ASME A358 高温用电熔焊奥氏体铬镍合金钢管标准规范(英汉对照)

Designation: A 358/A 358M - 01 An American National Standard 名称:A358/A358M-01 Used in USDOE-NE Standards

美国国家标准用于USDOE_NE标准

Standard Specification for

Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy

Steel Pipe for High-Temperature Service1

高温用电熔焊奥氏体铬镍合金钢管标准规范

This standard is issued under the fixed designation A 358/A 358M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (e) indicates an editorial change since the last revision or reapproval.

此标准以固定名称A358/ A 358 M发布，紧随名称之后的数字，表示采用本标准的年份或上次修改本标准的年份。上方的希腊字母(e)表示上一次再版或审核的版次变化。

1. Scope

范围

1.1 This specification2 covers electric-fusion-welded austenitic chromium-nickel alloy steel pipe suitable for corrosive or high-temperature service, or both.

此规范适用于腐蚀环境或高温环境的电熔焊奥氏体铬镍合金钢管。

NOTE 1—The dimensionless designator NPS (nominal pipe size) has been substituted in this standard for such traditional terms as —nominal diameter,‖ —size,‖ and —nominal size.‖

注1- 无量纲符号NPS（名义钢管尺寸）在此标准中替换为传统的术语“名义直径”“尺寸”和“标称尺寸”

1.2 This specification covers nineteen grades of alloy steel as indicated in Table 1. The selection of the proper alloy and requirements for heat treatment

shall be at the discretion of the purchaser, dependent on the service conditions to be encountered.

此规范包含图表 1 中 19 个级别的合金钢。根据使用条件，买方应慎重选择合适的合金钢，和正确的热处理程序。

1.3 Five classes of pipe are covered as follows:

下列包括 5 种类别的钢管

1.3.1 Class 1—Pipe shall be double welded by processes employing filler metal in all passes and shall be completely radiographed.

1 类 钢管采用所有焊道填充金属的双面焊，并完全经过射线检查。

1.3.2 Class 2—Pipe shall be double welded by processes employing filler metal in all passes. No radiography is required.

2 类 钢管采用所有焊道填充金属的双面焊，不需要射线检查。

1.3.3 Class 3—Pipe shall be single welded by processes employing filler metal in all passes and shall be completely radiographed.

3 类 钢管采用所有焊道填充金属单面焊，并完全经过射线检查。

1.3.4 Class 4—Same as Class 3 except that the weld pass exposed to the inside pipe surface may be made without the addition of filler metal (see 6.2.2.1 and 6.2.2.2).

4 类 和三类相同，只是焊道暴露于钢管内壁，可能没有填加填充金属。

1.3.5 Class 5—Pipe shall be double welded by processes employing filler metal in all passes and shall be spot radiographed.

5 类 钢管采用所有焊道金属填充的双面焊，应进行缺陷射线检测

1.4 Supplementary requirements covering provisions ranging from additional testing to formalized procedures for manufacturing practice are provided. Supplementary Requirements S1 through S6 are included as options to be specified when desired.

提供了补充要求，包括附加测试到生产实践的正规程序等条款。作为详细说明的选项，补充说明 S1-S6 也包括在内。

1.5 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification. The inch-pound units shall apply unless the —M‖ designation of this specification is specified in the order.

本文中所述的值或以英寸磅为单位，或采用国际单位，应作为标准区分对待。在本文中，国际单位在括号内表示。各系统所表示的数值不完全相等，所以每一系统必须区别于另一系统单独使用。两个系统的数值混在一起使用会导致规范的不一致。应采用英寸磅单位，除非在顺序上指定 M 为首选。

2. Referenced Documents

参考资料

2.1 ASTM Standards: ASTM 标准。

A 240/A 240M Specification for Heat-Resisting Chromium

and Chromium-Nickel Stainless Steel Plate, Sheet, and

Strip for Pressure Vessels 注 3

A240/A 240M 压力容器用耐热铬及铬镍不锈钢板，薄板和带材

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels 注 3

A262 奥氏体不锈钢晶间浸蚀敏感度检测的应用

A 480/A 480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip3

A480、A480M 平面轧辊不锈钢和耐热钢板材、薄板和带材一般要求的标准规范

A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys4

A941 钢，不锈钢,相关合金和铁合金术语

A 999/A 999M Specification for General Requirements for Alloy and Stainless Steel Pipe 4 A999/A999M 合金和不锈钢管的一般要求规范。

E 527 Practice for Numbering Metals and Alloys (UNS)4

E527 金属及合金编号（统一编号系统）2.2 ASME Boiler and Pressure Vessel Code: Section I, Welding and Brazing Qualifications5 Section IX, Welding Qualifications5

