



## Extruded Aluminum Corporation

### **OVERVIEW**

This material specification defines the requirements for aluminum log or billet used to produce extrusions.

### **SCOPE or APPLICATION**

This standard applies to all Primary and Secondary Billet as noted.

### **PURPOSE**

The purpose of this document is to define all necessary requirements, so that product with consistent quality levels is received.

### **RESPONSIBILITY**

Conformance to this specification is the responsibility of the supplier. It is the responsibility of the supplier to demonstrate compliance with the requirements of this specification. This process is the responsibility and is performed by Extruded Aluminum Corporation (EAC) operations.

### **STANDARD SECTIONS**

#### **Billet Specifications**

##### Casting system (Secondary Only)

- Log and billet produced to this material specification shall be cast in a direct chill casting system. The molten aluminum shall be degassed and filtered using systems that will consistently yield ingots that meet all requirements of this specification.

##### Hydrogen Gas Content (Secondary Only)

- The molten aluminum shall be sufficiently degassed to produce a maximum hydrogen gas content of not more than 0.25cm<sup>3</sup>/100gm of aluminum.
- The billet supplier shall regularly read H<sub>2</sub> measurements, by any standard method. Measurements should be conducted on a bi-weekly or monthly basis at each furnace. The supplier shall maintain records of the results of these tests.
- Reduced Pressure Tests are an acceptable method if a vacuum of –700 mm Hg is used.



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### Metal Cleanliness (All)

- Logs and billets shall not have inclusion larger than 200 microns. The material shall be free of any Bergman zones throughout the entire billet/log.
- The billet/log shall not have an Inverse Segregation Zone (ISZ) greater than 200 micron.
- Logs and billets shall be substantially free from internal inclusions. The billet supplier is required to maintain an internal process control and measurement system. All material must meet the AA level requirements as specified by the Aluminum Association Standards and Data, 2000.
- Each supplier has provide a semi-annual billet slice analysis confirming the above.

### Grain Size (All)

- All material shall be cast with suitable grain refiner to produce a grain size no larger than 300 $\mu$ m when measured as per ASTM E112.

### Chemical Composition (Secondary Only)

- All material produced to this specification shall meet the chemical composition limits specified in Table 1 – Chemical Composition Limits.
- All evaluations of chemical composition must comply with ASTM E34, ASTM E227 or ASTM 607.
- At least three samples shall be taken from every cast, from the casting trough, as follows: one sample near the beginning of the cast, one near the middle of the cast and one near the end of the cast. These samples shall be analyzed on a spectrometer or other suitable equipment that has been standardized with certified traceable standards. Each sample shall be analyzed at least three times.
- The average of the results of this analysis for each element shall be recorded and compared with the values specified in Table 1. Any average outside the specified limits indicates material that is not conforming and must not be shipped to EAC without a deviation being obtained prior to shipment. The averages shall be recorded on the Certificate of Compliance to be submitted with the material.



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**Table 1 - Chemical Composition Limits**

		Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Others	
										Each	Total
6005	Max	0.800	0.250	0.060	0.080	0.560	0.060	0.060	0.040	0.030	0.100
	Min	0.700	0.160	-	0.040	0.440	-	-	-	-	-
6005A	Max	0.780	0.280	0.160	0.300	0.560	0.050	0.050	0.040	0.030	0.100
	Min	0.660	0.180	0.080	0.200	0.440	-	-	-	-	-
6060	Max	0.400	0.230	0.050	0.040	0.470	0.030	0.040	0.040	0.030	0.100
	Min	0.320	0.140	-	0.010	0.370	-	-	-	-	-
6061	Max	0.750	0.300	0.300	0.120	1.000	0.150	0.150	0.040	0.030	0.100
	Min	0.500	0.200	0.180	-	0.800	0.040	-	-	-	-
6063	Max	0.480	0.250	0.050	0.060	0.540	0.030	0.030	0.040	0.030	0.100
	Min	0.400	0.180	-	0.030	0.450	-	-	-	-	-
6082	Max	1.100	0.300	0.090	0.600	0.700	0.040	0.050	0.040	0.030	0.100
	Min	1.000	0.150	-	0.480	0.600	-	-	-	-	-

