there is a specific reason to question the brazers ability to make brazed joints that meet the specification, or
 - ii. When the Brazer has not used the brazing process within a 6-month period.
 - (b) Renewal of a brazer performance qualification for other than refrigeration piping shall be requalified every 12 months.

- 14.4 The surfaces to be brazed shall be clean and free of grease, oxides, paint, scale and dirt of any kind. Any suitable chemical or mechanical method of cleaning may be used to provide a clean wettable surface for brazing.
- 14.5 All leaking joints shall be repaired. Brazed joints may be repaired by cleaning the exposed area, re-fluxing and re-brazing.
- 14.6 Soldered joints are not permitted for new construction or repairs of refrigeration pressure piping systems regulated by TSSA.

BRAZED REFRIGERATION REPAIRS

- 14.7 The **Project Manager** is responsible to ensure that all requirements of this manual are followed by the company when carrying out repairs to refrigeration pressure piping systems.
- 14.8 The company shall also comply with all other legislated requirements, including trade qualifications for the province of Ontario when performing repairs to refrigeration piping.
- 14.9 Repairs to refrigeration piping shall be done in accordance with the following:
- (a) The original code of construction,
 - (b) The original standard, or
 - (c) To a code, standard or specification most applicable to the work being completed.
- 14.10 Companies performing repairs to refrigeration piping systems with a capacity over 3 tons (11kW) refrigeration capacity or 5 tons Air Conditioning are required to have a TSSA Certificate of Authorization.
- 14.11 The company may perform self-inspection of brazed repairs to refrigeration pressure piping systems provided all of the following requirements are complied with:
- (a) The company shall be in possession of a valid TSSA Certificate of Authorization.
 - (b) The company shall follow the requirements of this manual.
 - (c) The company shall document the repair on a Refrigeration Piping Repair Report (Exhibit #8) for each repair which shall include the following information:
 - i. Date,
 - ii. Equipment owner name and address,
 - iii. Type of refrigeration system & capacity,
 - iv. Brazer ID (for brazed repairs),
 - v. Repair details,
 - vi. Leak test pressure and results,
 - vii. Refrigeration Technicians signature and date.
- 14.12 Each repair performed to a refrigeration pressure piping system regulated by TSSA that does not comply with all of the above requirements shall be subject to inspection and acceptance by a TSSA Inspector.
- 14.13 The Company shall ensure that repair records are kept on file for at least three (3) years minimum and shall be made available to the TSSA Representative upon request.

- 14.14 A leak test shall be performed after each repair of a refrigeration pressure piping system and shall include, but not be limited to the following:
- (a) All leaks shall be repaired, and the system shall be re-tested after all repairs are completed.
 - (b) The test pressure used for the leak test shall be one the following:
 - i. The safety valve set pressure,
 - ii. The manufacturers recommended test pressure, or
 - iii. As per a Code, standard or specification most applicable to the work.
 - (c) Ozone depleting substances shall not be used as trace gases.
 - (d) Environmental regulations shall be complied with when testing with refrigerants.
 - (e) If a leak is found, the system should be evacuated and repaired prior to topping up the refrigerant charge.
 - (f) Leak detection methods include, but are not limited to:
 - i. Bubble testing with soap suds solution,
 - ii. Electronic leak detection, or
 - iii. Fluorescent dye

EXHIBITS

Section 15
Rev 0

| EXHIBIT | TITLE | REVISION |
|---------|---|----------|
| 1a | Purchase Order | 0 |
| 1b | Material List | 0 |
| 2 | Hold Tag | 0 |
| 3a | Piping Inspection and Test Checklist | 0 |
| 3b | Repair/Alteration Inspection and Test Checklist | 0 |
| 4 | Non-Conformance Report | 0 |
| 5 | Brazer Record Log | 0 |
| 6 | Visual Personnel Certification Record | 0 |
| 7 | Nameplates | 0 |
| 8 | Refrigeration Piping Repair Report | 0 |