ASME 锅炉和压力容器准则

2.3 AWS Specifications:6 美国焊接学会规范

A 5.22 Flux Cored Arc Welding 管状焊丝电弧焊

A 5.30 Consumable Weld Inserts for Gas Tungsten Arc Welding

钨极气体电弧焊

A 5.4 Corrosion-Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes 耐腐蚀铬及铬镍钢覆盖焊条

A 5.9 Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Rods and Bare Electrodes

耐腐蚀铬及铬镍钢焊条和裸焊条

A 5.11 Nickel and Nickel-Alloy Covered Welding Electrodes

镍和镍合金包裹焊条

A 5.14 Nickel and Nickel-Alloy Bare Welding Rods and Electrodes

镍和镍合金裸焊条

2.4 Other Standard:

其它标准

注：

1 This specification is under the jurisdiction of ASTM Committee A01 on Steel,

Stainless Steel, and Related Alloys, and is the direct responsibility of Subcommittee

A01.10 on Stainless and Alloy Steel Tubular Products.

此规范归属于钢，不锈钢及相关合金 ASTM A01 委员会，不锈钢以及合金钢管材产品则归属于 A01.10 小组委员会。

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2 For ASME Boiler and Pressure Vessel Code applications see related Specifications

SA-358 in Section II of that Code.

对于 ASME 锅炉和压力容器准则的应用请见相关规范。

3 Annual Book of ASTM Standards, Vol 01.03.

ASTM 标准年刊，01,03 卷

4 Annual Book of ASTM Standards, Vol 01.01.

ASTM 标准年刊，01,01 卷

5 Available from ASME International, Three Park Avenue, New York, NY10016 - 5990.

纽约三公园大道 ASME 国际 10016-5990 有售。

6 American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL

33135. 美国焊接学会，佛罗里达州，迈阿密，Lejeune 路 550 号，351040 信箱

原件第一页结束

TABLE 1 Plate and Filler Metal Specifications 表格 1 板材和填充金属规范

图详见原图

图下注释：

A New designation established in accordance with ASTM E 527 and SAE J 1086.

新的名称根据 ASTM527 和 SAE J 1 0 8 6 标准建立。

B Choice of American Welding Society specification depends on the welding process used. 选择美国焊接学会的规范应根据使用的焊接工艺。

C In previous editions, S30600 was incorrectly shown as S01815.

在之前版本，S 3 0 6 0 0 被错误的显示为 S 0 1 8 1 5

SAE J1086 Practice for Numbering Metals and Alloys (UNS) 注 7

SAEJ 1086 金属和合金编号的应用（统一编号系统）。

3. Terminology

术语

3.1 Definitions: 定义

3.1.1 The definitions in Specification A 999/A 999M and Terminology A 941 are applicable to this specification.

A999 和 A999M 规范中的定义可以应用于此规范。

4. Ordering Information 订货信息

4.1 Orders for material under this specification should include the following, as required, to describe the desired material adequately:

在此规范下订购材料应按要求包含如下信息以充分描述所需材料。

4.1.1 Quantity (feet, metres, or number of lengths),

数量（英尺，米，或者长度的数量）

注释

7 Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096. 巴拿马州，沃伦达市，共富大道 400 号，邮编 15096，汽车工程师协会有售原件第二页结束

4.1.2 Name of material (electric-fusion-welded pipe),原材料名（电熔焊钢管）

4.1.3 Grade (Table 1), 级别（表格 1）

4.1.4 Class (see 1.3), 级别（见 1.3）

4.1.5 Size (outside diameter and nominal wall thickness), (尺寸，外直径和名义壁厚）

4.1.6 Length (specific or random), 长度 （指定或随机）

4.1.7 End finish (Section on Ends of Specification A 999/

A 999M),管端的样式（A999/A999M 规范中管端的切面）

4.1.8 Authorization for repair of plate defects by welding and subsequent heat treatment without prior approval if such is intended (see 9.3),

焊接缺陷修补的授权和在没有被许可的情况下相应的热处理（见 9.3 部分）

4.1.9 Specification designation,

规范名称

4.1.10 Special requirements,

特殊要求

4.1.11 Statement invoking requirements of 16.4 if such is intended.

16.4 部分需要陈述的要求。

4.1.12 Circumferential weld permissibility (see Section 16),

圆周焊接的接受度（见 16 部分）。

4.1.13 Supplementary Requirements (S1 through S6),

补充要求（S1—S6）

4.1.14 Applicable ASME Code if known,

可应用的已知的 ASME 标准

4.1.15 For ASME Code Section III applications, the service classification intended, and

对于 ASME 标准第三部分的应用，服务分类，

4.1.16 Certification requirements (see Section on Certification of Specification A 999/A 999M). 认证要求（见 A999 和 A999M 规范中关于认证的部分）

5. General Requirements

一般要求

5.1 Material furnished to this specification shall conform to the applicable requirements of the current edition of Specification A 999/A 999M unless otherwise provided herein.

