INF. 22

ECONOMIC COMMISSION FOR EUROPE

INLAND TRANSPORT COMMITTEE

Working Party on the Transport of Dangerous Goods
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Proposal to refer to EN standards in chapter 6.8 of the ADR

Transmitted by the European Committee for Standardisation (CEN)

CEN proposes to refer to two standards EN 12252: 2000 and EN 12493:2001 in 6.8.2.6 as follows:

DOC. Reference	Title of Document	Applicable sections
EN 12252:2000	Equipping of LPG road tankers	6.8.3.2
EN 12493 (except Annex C)	Design and manufacture of welded steel tanks for LPG road tankers	6.8.2.1; 6.8.2.4.1(with the exclusion of the leakproofness test); 6.8.2.5.1 and 6.8.3.5.1

Annex C of EN12493 gives the design conditions for countries that accept for national transport design conditions different from those in ADR. In order to avoid any confusion with regard to the validity of that Annex (though informative) for the design of tanks for international transport, it is proposed to exclude it from the reference.

A synopsis of the assessments made by the CEN consultant for these two standards was presented in INF.27E at the November 2000 session of WP15.
At that meeting, it was requested from CEN to provide together with the final proposal for adoption a comparison between the minimum thickness for pressure calculated according to the requirements of the standard and according to the requirements of ADR.
The comparison is shown in attachment for LPG tanks of various diameters and at various pressures. The last column indicates the variations. Negative figures are in favour of the thickness calculated by the standard; positive figures are in favour of the thickness calculated by the ADR. The maximum variation is 3.7% versus the “ADR thickness”.
For low pressures, the variations are due to the linear formula (without corrections for “other steels”) adopted in the standard (D/500 + 1.5 mm) for the calculation of the “minimum thickness against damage”compared to the “step” formula in ADR (6mm >1.8m; 5mm<1.8m).
For those reasons, the minimum thickness required by the standard is in many cases higher than that required by ADR.

Determination of minimum wall thickness according to EN 12493 and to chapter 6.8

Material	Material characteristics				ADR limitations		Std limitations		s	s	Ratio
Grade	Re	Rm	*A*		Rex0.75	Rmx0.5	Re/1.5	Rm/2.4	ADR	Std	s
Annex L	N/mm²	N/mm²	%	Re/Rm	N/mm²	N/mm²	N/mm²	N/mm²	N/mm²		
P235GH*	235	360	25	0.65	176	180	157	150	176	150	1.18
P265GH*	265	410	23	0.65	199	205	177	171	199	171	1.16
P295GH	295	460	22	0.64	221	230	197	192	221	192	1.15
P355GH	355	510	21	0.70	266	255	237	213	255	213	1.20
P275N*	275	390	24	0.71	206	195	183	163	195	163	1.20
P355N	355	490	22	0.72	266	245	237	204	245	204	1.20
P460N	460	570	17	0.81	345	285	307	238	285	238	1.20
S 235*	235	360	26	0.65	176	180	157	150	176	150	1.18
S 275*	275	430	22	0.64	206	215	183	179	206	179	1.15
S 355J2G3	355	510	22	0.70	266	255	237	213	255	213	1.20

*=mild steel

case 1a: Di=2300; De=2330 mm; test pressure 25 bar (with thermal insulation)

Material	s	s	e mini	e mini	e mini	e mini	e (mm)	e (mm)	Diff.
Grade	ADR	Std	pressure	pressure	6.8.2.1.18	D.3.1	final	final	e
Annex L	N/mm²		ADR	STD	ADR	STD	ADR	STD	%
P235GH*	176	150	16.31	16.07	6.0	6.16	16.3	16.1	1.5%
P265GH*	199	171	14.47	14.12	6.0	6.16	14.5	14.1	2.4%
P295GH	221	192	12.99	12.59	6.0	6.16	13.0	12.6	3.1%
P355GH	255	213	11.27	11.37	5.7	6.16	11.3	11.4	-0.8%
P275N*	195	163	14.74	14.84	6.0	6.16	14.7	14.8	-0.7%
P355N	245	204	11.73	11.83	5.7	6.16	11.7	11.8	-0.8%
P460N	285	238	10.09	10.17	6.1	6.16	10.1	10.2	-0.9%
S 235*	176	150	16.31	16.07	6.0	6.16	16.3	16.1	1.5%
S 275*	206	179	13.94	13.47	6.0	6.16	13.9	13.5	3.4%
S 355J2G3	255	213	11.27	11.37	5.6	6.16	11.3	11.4	-0.8%

