

ŽĎAS, a.s. Standardization	INFORMATION DOCUMENT		Q6001	Approval Date: 13. 08. 2020
	Name:	TDC of Products and Machine Parts <b>Bare Pipe Bends</b>		Page/Pages: 1/4

## Subject of Document

Technical delivery conditions (TDC) for hot- or cold-made bare pipe bends on one pipe up to the maximum bend angle of 180° of seamless steel pipes and materials listed in Tables 1 and 2 for supplies to ŽĎAS, a. s.

### 1 Technical Delivery Conditions according to Special Agreement

The following TDC scope is intended to ensure the quality of our products:

- a) An integral part of the order is a drawing of a pipe bend, with reference to this Information Document Q6001.
- b) The design of bends and limit deviations must comply with ČSN EN 13480-4, especially chap. 7. The maximum values of pipe bend wall thickness thinning-down are given in Tables 1 and 2.
- c) Supply the bends with untreated ends for sharp-edged weld.  
*Note: the pipes with measuring-in allowance have higher weight than the net weight mentioned in the drawing.*
- d) The bends must be free of all impurities.
- e) The type of inspection document according to EN 10204-3.1 must be documented to the starting material used for bending (semi-finished product).
- f) Deliver the made bends with the inspection document according to EN 10204 - 2.1.
- g) Each pipe bend must be marked with the number of the drawing that belongs to the given pipe bend. Marking is done by stamping on the allowance as close as possible to the end of the pipe. The font size is chosen in the range of 6 to 10 mm according to the size of the pipe.

Worked out by: Kamil Kluch	Approved by: Ing. Radek Vlček	Dated document
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Table 1 – Minimum required pipe bend wall thickness values for standard bending radii  
Dimensions in v mm


Outer diameter of the pipe, D	Pipe wall thickness, t	Material	Min. required wall thickness on the inner side	Min. required wall thickness on the outer side	Bending radius	
33.7	4.5	P355N	<b>4.28</b>	<b>3.89</b>	100	
38	5	P355N	<b>5.40</b>	<b>4.88</b>	120	
42.4	5.6	P355N	<b>5.66</b>	<b>5.07</b>		
42.4	7.1	P355N	<b>7.20</b>	<b>6.39</b>		
48.3	2.6	P235TR2	<b>2.41</b>	<b>2.25</b>		
		P355N	<b>2.30</b>	<b>2.16</b>		
48.3	4	P355N	<b>4.17</b>	<b>3.74</b>		
48.3	8	P355N	<b>8.21</b>	<b>7.15</b>		
48.3	10	P355N	<b>10.10</b>	<b>8.75</b>		
60.3	2.9	P235TR2	<b>2.81</b>	<b>2.63</b>		180
		P355N	<b>2.50</b>	<b>2.37</b>		
60.3	5	P355N	<b>4.86</b>	<b>4.41</b>		
60.3	8	P355N	<b>7.61</b>	<b>6.81</b>		
60.3	10	P355N	<b>9.80</b>	<b>8.72</b>		
60.3	16	P355N	<b>16.16</b>	<b>13.88</b>	150	
			<b>15.54</b>	<b>14.20</b>	250	
			<b>15.42</b>	<b>14.27</b>	290	
70	14.2	P355N	<b>1.59</b>	<b>11.40</b>	220	
76.1	2.9	P355N	<b>2.73</b>	<b>2.56</b>	230	
76.1	6.3	P355N	<b>6.38</b>	<b>5.73</b>		
76.1	10	P355N	<b>9.41</b>	<b>8.22</b>		
76.1	12.5	P355N	<b>12.13</b>	<b>10.52</b>	195	
76.1	16	P355N	<b>15.71</b>	<b>13.65</b>		
76.1	20	P355N	<b>18.57</b>	<b>16.16</b>	195	
			<b>18.15</b>	<b>16.38</b>	260	
			<b>17.92</b>	<b>16.51</b>	325	
88.9	3.2	P235TR2	<b>3.14</b>	<b>2.94</b>	300	
		P355N	<b>2.95</b>	<b>2.77</b>		
88.9	11	P355N	<b>10.41</b>	<b>9.44</b>	320	
88.9	14.2	P355N	<b>13.91</b>	<b>12.12</b>	240	
			<b>13.60</b>	<b>12.28</b>	320	
88.9	17.5	P355N	<b>16.72</b>	<b>15.06</b>	320	
88.9	25	P355N	<b>24.76</b>	<b>21.67</b>	240	
			<b>21.60</b>	<b>20.04</b>	400	
101.6	10	P235TR2	<b>9.34</b>	<b>8.31</b>	300	
		P355N	<b>8.50</b>	<b>7.60</b>		
101.6	12.5	P355N	<b>12.03</b>	<b>10.67</b>		
101.6	16	P355N	<b>15.49</b>	<b>13.64</b>		
101.6	20	P355N	<b>19.26</b>	<b>16.93</b>		