在此规范下供应的的材料应与当前版本的 A999 和 A999M 规范适用的要求一致，除非在此另外提供要求。

6. Materials and Manufacture

材料和生产

6.1 Materials: 材料

6.1.1 The steel plate material shall conform to the requirements of one of the grades of Specification A 240/A 240M, listed in Table 1, except as provided in 6.3.2.3.

钢板材料应与表格 1 中所列的 A240/A240M 规范中的某一级别的要求一致，6.3.2.3 所述状况除外。

6.2 Welding:

焊接

6.2.1 The joints shall be full penetration double-welded or single-welded butt joints employing fusion welding processes as defined under —Definitions,‖ ASME Boiler and Pressure

Vessel Code, Section IX. This specification makes no provision for any difference in weld qualityrequirements regardless of the weld joint type employed (single or double) in making the

weld. Where backing rings or strips are employed, the ring or strip material shall be of the same P-Number (Table QW-422 of Section IX) as the plate being joined. Backing rings or strips

shall be completely removed after welding, prior to any required radiography, and the exposed weld surface shall be examined visually for conformance to the requirements of 6.2.3. Welds made by procedures employing backing strips or rings which remain in place are prohibited. Welding procedures, and welding operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX.

如 ASME 锅炉和压力容器准则的定义中所述，焊缝为采用氧炔焊工艺焊透的双面焊或者单面对接焊。此规范并未就提出焊接质量方面的差异，无论在焊接中采用哪种焊缝类型（单面或者双面）。焊接时，当使用条型衬垫后者环形衬垫时，所用材料应与产品号（P number）（第 9 章表格 QW-422）一致。在作任何射线检测之前，应在焊接完成后完全去除环形衬垫或条型衬垫，并应用肉眼检测裸露的焊接表面是否与 6.2.3 中要求一致。禁止采用条形衬垫或环形衬垫并保留在原位置。焊接程序和焊工都应具有符合第九章 ASME 锅炉和压力容器准则的资质。

6.2.2 Except as provided in 6.2.2.1 and 6.2.2.2, welds shall be made in their entirety by processes involving the deposition of filler metal.

除了 6.2.2.1 和 6.2.2.2 的情形，在保证填充金属沉淀过程的整体性。

6.2.2.1 For Class 4 pipe employing multiple passes, the root-pass may be without the addition of filler metal.

对于 4 类管采用多道焊道，根部焊道可以不必添加金属。

6.2.2.2 For Class 4 pipe, the weld surface exposed inside the pipe may result from a single pass made from the inside of the pipe without the addition of filler metal.

对于 4 类管，裸露在内的焊接表面可能由管道内部一个焊道引起，并未增加填充材料。

6.2.2.3 All single-welded pipe shall be completely radiographed.

所有的单面焊管应进行完整的射线检测。

6.2.3 The weld surface on either side of the weld may be flush with the base plate or may have a reasonably uniform crown, not to exceed 1.8 in. [3 mm]. Any weld reinforcement may be removed at the manufacturer’s option or by agreement between the manufacturer and purchaser. The contour of the reinforcement should be reasonably smooth and free from irregularities. The deposited metal shall be fused uniformly into the plate surface. No concavity

of contour is permitted unless the resulting thickness of weld metal is equal to or greater than the minimum thickness of the adjacent base metal.

焊接的任意一面的表面可能会与底盘一起变红或者产生合理的变形，不超过 1/8 英寸（3mm）。任何焊接补强都应按生产商的选择去除或者生产商和采购商达成一致。补强的外廓应平整，规则。堆积的金属应一致的熔入钢板表面。不允许轮廓有凹陷，除非导致的厚度等于或大于附近的底层金属的最小厚度。

6.2.4 Weld defects shall be repaired by removal to sound metal and rewelding. Subsequent heat treatment and examination (that is, visual, radiographic, and dye penetrant) shall be as required on the original welds.

6.2.4 焊接缺陷应通过去除缺陷部分直至漏出金属并重新焊接的方法修补。应以原焊接同样的要求进行随后的检测（即 目测，射线检测和着色渗透检测）。

6.3 Heat Treatment:

热处理

6.3.1 Unless otherwise stated in the order, heat-treatment shall consist of heating the material to a minimum temperature of 1900° F [1040° C] except for S31266, S31254, S32654, S32050, and S30815 which shall be heated to a minimum temperature of 2100° F [1150° C], and 1920° F

[1050° C] respectively, S24565 which shall be heated to a minimum temperature of 2050° F

[1120° C], N08367 which shall be heated to a minimum temperature of 2025° F [1107° C], and N08926 which shall be heat treated to a minimum temperature of 2010° F [1100° C], all treatments being followed by quenching in water or rapidly cooling by other means. N08904 shall be heat treated to a minimum temperature of 2000° F [1095° C] and cooled rapidly. UNS N08810 shall be heated to a minimum temperature of 2050° F [1120° C] and cooled rapidly. UNS N08020 shall be heated in the range from 1800 to 1850° F [982 to 1010° C] and cooled rapidly.

