

ISO 14692-3:2002-12 (E)

Petroleum and natural gas industries - Glass-reinforced plastics (GRP) piping - Part 3: System piping

| Contents | | Page |
|--------------------|--|-------------|
| Introduction | | vi |
| 1 | Scope | 1 |
| 2 | Normative references | 1 |
| 3 | Terms and definitions | 1 |
| 4 | Symbols and abbreviated terms | 1 |
| 5 | Layout requirements | 2 |
| 5.1 | General | 2 |
| 5.2 | Space requirements | 2 |
| 5.3 | System supports | 3 |
| 5.4 | Isolation and access for cleaning | 5 |
| 5.5 | Vulnerability | 5 |
| 5.6 | Joint selection | 6 |
| 5.7 | Fire and blast | 7 |
| 5.8 | Control of electrostatic discharge | 8 |
| 5.9 | Galvanic corrosion | 9 |
| 6 | Hydraulic design | 9 |
| 6.1 | General | 9 |
| 6.2 | Flow characteristics | 9 |
| 6.3 | General velocity limitations | 9 |
| 6.4 | Erosion | 10 |
| 6.5 | Water hammer | 10 |
| 6.6 | Cyclic conditions | 11 |
| 7 | Structural design | 11 |
| 7.1 | General | 11 |
| 7.2 | Manufacturer's pressure rating | 11 |
| 7.3 | Qualified pressure | 11 |
| 7.4 | Factored qualified pressure | 12 |
| 7.5 | System design pressure | 13 |
| 7.6 | Loading requirements | 14 |
| 7.7 | Allowable displacements | 16 |
| 7.8 | Qualified stress | 16 |
| 7.9 | Factored stress | 16 |
| 7.10 | Limits of calculated stresses due to loading | 17 |
| 7.11 | Determination of failure envelope | 18 |
| 8 | Stress analysis | 25 |
| 8.1 | Analysis methods | 25 |
| 8.2 | Analysis requirements | 25 |
| 8.3 | External pressure/vacuum | 26 |
| 8.4 | Thermal loading | 27 |
| 8.5 | Stresses due to internal pressure | 27 |
| 8.6 | Stresses due to pipe support | 28 |
| 8.7 | Axial compressive load (buckling) | 29 |

| | | |
|--------------|--|-----------|
| 9 | Fire performance | 30 |
| 9.1 | General | 30 |
| 9.2 | Fire endurance | 31 |
| 9.3 | Fire reaction | 32 |
| 9.4 | Fire-protective coatings | 32 |
| 10 | Static electricity | 33 |
| 10.1 | General | 33 |
| 10.2 | Classification code for control of electrostatic charge accumulation | 33 |
| 10.3 | Mitigation options | 33 |
| 10.4 | Design and documentation requirements | 34 |
| 10.5 | Pipes that contain a fluid with an electrical conductivity more than 10 000 pS/m | 36 |
| 10.6 | Pipes that contain a fluid with an electrical conductivity less than 10 000 pS/m | 36 |
| 10.7 | Pipes exposed to weak/moderate external electrostatic-generation mechanisms | 37 |
| 10.8 | Pipes exposed to strong external electrostatic generation mechanisms | 37 |
| 10.9 | Continuity of electrical path within piping system | 38 |
| 10.10 | Lightning strike | 38 |
| 11 | Installer and operator documentation | 38 |
| | Annex A (informative) Guidance for design of GRP piping system layout | 40 |
| | Annex B (informative) Description and guidance on selection of jointing designs | 42 |
| | Annex C (informative) Guidance on material properties and stress/strain analysis | 47 |
| | Annex D (normative) Guidance on flexibility analysis | 49 |
| | Annex E (normative) Calculation of support stresses for large-diameter liquid-filled pipe | 59 |
| | Annex F (informative) Guidance on quantifying fire performance properties | 63 |
| | Annex G (informative) Static electricity | 68 |
| | Annex H (informative) Inspection strategy | 76 |
| | Bibliography | 79 |