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HEAT TREATMENT OF ALCAN 65S BILLET FOR DRTE

by

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SUMMARY OF RESULTS

The tensile properties of as-cast billets after heat treatment to the T6 condition were only slightly lower than values specified for this alloy in the wrought condition. Modifications in ageing conditions, though not possible in this work, would probably have enabled minimum specified properties to have been met.

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INTRODUCTION

A request was received from the Defence Research Telecommunications Establishment (DRTE), Defence Research Board, File: DRTE 0201-03 (E) Shirley Bay (letter dated 28 September 1966) to heat treat a hollow cylinder of Alcan 65S aluminum alloy (equivalent to CSA. HA. 5. GS 11N) which was to be used to make a model of the ISIS-A satellite thrust tube.

In consultation with DRTE staff it was decided, as the cylinder was large (27 in. long, 12 in. O.D., 7 in. ID) and in the as-cast (semi continuous casting) condition, to carry out a trial heat treatment on a surplus piece of the same billet (about 10 in. long) in order to establish furnace times and provide material for test bars so that tensile properties could be checked.

Information obtained (by DRTE) from the Aluminum Company of Canada Limited indicated that mechanical properties to be expected on cast Alcan 65S-T6 should "be within 3%-5% of those for a wrought product "

HEAT TREATMENT

A load thermocouple was inserted about 1-1/2 in. into the trial cylinder and it was observed that the required solution temperature, 520°C, was reached after about 2-1/2 hours in the furnace. After soaking for a further 2 hours (as recommended by the Aluminum Company of Canada Limited) the cylinder was quenched in cold water. A similar regime was followed for the final piece, although probably owing to its larger mass, the solution temperature was reached in about 4-1/4 hours.

For both pieces the ageing treatment was 5 hours at 185°C and, in each case, the cylinder was in the furnace for about 7 hours before reaching this temperature.

TENSILE TESTS

Tensile test (gauge length 2 in. long, 1/2 in. diameter) were

machined from the trial cylinder, four longitudinally and four transverse (on chords). The average results were as follows:

TABLE 1

Tensile Test Results

	Ultimate Tensile Strength, kpsi	0.2 Yield Strength, kpsi	Elongation % in 2 in.
Transverse	45.1	40.5	9.0
Longitudinal	44.2	40.7	6.0
Spec. Minima +	42.0	35.0	10
Typical ≠	45.0	40.0	12

+ CSA HA.5.GS 11N-T6 (Equivalent to Alcan 65S-T6). Rolled or drawn bar.

≠ As given in Handbook of Aluminum, Aluminum Company of Canada Limited.

It will be seen that both the ultimate tensile and yield strengths are typical for the alloy, whereas the elongation is low. It seems probable that the disproportionately long time required for the cylinder to reach the specified ageing temperature resulted in overageing and that a better combination of properties (probably above specification minima) could have been obtained by reducing the ageing temperature. However, the results of the tensile tests were not available before heat treating the final cylinder (due to time limitations) and, in any case, several tests would have been necessary to establish correct conditions and neither sufficient time nor material were available.

CONCLUSIONS

In conclusion, it appears that the use of as-cast Alcan 65S has a comparatively small effect on the tensile properties obtained as compared with those typical of the wrought alloy and that even for heavy sections it is possible to exceed minimum specification properties.

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