

S. NO. 500.

O.S.K. DAIREN LINER.

SPECIFICATIONS FOR REDUCTION GEAR MATERIALS.

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APPROVED



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S. No. 500.

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Specifications for Reduction Gear Materials.

Kind of materials	Purpose	Specification No.	Dr. No.
Nickel steel	Flexible shaft	No. 1	To - 2
Special steel	1st & 2nd gear wheel shaft	No. 2	To - 6
High tension steel	1st & 2nd gear wheel rim	No. 3	To - 7
Nickel steel	1st Red. H.P. pinion	No. 4	To - 8
" "	1st Red. L.P. pinion	No. 4	To - 9
" "	2nd Red. H.P. & L.P. pinion	No. 4	To -10



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Specification No. 1.

Specification of Nickel Steel Forging for Flexible Shaft.

The steel shall be made by the acid open hearth or Electric process.

The chemical composition shall be as follows :-

Carbon	0.24 % to 0.35 %
Manganese	0.5 % to 0.8 %
Silicon	not to exceed 0.25 %
Sulphur	" " " 0.04 %
Phosphorus	" " " 0.4 %
Nickel	3.2 % to 3.75 %

The forgings are to be sound; they are to be gradually and uniformly forged from ingots from which at least 40 % of the total weight of the ingot is to be removed from the top end of the ingot and at least 5 % of the total weight of the ingot from the bottom end. The sectional area of the body of the forging (as forged) is not to exceed one-fifth of the sectional area of the original ingot, and no part of the forging (as forged) is to have more than two-thirds of the sectional area of the original ingot.

Mechanical Test.

The test pieces are to be cut from the treated forgings, and satisfy the following conditions.

The tensile test pieces are to be turned so as to have a diameter of 0.564 inch with a gauge length of 2 inches.

The bend test pieces are to be machined to a rectangular section  $\frac{3}{4}$  inch wide by  $\frac{3}{8}$  inch thick. They are to be bent over the thinner section. The bending may be performed either by pressure or blows.

The impact test pieces are to be cut longitudinally from the ends of the shaft, 10 m/m square with "v" notch 2 m/m deep x 45°, with 0.25 m/m radius at root.

Ultimate tensile strength	not less than 40 tons per sq. in.
Yield point	not less than 60% of the ultimate tensile
Elongation	not less than 20% in 2 ins.
Cold bend test	180° without fracture over $\frac{3}{4}$ ins. radius
Impact test (Izod)	25 ft. lbs.

#### Testing and inspection.

The testing and inspection are to be carried out in the presence of Lloyd's and Teikoku Kaijikyokai's surveyors according to Lloyd's and Teishinsho's requirement and accompanied with their certificates and corresponding test results, mechanical and chemical.



Specification No. 2.

Specification for Special Steel.

The forgings are to be sound; they are to be made from sound ingots, and are to be gradually and uniformly forged. The sectional area of the body of the forging (as forged) is not to exceed one-fifth of the sectional area of the original ingot, and no part of the forging (as forged) is to have more than two-thirds of the sectional area of the original ingot.

Annealing.

The forgings are to be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole forging being uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes.

Mechanical Test.

The test pieces are to be cut from forgings after the annealing of the forging has been completed and satisfy the following conditions.

The tensile test pieces are to be turned so as to have a diameter of 0.564 inch with a gauge length of 2 inches.

The bend test pieces are to be machined to a rectangular section 1 inch wide by  $\frac{3}{4}$  inch thick, with the edges rounded to a radius of  $\frac{1}{16}$  inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.



Ultimate tensile strength	34 tons per sq. in. to 38 tons per sq. in.
Elongation	not less than 23% for 34 ton steel not less than 19% for 38 ton steel and in no case must the sum of the tensile breaking strength and corresponding elongation be less than 57.
Cold bend test	180° without fracture over $\frac{3}{8}$ in. radius for 34 - 36 tons steel. 180° without fracture over $\frac{5}{8}$ in. radius for 36 - 38 tons steel.

Testing and inspection.

The testing and inspection are to be carried out in the presence of Lloyd's and Teikokukaiji Kyokai's surveyors according to Lloyd's and Teishinsho's requirements and accompanied with their certificates and corresponding test results.



