



SZ36-1 EDP卷管程序

11 Sheets with cover

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1. DESCRIPTION

概述

This structural tubular fabrication procedure consists of the process of rolling plates to pipes and the process of pipe splicing.

此卷管程序包括了卷管程序和管接长程序。

Work shall not be performed when weather prohibits satisfactory workmanship or when conditions prevent required inspection.

当天气情况不允许或检验工作不能进行时不可进行施工。

Hydrostatic testing of structural tubular is not required. Rolled tubular shall not have more than one longitudinal seam. Welded pipe shall be manufactured using steel plate cold bent to shape and weld by automatic submerged arc, manual arc.

卷制管不需进行液压试验。卷制的管体上最多只能有一条纵缝。钢板卷管成型后，进行焊接，可采用埋弧焊，手弧焊等焊接方法。

Welding and welding inspection shall be in accordance with AWS D1.1.

焊接和焊缝检验执行 AWS D1.1 标准。

The two longitudinal seams of adjoining sections shall be offset around 90° .

两条相邻纵缝应错开最小 90°。

Offset of plate Edge for welded pipe, radial offset of abutting edges of longitudinal weld seam shall not exceed the requirement of.

纵缝错边和管端错边量不应超过要求。

Girth joins shall be fitted up to give minimum wall offset on full circumference of joints, But offsets greater than 1.6mm shall be ground smooth or machined to provide a2.5:1 taper at the transition.

环缝的组对错边量最大不应超过 1.6mm，如若超出，应圆滑过渡或加工一个 2.5:1 的斜度。

Height of outside weld bead shall not extend above the prolongation of the original surface of the pipe more than the amount list: wall thickness \leq 12.7mm, maximum height of weld bead \leq 3.2mm; wall thickness $>$ 12.7mm, maximum height of weld bead \leq 4.8mm.

外焊缝余高应满足如下要求：壁厚 \leq 12.7mm 时，焊缝余高应 \leq 3.2mm；壁厚 $>$ 12.7mm 时，焊缝余高应 \leq 4.8mm。

Cold forming shall be limit to 5% strain or and outside diameter to wall thickness ratio of greater than 20.

冷成型时，曲率应小于 5% 或者外径/壁厚不大于 20。

In the event of excessive distortion, any reworking shall be subject to the prior approval of the DNS, procedures for anticipated rework situations should be submitted to the DNS for



review and comment prior to fabrication.

在制作过程中，如有缺陷超过要求的，在进行返修前应征得同意，方可进行。

For pipe welded from both sides, the inside weld bead shall not extend above the prolongation of the original inside surface of the pipe more than 3.2mm for 38mm of wall thickness.

对于壁厚为 38mm 的管，内焊缝的焊缝余高不应超过 3mm.

The tubule circumference open sizes that are stated in plate layout drawing are for reference sizes only, the accurate size shall be calculated by tubule manufacture self.

卷制管的准确周长应有制作方进行计算得出，排版图中给出的尺寸用于参考。

All tubule No. shall be painting marked clearly for identification and trace, the part No. of every tubule in the drawing is shown of drawing.

所有的管子上应清楚的标出该管的杆件号，以便于追踪，杆件号的说明参照图纸要求。

The temporary support and located block using for tubule forming and welding shall be cut off, the surface is to be ground clean,. Damage basic metal shall not be permit.

在施工过程中的临时支撑，使用后应切除，切除时不允伤及母材，表面应打磨光滑。

This procedure describes in detail the overall fabrication process, which starts from preparation of steel plates to rolling, welding, inspection etc.

此程序详细描述了卷制的整个过程，从钢板预制到卷管成型，焊接，检验等。

2. REFERENCE STANDARD AND CODE

参照的标准和规范

AWS D1.1:

Structural Welding Code

API 2B

Specification for The Fabrication of Structural Steel Pipe



3. DETAILS OF PROCESSES

PROCESS	DESCRIPTION	REMARKS
1. Pipe Manufacture 卷制制作	Prior to cutting, all material shall be inspected and accepted according to MATERIAL INSPECTON PROCEDURE 在切割前，所有的材料都应被检验，并符合材料检验程序。	
1.1 Plate cutting 板切割	<p>1. Decide plate's type, grade and brand, etc. 确定板的级别，牌号等。</p> <p>2. Decide cutting lines and rolling direction of plates according to prescribed pipe size. 按照预定的板尺寸确定切割线和卷制方向。</p> <p>3. Cutting with flame cutting machine. The plate edges shall be dressed back by grinding, as appropriated, to clean material; all cut edges shall be visually examined prior to beveling, for laminations, cracks and other flaws, all flaws shall be repair. 采用气割机进行切割。 切割边缘应打磨光滑；所有的切割边在开坡口前应进行外观检验，不允许有重皮，裂纹或其他裂缝，所发现的缺陷应进行返修。</p>	<p>For the material traceability, see material inspection procedure 对于材料跟踪参照材料检程序。</p> <p>The rolling direction of the plate from which the pipe is formed shall be longitudinal 管的卷制方向应为纵向。</p> <p>Bevel both longitudinal and circumferential grooves at the same time. 纵缝和环缝坡口应同时切割</p>