PURCHASE ORDER

EXHIBIT 1a
Rev 0

Attach a sample Purchase Order

HOLD TAG

EXHIBIT 2
Rev 0

HOLD

Reason for Hold:

| |
|--|
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| |
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| |
| |
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| |

Company Name

PIPING INSPECTION AND TEST CHECKLIST

EXHIBIT 3a
Rev 0

Company Logo and/or Company name

| | | | |
|---|---|-------------------------------------|--------------------------------------|
| Job Number: | | CRN P#: | |
| <input type="checkbox"/> ASME B31.1 | <input type="checkbox"/> ASME B31.3 Cat _____ | <input type="checkbox"/> ASME B31.5 | <input type="checkbox"/> CSA Z7396.1 |
| H = Hold Point V = Verification Point W = Witness Point | | Company Initial and Date | H, V or W |
| AI Initial and Date | | | |
| Drawings reviewed prior to production | | | |
| Materials accepted and inspected | | | |
| Customer supplied material accepted and inspected | | | |
| Fitting CRN registrations verified | | | |
| WPS/BPS verified | | | |
| Welder/Brazer qualifications verified | | | |
| NDE completed and reports accepted | | | |
| PWHT complete and reports accepted | | | |
| Supports visually inspected and accepted | | | |
| Visual welding examination completed and accepted | | | |
| Preliminary pneumatic test completed and accepted | | | |
| Pressure test completed and accepted | | | |
| Leak test completed and accepted | | | |
| Non-Conformances completed and accepted | | | |
| Data report completed and accepted | | | |

To be completed when acceptable to the Authorized Inspector:

| Client Pressure Test Witness | | | |
|------------------------------|--|---------------|--|
| Name: | | Organization: | |
| Title: | | Date: | |
| Signature: | | | |

REPAIR/ALTERATION INSPECTION AND TEST CHECKLIST

EXHIBIT 3b
Rev 0

Company Logo and/or Company name

| | | | |
|---|---|--|---------------------|
| Job Number: | CRN #: | 5AN #: | |
| <input type="checkbox"/> Repair | | <input type="checkbox"/> Alteration | |
| <input type="checkbox"/> ASME Section VIII-1 | <input type="checkbox"/> ASME Section I | <input type="checkbox"/> ASME Section IV | |
| H = Hold Point V = Verification Point W = Witness Point | Company Initial and Date | H, V or W | AI Initial and Date |
| Drawings reviewed prior to production | | | |
| Materials accepted and inspected | | | |
| Customer supplied material accepted and inspected | | | |
| Fitting CRN registrations verified | | | |
| WPS/BPS verified | | | |
| Welder/Brazer qualifications verified | | | |
| NDE completed and reports accepted | | | |
| PWHT completed and reports accepted | | | |
| Pressure test completed and accepted | | | |
| Leak test completed and accepted | | | |
| Non-Conformance Reports completed and accepted | | | |
| Nameplate stamping and attachment verified and accepted | | | |
| Data report completed and accepted | | | |

NON-CONFORMANCE REPORT

EXHIBIT 4
Rev 0

Company Logo and/or Company name

| | | |
|-----------|-------|---------|
| Report #: | Date: | Item #: |
|-----------|-------|---------|

(1) Description of Non-Conformance:

| |
|--|
| |
|--|

(2) Recommended Disposition:

| | | | |
|------------------------------------|---------------------------------|---------------------------------|--------------------------------|
| <input type="checkbox"/> Use-As-Is | <input type="checkbox"/> Repair | <input type="checkbox"/> Reject | <input type="checkbox"/> Other |
|------------------------------------|---------------------------------|---------------------------------|--------------------------------|

| |
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Disposition Approved By:

| | |
|--|-------------|
| Project Manager: _____ (Signature) | Date: _____ |
|--|-------------|

| | |
|---|-------------|
| Authorized Inspector: _____ (Signature) | Date: _____ |
|---|-------------|

| | |
|------------------------------------|-------------|
| Other: _____ (Signature) | Date: _____ |
|------------------------------------|-------------|

