ALLOY 7075

DESCRIPTION

Introduced by Alcoa in 1943, alloy 7075 has been the standard workhorse 7XXX series alloy within the aerospace industry ever since. It was the first successful Al-Zn-Mg-Cu high strength alloy using the beneficial effects of the alloying addition of chromium to develop good stress-corrosion cracking resistance in sheet products. Although other 7XXX alloys have since been developed with improved specific properties, alloy 7075 remains the baseline with a good balance of properties required for aerospace applications.

Alloy 7075 is available in bare and alclad sheet and plate product forms in the annealed state as well as several tempers of the T6, T73 and T76 types.

APPLICATIONS

Alloy 7075 sheet and plate products have application throughout aircraft and aerospace structures where a combination of high strength with moderate toughness and corrosion resistance are required.

Typical applications are alclad skin sheet, structural plate components up to 4 inches in thickness and general aluminum aerospace applications. **CHEMICAL COMPOSITION LIMITS (WT. %)**

Si 0.40	Zn 5.1-6.1
Fe 0.50	Ti. 0.20
Cu 1.2-2.0	Others, each 0.5
Mn. 0.30	Others, total 0.15
Mg. 2.1-2.9	Balance, Aluminum
Cr 0.18-0.28	

Note: Value maximum if range not shown.

MECHANICAL PROPERTIES

ALLOY 7075 All values are minimum long transverse mechanical properties except where noted.

TEMPER	THICKNESS	TENSILE STRENGTH	YIELD STRENGTH	ELONGATION
	in. (mm)	ksi (MPa)	ksi (MPa)	%
0 Sheet & plate	0.015-2.00 (0.38-50.80)	40 (max) (276)	21 (max) (145)	9-10
T6 Sheet	0.008-0.249 (0.203-6.32)	74-78 (510-538)	63-69 (434-476)	5-8
T651 Plate	0.250-4.000 (6.35-101.60)	78-67 (538-462)	67-54 (462-372)	9-3

T76 Sheet	0.125-0.249 (3.18-6.32)	73 (503)	62 (427)	8
T7651 Plate	0.250-1.000 (6.35-25.40)	72-71 (496-490)	61-60 (421-414)	8-6
T73 Sheet	0.040-0.249 (1.02-6.32)	67 (462)	56 (386)	8
T7351 Plate	0.250-4.000 (6.35-101.60)	69-61 (476-421)	57-48 (393-331)	7-6

ALCLAD 7075

Two side cladding. Nominal cladding thickness is 4% on gauges under 0.062 in. (1.57 mm); 2.5% on gauges over 0.062 in. (1.57 mm). Property values for one side clad material are similar (not shown). All values are minimum long transverse mechanical properties except where noted.

TEMPER	THICKNESS	TENSILE STRENGTH	YIELD STRENGTH	ELONGATION
	in. (mm)	ksi (MPa)	ksi (MPa)	%
0 Sheet & plate	0.008-1.000 (0.203-6.32)	36-40 (max) (248-276)	20-21 (max) (138-145)	9-10
T6 Sheet	0.008-0.249 (0.203-6.32)	68-76 (469-524)	58-65 (400-448)	5-9
T651 Plate	0.250-4.000 (6.35-101.60)	75-67 (517-462)	65-54 (448-372)	9-3
T76 Sheet	0.125-0.249 (3.18-6.32)	68-70 (469-482)	57-59 (393-407)	8
T7651 Plate	0.250-1.000 (6.35-25.40)	69-71 (476-490)	58-60 (400-414)	8-6
T73 Sheet	0.040-0.249 (1.02-6.32)	63-66 (434-455)	51-54 (352-372)	8
T7351 Plate	0.250-1.000 (6.35-25.40)	66-69 (455-476)	54-57 (372-393)	8-7

FRACTURETOUGHNESS

Alloy 7075 sheet and plate products offer moderately good strength/toughness relationships and are the standard of comparison for more recent 7XXX series alloy developments. Alloy 7075 sheet and plate products are not offered with guaranteed minimum fracture toughness values.

TYPICAL FRACTURE TOUGHNESS VALUES Alloy 7075 Plate

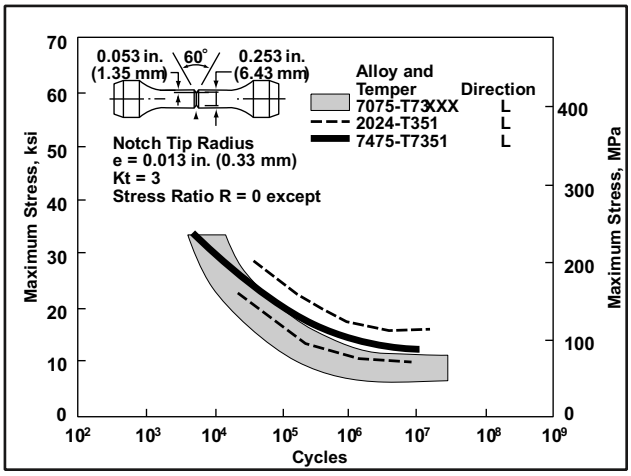
ALLOY	TEMPER	K_{1C}: ksi√in. (MPa√m)*	
		L-T	T-L
7075	T651	26 (28.6)	22 (24.2)
	T7351	30 (32.0)	26 (28.6)

*Compact specimen (ASTME399)

FATIGUE PROPERTIES

COMPARISON OF AXIAL-STRESS NOTCH-FATIGUE DATA FOR ALLOYS 7075-T73XXX 2024-T351 AND 7475T7351 PRODUCTS

The fatigue behavior of alloy 7075 plate products is shown in the accompanying figure comparing axial-stress notch-fatigue data of 2XXX and 7XXX series alloys.