除非订单中另有陈述，否则热处理应包括把材料加热到至少 1900 华氏度（1040 摄氏度），S31266，S31254, S32654, S32050, 和 S30815 除外，应分别加热到至少 2100 华氏度（1150 摄氏度）和 1920 华氏度（1050 摄氏度），S24565 应加热到至少 2050 华氏度（1120 摄氏度），N08367 应加热到至少 2025 华氏度（1107 摄氏度），N08926 应加热到至少 2010 华氏度（1100 摄氏度）。所有热处理后应淬火或采取其他方式急冷。N08904 应加热到至少 2000 华氏度（1095 摄氏度）并急冷。ＵＮＳ Ｎ０８８１０应加热到至少２０５０华氏度（１１２０摄氏度）并急冷。ＵＮＳ Ｎ０８０２０应加热到１８００－１８５０华氏度（８９２－１０１０摄氏度）并急冷。

6.3.2 The purchase order shall specify one of the following conditions if the heat-treated condition specified in 6.3.1 is not desired by the purchaser:

如果采购商并不需要6．３．１规定的热处理条件，采购订单应规定如下条件之一。

6.3.2.1 A final heat-treatment temperature under 1900° F [1040° C]—Each pipe supplied under this requirement shall be Stenciled with the final heat-treatment temperature in degrees Fahrenheit or degrees Celsius after the suffix —HT‖. Controlled structural or special service characteristics may be specified as a guide for the most suitable heat treatment.

在１９００华氏度（１０４０摄氏度）以下最终热处理，在此要求下供应的每一根管应用字母ＨＴ后加最终热处理温度，采用华氏度或摄氏度，标记在管体。可以指定受控的结构性的或特别的服务特性作为最适合的热处理温度指南。

6.3.2.2 No final heat treatment of pipe fabricated of plate that has been solution heat treated at temperatures required by this specification—Each pipe supplied under this requirement shall be stenciled with the suffix —HT-O‖.

无最终热处理的钢管，这种钢管的钢板材料经过本规范所要求的温度的溶液热处理，在此条件下供应的每一根管应在管体上标注字母HT-O。

6.3.2.3 No final heat treatment of pipe fabricated of plate that has not been solution heat treated—Each pipe supplied under this requirement shall be stenciled with the suffix “HT-SO‖. 无最终热处理的钢管，这种钢管的钢板材料没有经过溶解热处理，在此条件下生产的每一根管应在管体上标注字母HT-SO

6.4 A solution annealing temperature above 1950° F [1065° C] may impair the resistance to intergranular corrosion after subsequent exposure to sensitizing conditions in Grades 321, 347, and 348. When specified by the purchaser, a lower temperature stabilization or re-solution anneal shall be used subsequent to the initial high temperature solution anneal (see Supplementary Requirement S5).

321,347和348级的溶液退火温度在1950华氏度（1065摄氏度）可能在随后暴露于敏感条件中时削弱抗晶间腐蚀的耐受力。当采购商要求时，在先期高温溶液退火之后，应采用稍低温度的稳定或再溶解退火。

7. Chemical Composition

化学构成

7.1 The chemical composition of the plate shall conform to the requirements of the applicable specification and grade 3 listed in Specification A 240/A 240M.

钢板的化学构成应符合适用的规范的要求和 A240/A240M 规范中所列的 3 级的标准。

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7.2 The chemical composition of the welding filler metal shall conform to the requirements of the applicable AWS specification for the corresponding grade shown in Table 1, or shall conform to the chemical composition specified for the plate in Specification A 240/A 240M, or shall, subject to purchaser approval, be a filler metal more highly alloyed than the base metal when needed for corrosion resistance or other properties. Use of a filler metal other than that listed in Table 1 or conforming to the chemical composition specified for the plate in Specification A 240/A 240M shall be reported and the filler metal identified on the certificate of tests. When nitrogen and cerium are specified elements for the ordered grade, the method of analysis for these elements shall be a matter of agreement between the purchaser and the manufacturer.