to be continued

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Table 1 – finalization


Outer diameter of the pipe, D	Pipe wall thickness, t	Material	Min. required wall thickness on the inner side	Min. required wall thickness on the outer side	Bending radius	
108	28	P355N	25.56	22.43	300	
			25.03	22.71	400	
			24.73	22.89	500	
			27.35	25.58	600	
114.3	3.6	P355N	3.42	3.13	300	
114.3	10	P355N	9.52	8.38		
114.3	17.5	P355N	17.49	15.12		
127	32	P355N	31.83	28.33	425	
			31.67	28.42	457	
139.7	4	P235TR2	3.92	3.69	625	
		P355N	3.62	3.42		
139.7	17.5	P235TR2	17.17	15.78		
		P355N	15.52	14.30		
139.7	22.2	P355N	21.26	19.60		
139.7	28	P355N	25.76	23.69		
152.4	12.5	P235TR2	12.32	11.18		600
		P355N	11.66	10.67		
159	40	P355N	37.80	33.92		
168,3	4.5	P235TR2	4.50	4.14		
		P355N	4.20	3.89		
168.3	20	P355N	18.55	16.70		
168.3	25	P355N	24.48	21.96		
168.3	32	P355N	30.50	27.35		
177.8	16	P235TR2	15.07	13.51		
		P355N	13.62	12.26		
193.7	25	P235TR2	24.10	21.27		
		P355N	21.73	19.27		
193.7	50	P355N	48.67	42.87		
219.1	6.3	P235TR2	6.31	5.58		
		P355N	5.18	4.64		
219.1	36	P235TR2	35.94	31.00		
		P355N	33.50	29.17		
219.1	45	P355N	42.80	37.38		
244.5	50	P355N	46.05	40.69	750	
244.5	60	P355N	59.93	52.54		
273	65	P355N	67.13	57.84		

 - The coefficient of the joint value  $z = 1$  is used in the calculation - for devices subjected to destructive and non-destructive testing, which confirms that the whole set of joints does not show significant defects.

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Table 2 – Minimum required pipe bend wall thickness values for standard bending radii for non-recommended bending radii  
Dimensions in mm

Outer diameter of the pipe, D	Pipe wall thickness, t	Material	Min. required wall thickness on the inner side	Min. required wall thickness on the outer side	Bending radius
139.7	4	P235TR2	4.03	3.63	375
			3.96	3.66	500
		P355N	3.72	3.37	375
			3.66	3.40	500
139.7	17.5	P235TR2	17.83	15.46	375
			17.42	15.67	500
		P355N	16.10	14.03	375
			15.74	14.21	500
139.7	22.2	P355N	22.01	19.19	375
			21.53	19.44	500
139.7	28	P355N	27.28	23.74	375
			26.67	24.06	500
152.4	12.5	P235TR2	13.00	11.47	450
			12.90	11.52	500
			12.60	11.70	750
		P355N	11.74	10.41	450
			11.65	10.45	500
			11.39	10.61	750
159	40	P355N	38.69	33.45	450
			38.32	33.63	500
			37.31	34.23	750
168.3	4.5	P235TR2	4.58	4.09	450
			4.55	4.11	500
			4.45	4.16	750
		P355N	4.20	3.78	450
			4.17	3.79	500
			4.09	3.84	750
168.3	20	P355N	18.98	16.48	450
			18.80	16.56	500
			18.31	16.84	750
177.8	16	P235TR2	15.44	13.33	450
		P355N	13.94	12.10	
193.7	50	P355N	49.51	42.47	500
219.1	6.3	P235TR2	6.45	5.83	700
			6.40	5.86	800
		P355N	5.34	4.88	700
			5.30	4.90	800

 - The coefficient of the joint value  $z = 1$  is used in the calculation - for devices subjected to destructive and non-destructive testing, which confirms that the whole set of joints does not show significant defects.