

FINAL CORRECTIONS FOR PRINTER

EFC 16 SECTION	EFC 16 2 <sup>ND</sup> EDN PAGE	CHANGE REQUIRED
CONTENTS		To be updated by printer in line with changes to sections outlined below
NEW SECTION "Third Edition Note"	Un-numbered page before page 1, below the existing Second Edition Note	<p>ADD: "Third Edition Note</p> <p>Since the first publication, experience has highlighted improvements which could be made to the guidance given in this document, particularly for test methods. Specifically it was found that the test solution was difficult to maintain within the pH range over the full time. Frequent adjustments to the pH resulted in the risk of air entering the test chamber. Other aspects which lacked clarity concerned the evaluation of HIC and C-ring and 4-pb SSC test samples. Improvements to the text on these matters, plus minor editorial improvements, are incorporated in this third edition.</p> <p>Liane Smith Chairman (1998 – 2008) Carbon and Low Alloy Steels Working Group of the Working Party European Federation of Corrosion</p> <p>Stein Olsen Chairman (2001-2008) Working Party on Corrosion in Oil and Gas Production European Federation of Corrosion</p>
1	1	REPLACE: "Crack surface ratio" to "Crack sensitivity ratio"
1	3	REPLACE: Definition of K1scc should be replaced with  "The threshold stress intensity factor above which stress corrosion crack propagation is sustained."
1	4	REPLACE: Definition of SOHIC with:  "Cracking in rolled or forged steel, which is stressed in a direction close to the rolling or forging plane of the steel in a hydrogen charging environment, and which consists of linked stacks of small cracks with each individual small crack lying in the rolling plane but the linking cracks being approximately normal to the causative stress (and therefore through thickness)."
1	5 (at end of	ADD:

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	definitions starting with letter S)	$\sigma_{th}$ : Threshold stress
1	9	ADD: MPI : Magnetic Particle Inspection
7.1	19 (3 lines before end of this section)	DELETE: "....even traces elements of H <sub>2</sub> S....."
Table 8.1	24	ADD TO TITLE: (HV10) to read "Applicable Vickers hardness (HV10) limits for welds"
8.2.1	24 (1 <sup>st</sup> line below table)	DELETE: "@ " character so it reads ".....250 HV30 (22 HRC)."
8.2.1	24 (last line)	DELETE: Delete sentence starting, "If hydrogen exit ...."
ANNEX 3 Section A.3	30 (line 1)	REPLACE: "basis" by "base" (to read, "base test solution")
ANNEX 3 Section A.3	30	ADD: New text after second sentence –  For tests requiring greater pH stability an alternative solution (NACE TM0177-Solution B) may be more appropriate. For example, this solution would be recommended for repeated routine testing. Where this solution is selected it shall be identified as "NACE TM0177-Solution B" quoting the adjusted test pH."  START NEW PARAGRAPH with the continuing existing text "pH is adjusted....etc."
ANNEX 3 Section A.3	30 (Line 8)	REPLACE:  Replace "solutions" by "pH conditions" to read –  "...the following pH conditions may be considered...."
ANNEX 3 Section A.3	30 (Line 10, line 12)	REPLACE (X2):  "basis" by "test" to read "...will use the test solution adjusted...." (two places, same change)
Table A.9	32 (Heading)	REPLACE: Should read- "Acceptance criteria for SSC test methods"
Table A.9	32 (first 3 rows of RH column)	ADD: the subscript "3" to "Actual YS" in first 3 rows to be consistent with following 3 rows.
Table A.9	32 (last row, first column)	REPLACE: "Heavy section or complex shape components T/D>0.05" with new text

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		<p>“Items Utilising Fracture Mechanics Design Basis” Add a reference to new reference 15 included in list of references below.</p>
Table A.9	32 (2 <sup>nd</sup> to last row)	<p>ADD: After the letters “DCB” put a superscript 5 to indicate a new note for the table.</p> <p>ADD: Note 5 underneath as</p> <p>5 Lower values of stress intensity may be applicable for high strength steels and acceptance criteria may be design dependent.</p>
APPENDIX 1 Section 1.4	34	<p>REPLACE: <math>R_a \leq 0.2\text{mm}</math> with <math>R_a \leq 0.2\mu\text{m}</math></p>
APPENDIX 2 Section 2.2	35	<p>ADD: Insert a sentence after the current first sentence to read –</p> <p>“The height and width dimensions of any specimen should not vary by more than 0.15 mm across the parallel faces for unwelded parent material.”</p> <p>Paragraph continues with “For welded joints....etc”.</p>
APPENDIX 2 Section 2.3	35	<p>REPLACE: Second sentence (commencing “If required...” with,</p> <p>“Strain gauges can be attached to the side of the protruding weld bead on the test sample, or alternatively to a dummy sample, to determine the local stress corresponding to a given deflection.”</p>
APPENDIX 2 (existing Section 2.4)	36	<p>REPLACE: Title to read 2.5 Reporting Requirements for Welded Specimens</p> <p>First line, 3<sup>rd</sup> word, should read “welded” i.e. “...testing <del>weld</del> welded samples.....”</p> <p>(see NEW section 2.4 below to be inserted)</p>
APPENDIX 2	36	<p>ADD: New Section as follows:</p> <p>2.4 Failure Appraisal</p> <p>Test specimens should be evaluated for any evidence of cracking including:</p> <ul style="list-style-type: none"> <li>i) Surface breaking SSC</li> <li>ii) Sub-surface / surface breaking SOHIC and SZC</li> </ul>

