

ITEM	TEST	REF.STANDARD	PROCEDURE	REQUIREMENTS	COMMENTS
1	Anode alloy	Table 1 para.3.1.1	<p>1- Take the chips sample for chemical analysis (The drilling for chemical analysis shall be made with a special analysis drill bit)</p> <p>2-Do the chemical analysis of samples (using the atomic absorption ,inductively coupled plasma ,or directly coupled plasma spectrophotometers)</p>	pb<0.006 % wt Fe<0.005 %wt CU<0.005 % wt Al=0.1 - 0.5 % wt Cd=0.025 - 0.07 % wt	Total constituents shall not exceed 0.1 percent Pb>0.007 Fe>0.006 Cu>0.006
2	Anode weight	para.3.3.3	weigh each of anode	The weight of each anode must be within ±3% of the nominal weight or 2 kg whichever greater.	
3	cast galvanic anode identification	ABSORPTION. 3.5.2	Each anode shall be cast or die-stamped with the following: 1-Manufactures symbol 2-Heat number		
4	Carbon equivalent at insert	para.3.7.2	calculate the carbon equivalent (CE) by the following formula : $CE=C+(1/6)Mn+(1/5)(Cr+Mo+V)+(1/5)(Ni+Cu)$	CE<0.45	
5	Laboratory tests for measuring the electrochemical efficiency	Appendix A DNV RP B 401	1- select the 3 samples for each 15 tones of anodes . 2- provide specimen with dimension ? 10± 1mm× 50 ± 5mm by machining . 3- Drill one of the ends with 2mm diameter then connect the support rod in Titanium and coat the connection by electrically insulation coating . 4- Weigh the samples by 0.1mg balance . (W1)		



## Quality Plan

### Zinc Anode

Anode Code :

Doc No : DT070

Client :

Project :

Order No :

Date :

Standard :MIL -A- 18001K DNV RPB401 NACE RP0387-99 NORSOK M-501

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			<p>5- Fill the tube cathode with sea water . The minimum area of cathode must be 400 cm<sup>2</sup> (20 times the anode area ) and minimum of water is 1 lit .</p> <p>6- Impress the current at the following program</p> <ul style="list-style-type: none"> <li>- Day 1: 1.5mA\cm<sup>2</sup> for anode surface</li> <li>- Day 2: 0.4mA\cm<sup>2</sup> for anode surface</li> <li>- Day 3: 4.0mA\cm<sup>2</sup> for anode surface</li> <li>- Day 4: 1.5mA\cm<sup>2</sup> for anode surface</li> </ul> <p>7- The accuracy of current is <math>\pm 0.1</math> mAcm<sup>2</sup> and the time period is 24 <math>\pm</math> 1 hr .</p> <p>8- Measure the potential at the end of each period base on reference electrode .</p> <p>9- After the test , clean the specimens for 10 min at 80°C in a solution containing 20 gr chromium trioxide and 30cc concentrated phosphoric acid per liter water .</p> <p>10- dry the specimens by tap water and ethanol .</p> <p>11- Weigh the specimens to the nearest 0.1mg (W2)</p> <p>12- Calculate the efficiency</p> $\epsilon = \frac{c \cdot 1000 \cdot W}{W_2 - W_1}$ <p>W=W<sub>2</sub>-W<sub>1</sub> (gr) c: Total current charge (A.hr )</p>		
6	Cast galvanic anode identification	Para . 3.2\ Nace RP 0387	<p>1- Check the following items :</p> <ul style="list-style-type: none"> <li>- heat &amp; sequence number</li> <li>- heat treatment batch number</li> </ul>	Each anode must be marked for cast No . & heat treatment bath No .	

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7	Dimensions & Straightness of anode	Para 3.4 / Nace RP0387	Measure the following items – mean length of anode – mean width – mean thickness – straightness	– mean length must be within $\pm 3\%$ nominal length or $\pm 25\text{mm}$ whichever is smaller – mean width must be $\pm 5\%$ of the nominal mean width – mean depth must be $\pm 10\%$ of the nominal mean depth – straightness must not deviate more than 2% of anode nominal length from the longitudinal of anode .	inspection frequency is $\geq 10\%$ of all anodes
8	Insert dimensions and positions	para 3.5/ NACE RP 0387	– Measure the insert location	– insert location within the anodes must not deviate from nominal position more than 5% of the nominal anode width and length and 10% of the nominal anode depth	Inspection frequency: all of the anode must be checked for critical dimensions – 10% of all anodes
9	Surface irregularations	para 3.7.1 MIL - A- 18001K	inspect the following items : – shrinkage depression – Flash burrs – Surface slag – Crack	– shrinkage depression shall be accepted . – shall not exrrd 1/4 inch in depth	