焊接填充金属的化学构成应与表格 1 所示的相应级别的适用于美国焊接学会规范的要求相一致，或应与 A240/A240M 规范中的钢板的化学构成一致，或者，经采购商同意，在需要耐腐蚀和其他特性时，比基层金属更高级别的合金。使用表格一之外的填充金属或者与 A 240/A 240M 规范的钢板不一致的填充金属，这种情况应上报并且这种金属应在测试证书上加以鉴定。当订购的级别中规定包含氮和铈成分，买方和生产商应就用于这些成分分析的方法达成一致。

8. Permissible Variations in Dimensions

允许的尺寸变量

8.1 Permissible Variations—The dimensions at any point in a length of pipe shall not exceed the following:

容许的变化---钢管长度方向上任意一点的尺寸不应超过如下标准：

8.1.1 Outside Diameter—Based on circumferential measurement, ±0.5 % of the specified outside diameter.

外径---不能超过规定外径的±0.5 %。

8.1.2 Out-of-Roundness—Difference between major and minor outside diameter, 1 %.

失圆度---较大的外径和较小的外径，1%

8.1.3 Alignment—Using a 10-ft or 3-m straightedge placed so that both ends are in contact with the pipe, 1.8in. [3 mm].

校准---使用 10 英尺或 3 米直尺两端与钢管接触，1/8 英寸（3mm）。

8.1.4 Thickness—The minimum wall thickness at any point in the pipe shall not be more than 0.01 in. [0.3 mm] under the nominal thickness.

厚度---钢管上任意一点的壁厚应不超过 0.01 英寸名义厚度（0.3 毫米）

9. Workmanship, Finish, and Appearance

工艺，磨光和外观

9.1 The finished pipe shall have a workmanlike finish.

成品钢管应有较好的磨光

9.2 Repair of Plate Defects by Machining or Grinding— Pipe showing slivers may be machined or ground inside or outside to a depth which shall ensure the removal of all included scale and slivers, providing the wall thickness is not reduced below the specified minimum wall thickness. Machining or grinding shall follow inspection of the pipe as rolled, and shall be followed by supplementary visual inspection.

通过加工或打磨修补钢板缺陷—带有碎屑的钢管可以在以壁厚不小于规定的最后小壁厚为前提下，在内部或外部加工或者打磨到直至确保去除所有鳞片和碎屑。加工或打磨后应做压制管检测，并做补充目测。

9.3 Repair of Plate Defects by Welding— Defects which violate minimum wall thickness may be repaired by welding, but only with the approval of the purchaser. Areas shall be suitably prepared for welding with tightly closed defects removed by grinding. Open, clean defects, such as pits or impressions, may require no preparation. All welders, welding operators, and weld procedures shall be qualified to the ASME Boiler and Pressure Vessel Code, Section IX. Unless the purchaser specifies otherwise, pipe required to be heat treated under the provisions of 6.3, shall be heat treated or reheat treated following repair welding. Repaired lengths, where repair depth is greater than 1/4 of the thickness, shall be pressure tested or repressure tested after repair and heat treatment (if any). Repair welds shall also be examined by suitable nondestructive examination techniques, including any techniques specifically required of the primary weld.

通过焊接修复钢板缺陷---不符合最小壁厚要求的钢管可以通过焊接修复，但只能在采购商允许的情况下。修补区域应通过仅打磨缺陷处的办法做好焊接准备。开阔，干净的缺陷部位， 比如凹点和压痕不需要做准备工作。所有的焊机，焊工和焊接工艺应符合 ASME 锅炉和压力容器标准，第 IX.部分。除非采购商另有规定，钢管需要按照 6.3 的规定进行热处理，应按照管道焊接的标准进行热处理或重新热处理。在修理的长度范围内，修理深度超过 1/4 厚度，应进行压力测试或者在修补和热处理（如果有）后重新做压力测试。修补焊接也要通过适当的无损检测技术检测，包括检测主要焊接部位的特定的检测技术。

9.4 The pipe shall be free of scale and contaminating iron particles. Pickling, blasting or surface finishing is not mandatory when pipe is bright annealed. The purchaser may request that a passivating treatment be applied.

钢管应无鳞片，不包含铁屑。当钢管光亮退火时，酸洗，爆破和表面处理都不是强制的。采购商可能会要求做钝化处理。

10. Heat Analysis

热分析

10.1 An analysis of each heat of steel shall be made by the plate manufacturer to determine the percentages of the elements prescribed in Specification A 240/A 240M. The chemical composition thus determined shall conform to the requirements prescribed in Specification A 240/A 240M.

钢板生产商应钢铁热分析来确定 A240/A240M 规范中描述的成分。化学构成因此确定将与 A240/A240M 规范中描述的相一致。

11. Product Analysis

产品分析

11.1 For each lot of 500 ft [150 m] of pipe or fraction thereof, analysis shall be made by the manufacturer from the finished pipe of the plate and of the weld deposit. Drillings for analysis may be taken from the mechanical test specimens. The results of these analyses shall be reportedto the purchaser or the purchaser’s representative, and shall conform to the requirements of Section 7, subject to the product analysis tolerance of Table 1 in Specification A 480/A 480M.