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		<p>The following evaluation method should be used:</p> <ul style="list-style-type: none"> <li>i) Initial visual examination at 10x magnification.</li> <li>ii) MPI of stressed test face.</li> <li>iii) Sectioning of the specimens at any suspicious features noted in steps (i) and (ii), or otherwise at mid-width.</li> <li>iv) Metallographic examination in the unetched condition at 100x magnification of both cut faces. The size and location of any cracks should be confirmed in the etched condition.</li> </ul> <p>All cracks identified should be reported, clearly identifying the type of crack and location.</p> <p>Any stress corrosion cracks or SOHIC extending more than 0.1 mm in the through-thickness direction should be considered as cause for failure.</p> <p>Any pits or other notable corrosion features should be recorded.</p>
Appendix 3 Section 3.1	37 (line 3)	<p>REPLACE:</p> <p>Last two sentences which currently read, "The K<sub>1scc</sub> value....etc...fracture mechanics" with:</p> <p>"K<sub>1scc</sub> can be used as a fitness for service parameter when significant defects are expected and a fracture mechanics approach to design and component integrity is adopted. The values obtained in Test Method D are specific to the testing conditions and exposure time and provide primarily a ranking of tested materials. They should only be used for fitness for service purposes if the test conditions are similar or more severe than service and if there is sufficient confidence in crack arrest during the test period".</p>
Appendix 3 Section 3.6	38	<p>RE-NUMBER AS:</p> <p>3.5 Test Duration</p> <p>REPLACE: 15 days by "30 days"</p> <p>ADD: New sentence at the end- "Testing for a longer period may be needed to achieve the correct K<sub>1scc</sub> value for certain material-environment combinations."</p>
Appendix 3 Section 3.5	38	RE-NUMBER AND NEW TITLE AS:

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		<p>3.6 Failure Appraisal</p> <p>ADD: New sentence at end of this section as a new paragraph after the current text "...and B= specimen thickness (m)."</p> <p>"The K1SSC value shall exceed the acceptance criteria defined for the design or based upon the general guideline in Table A.9."</p>
ANNEX B Section B.8	43	<p>CHANGE: Change CTR limit from 3% to 5% Change CSR limit from 1.5% to 2%</p> <p>ADD: Additional bullet point below the 3 bullets under the heading "Note:"</p> <p>"The acceptance criteria for each test sample should be applied to the average of each ratio from the three cut faces examined."</p>
ANNEX C	45	<p>ADD: New paragraph below current text on page 45 -</p> <p>"Note that actual pH values in highly concentrated chloride environments (&gt;0.5 M NaCl) may be lower than the estimates indicated in these figures."</p>
Annex C	47	<p>ADD legend defining meaning of dashed/continuous/dotted lines in Figs C3 – C5. This was in 1<sup>st</sup> ed but lost in 2<sup>nd</sup> ed.</p> <p>..... Ca<sup>2+</sup> &lt; HCO<sub>3</sub><sup>-</sup> (meq L<sup>-1</sup>)  ----- Ca<sup>2+</sup> = HCO<sub>3</sub><sup>-</sup> (meq L<sup>-1</sup>)  ___ Ca<sup>2+</sup> &gt; HCO<sub>3</sub><sup>-</sup> (meq L<sup>-1</sup>)</p> <p>(I suggest printer checks first edition page 45).</p>
References	55	<p>Reference 3 – Replace "1996" With "2nd Edn. 2002"</p> <p>Reference 4 REPLACE full stop at end of the title by a comma, i.e. ".....Induced Cracking, Corrosion '85..."</p> <p>Reference 6 REMOVE numerical character from 3rd name, REPLACE as "Truchon".</p> <p>Reference 7 Capitalise first letters of title and journal i.e. "pH Measurements Under high Pressures of CO2 and H2S, Mat. Perform., 1984..."</p> <p>Reference 8 Capitalise first letters of title i.e."An Optimised Procedure</p>

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		<p>for Corrosion testing Under CO2 and H2S Gas Pressure,”</p> <p>Reference 9 Comma required at end of title i.e. ....H2S Induced Cracking, Corros. Sci., ...”</p> <p>Reference 14: REPLACE. “Condensate Lme Line” And ADD spaces between numbers on last line.</p> <p>ADD: Reference 15: BS 7910:2005 "Guide to methods for assessing the acceptability of flaws in metallic structures"</p>

