1.0 Purpose

The purpose of this specification is to define the NRG requirements for purchasing code instrument tubing, welded and compression fittings.

2.0 Scope

2.1 This specification shall apply to the purchase of all stock and non-stock instrument tubing, welded and compression and fittings.

2.2 This specification permits the purchase of either Swagelok Corporation or Parker Hannifin Corporation products. It is up to each NRG station to standardize on a manufacturer.

3.0 Definitions

3.1 ASME – American Society of Mechanical Engineers

3.2 ASTM - American Society for Testing and Materials

3.3 ISO – International Organization for Standardization

3.4 NRG – NRG Energy Inc.

3.5 Manufacturer – The organization making the instrument tubing, welded or compression fittings

3.7 Supplier – The organization providing the instrument tubing, welded or compression fittings

4.0 References

4.1 ASME B31.1, “Power Piping”

4.2 ASME B16.22, “Wrought Copper and Copper Alloy Solder Joint Pressure Fittings”

4.3 ASTM A182, “Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service”

4.4 ASTM A213, “Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat Exchanger Tubes”

4.5 ASTM A276, “Specification for Stainless Steel Bars and Shapes”

4.6 ASTM A450, “Specification for General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes”

4.7 ASTM A479, “Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels”

4.8 ASTM B68, “Standard Specification for Seamless Copper Tube, Bright Annealed”

4.9 ASTM F1387, “Standard Specification for Performance of Piping and Tubing Mechanically Attached Fittings”

The latest edition of the above codes and specifications shall apply. In the event of conflicts between this specification and the references cited above, the Supplier shall notify NRG, who will make the final judgment and interpretation.

5.0 Responsibility

5.1 The Supplier shall be responsible for fulfilling the requirements as set forth in this specification. Exceptions to and deviations from this specification shall be clearly delineated in the Supplier’s bid for disposition by NRG.

5.2 The Supplier shall provide certified material test reports (CMTRs) for all instrument tubing. All CMTRs shall report chemical and mechanical test data as required. CMTRs shall be in English units or if in another language with conversions to English units.

5.3 The Manufacturer shall have a Quality Program currently certified to ISO 9001.

5.4 If the Supplier is not the Manufacturer, the Supplier must have a formal program for qualifying their manufacturers and must have evidence of periodically monitoring their performance.

5.5 NRG Supply Chain Department shall include the ordering information from the applicable ASTM specification in the purchase order. This information includes, but is not limited to:

5.5.1 Description of the product
5.5.2 ASTM material specification number and grade
5.5.3 OD and wall thickness
5.5.4 Class rating for fittings
5.5.5 Manufacturer (Swagelok or Parker Hannifin)
5.5.6 Quantity
5.5.7 Requirement that supplier provide CMTRs for instrument tubing

5.5 NRG is responsible for ensuring that the wall thickness of tubing meets the minimum wall thickness requirements of ASME B31.1 for the intended application.

6.0 Material

6.1 For stainless steel tubing:

6.1.1 Tubing shall be manufactured in accordance with the requirements of ASTM A450/S450M and ASTM A213/A213M.

6.1.2 Tubing shall be seamless.

6.1.3 For non-corrosive applications not exceeding 1000° F, tubing shall be ASTM A213, Grade TP316.

6.1.4 For corrosive applications below 850° F, tubing shall be ASTM A213, Grade TP316L.

6.1.5 All instrumentation tubing shall be internally clean and free of dirt, rust, oil or other foreign matter.

6.2 For stainless steel welded fittings:

6.2.1 Fittings shall be "Cajon" socket-weld type made by Swagelok Corporation or "Weldlok" made by Parker Hannifin Corporation.

6.2.2 For applications not exceeding 1000° F, forgings shall be ASTM A182, Grade F316.

6.2.3 For applications exceeding 1000° F, forgings shall be ASTM A182, Grade F316H.

6.2.4 For applications not exceeding 1000° F, bar stock shall be ASTM A276 Type S316 or A479 Type S316.

6.2.5 For applications exceeding 1000° F, bar stock shall be ASTM A479 Type S316H.

6.3 For stainless steel compression fittings:

6.3.1 Fittings shall be Swagelok or “A-Lok" made by Parker Hannifin Corporation

6.3.2 For applications not exceeding 1000° F, bar stock shall be ASTM A276 Type S316 or A479 Type S316.

6.3.3 For applications exceeding 1000° F, bar stock shall be ASTM A479 Type S316H.

6.3.4 Fittings shall comply with all standard qualification tests and supplementary tests of ASTM F1387.

6.4 For copper tubing and fittings:

6.4.1 Tubing shall be ASTM B68, Type C12200, bright annealed, seamless copper in a soft annealed temper. Type C12200 is a phosphorized copper with high residual phosphorus.

6.4.2 Semi-permanent copper fittings shall be wrought copper solder-joint pressure fittings in accordance with ASME B16.22.

7.0 Marking and Packaging

7.1 Stainless steel tubing shall be marked once every three to four feet with the ASTM specification number and grade, OD, wall thickness, and heat number.

7.2 Fittings shall be supplied in the original manufacturer's boxes with the ASTM specification number and grade marked.

8.0 Documentation

The Supplier's final documentation package shall include the following:

8.1 CMTRs for instrument tubing
8.2 Manufacturer's ISO certificate