

ISO/TR 17844:2004-09 (E)

Welding - Comparison of standardised methods for the avoidance of cold cracks

Contents		Page
Foreword		vi
Introduction		vii
1	Scope	1
2	CE-method	1
2.1	Cracking test method	1
2.2	Parent metal composition range	1
2.3	Plate thickness and joint geometry	2
2.4	Hydrogen level and welding process	2
2.4.1	Hydrogen scales	2
2.4.2	Selection of hydrogen scales	2
2.5	Heat input	3
2.6	Special considerations	7
2.6.1	Conditions which might require more stringent procedures	7
2.6.2	Relaxations	8
2.6.3	Simplified conditions for manual metal-arc welding	8
2.7	Determination of preheat	10
3	CET-method	18
3.1	Cracking test method	18
3.2	Parent metal composition range	19
3.3	Plate thickness	20
3.4	Hydrogen level and welding process	21
3.5	Heat input	21
3.6	Influence of residual stress	22
3.7	Determination of preheat	22
3.7.1	Calculation of the minimum preheat temperature	22
3.7.2	Example for determination : numerical determination of the preheat temperature	23
3.7.3	Example for determination : graphical determination of the preheat temperature	23
3.8	Special considerations	25
3.8.1	Reduction of hydrogen content by post heating (soaking)	25
3.8.2	Welding with reduced preheating	25
3.8.3	Welding with austenitic consumables	25
4	CEN-method	25
4.1	Cracking test method	25
4.2	Parent metal composition range	26
4.3	Material thickness	27
4.4	Weld metal hydrogen content and welding process	27
4.5	Heat input	27
4.6	Weld metal yield strength	28
4.7	Determination of preheat	29
4.8	Special considerations	29
4.8.1	Weld metal hydrogen content	29
4.8.2	Number of the weld layers and weld metal strength	30
4.8.3	Restraint	30
4.8.4	Weld metal hydrogen cracking	30
5	Pcm-method	34
5.1	General	34

5.1.1	Cracking test method	34
5.1.2	HAZ hardness control method	34
5.1.3	Hydrogen controlled method	35
5.2	Parent metal composition range	35
5.2.1	Hardness controlled method	35
5.2.2	Hydrogen controlled method	35
5.2.3	Selection of method	35
5.2.4	Hydrogen controlled method	36
5.3	Plate thickness and joint geometry	36
5.3.1	HAZ hardness controlled method	36
5.3.2	Hydrogen controlled method	36
5.4	Hydrogen levels and welding process	37
5.4.1	HAZ hardness controlled method	37
5.4.2	Hydrogen controlled method	37
5.5	Energy input	37
5.6	Special considerations	38
5.7	Determination of minimum preheat	38
5.7.1	Method according to value of CE	38
5.7.2	HAZ hardness controlled method	38
5.7.3	Hydrogen content controlled method	39
Annex A (informative) Comparison of the different methods		48
A.1	General	48
A.2	Parent metal composition range	48
A.3	Plate thickness and joint geometry	48
A.4	Hydrogen levels	49
A.5	Heat input	49
A.6	Prediction comparison	49
A.7	Summary and conclusions	50
Annex B (informative) Abbreviations		71
Bibliography		72