PROCESS	DESCRIPTION	REMARKS
	4. Dimensional inspection before and after cutting. 在进行切割前和切割后都应进行尺寸检验。	Dimensional inspection according to drawing 尺寸检验参照图纸
1.2 Edge crimping 压头	5. Plate edges are crimped by pressing to the prescribed radius before rolling. 在卷制前应进行压头处理。	
1.3 Plate rolling 卷板	Plate shall be rolled from the edge side first and then symmetrically rolled to the prescribed pipe radius. Notes: 板应从边缘卷起，对称的卷制到要求的弧度。 1. The edge is crimped pressing. 首先把板边缘压紧 2. Pressing of upper roll shall be gradually increased so that the required radius can be gradually achieved. 上辊压力逐渐的增加，以使板卷制到要求的弧度。 3. 60 degree inside arc template panels shall be made according to required diameters for the inspection of pipes according to the requirements described. 按照要求，采用 60°内弧样板进行检验。	



PROCESS	DESCRIPTION	REMARKS
1.4 Tack welding of longitudinal seam fit-up. 纵缝组对、点焊	Root gap and high-low of longitudinal seam shall be adjusted with suitable clamping apparatus and then fastened by tack welding, the total length of which shall be long enough to achieve the fastening strength required. Each section of tack weld shall be no less than 50mm, and in line with the requirements of welding procedure. 纵缝的跟部间隙和错边量应根据要求，采用合适的夹具进行调整，以达到规定值。点焊焊缝不应小于 50mm，而且应按照焊接工艺要求进行焊接。	
1.5 Fit-up inspection 组对检验	Fit-up inspection shall be performed with inside or outside arc template panel and rulers according to API 2B and related welding procedure. 按照 API 2B 的要求和相关焊接程序，进行组对检验。	
1.6 Tab welding 过渡焊接	Run-on and run-off tabs shall be welded at the both ends of longitudinal weld seam of pipes rolled from plates. The tabs, which are 100mm long, shall be consistent with pipe in groove and thickness. 引、熄弧板应被焊接在纵缝的两端。引、熄弧板长 100mm，坡口和厚度与管纵缝一致。	Tab material shall be the same as that of the pipe. 过渡板的材料应与管体材料相同。
1.7 Internal welding of longitudinal seam. 内纵缝焊接	With SAW process, see WPS. 采用埋弧焊焊接，具体参照 WPS。	
1.8 External gouging of longitudinal seam. 外纵缝焊接	Before external welding, root gouging on external side, including all the tack welds and root welds, shall be performed, with the method of Arc Air Gouging. Finally the groove shall be ground to remove carbon layer and other defects. 在外纵缝焊接前，跟部应进行碳弧气刨、打磨光滑，渗碳层或其他缺陷应清除干净。	



PROCESS	DESCRIPTION	REMARKS
1.9 External welding of longitudinal seam. 外纵缝焊接	With SAW process, see WPS. 采用埋弧焊焊接，具体参照 WPS。	
1.10 Tabs removal 清除引、熄弧板	Tabs shall be removed with flame cutting and ground smooth. 纵缝焊接完后，引、熄弧板应被切除并打磨光滑。	
1.11 Pipe reforming. 滚圆	<p>If the welded pipe, after self-inspection, needs to be corrected, reforming shall be performed to the prescribed radius. If the pipe is found acceptable by self-inspection, it can be submitted to inspection department for further inspection. Before reforming however, overlaps of weld (if any) shall be ground off so that the weld may transits to the base metal smoothly to the visual requirements.</p> <p>Note: During reforming, the upper roll shall not press too much in case the weld and base metal are damaged mechanically.</p> <p>Over-grinding of permanent structural steels, to remove flaws in excess of 10%t, (where t is wall thickness of the base material), or 2mm, which is the lesser, shall require a weld repair in accordance with section 3.21 of SPC-FPSO-ST-003.</p> <p>自检后，如果管直径未达到要求，应进行滚圆。如果，自检合格，应提交质量检验部门进行进一步检验。在滚圆前，所有焊缝的焊瘤等缺陷应打磨光滑，与母材圆滑过渡。</p> <p>说明：在滚圆过程中，上辊压力不能太大，以防损坏母材和焊缝。打磨深度不应超过 10%t (t 为母材厚度)，且不超过 2mm。如若超出，进行焊补。</p>	
2. Pipe Splicing 管接长		
2.1 Pipe end beveling 管端坡口	<p>For requirements of pipe end beveling, please see sizes are as Client's requirement.</p> <p>管端坡口要求应满足业主的要求。</p>	



