

NEW ZEALAND GOVERNMENT RAILWAYS MECHANICAL BRANCH	CARBON STEEL CASTINGS	CODE No. 91 Page No. 1 of 1 Issue No 2 Date Issued 29/4/60
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(1) GENERAL

All carbon steel castings shall comply with the following chemical composition and physical properties unless drawings indicate otherwise or special instructions are issued for an alternative composition.

(2) CHEMICAL COMPOSITION

Carbon, per cent		0.17 to 0.22	
Silicon, per cent		0.30 to 0.40	
Manganese, per cent		0.60 to 0.80	
Sulphur, per cent	Max.	0.040	
Phosphorus, per cent	Max.	0.040	
Copper, per cent	Max.	0.50	} Total content of these elements not to exceed 1.0 per cent.
Nickel, per cent	Max.	0.50	
Chromium, per cent	Max.	0.25	
Molybdenum plus Tungsten, per cent	Max.	0.25	

(3) PHYSICAL PROPERTIES

Ultimate tensile stress (tons/sq. in.)	Min.	27
Yield stress (tons/sq. in.)	Min.	13.5
Elongation, per cent	Min.	26
Reduction in area, per cent	Min.	38

The physical properties shall be carried out on test pieces conforming to the dimensions of British Standard Test Piece C. The test samples shall be cast attached to a casting whenever practicable and shall receive the same heat treatment as the parent casting. One test shall be made from each melt. Works Managers will require to make arrangements for the expeditious handling of test pieces so that the results will be available within four days of the completion of heat treatment.

(4) HEAT TREATMENT

Unless otherwise approved by the Foundry Metallurgist, castings shall be fully annealed by heating to 1700°F holding at that temperature for at least one hour per inch of thickness of the thickest section, and cooling slowly in the furnace. Furnace temperatures for heat treatment shall be accurately indicated by pyrometers and the desired temperatures shall be governed accordingly. Castings shall not be removed from the furnace until the pyrometers indicate that the entire furnace charge has fallen to a temperature of 700°F or lower.

Rapid cooling of castings or any further heat treatment other than re-annealing shall not be undertaken without specific authority. Consideration can given to normalising in lieu of fully annealing when the design and size of the castings are such as to permit such treatment without harmful effects.

(5) REPAIR WELDING

Minor defects may be welded by an approved process. The defects shall be cleaned out to solid metal before welding and submitted to the castings inspector for approval.

Re-heat treatment is at the discretion of the Foundry Metallurgist.

When the removal of a defect necessitates a major repair weld, repair shall be at the discretion of the Assistant Works Manager. The repair weld shall be made by an approved process after the Assistant Works Manager has examined the casting with the defect removed. All castings with major repair welds shall be re-heat treated.

(6) RECORDS

Each cast is to be allocated a serial number which should be stamped on all large castings. A book is to be kept by the Foundry Metallurgist giving the cast number, date, the physical properties of the test piece, and the main items cast.