

# Contents

Page

Foreword.....	4
<b>1 Scope .....</b>	<b>5</b>
<b>2 Normative references .....</b>	<b>5</b>
<b>3 Terms, definitions and symbols.....</b>	<b>6</b>
3.1 Terms and definitions .....	6
3.2 Symbols .....	8
<b>4 Breather device and safety device .....</b>	<b>9</b>
<b>5 Materials .....</b>	<b>10</b>
5.1 General.....	10
5.2 Material properties.....	10
5.3 Compatibility of shell materials with substances carried .....	11
<b>6 Design .....</b>	<b>12</b>
6.1 General.....	12
6.2 Design verification.....	12
6.3 Requirements for shells of non-circular cross-section .....	12
6.4 Dynamic conditions.....	12
6.5 Pressure conditions .....	13
6.6 Partial vacuum conditions .....	13
6.7 Design temperature .....	13
6.8 Design stress .....	13
6.9 Shell thickness.....	14
6.10 Shell openings, neckrings and closures.....	18
6.11 Shell partitions, surge plates and baffles .....	18
6.12 Attachments to the shell .....	19
6.13 Shell supporting structure.....	20
6.14 Protection of service equipment mounted on the tank top.....	20
<b>7 Manufacture.....</b>	<b>27</b>
7.1 General.....	27
7.2 Cutting and edge preparation.....	28
7.3 Forming.....	28
7.4 Welding .....	29
7.5 Manufacturing tolerances .....	30
7.6 Rectification of defects .....	31
<b>Annex A (normative) Methods of design verification .....</b>	<b>32</b>
A.1 General.....	32
A.2 Dynamic testing .....	32
A.3 Finite element stress analysis.....	33
A.4 Reference design .....	35
A.5 Calculation method – worksheet.....	35
<b>Annex B (normative) Method of measurement of specific resilience.....</b>	<b>56</b>
B.1 Principle.....	56
B.2 Apparatus .....	56

<b>B.3</b>	<b>Samples of materials to be tested .....</b>	<b>60</b>
<b>B.4</b>	<b>Procedure .....</b>	<b>62</b>
<b>B.5</b>	<b>Results .....</b>	<b>63</b>
<b>B.6</b>	<b>Global resilience (see 6.9.2.2 i)) .....</b>	<b>64</b>
<b>B.7</b>	<b>Comparative methods to calculate the energy absorbed during an overturning or an impact. (see 6.9.2.2 j)) .....</b>	<b>65</b>
<b>Annex C</b>	<b>(normative) Design of neckrings, flanges and closures .....</b>	<b>66</b>
<b>Annex D</b>	<b>(informative) Examples of welding details .....</b>	<b>67</b>
<b>D.1</b>	<b>General .....</b>	<b>67</b>
<b>D.2</b>	<b>Tank construction .....</b>	<b>67</b>
<b>D.3</b>	<b>Attachment of reinforcements .....</b>	<b>78</b>
<b>D.4</b>	<b>Attachment of branches .....</b>	<b>80</b>
<b>D.5</b>	<b>Attachment of flanges, collars and reinforcing pads to the shell .....</b>	<b>82</b>
<b>D.6</b>	<b>Attachment of flanges onto branches .....</b>	<b>83</b>
<b>D.7</b>	<b>Attachment of heating channels to shells .....</b>	<b>84</b>
	<b>Bibliography .....</b>	<b>86</b>