Mechanical property & Chemical analysis of UIC860V standard steel rail

- Catalogue of Rail defects Code UIC 712R/2002 [1-8].

THE PRESCRIBED PROPERTIES OF STEEL FOR RAILWAY RAILS

The Requirements of the Codex UIC 860V

Technical conditions of manufacture and delivery of railway rails were standardized in Codex UIC 860V of the International Railroad Union, which has been harmonized with the world trends before 20 years.

Table 1. gives a survey of the prescribed values regarding chemical composition and tensile properties for four types of normally hard rail steels [4, 9].

Table 2. **Steel grades hardness range, fracture toughness and other [10]**
Table 2. **Raspon vrijednosti tvrdoća čelika za tračnice, lomna žilavost i drugo [10]**

Steel grade	Hardness range HBW	Fracture toughness K_{Ic} / MPa m$^{1/2}$ Minimum value		Description lines	Branding	R_m min / MPa	Elongation min A_5 / %
		Single	Mean				
200	200-240	30	35	C-Mn		680	14
220	220-260	30	35	C-Mn	——	770	12
260	260-300	26	29	C-Mn	——	880	10
260 Mn	260-300	26	29	C-Mn	——	880	10
320 Cr	320-360	24	26	1 %C	——	1080	9
350 HT	350-390	30	32	C-Mn low-alloyed HT*	——	1175	9
350 LHT	350-390	26	29	with HT*	——	1175	9

HT* – heat treated rail that has undergone accelerated cooling from austenitizing temperature during the metallurgical transformation period.

Two major divisions of the draft proposal EN are: qualifying tests and acceptance tests. The qualifying tests introduce a number of perfomance requirements not previously prescribed in national or international standards (such as fracture toughness K_{Ic}). They also include typical results from relevant acceptance tests. The acceptance tests have been designed to control the characteristics of the rail steel and rail that are of relevance for the production of high quality rails and the demands of the railway user. The principle of the

Table 1. **Prescribed chemical composition and tensile properties of rail steels according to UIC 860V**
Tablica 1. **Propisani kemijski sastav i vlačna svojstva čelika za tračnice prema UIC 860V**

Grade of steel	Chemical composition, elements in % of mass						Tensile strength R_m / MPa	Elongation, min A_5 / %
	C	Mn	Si	Cr	P_{max}	S_{min}		
R0700	0,4-0,6	0,8-1,25	0,05-0,35	-	0,05	0,05	680-830	14
R0900 A	0,6-0,8	0,8-1,3	0,1-0,5	-	0,04	0,04	880-1030	10
R0900 B	0,55-0,75	1,3-1,7	0,1-0,5	-	0,04	0,04	880-1030	10
R1100 *	0,6-0,82	0,8-1,3	0,3-0,9	0,8-1,3	(0,025)	0,03	≥ 1080	9

* Other alloy elements such as V or Mo, Nb can be applied according to agreement between manufacturer and the buyer.

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