*=mild steel

case 3a: Di=1700 mm; De=1720 mm; test pressure 25 bar (with thermal insulation)

Material	s	s	e mini	e mini	e mini	e mini	e (mm)	e (mm)	Diff.
Grade	ADR	Std	pressure	pressure	6.8.2.1.18	D.3.1	final	final	e
Annex L	N/mm²		ADR	STD	ADR	STD	ADR	STD	%
P235GH*	176	150	12.06	11.86	5.0	4.94	12.1	11.9	1.6%
P265GH*	199	171	10.69	10.42	5.0	4.94	10.7	10.4	2.5%
P295GH	221	192	9.60	9.30	5.0	4.94	9.6	9.3	3.2%
P355GH	255	213	8.33	8.39	4.8	4.94	8.3	8.4	-0.7%
P275N*	195	163	10.90	10.96	5.0	4.94	10.9	11.0	-0.5%
P355N	245	204	8.67	8.73	4.8	4.94	8.7	8.7	-0.7%
P460N	285	238	7.46	7.51	5.1	4.94	7.5	7.5	-0.7%
S 235*	176	150	12.06	11.86	5.0	4.94	12.1	11.9	1.6%
S 275*	206	179	10.30	9.94	5.0	4.94	10.3	9.9	3.5%
S 355J2G3	255	213	8.33	8.39	4.6	4.94	8.3	8.4	-0.7%

case 1d: Di=2300; De=2330 mm; test pressure 12 bar (with thermal insulation)

Material Grade Annex L	s ADR N/mm²	s Std N/mm²	e mini pressure ADR	e mini pressure STD	e mini 6.8.2.1.18 ADR	e mini D.3.1 STD	e (mm) final ADR	e (mm) final STD	Diff. e %
P235GH	176	150	7.83	7.74	6.0	6.16	7.8	7.7	1.1%
P265GH	199	171	6.94	6.80	6.0	6.16	6.9	6.8	2.1%
P295GH	221	192	6.24	6.06	6.0	6.16	6.3	6.1	4.2%
P355GH	255	213	5.41	5.47	5.7	6.16	5.7	6.1	-6.8%
P275N	195	163	7.08	7.15	6.0	6.16	7.1	7.1	-1.0%
P355N	245	204	5.63	5.69	5.7	6.16	5.7	6.1	-7.3%
P460N	285	238	4.84	4.89	6.1	6.16	6.1	6.1	0.1%
S 235J2G3	176	150	7.83	7.74	6.0	6.16	7.8	7.7	1.1%
S 275J2G3	206	179	6.69	6.48	6.0	6.16	6.7	6.5	3.1%
S 355J2G3	255	213	5.41	5.47	5.6	6.16	5.6	6.1	-10.2%

case 3d: Di=1700 mm; De=1720 mm; test pressure 12 bar (with thermal insulation)

Material Grade Annex L	s ADR N/mm²	s Std N/mm²	e mini pressure ADR	e mini pressure STD	e mini 6.8.2.1.18 ADR	e mini D.3.1 STD	e (mm) final ADR	e (mm) final STD	Diff. e %	
P235GH	176	150	5.79	5.71	5.0	4.94	5.8	5.7	1.3%	
P265GH	199	171	5.13	5.02	5.0	4.94	5.1	5.0	2.2%	
P295GH	221	192	4.61	4.48	5.0	4.94	5.0	4.9	0.4%	**
P355GH	255	213	4.00	4.04	4.8	4.94	4.8	4.9	-3.4%	**
P275N	195	163	5.23	5.28	5.0	4.94	5.2	5.3	-0.9%	
P355N	245	204	4.16	4.20	4.8	4.94	4.8	4.9	-3.8%	**
P460N	285	238	3.58	3.61	5.1	4.94	5.1	4.9	3.1%	**
S 235J2G3	176	150	5.79	5.71	5.0	4.94	5.8	5.7	1.3%	
S 275J2G3	206	179	4.95	4.79	5.0	4.94	5.0	4.9	1.2%	**
S 355J2G3	255	213	4.00	4.04	4.6	4.94	4.6	4.9	-6.7%	**

**=surge plates thickness=e