Specification No. 3.

Specification of H.T. Steel Forgings for Gear Wheel Rim.

The forgings are to be sound; they are to be made from sound ingots, and are to be gradually and uniformly forged. The sectional area of the body of the forging ( as forged ) is not to exceed one-fifth of the sectional area of the original ingot.

Annealing.

The forgings are to be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole forging being uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes.

Mechanical Test.

The test pieces are to be cut from forgings after the annealing of the forging has been completed and satisfy the following conditions.

The tensile test pieces are to be turned so as to have a diameter of 0.564 inch with a gauge length of 2 inches.

The bend test pieces are to be machined to a rectangular section 1 inch wide by  $\frac{3}{4}$  inch thick, with the edges rounded to a radius of  $\frac{1}{16}$  inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.

The impact test pieces are to be machined to a 10 m/m square section with "V" notch 2 m/m deep x 45°, with 0.25 m/m radius at root.



Ultimate tensile strength	not less than 38 tons per sq. in.
Yield point	not less than 25 tons per sq. in.
Elongation	not less than 20 % in 2 ins.
Cold bend test	180° without fracture over $\frac{3}{4}$ in radius
Impact test (Isod)	not less than 22 ft. lbs.
Hardness test (Brinell)	not less than 180

Testing and Inspection.

The testing and inspection are to be carried out in the presence of Lloyd's and Teikoku Kaiji Kyokai's surveyors according to Lloyd's and Teishinsho's requirements and accompanied with their certificates and corresponding test results.



Specification No. 4.

Specification of Nickel Steel Forging for Pinion Shaft.

The steel shall be made by the acid open hearth or Electric process.

The chemical composition shall be as follows :-

Carbon	not to exceed	0.35 %
Manganese	" " "	0.8 %
Silicon	" " "	0.25 %
Sulpher	" " "	0.04 %
Phosphorus	" " "	0.04 %
Nickel	about	3 %

The forgings are to be sound: they are to be gradually and uniformly forged from ingots from which at least 40 % of the total weight of the ingot is to be removed from the top end of the ingot and at least 5 % of the total weight of the ingot from the bottom end. The sectional area of the body of the forging ( as forged ) is not to exceed one-fifth of the sectional area of the original ingot, and no part of the forging ( as forged ) is to have more than two-thirds of the sectional area of the original ingot.

The forgings shall be made with sufficient material on the portion from which the teeth are cut to allow of 1 inch on all surfaces ( 2 inches on diameters ) being removed before heat treatment, leaving a diameter sufficient to allow of not less than

$\frac{1}{4}$  inch on all surfaces to be removed after heat treatment.

After rough turning, and prior to heat treatment, the forgings are to be bored, the diameter of the hole being as large as possible in order to relieve contraction stresses set up in treatment.  
( only for hollow pinion shaft )

#### Mechanical Test.

The test pieces are to be cut from the treated forgings, and satisfy the following conditions.

The tensile test pieces are to be turned so as to have a diameter of 0.564 inch with a gauge length of 2 inches.

The bend test pieces are to be machined to a rectangular section  $\frac{3}{4}$  inch wide by  $\frac{3}{8}$  inch thick. They are to be bent over the thinner section. The bending may be performed wither by pressure or blows.

The impact test pieces are to be cut longitudinally from the ends of the pinion, 10 m/m square with "V" notch 2 m/m deep x 45°, with 0.25 m/m radius at root.

Ultimate tensile strength	not less than 48 tons per sq. in. longitudinal and transverse
Yield point	not less than 32 tons per sq. in. longitudinal and transverse
Elongation	not less than 20 % longitudinal, 16 % transverse
Cold bend test	180° without fracture over $\frac{3}{4}$ in radius longitudinal & transverse
Impact test (Isod)	not less than 35 ft. lbs longitudinal
Hardness test (Brinell)	not less than 220

Testing and Inspection.

The testing and inspection are to be carried out in the presence of Lloyd's and Teikoku Kaijikyokai's surveyors according to Lloyd's and Teishinsho's requirements and accompanied with their certificates and corresponding test results, mechanical and chemical.





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