SECTION M2

BASE MATERIAL REQUIREMENTS

1. GENERAL: Unless otherwise indicated herein, the requirements within this Section apply to field fabrication operations by the Buyer, and shop fabrication operations by the Seller, including any potential Subcontractors utilized by either. The generic term Fabricator shall be used to denote both Buyer and Seller requirements. Where the term Buyer is utilized for certain requirements, these requirements shall only apply to field fabrication. Where the term Seller is utilized for certain requirements, these requirements shall only apply to shop fabrication.

2. MATERIAL SOURCING: The following sections define the applications for material sourcing:

2.1. All material shall be marked in accordance with the applicable ASME, ASTM, ANSI, AWWA or other specification. Any component missing legible marking as required by the applicable specification will be rejected by the Buyer and replaced at the Seller's cost.Material to be used for all installations shall meet the requirements of the appropriate ASTM-equivalent standards, including but not limited to, any foreign sourced materials.

2.2. Material Test Reports (MTR) in accordance with ASME/ASTM SA/A999 shall be provided for all of the following:

a. All key wetted mechanical components, pressure containing, and pressure retaining components for materials which are not ASME materials P-No. 1-5 and 8.

b. All pressure containing and pressure retaining components in B31.1 covered piping systems, regardless of material.

c. All key wetted mechanical components, pressure containing, and pressure retaining components for CL600 and higher systems, regardless of material.

d. All key wetted mechanical components, pressure containing, and pressure retaining components for systems containing a hazardous or flammable fluid (e.g., natural/fuel gas, hydrogen, fuel oil, lube oil, ammonia, etc.) regardless of material or pressure class.

2.3. The MTR shall document the results of all physical property testing after final forming operations are complete. If chemical analysis testing is performed and reported by the material processor, it shall be clearly marked as a product analysis. Submittals of MTRs may be electronic copies of the originals. Generic and photographs of MTRs and not acceptable. Material determined to be non-compliant with this Specification will be replaced per the requirements herein. Note additional MTR requirements and details may be provided on specific equipment data sheets or specifications.Seller shall perform a product analysis testing of materials if required by the material specification, construction code, and requirements specified herein. The product analysis conducted shall verify that the chemical composition of the sourced materials meets the requirements of the applicable specification and standard. Material determined to be non-compliant with this specification will be replaced per the requirements herein.

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2.4. The Buyer may perform independent product analysis testing on the provided materials. Any materials found to be out of compliance with the applicable specification will be rejected and all items of that heat shall be immediately tested by the Seller.

2.5. Items verified by the material analysis that are found to be in accordance with the material specifications shall be deemed acceptable.

2.6. Items found to be not in accordance with the specification shall be replaced at the Seller's expense, including all materials of that heat number. In case of material replacement, delivery liquidated damages will be applicable for the duration from the original contractual delivery date until the replacement material is delivered to site. All costs associated with material that fails testing shall be borne by the Seller.

2.7. Materials sourced from China or India are not acceptable for pressure parts unless specifically allowed by Buyer. Seller shall notify Buyer if commercial availability requires procurement of pressure parts with materials sourced from China or India. Materials sourced from China or India shall be acceptable for Fuel Gas Ball Valves and Severe Service Ball Valves. Small bore valves class 800 or less may be sourced from China. Sub-suppliers may source materials for pressure parts from China or India if part of a standard package.

2.7.1. Materials sourced from China are not acceptable for chemical piping, or piping/tubing used in the CEMS system unless specifically allowed by Buyer.

3. SAFE ENDS: Welded terminal points (safe ends) shall have base materials having a P-No. classified via ASME BPVC Section IX and be long enough to avoid adverse conditions during subsequent field fabrication and heat treating. The Supplier shall assume field heat treatments will be performed via AWS D10.10.

4. CREEP STRENGTH ENHANCED FERRITIC (CSEF) STEELS:

4.1. General: The requirements herein are applicable to all CSEF materials. Close control of alloying elements, and the processes during fabrication and welding are critical in order to maintain the desired properties of CSEF materials. The requirements herein shall be utilized to achieve the required design strength, to fabricate parts free of cracks, and to detect undesirable parts before they are put into service.