(3) Disposition Completed:

| | |
|--|-------------|
| Project Manager: _____ (Signature) | Date: _____ |
|--|-------------|

| | |
|---|-------------|
| Authorized Inspector: _____ (Signature) | Date: _____ |
|---|-------------|

| | |
|------------------------------------|-------------|
| Other: _____ (Signature) | Date: _____ |
|------------------------------------|-------------|

Notes:

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Company Logo and/or Company name

Employee Name

Has been appointed as a Visual Examiner for **Company Name** and meets the Visual Examiner requirements of ASME B31.1

and

Meets the Visual Acuity requirements of ASME Section V Article 9, for J1 lettering.

Appointed by: Name Title: President

Signature: _____ Date: _____

Annual Renewal

To be signed by the **President** to verify continued proficiency

| 2019 | 2020 | 2021 | 2022 | 2023 |
|--|--|--|--|--|
| Acceptable <input type="checkbox"/> | Acceptable <input type="checkbox"/> | Acceptable <input type="checkbox"/> | Acceptable <input type="checkbox"/> | Acceptable <input type="checkbox"/> |
| Not Acceptable <input type="checkbox"/> | Not Acceptable <input type="checkbox"/> | Not Acceptable <input type="checkbox"/> | Not Acceptable <input type="checkbox"/> | Not Acceptable <input type="checkbox"/> |
| Sign _____ | Sign _____ | Sign _____ | Sign _____ | Sign _____ |
| Date: _____ | Date: _____ | Date: _____ | Date: _____ | Date: _____ |
| Visual Acuity | Visual Acuity | Visual Acuity | Visual Acuity | Visual Acuity |
| J1 Corrected <input type="checkbox"/> | J1 Corrected <input type="checkbox"/> | J1 Corrected <input type="checkbox"/> | J1 Corrected <input type="checkbox"/> | J1 Corrected <input type="checkbox"/> |
| J1 Un-corrected <input type="checkbox"/> | J1 Un-corrected <input type="checkbox"/> | J1 Un-corrected <input type="checkbox"/> | J1 Un-corrected <input type="checkbox"/> | J1 Un-corrected <input type="checkbox"/> |

Note: All Lettering to be minimum 5/32" in height

| | |
|----------------------------|---------------------------------|
| <input type="text"/> | |
| ALTERED BY | |
| MAWP <input type="text"/> | PSI AT <input type="text"/> ° F |
| *MDMT <input type="text"/> | PSI AT <input type="text"/> ° F |
| CRN NUMBER | <input type="text"/> |
| DATE <input type="text"/> | TSSA QA# <input type="text"/> |

* when applicable

| | |
|----------------------|----------------------|
| <input type="text"/> | |
| REPAIRED BY | |
| <input type="text"/> | <input type="text"/> |
| DATE | TSSA QA# |

REFRIGERATION PIPING REPAIR REPORT

EXHIBIT 8
Rev 0

| | |
|--|---|
| <p><i>Company Logo and/or Company name</i></p> | <p>TSSA Certificate of Authorization Number QA-00000</p> |
| <p>Location of Installation:</p> | <p>Date:</p> |
| <p>Equipment (type & capacity):</p> | <p>Refrigerant:</p> |

| Description of Repair: | | | |
|---|------------|--|-------------------------------------|
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| <p>Leak Test Pressure:</p> | <p>psi</p> | <p>Leak Test Results Acceptable ?</p> | <p><input type="checkbox"/> Yes</p> |
| <p> </p> | <p> </p> | <p> </p> | <p><input type="checkbox"/> No</p> |
| | | | |
| <p>Technician name (print, sign & date):</p> | | | <p>Brazer ID Number:</p> |