对于每一批 500 英尺（150 米）钢管或者它的一部分，生产商应做成品管和焊接的分析报告。用于分析的钻孔可以使用机械测试的标本。这些分析结果应报告给采购商或者采购商代表，并且应符合第七部分的要求，满足 A480/A480M 规范中表格 1 中的产品分析公差。

11.2 If the analysis of one of the tests specified in 9.1 does not conform to the requirements specified in Section 7, analyses shall be made on additional pipe of double the original number from the same lot, each of which shall conform to the requirements specified.

如果 9.1 中规定的测试之一的分析报告与第七部分规定的要求不同，应在同批次钢管中取双倍于原数量的钢管再做分析，每组分析都应与规定的要求一致。

12. Tensile Requirements

张力要求。

12.1 The plate used in making the pipe shall conform to the requirements as to tensile properties of the applicable specifications listed in Table 1. Tension tests made by the plate manufacturer shall qualify the plate material.

生产钢管时所使用的钢板应符合表格 1 中适用的规范的张力特性的要求。钢板生产商所作的张力测试应证明钢板材料合格。

12.2 The transverse tension test taken across the welded joint specimen shall have a tensile strength not less than the specified minimum tensile strength of the plate.

对焊缝样本所作的横向张力测试应采用不小于规定的钢板最小张力。

13. Transverse Guided-Bend Weld Tests

横向导向弯曲焊接测试

13.1 Two bend test specimens shall be taken transversely from the pipe. Except as provided in 13.2, one shall be subject to a face guided-bend test and the second to a root guided-bend test. One specimen shall be bent with the inside surface of the pipe against the plunger, and the other with the outside surface against the plunger.

应横向取 2 个弯曲测试标本。除了 13.2 中情形，一个应做表面导向弯曲测试，第二个做根部弯曲测试。一个标本应使管道内表面朝向活塞弯曲，另一个标本外表面朝向活塞。

13.2 For wall thicknesses over 3.8 in. [9.5 mm] but less than 3.4in. [19 mm] side-bend tests may be made instead of the face and root-bend tests. For specified wall thicknesses 3.4 in. [19 mm] and over, both specimens shall be subjected to the side-bend tests. Side-bend specimens shall be bent so that one of the side surfaces becomes the convex surface of the bend specimen.

对于壁厚超过 3.8 英寸（9.5mm）但小于 3.4 英寸（19mm）可以做侧面弯曲测试来替代表面和根部弯曲测试。对于特定的壁厚达到 3.4 英寸（19mm）及以上的钢管，两个标本都应做侧面弯曲测试。侧面弯曲的标本应为弯曲的，这样一个侧面表面可以作为弯曲标本的凸面。 13.3 The bend test shall be acceptable if no cracks or other defects exceeding 1.8 in. [3 mm] in any direction be present in the weld metal or between the weld and the pipe metal after bending. Cracks which originate along the edges of the specimen during testing, and that are less than 1.4in.

[6.5 mm] measured in any direction shall not be considered.

弯曲后，如果没有裂缝或其他在任何方向上超过 1.8 英寸（3mm）的缺陷出现在焊接金属或焊接与管道金属之间，弯曲测试应为合格。在测试中，沿管边缘出现的裂缝和任何方向上小于 1.4 英寸（6.5mm）大小的裂缝不予考虑。

14. Test Specimens and Methods of Testing 测试标本和测试方法

14.1 Transverse tension and bend test specimens shall be taken from the end of the finished pipe; the transverse tension and bend test specimens shall be flattened cold before final machining to size.

横向张力和弯曲测试标本应从成品钢管的端点取样，横向张力和弯曲测试标本应在最终加工成合适尺寸之前冷压平。

14.2 As an alternative to the requirements of 14.1, the test specimens may be taken from a test plate of the same material as the pipe, which is attached to the end of the cylinder and welded as a prolongation of the pipe longitudinal seam.

作为 14.1 要求的备选项，测试标本可以取自与钢管同样材料的测试钢板，附于气缸尾部并焊接作为管道纵向焊缝的延伸。

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14.3 Tension test specimens shall be made in accordance with Section IX, Part QW, Paragraph QW-150 of the ASME Boiler and Pressure Vessel Code and shall be one of the types shown in QW-462.1 of that code.

张力测试标本应根据 ASME 锅炉和压力容器标准第 QW-150 段，QW 部分，IX 章节制作，并且应为该标准的 QW-462.1 中所显示的类型的一种。

14.3.1 Reduced-section specimens conforming to the requirements given in QW-462.1(b) may be used for tension tests on all thicknesses of pipe having outside diameter greater than 3 in. [76 mm].

符合 QW-462.1(b)要求的缩减断面标本可以用于外径大于 3 英寸(76mm)的管的所有厚度的张力测试。

14.3.2 Turned specimens conforming to the requirements of QW-462.1(d) may be used for tension tests.

符合 QW-462.1(b)要求的车削的标本可以用于张力测试。

14.3.2.1 If turned specimens are used as given in 14.3.2.2 and 14.3.2.3, one complete set shall be made for each required

tension test.

