

## Rapid Manufacture Rings the Bell for Brass Founders

Brass Founders Sheffield (BFS), located in South Yorkshire, has over 85 years experience in the production of non-ferrous castings. BFS have a versatile and capable jobbing foundry with the ability to produce small or large runs and the capacity to produce castings of up to 1500kg in a range of materials, including bronzes, brasses, copper and aluminium based alloys.

BFS, together with their sister companies, Pattinson Brothers Engineering and Lifting Gear Products, offer a specialised service to include both casting and precision machining of parts. All three companies are part of the Europa Engineering Ltd group of companies located in South Yorkshire.

The concept of the 'weather bell' was developed over a period of several years following extensive harmonic studies and discussions between Dr Neil McLachlan and Marcus Vergette. Neil has worked for over a decade on the design of musical bells and, following an approach by Marcus, they developed a design concept of a bell that could produce multiple pitches when struck at different locations. This required designing a bell where the maxima of vibration of groups of modes occurred in distinct regions of the bell profile, and that these groups of modes are tuned to harmonic relationships within each group and some musical (frequency) relationships between the groups. Previous experience indicated that these requirements would best be achieved with a cylindrical form having a number of nodal rings.



**Artist impression of Weather bell  
in a coastal location**

Computer simulations of the harmonic characteristics were carried out to develop the bell shape and following several iterations a design was determined which could produce four distinctly different pitches by the use of a central pivoting rod which strikes the bell at one of four locations depending on the direction of motion.

From this complex design it became evident that casting the bell would present a number of technical difficulties, any geometrical deviation from the profile or porosity in the casting being likely to alter the frequency of the modes from the computed data.

BFS have always been a forward thinking company, utilising both new and traditional manufacturing processes to meet customer demands, and with the requirements to design a manufacturing route for this large specialised bronze ‘weather bell’ came the need for some new approach to casting technology. As BFS have had a long association with Cti, it was a natural step to enlist their help in the manufacturing process for the casting.

From the requirements to produce a ‘one-off’ item and for this to be of a highly accurate form, the process of direct mould manufacture using Cti’s machined layered Patternless® approach was determined to be the optimum technique to be used. The initial configuration of a single, double hour-glass shape was developed into two individual cast pieces with a central fixing casting incorporating the striker assembly.

BFS supplied the drawing information from which Cti developed the model, mould manufacturing strategy, and feeding and gating process. These were developed to suit the casting capabilities of BFS and the moulds were prepared at Cti and returned to BFS for casting.



Casting into a Patternless® mould

The material specified for the bell was ‘Admiralty Brass’, nominally an 80% copper, 20% tin alloy which has long been used as the standard naval bell material.

BFS produced the bell castings and finishing was carried out at their sister company, Pattinson Brothers Engineering.



Finishing of Bell

The bell will be located at Appledore in Devon, with ongoing discussions of a further 11 bells to be manufactured and located at coastal positions around the British Isles.

Barrie McCabe, Managing Director of Brass Founders Sheffield says that “the ability of BFS to take advantage of the new rapid manufacturing technology available at Cti in producing such demanding products and to exacting dimensional tolerances has provided BFS with unequalled support in meeting specialised customer requirements. The business potential of such items is expected to exceed £250k within the foreseeable future and builds on the technical expertise the company can offer clients”.

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