

Lead Sheet for Building



Lead Sheet, that most traditional and enduring of building materials, is produced by one of three methods:

- Sand casting
- Milling or Rolling
- Machine casting or Direct Method

This briefing note explains the processes and describes the physical and chemical differences between the products.

Sand Cast Sheet

Background

The Romans used Sand Cast Sheet for making ducts and water storage tanks. Its use was extended in the Norman Period to include roofing and weatherings. Many churches and cathedrals were originally roofed with sand cast sheet and records show that the material gives outstanding long life when made and fitted correctly.

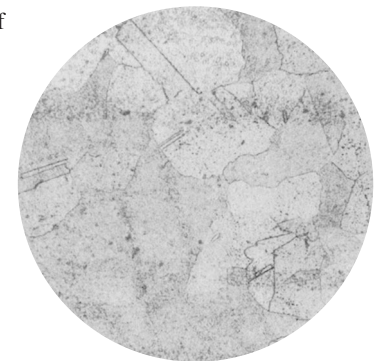
Method of Manufacture

Sand cast lead sheet is made today by the traditional method of running molten lead over a bed of prepared sand on a casting bench. Compared to the other types of lead sheet, a relatively small amount of this material continues to be produced by specialist companies primarily for replacing old cast lead roofing and for ornamental leadwork.

Consistency of thickness and composition of sand cast sheet is dependent on two key factors: the skill of the caster, and the blend of reprocessed old sheet and new ingots in its manufacture. The 'sand side' of the sheet has a characteristic rough finish and the material is normally available in thicknesses ranging from 2.65mm to 3.55mm.

Acceptance

Sand cast sheet is not made to a chemical specification. Sand cast sheet has a microstructure of large columnar grains as shown in *Fig 1*. It is not made to a British Standard and does not have an Agrément Certificate.



*Figure 1: Sand Cast lead, magnification x7
Etchant: Voces Reagent*

Milled or Rolled Lead Sheet

Background

Sheet metal rolling by machine was invented by Leonardo da Vinci in the 1500s. Records of producing lead sheet by rolling, dating as far back as the mid 1600s, exist in the archives of an LSA member, but it was not until the early 20th century that rolled lead sheet was readily available as an alternative to traditional sand cast sheet for roofing and weathering.

Method of Manufacture

In current lead rolling technology a lead slab of 2 tonnes or more is cast in a water-cooled mould. After solidification, it is placed on the rolling table and passed through the rolling mill until reduced to the required consistent thickness. It is then slit to width and cut to length for packing and distribution.

Lead Sheet for Building

Rolled Lead Sheet *contd*

Over 100 years experience has shown that when correctly sized and fitted, rolled lead sheet has a long life equivalent to that of traditional sand cast sheet.

Acceptance

In the UK, rolled lead sheet is the only lead sheet for building made to a British Standard – BSEN 12588:2006 Rolled Lead Sheet for Building Purposes. This specifies thickness and chemical composition to produce a consistent microstructure, as shown in *Fig 2*, which provides the required resistance to creep and thermal fatigue. The standard provides guidelines for length and width and stipulates that the sheet shall be free from inclusions and laminations. For building purposes, rolled lead sheet is available in Codes 3-8 thickness range 1.32mm to 3.55mm (+5% measured at any one point) and from widths 150mm to 2400mm.



Figure 2: Rolled lead, magnification x 30
Etchant: Voces Reagent

Machine Cast Sheet

Background

Machine cast lead sheet – often referred to as the Direct Method (DM) – had its beginnings in a process suggested by Sir Henry Bessemer in the 1800s. Initially only thin sheets 0.5 to 1.5mm were produced for sound attenuation purposes. It was not until the mid 1950s that the process was developed in Australia to produce the wider range of thicknesses required by the building industry.

Method of Manufacture

Early in the 1980s machine cast lead sheet was introduced into the UK. It is made by immersing a rotating water cooled metal drum into a bath of molten lead at a constant temperature. As the drum turns, the lead solidifies on the surface and is peeled off as it emerges from the melt, slit to width and wound onto a coiler. The thickness of sheet produced can be varied by altering principally the rotation speed of the drum and the depth of immersion.

Acceptance

Machine cast sheet differs from sand cast and rolled sheet in both surface finish and grain structure, see *Fig 3*. The surface of DM sheet not in contact with the drum has a dimpled finish. To achieve the optimum grain structure, it is usual to sand blast the surface of the drum. DM sheet does not conform to a British Standard. Individual manufacturers in the UK do have British Board of Agrément certificates, but these only detail the specific chemical, physical and technical characteristics of each manufacturer's product. For building purposes, machine cast lead sheet is available in thicknesses ranging from 1.32mm to 3.55mm up to a maximum width of 1460mm.

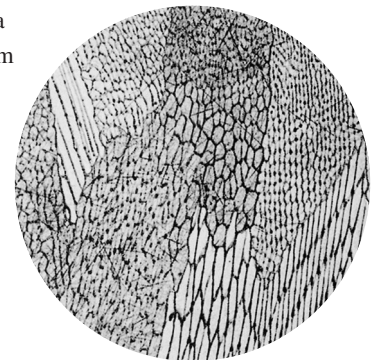


Figure 3: Machine Cast lead, magnification x 100
Etchant: Voces Reagent

Summary

Lead sheet has always been associated with quality and durability in the built environment and the Lead Sheet Association is in the forefront of advancing and maintaining that reputation.

For this reason the **LSA's technical advice in respect of application and installation, as detailed in their Lead Sheet Manuals, only relates the use of Rolled Lead Sheet conforming to BS:EN 12588**. The services of the LSA technical bureau are therefore available to all specifiers and installers of **Rolled Lead Sheet** throughout the construction industry.

Although **Sand Cast Sheet** has a similar pedigree to Rolled Lead in terms of its performance on many historic buildings, the sheet is produced to greater nominal thickness' compared to rolled sheet in order to compensate for the variations in manufacturing techniques and thickness.

Machine Cast Sheet also suffers from thickness variations and for roofing purposes has only been in existence for just over 20 years that also prevent its acceptance under BS:EN 12588.

For these reasons the LSA only provide advice on **Rolled Lead Sheet**.



For further information contact Lead Sheet Association

Unit 10, Archers Park, Branbridges Road, East Peckham, Kent TN12 5HP

Tel: 01622 872432 Fax: 01622 871649 Website: www.leadsheetassociation.org.uk