**Homogenization Requirements (Secondary Only)**

- All material shall be suitably homogenized so that Mg<sub>2</sub>Si shall be dissolved in solid solution. The iron rich phase, AlFeSi, shall be transformed from beta to alpha in a proportion of at least 95%. Metallographic samples chosen randomly, suitably prepared and examined under 500X magnification shall exhibit no cast-like structures.
- The supplier shall determine the frequency of the samples. The supplier shall maintain records with the results of this analysis or the metallographic sample itself.
- The supplier shall take a minimum of an annual survey of the homogenizing ovens. These reports shall be sent to Extruded Aluminum Corporation.



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### Ultrasonic Inspection (All)

- Each log shall be ultrasonically inspected by the contact or immersion method to ensure that it is free of splits, cracks, inclusions, excessive shrinkage or porosity and other defects.
- The supplier shall maintain ultrasonic instrument standardization procedures that are in compliance with AMS-STD-2154 Inspection, Ultrasonic, Wrought Metals, and Process in accordance with SAE.
- Each log shall be inspected at strategic locations at the head, near the middle and at the butt. The supplier shall determine the inspection pattern.
- Any indication of a crack or split that is in excess of 80% of the full screen is reason for rejection of the log.

### Physical Characteristics (All)

- Surface - All billet and log shall be essentially free of dirt/oil or any foreign material adhered to or imbedded into the surface. Billet and log surface shall be essentially free of cold folds, tears, liquation or any significant irregularity. There shall not be any denting/gouging deeper than .120". No oxide patches.
- Diameter - The required diameter shall be specified in the purchase order release. Unless otherwise specified by the purchase order, the tolerance on the diameter shall not exceed +/- 1%.
- Length - The required length shall be specified in the purchase order release. The tolerance on the length shall not exceed +/- 0.125" for cut lengths and +/- 0.25" for logs.
- End Cut - The end cut shall be a straight flat surface. The perpendicularity tolerance of the end cut in relation to the longitudinal axis of the billet or log shall not exceed +/- 1.0°.
- Bow - The maximum bow shall not exceed 0.05" of total length.
- Packaging - Logs must be delivered in bundles of 3. To aid in product identification, we ask the ends of the material be sprayed with the following colors:



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6005	Red (Orange)
6005A	Red (Orange) & Green
6005 Low Mg	Yellow
6061	Blue
All Others	None

### Identification and Traceability

- All information shall be in English.
- Each billet or log shall be impression stamped on one end with the alloy number (i.e. 6063) and with the cast/drop number.
- Each package shall have a bar code identification label securely attached to the packaging (nothing shall be affixed to the metal). Our preference is to have this information presented in a 2D bar code (1D codes will be accepted at this time). The label shall contain at least the following information:
  - Supplier name and location
  - Supplier code (provided by EAC)
  - EAC purchase order release number
  - Bundle/Packaging Identification Number
  - Number of logs/billets
  - Alloy
  - Type (provided by EAC on purchase order release)
  - Cast/Lot numbers
  - Diameter
  - Length
  - Weight
  - Date
- Ultimately, we are looking to have the data from the Material Certificate of Analysis be included in the bar code. Until that is implemented, at least twenty four hours before the receipt of each shipment, EAC must receive a Material Certificate of Analysis in format shown in the attachment. These Certifications must be sent electronically to [certs@extrudedaluminum.com](mailto:certs@extrudedaluminum.com).

### Records

- Any records kept by the supplier which documents the conformance or non-conformance to this specification of material shipped shall be made available



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upon request within no more than 1 week from the time a request has been received.

- The supplier shall maintain all such records for a period of at least one-year. At the end of this period, the records shall be discarded in a manner that preserves the confidentiality of the information contained in the records discarded.

**REVISIONS**

Date	Changed By	Description of Changes