PROCESS	DESCRIPTION	REMARKS
2.2 Fit-up and tack welding. 组对和点焊	1. Fit-up requirement: Root gap:2.0-4.0mm 根部间隙: 2-4mm high-low: 错边要求: No mismatch is excess of t/10 for the wall thickness of the plate greater than 19mm; and for the wall thickness up to 19mm, the mismatch shall not excess of 2mm.. 板厚>19mm 时, 错边量不能超过 t/10; 板厚≤19mm, 错边量不能超过 2mm.	
2.3 External welding of circumferential seam. 外环缝焊接	Root and fill with SMAW process, the cap with SAW process. See WPS. 焊接时, 跟部采用手弧焊, 盖面采用埋弧焊焊接, 具体参照 WPS.	The difference between the measured maximum and minimum internal diameter for tubular from plate shall not exceed 1% of the nominal diameter and not exceed 5mm maximum.
3. Visual, dimensional and tolerance inspection. 外观, 尺寸和公差检验	1. Visual inspection of welds as per section 3.6 of AWS D1.1. For longitudinal weld, longitudinal welds of two adjacent pipe sections shall be staggered around 180° except otherwise noted, and the distance at least 500mm at the same time. 外观检验应按照AWS D1.1 3.6 的要求进行。对于纵缝, 两相邻两道纵缝应错开大约 180°左右, 除非特殊说明, 两相邻纵缝的距离不应小于 500mm. 2. Length tolerance The actual length of each pipe rolled consult fabrication drawing (+10mm-0mm). 长度公差: +10mm, -0mm	最大和最小直径径差不应超过 1% 公称直径, 且最大不超过 5mm。



3. Out roundness

椭圆度

The out-of-roundness, that is, the difference between the major and minor outside diameters at any point in a length of pipe, shall not exceed 1 percent of the nominal diameter or 5mm maximum

壁厚 $\leq 50\text{mm}$ (2") 时, 椭圆度误差不能超过 1%公称直径, 最大不能超过 5mm;

4. Circumference

周长

The outer circumference of pipes at any point in a length of pipe shall be within $\pm 10\text{mm}$.

在管任意长度上任意一点, 管的外周长应在 $\pm 10\text{mm}$ 以内。

5. Straightness

直线度

The maximum allowable deviation from straightness in any 3m(10ft) increment of length shall be calculated as the formula below. The maximum allowable deviation from straightness in any 10m(40ft) increment shall not exceed 3mm (pipe length not exceed 3m)

10mm (pipe length not exceed 12m)

12mm (pipe length exceed 12m)

直线度要求:

管长 $\leq 3\text{m}$ 直线度允差 $\leq 3\text{mm}$

管长 $\leq 12\text{m}$ 直线度允差 $\leq 10\text{mm}$

管长 $>12\text{m}$ 直线度允差 $\leq 12\text{mm}$



PROCESS	DESCRIPTION	REMARKS
4. NDT 无损检验	<p>6. Pipe ends 管端</p> <p>Bevels of pipe ends shall be in line with specific requirements. Root face shall be perpendicular to the longitudinal axis of the pipe. The deviation shall be within $\pm 5\text{mm}$, measured with right angle square across the pipe end, and the bevel of the pipe end.</p> <p>管端坡口要求按规定要求进行制作，管端垂直度 $\leq \pm 5\text{mm}$。</p>	<p>If splicing is needed and temporary attachments on pipes need to be removed, the attachment welds shall be ground smooth.</p> <p>如果需要接长，管体上的临时附件应清除干净，焊缝打磨光滑。</p>
	<p>NDT inspection shall be according to :</p> <p>无损检验要求如下:</p> <p>a. All welds shall be visually inspected on both the inside and outside surfaces; The weld profile shall meet the requirements of AWS D1.1, Section 3.6.</p> <p>b. 10 percent of each longitudinal weld (including the extreme ends) and girth weld shall be examined by UT and MT in accordance with the requirements of API RP 2X.</p> <p>所有焊缝内外都应进行外观检验，外观检验要求参照 AWS D1.1 3.6 部分;</p> <p>b. 纵缝 10% (包括最末端) 和每道环缝 100% 都应进行 UT 和 MT 检验，检验要求参照 API PR 2X</p>	
5. Defect repair of base metal 母材缺陷返修	<p>Each defect found in base metal shall be further detected to determine its area. For pipes that have be completed, the defects whose depth does not exceed 5 percent of nominal wall thickness and mechanical damage the depth of which does not exceed 5 percent of nominal wall thickness or 1.6mm(1/16in) may be neglected. The defects exceeding the above limits shall be removed to the sound metal. After removal, the concave shall be smooth. The removal thickness shall not exceed 7 percent of nominal wall thickness, with the maximum of 3.2mm (1/8in).</p> <p>管成型后，可不除去深度不超过 5% 公称壁厚的缺陷和不超过 5% 公称壁厚或 1.6mm 的机械损伤; 超过上述限度的缺陷，应打磨光滑，打磨部位减小的厚度不超过 7% 公称壁厚，最大不超过 3.2mm。缺陷超过 20% 公称壁厚的，进行焊补。</p>	
6. Repair of weld defects 焊缝返修	<p>Weld defects that are not allowed by the specification shall be dealt with. For specific operations such as remove and repair of defects in internal and external welds, please see the corresponding welding procedures.</p> <p>超过规定的焊接缺陷应进行返修，具体参照相关焊接工艺。</p>	