

ISO/TR 10400:2007-12 (E)

Petroleum and natural gas industries - Equations and calculations for the properties of casing, tubing, drill pipe and line pipe used as casing or tubing

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Conformance	2
2.1	Normative references	2
2.2	Units of measurement	2
3	Normative references	2
4	Terms and definitions	3
5	Symbols	5
6	Triaxial yield of pipe body	14
6.1	General	14
6.2	Assumptions and limitations	15
6.3	Data requirements	15
6.4	Design equation for triaxial yield of pipe body	16
6.5	Application of design equation for triaxial yield of pipe body to line pipe	17
6.6	Example calculations	17
7	Ductile rupture of the pipe body	21
7.1	General	21
7.2	Assumptions and limitations	21
7.3	Data requirements	22
7.4	Design equation for capped-end ductile rupture	24
7.5	Adjustment for the effect of axial tension and external pressure	25
7.6	Example calculations	28
8	External pressure resistance	30
8.1	General	30
8.2	Assumptions and limitations	30
8.3	Data requirements	31
8.4	Design equation for collapse of pipe body	31
8.5	Equations for empirical constants	37
8.6	Application of collapse pressure equations to line pipe	38
8.7	Example calculations	39
9	Joint strength	39
9.1	General	39
9.2	API casing connection tensile joint strength	40
9.3	API tubing connection tensile joint strength	46
9.4	Line pipe connection joint strength	47
10	Pressure performance for couplings	47
10.1	General	47
10.2	Internal yield pressure of round thread and buttress couplings	48
10.3	Internal pressure leak resistance of round thread or buttress couplings	49

11	Calculated masses	51
11.1	General	51
11.2	Nominal masses	51
11.3	Calculated plain-end mass	51
11.4	Calculated finished-end mass	52
11.5	Calculated threaded and coupled mass	52
11.6	Calculated upset and threaded mass for integral joint tubing and extreme-line casing	53
11.7	Calculated upset mass	54
11.8	Calculated coupling mass	55
11.9	Calculated mass removed during threading	59
11.10	Calculated mass of upsets	64
12	Elongation	68
13	Flattening tests	68
13.1	Flattening tests for casing and tubing	68
13.2	Flattening tests for line pipe	69
14	Hydrostatic test pressures	70
14.1	Hydrostatic test pressures for plain-end pipe, extreme-line casing and integral joint tubing	70
14.2	Hydrostatic test pressure for threaded and coupled pipe	70
15	Make-up torque for round thread casing and tubing	72
16	Guided bend tests for submerged arc-welded line pipe	72
16.1	General	72
16.2	Background	74
17	Determination of minimum impact specimen size for API couplings and pipe	74
17.1	Critical thickness	74
17.2	Calculated coupling blank thickness	76
17.3	Calculated wall thickness for transverse specimens	77
17.4	Calculated wall thickness for longitudinal specimens	78
17.5	Minimum specimen size for API couplings	79
17.6	Impact specimen size for pipe	81
17.7	Larger size specimens	81
17.8	Reference information	81
Annex A (informative) Discussion of equations for triaxial yield of pipe body		82
Annex B (informative) Discussion of equations for ductile rupture		95
Annex C (informative) Rupture test procedure		131
Annex D (informative) Discussion of equations for fracture		133
Annex E (informative) Discussion of historical API collapse equations		140
Annex F (informative) Development of probabilistic collapse performance properties		154
Annex G (informative) Calculation of design collapse strength from collapse test data		188
Annex H (informative) Calculation of design collapse strengths from production quality data		191
Annex I (informative) Collapse test procedure		205
Annex J (informative) Discussion of equations for joint strength		210
Annex K (informative) Tables of calculated performance properties in SI units		220
Annex L (informative) Tables of calculated performance properties in USC units		222
Bibliography		224