

DIN CEN ISO/TR 10400: 2011-07(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 (ISO/TR_10400:2007); English version CEN_ISO/TR_10400:2011, only on CD-ROM

Contents

Page

| | |
|---|----|
| Foreword | 4 |
| Introduction..... | 5 |
| 1 Scope | 6 |
| 2 Conformance | 7 |
| 2.1 Normative references | 7 |
| 2.2 Units of measurement..... | 7 |
| 3 Normative references | 7 |
| 4 Terms and definitions | 8 |
| 5 Symbols..... | 10 |
| 6 Triaxial yield of pipe body | 19 |
| 6.1 General | 19 |
| 6.2 Assumptions and limitations | 20 |
| 6.3 Data requirements | 20 |
| 6.4 Design equation for triaxial yield of pipe body | 21 |
| 6.5 Application of design equation for triaxial yield of pipe body to line pipe | 22 |
| 6.6 Example calculations | 22 |
| 7 Ductile rupture of the pipe body | 26 |
| 7.1 General | 26 |
| 7.2 Assumptions and limitations | 26 |
| 7.3 Data requirements | 27 |
| 7.4 Design equation for capped-end ductile rupture | 29 |
| 7.5 Adjustment for the effect of axial tension and external pressure | 30 |
| 7.6 Example calculations | 33 |
| 8 External pressure resistance | 35 |
| 8.1 General | 35 |
| 8.2 Assumptions and limitations | 35 |
| 8.3 Data requirements | 36 |
| 8.4 Design equation for collapse of pipe body..... | 36 |
| 8.5 Equations for empirical constants | 42 |
| 8.6 Application of collapse pressure equations to line pipe..... | 43 |
| 8.7 Example calculations | 44 |
| 9 Joint strength..... | 44 |
| 9.1 General | 44 |
| 9.2 API casing connection tensile joint strength | 45 |
| 9.3 API tubing connection tensile joint strength..... | 51 |
| 9.4 Line pipe connection joint strength | 52 |
| 10 Pressure performance for couplings | 52 |
| 10.1 General | 52 |
| 10.2 Internal yield pressure of round thread and buttress couplings..... | 53 |
| 10.3 Internal pressure leak resistance of round thread or buttress couplings..... | 54 |

| | | |
|--------------|--|-----|
| 11 | Calculated masses | 56 |
| 11.1 | General | 56 |
| 11.2 | Nominal masses | 56 |
| 11.3 | Calculated plain-end mass | 56 |
| 11.4 | Calculated finished-end mass | 57 |
| 11.5 | Calculated threaded and coupled mass..... | 57 |
| 11.6 | Calculated upset and threaded mass for integral joint tubing and extreme-line casing | 58 |
| 11.7 | Calculated upset mass | 59 |
| 11.8 | Calculated coupling mass | 60 |
| 11.9 | Calculated mass removed during threading..... | 64 |
| 11.10 | Calculated mass of upsets | 69 |
| 12 | Elongation | 73 |
| 13 | Flattening tests | 73 |
| 13.1 | Flattening tests for casing and tubing..... | 73 |
| 13.2 | Flattening tests for line pipe..... | 74 |
| 14 | Hydrostatic test pressures | 75 |
| 14.1 | Hydrostatic test pressures for plain-end pipe, extreme-line casing and integral joint tubing | 75 |
| 14.2 | Hydrostatic test pressure for threaded and coupled pipe | 75 |
| 15 | Make-up torque for round thread casing and tubing | 77 |
| 16 | Guided bend tests for submerged arc-welded line pipe..... | 77 |
| 16.1 | General..... | 77 |
| 16.2 | Background | 79 |
| 17 | Determination of minimum impact specimen size for API couplings and pipe | 79 |
| 17.1 | Critical thickness | 79 |
| 17.2 | Calculated coupling blank thickness..... | 81 |
| 17.3 | Calculated wall thickness for transverse specimens | 82 |
| 17.4 | Calculated wall thickness for longitudinal specimens | 83 |
| 17.5 | Minimum specimen size for API couplings..... | 84 |
| 17.6 | Impact specimen size for pipe..... | 86 |
| 17.7 | Larger size specimens | 86 |
| 17.8 | Reference information..... | 86 |
| Annex A | (informative) Discussion of equations for triaxial yield of pipe body | 87 |
| Annex B | (informative) Discussion of equations for ductile rupture | 100 |
| Annex C | (informative) Rupture test procedure | 136 |
| Annex D | (informative) Discussion of equations for fracture | 138 |
| Annex E | (informative) Discussion of historical API collapse equations | 145 |
| Annex F | (informative) Development of probabilistic collapse performance properties..... | 159 |
| Annex G | (informative) Calculation of design collapse strength from collapse test data | 193 |
| Annex H | (informative) Calculation of design collapse strengths from production quality data..... | 196 |
| Annex I | (informative) Collapse test procedure..... | 210 |
| Annex J | (informative) Discussion of equations for joint strength | 215 |
| Annex K | (informative) Tables of calculated performance properties in SI units..... | 225 |
| Annex L | (informative) Tables of calculated performance properties in USC units | 227 |
| Bibliography | | 229 |