

THE EVEN KEEL

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106,000 lb. Keel Tests Mars' 'Metal'

The XN 90 project called for a finished centerboard keel of 41' 6" in length for a 124' sloop being constructed by Hodgdon Yachts.

The project demanded attention to the intricate details of pattern assembly, mould construction, and the final casting. The design challenge was extensive because of two main factors: The 23' centerboard slot (only 7.5" wide) with its cast in place pivot hardware, and the immense weight of the mould assembly along with the cast keel.

For [Mars Metal](#), a project of this size, brings forward the abundant technical know how of its staff. Each aspect of the manufacturing process, during the 9 week project period, required Mars to use its engineering prowess.

The pattern was constructed in port and starboard sections that were 43.5' long. The casting box, a welded steel structure, weighted 15,000 lbs. 60,000 lbs. of foundry sand was added to each side. The mould was completed with a three part, tongue and groove centerboard slot core, filled with 6,000 lbs. of sand. The completed mould weighted in at 141,000 lbs. without the lead in the keel.

Bronze plates, engineered by Mars, were placed as a wearing surface within the core slot. The bronze plates are held in place with 12 stainless steel studs on each side, that are removable for future maintenance.

The 23-2.5" diameter stainless steel keel 'J' bolts, built to Mars' specifications weighted 2180 lbs. The 'J' bolt construction assembly included an internal, welded stainless steel superstructure, and 3 external 12' cages, that ensured exact bolt placement in the finished keel.

Eight weeks after the internal shop drawings were complete, the 53 tons of molten lead were continuously poured into the mould, in just over 5 hours.

Releasing the XN 90 from the mould was a huge engineering challenge because the various components now weighted 1/4 of a million pounds. The external cages were cut away from the keel bolts and an I-beam laid down the center of the keel. Steel plates, with hoes cut, bridges the area over the beam to the keel bolts. Once the keel bolts were secured to the plates, outriggered legs were welded on as a 'stand' for the completed keel. A 400 ton capacity gantry crane lifted the keel from the casting box assembly.

The keel was ground, faired, painted and placed on the flatbed for shipment. The 'ready to install' final product exceeded expectations, in terms of exactness to the specifications and excellent quality.

A perfect example of why Mars Metal Company, with [MARSKEEL Technology](#) is proud to announce that
"SUCCESS IS BUILT FROM THE BOTTOM UP"