如果如 14.3.2.2 和 14.3.2.3 使用单车削标本，每个要求的张力测试应制作一整套标本。

14.3.2.2 For thicknesses to and including 1 1/4 in. [32 mm], a single turned specimen may be used.

对于壁厚达到 1 1/4 英寸（32mm）以及以下的钢管可以使用单车削标本

14.3.2.3 For thicknesses over 1 1/4 in. [32 mm], multiple specimens shall be cut through the full thickness of the weld with their centers parallel to the material surface and not over 1 in. [25 mm] apart. The centers of the specimens adjacent to material surfaces shall not exceed 5/8 in. [16 mm] from the surface.

对于壁厚超过 1 1/4 英寸（32mm）的钢管，应制作多个标本，切穿焊接部分整个厚度，中心平行于材料表面，并相距不超过 1 英寸（25mm）。

14.4 The test specimens shall not be cut from the pipe or test plate until after final heat treatment. 测试标本不得于最终热处理之前切割。

15. Mechanical Tests Required

要求的材料测试

15.1 Transverse Tension Test—One test shall be made to represent each lot (see Note 2) offinished pipe.

横向张力测试----一次测试应代表该批次（见注 2 ）成品钢管。

NOTE 2—The term －lot‖ applies to all pipe of the same grade (may include more than one heat of steel) within a 3.16-in. [4.7-mm] range of thickness and welded to the same weld procedure, and when heat treated, done so to the same

heat-treating procedure and in the same furnace. The maximum lot size shall be 200 linear ft [60 m] of pipe.

注 2---批次适用于所有 3.6（4.7mm）英寸厚度范围以内同级别钢管（可能包含不止一种钢铁温度）和焊接时采用同样焊接工艺的钢管，并且使用同样热处理工艺和同一台熔炉的钢管。 15.2 Transverse Guided-Bend Weld Test— One test (two pecimens) shall be made to represent each lot (Note 2) of finished pipe.

横向导向弯曲焊接测试----一次测试（两个标本）应代表每批次（见注 2）成品钢管。

15.3 Hydrostatic Test—Each length of pipe shall be subjected to a hydrostatic test in accordance with Specification A 999/A 999M, unless specifically exempted under the provision of 15.4. Pressure shall be held for a sufficient time to permit the inspector to examine the entire length of the welded seam.

水压测试---钢管长度应依据 A 999/A 999M 标准的水压测试的要求，除非按 15.4 条款下免除。应保持压力至足够的测试时间以供检验员检验整个焊缝长度。

15.4 The purchaser, with the agreement of the manufacturer, may complete the hydrostatic test requirement with the system pressure test, which may be lower or higher than the specification test pressure, but in no case shall the test pressure be lower than the system design pressure. Each length of pipe furnished without the completed manufacturer’s hydrostatic test shall include with the mandatory marking the letters —NH.‖

在与生产商取得一致的情况下，采购商可以通过系统压力测试完成水压测试，可能低于或高于规定的测试压力，但在任何情况下，测试压力都不应低于系统设计压力。未做完整的生厂商水压测试生产的钢管应用字母 NH 做强制标志。

16. Radiographic Examination

射线检测

16.1 For Classes 1, 3, and 4 pipe, all welded joints shall be completely examined by radiography. 等级为 1、3 和 4 的管道，所有焊缝要全部进行射线检测。

16.2 For Class 5 pipe, the welded joints shall be spot radiographed to the extent of not less than 12 in. [300 mm] of radiograph per 50 ft [15 m] of weld.

等级为 5 的管道，焊缝要进行局部射线检测，每 50 ft (15m)要进行不少于 12 in. (300mm)的射线探伤。

16.3 For Classes 1, 3, and 4 pipe, radiographic examination shall be in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, latest edition, Paragraph UW-51.

等级为 1、3 和 4 的管道，射线检测要按照 ASME 锅炉和压力容器规范，第 VIII 部分，最新版，UW-51 段落的要求进行。

16.4 For Class 5 pipe, radiographic examination shall be in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, latest edition, Paragraph UW-52.

等级为 5 的管道，射线检测要按照 ASME 锅炉和压力容器规范，第 VIII 部分，1 段，最新版，UW-52 段落的要求进行。

16.5 Radiographic examination may be performed prior to heat treatment.

射线检测可以在热处理之前进行。

17. Lengths

长度

17.1 Circumferentially welded joints of the same quality as the longitudinal joints shall be permitted by agreement between the manufacturer and the purchaser.

在生产商和采购商协商一致的情况下，同纵向的接缝质量相同的圆周焊缝应予准许。

18. Product Marking

产品标记

18.1 In addition to the marking prescribed in Specification A 999/A 999M, the markings on each length of pipe shall include the plate material designations as shown in Table 1, the marking requirements of 6.3 and 15.4, and Class 1, 2, 3, or 4, as appropriate (see 1.3).