4.2. Base Materials shall meet the required chemistry values provided in the latest edition of the EPRI Guidelines and Specifications for High-Reliability Fossil Power Plants – Best Practice Guideline for Manufacturing and Construction of Grade 91 Steel Components, EPRI Guidelines and Specifications for High-Reliability Fossil Power Plants – Best Practice Guideline for Manufacturing and Construction of Grade 92 Steel Components, Table A-1 or the latest version of ASTM Specifications A335, A234, A369, A213, A387, A182, and A336 which conforms to the Grade 91 Type 2 or Grade 92 materials.

4.3. HARDNESS TESTING: CSEF steels shall receive hardness testing in accordance with Section M4 - Quality and Examination Requirements.

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4.4. POSITIVE MATERIAL IDENTIFICATION (PMI): PMI verification shall be performed in accordance with M4 - Quality and Examination Requirements.

5. SUPPLEMENTAL CASTING REQUIREMENTS:

5.1. General: This Section outlines the material specification, chemistry tolerance limits, fabrication requirements, inspection requirements, acceptance standards, and certification requirements.

5.2. Material Specification: All casting orders executed by the Seller shall be in reference to and in accordance with ASME/ASTM specification, as applicable.

5.3. Carbon And Low Alloy Steel Castings: To demonstrate the acceptability of the metallurgical properties of each carbon and low alloy steel casting furnished as a pressure retaining component and with a design temperature greater than 210°F or for service with flammable, combustible, or hazardous fluids, each casting shall have its aluminum content in the heat analysis furnished on the Material Test Report (MTR). If the aluminum content exceeds 0.08%, documentation demonstrating compliance with ASTM A703 S23 requirements will be required prior to acceptance of the casting. If the MTR from the casting manufacturer does not include the aluminum content, the Supplier shall perform a chemical analysis in accordance with ASTM A703 and shall provide an MTR that includes aluminum content. This test is to be considered a heat analysis therefore, the product analysis tolerances permitted by ASTM A703 shall not be applicable as acceptance criteria.

5.4. Creep Strength Enhanced Ferritic (CSEF) Castings: Fabrication and/or installation of all ASME/ASTM SA/A 217 C12A and A1091 C91 materials shall also follow the requirements of ASME B31.1, Article 125. ASME/ASTM SA/A217 C12A and ASTM A1091 C91 chemistry requirements must meet the requirements defined herein.

5.5. Duplex and Super Duplex Castings: Castings shall be specified and ordered in reference to ASTM A890 and shall meet the following additional requirements:

5.5.1. The following supplementary requirements of ASTM A890 shall apply: S5 (Examination of Weld Preparation), S10 (Hardness Testing), S12 (Test Report), S31 (Estimating Ferrite Content) in accordance with ASTM E562 and the number of fields counted shall be sufficient to achieve a percent relative accuracy of 10%, S33 (Post Weld/Heat Treatment), S34 (Prior Approval of Weld Material), and S35 (Heat Treatment of Test Material). Minor weld repairs as defined by ASTM A890 S33.2 are not required to be post weld heat treated.

5.5.2. Ferrite content and hardness testing for foundry repair welds that are not post weld heat treated shall be in accordance with the requirements in Section M4.

6. FORGING REQUIREMENTS:

6.1. Forged pressure parts with operating temperatures in the creep regime and where the parts are not made from a closed form die (i.e. significant machining to block made from an ingot, billet, bloom, slab, etc.) shall be constructed so the final product has generous bends and large fillets. The principle of material removal shall be to make all wall sections as uniform as

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possible, consistent with any required pressure reinforcement of a cast pressure part. Exterior surfaces of the component shall be machined to remove as much excess metal as possible and contoured to provide smooth continuous transitions. Radii to eliminate block corners shall be, at a minimum, one half of the outside radius of the connecting pipe and all other radii, internal and external, shall be at a minimum 1/2 inch unless specifically required to be less for sealing purposes. The following transitions from the point of the butt weld shall be provided as follows:

6.1.1. The specified weld preparation of the matching pipe.

6.1.2. At a minimum, the envelope for welding end transitions as defined on Figure 1 of B16.25.

6.1.3. A generous radius to the final outside surface (Note 1, Figure 1, B16.25) should be applied.

6.1.4. The outline drawing shall include dimensioned cross-sectional views indicating the external and internal contours of the body in order to show conformance to the above.

END OF SECTION

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