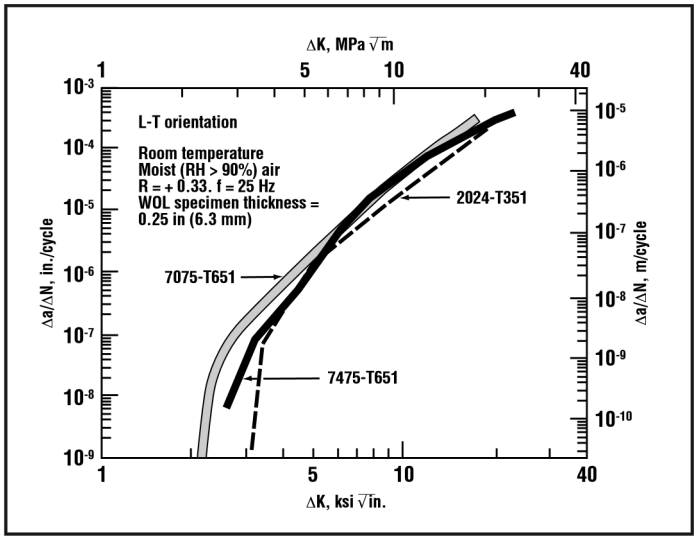


ALLOY 7075

FATIGUE CRACK GROWTH

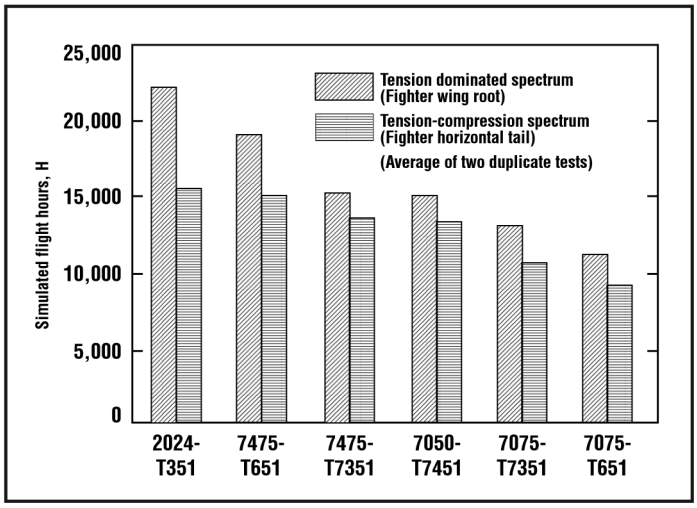
Fatigue crack growth rates for plate products of 7075-T6 in constant amplitude tests are compared with products of alloys 2024, 7050, and 7475.

COMPARISON OF FATIGUE CRACK GROWTH RATE DATA FOR ALLOY 7075-T651, 2024-T351 AND 7475-T651 PLATE



Fatigue crack growth behavior under spectrum loading is becoming increasingly important in the selection of alloys for fatigue critical aircraft structures. Various high strength aerospace alloys are compared for life prediction in flight hours using two types of fatigue spectrums; a wing root application (tension dominated), and a horizontal tail application (tension-compression).

SPECTRUM FATIGUE RANKING



Source: U.S. Navy Contract N00019-81-C-0550/Northrop Corp.

CORROSION RESISTANCE

Alloy 7075 has been thoroughly evaluated for corrosion resistance of atmospheric weathering, stress-corrosion cracking and exfoliation in all currently available tempers. These values have been used as a standard for

comparison in the development of more recent high strength aerospace alloys. Within the 7XXX series of alloys, resistance to general corrosion attack, SCC and exfoliation improves significantly in the overage tempers (T7 type) compared with peak strength tempers (T6).

Generally, the T76 type temper is considered the exfoliation resistant temper, while the T73 type temper is considered the SCC resistant temper. It should be noted that T73 is as resistant to exfoliation as T76, but at lower strength levels.

For applications where good surface appearance is required or in corrosive environments, alclad 7075 sheet and plate products are recommended.

THERMALTREATMENT

Many heat treatments and heat treating practices are available to develop optimum strength, toughness and other desirable characteristics for proper application of alloy 7075 sheet and plate products. Refer to MIL-H-6088, *Heat Treatment of Aluminum Alloys* for additional information.

PROCUREMENTSPECIFICATIONS

PLATE

Temper	T651	T7651
Specification	QQ-A-250/13	QQ-A-250/24
MIL-HDBK-5	Approved	

BARE SHEET		**ALCLAD SHEET**
Specification	QQ-A-250/12,24	QQ-A-250/13,25,26
MIL-HDBK-5	Approved	Approved

OTHER PRODUCT FORMS

Other product forms of alloy 7075 are extrusions, forgings, wire rod and bar, and rivets.

REFERENCES:

1. The Aluminum Association, *Standards and Data*.
2. The Aluminum Association, *Position on Fracture Toughness Requirements and Quality Control Testing T-5*.
3. MIL-H-6088, *Heat Treatment of Aluminum Alloys*.