

Comparison of UIC 860-O and EN 13674-1

The UIC-Codex 860-O specifies material properties that must be met by the rails produced. In contrast to the European Standard EN 13674, requirements for production are not strictly defined. The last revision was done in 1986 and consequently UIC 860-O reflects to the state-of-the-art of this time. Only four rail steel grades are defined by their tensile strength.

The European Standard EN 13674-1 defines seven rail grades by their hardness. This is based on the fact that hardness correlates properly with the wear properties of the particular steel. The European Standard is a product standard that ensures that the required performance in service is achieved. In order to guarantee safety, two steps of product testing are defined: Qualification tests must be done including fracture toughness and fatigue testing. Acceptance tests verify that each rail delivered complies with the specified requirements.

In contrast to UIC 860-O, non-destructive tests are specified in detail as part of the acceptance tests. All rails must be tested by ultra-sonic and eddy current on a 100 % level to ensure freedom from detrimental defects. As European Railroads move towards high-speed transportation, testing of surface flatness is an additional requirement so far not specified in other documents.

Additionally, where product properties are difficult or impractical to test, details of the production processes are specified. For example, a vacuum treatment of the liquid steel is mandatory for all steel grades to ensure that no shatter cracks will develop in the finished rails. Throughout, state-of-the-art production technology must be applied to meet all requirements.

Table 1: most remarkable differences of requirements

UIC 860-O	EN 13674-1
Specifies four rail grades	Specifies seven rail grades including head hardened steels
Ingots or continuous cast blooms	Only continuous cast blooms to be used
Rail grade identification by tensile strength	Rail grade identification by hardness
	Profile identification by the weight per meter
	Profile drawings cleared from over-specified dimensions
One class of profile dimensions	Two classes of profile dimensions
	Two classes on straightness and flatness
	Defines details of production processes: Degassing mandatory Two-stage roller straightening Best practice to be applied throughout
	Qualification tests: Fracture toughness Crack growth Fatigue test Detailed hardness test over the rail length Residual stress
Acceptance tests: Chemical composition of main alloying elements Tensile testing – as main product test	Acceptance tests: Chemical composition incl. Hydrogen and limits for residuals Hardness – as main product test Tensile properties by calculation Steel cleanliness Oxygen content Microstructure Decarburization Non-destructive testing
Ultrasonic , no description on details	Non-destructive testing: Detailed description on limits and calibration of the equipment Ultrasonic – internal quality Eddy current – surface quality Flatness testing by laser
Technical guarantee conditions described	Guarantee conditions are contractual, not specified here