在 A 999/A 999M 规范所描述的标记的基础上，每一段管的标记应包括表格 1 所示钢板材料名称，6.3 和 15.4 部分的标记要求，在适当的时候标记出 1 类，2 类，3 类，4 类管（见 1.3） 18.2 Bar Coding—In addition to the requirements in 18.1 bar coding is acceptable as a supplementary identification method. Bar coding should be consistent with the Automotive Industry Action Group (AIAG) standard prepared by the Primary Metals Subcommittee of the AIAG Bar Code Project Team.

条形码---在 18.1 的要求的基础上，可以接受条形码作为补充性的身份鉴定方法。条形码应与 AIAG（汽车工业行动小组）条形码项目组主要金属组委会所提供的汽车工业行动小组（AIAG）标准相一致。

19. Keywords

关键词

19.1 arc welded steel pipe; austenitic stainless steel; chromium-nickel steel; fusion welded steel pipe; high temperature application; steel pipe; temperature service applications; high; welded steel pipe

电弧焊钢管；奥氏体不锈钢；镉镍钢；熔焊钢管；高温应用；钢管；温度服务应用；高；焊接钢管。

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SUPPLEMENTARY REQUIREMENTS

补充性的要求

One or more of the following supplementary requirements shall apply only when specified in the purchase order. The purchaser may specify a different frequency of test or analysis than is provided in the supplementary requirement. Subject to agreement between the purchaser and manufacturer, retest and retreatment provisions of these supplementary requirements may also be modified.

只有在采购商订单规定的情况下，一条或多条如下补充条款才适用。

S1. Product Analysis

产品分析

S1.1 Product analysis shall be made on each length of pipe. Individual lengths failing to conform to the chemical composition requirements shall be rejected.

每一段管都应做产品分析。不满足化学构成要求的个体应为不合格产品。

S2. Tension and Bend Tests 张力和弯曲测试

S2.1 Tension tests (Section 12) and bend tests (Section 13) shall be made on specimens to represent each length of pipe. Failure of any test specimen to

meet the requirements shall be cause for the rejection of the pipe length represented.

张力测试（12 部分）和弯曲测试（13 部分）应采用代表每个钢管长度的标本。任何不能满足要求的测试标本应代表该长度的钢管为不合格产品。

S3. Penetrant Oil and Powder Examination

渗油和粉末检测

S3.1 All welded joints shall be subjected to examination by a penetrant oil and powder method. The details of the method and the disposition of flaws detected shall be a matter for agreement between the purchaser and the manufacturer.

所有的焊缝都应做渗油和粉末检测。使用方法详情和检测到的缺陷应由采购商和生产商协商取得一致。

S4. Ferrite Control in Weld Deposits

在堆焊中对铁素体的控制

S4.1 The ferrite content of the deposited weld metal in any length of pipe may be determined. The procedural details pertaining to this subject (that is, welding; plate and weld deposit chemistry; testing equipment and method; number and location of test sites; and ferrite control limits) shall be a matter for agreement between the purchaser and the manufacturer.

堆焊金属中铁素体的含量在每段钢管都可控制。关于这个题目详情（即：焊接；钢板和堆焊化学；检测设备和方法；数量和检测现场的位置；铁素体控制限制）应由采购商和生产商协商取得一致。

S5. Stabilizing Heat Treatment

稳定化热处理

S5.1 Subsequent to the heat treatment required in 6.3, Grades 321, 347, and 348 shall be given a stabilization heat treatment at a temperature lower than that used for the initial solution annealing heat treatment. The temperature of stabilization heat treatment shall be at a temperature as agreed upon between the purchaser and vendor.

在如 6.3 要求的热处理之后，321，347 和 348 级别应给予稳定化热处理，温度应低于最初的固熔退火热处理。稳定化热处理的温度应由采购商和销售商协商取得一致。

S6. Intergranular Corrosion Test

晶间腐蚀测试

S6.1 When specified, material shall pass intergranular corrosion tests conducted by the manufacturer in accordance with Practices A 262, Practice E.

当有规定时，原材料应通过生产商根据 E 规范，A262 惯例所做的晶间腐蚀测试

NOTE S1—Practice E requires testing on the sensitized condition for low carbon or stabilized grades, and on the as-shipped condition for other grades.

注 S1---E 规范要求对于低碳或稳定级别做敏感条件下的测试 ；对于其他级别做发货条件下的检测

S6.2 A stabilization heat treatment in accordance with Supplementary Requirement S5 may be necessary and is permitted in order to meet this requirement for the grades containing titanium or columbium.

对于包含钛和铌元素的级别，为了满足此要求，根据补充要求 S5 所做的稳定化热处理是有必要并被许可的。

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