A RETROFIT SPREADER PLATE

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exhibit no. 31

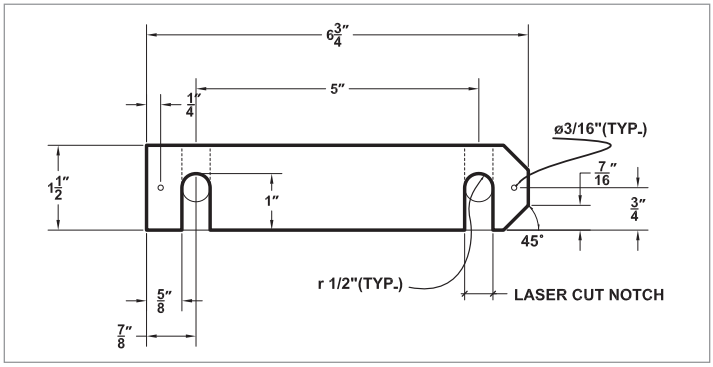

Figure 2

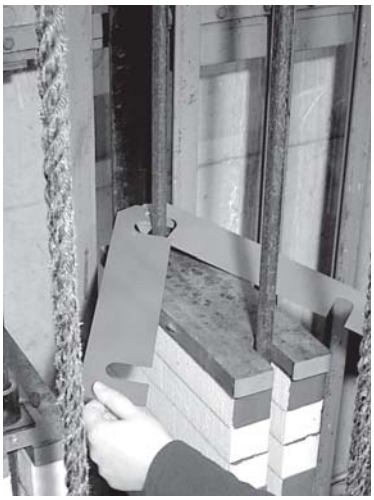

Figure 1

Figure 3

For approximately five years now, manufacturers of counterweight rigging systems have provided spreader plates on their counterweight arbors in numbers that allow them to be placed at consistent 2´ intervals in the weight stack. The placement of these spreaders helps to moderate the outward forces applied to the ¾˝ arbor rods and prevent weights from spilling off the arbor. On new construction, the installation of additional spreader plates as the arbors are assembled at the factory is easily accomplished. However, in older existing installations, the addition of factory-supplied spreaders is difficult. Typically, an arbor must be dismantled to allow installation of such one-piece spreaders. In April of 2003, faced with the prospect of dismantling some forty J.R. Clancy 15 Series, 8´ tall arbors to accomplish such an installation, I sought an alternative to this time-consuming procedure.

My ideal solution would be both inexpensive and easily installed in a few minutes by available labor, and of course properly fulfill the function that factory-installed spreaders perform. Some initial research led to a solution by Steve Waxler of the College Conservatory of Music at the University of Cincinnati, and I tested one of his add-on spreaders in our system. Liking this basic design, I then modified it to suit the requirements of our system. This included increasing the width and length of the plate so the weights would not tip slightly from side to side and rattle, and to match the slot size to match the existing arbor rods. Testing with plywood prototypes of ⅛˝ lauan helped determine the final shape and size of the plates including the small chamfer at the corners which allows clearance past the back bar of the arbor during installation (fig. 1).

The final assembled plate consists of two identical slotted and bored pieces measuring 3˝ by 13½˝ as in the accompanying drawing (fig. 2). At installation, one slotted piece is turned over and stacked atop the other. The rear-bolted connection is made with a #10-24 x ½˝ stainless steel pan head bolt with a stainless steel Nylon lock nut. The two halves of the plate are spread apart enough to allow the slots to pass around the rear arbor rod. When the two halves of the plate are closed, the resulting 1˝ diameter holes fit closely around the rod and do not allow the plate to move about (fig. 3). I choose to use a bolted connection at the front and rear rather than a rivet at the rear and a bolt in the front. This holds the spreader firmly in position while allowing the device to be dismantled easily if necessary .

Once I had a final design, I found a local machine shop that would use a laser cutting machine to have each plate bored and notched. Although this slightly raised the final per unit cost above what I could produce in the scene shop, the turnaround time was significantly reduced. The machinist was able to produce ninety identical pieces that I could have assembled into the finished product after in-house degreasing, priming and painting.

In practice, I choose to have the spreader serve one final function—that of a line of demarcation between the constant pipe weight and load weight on the arbor. Painted bright red, it is evident to even novice stagehands that when one reaches the red plate, one stops removing weight. (See photos above.)

BILL OF MATERIALS

Each spreader consists of two pieces of 16-gague A36 steel laser cut to 3˝ by 13˝—
Cutting cost per pair: $12.80
Two #10-24 x ½˝ stainless steel pan head bolt w/ stainless steel Nylon lock nut per plate—
Cost per set: $.54
Three cans X-O Rust spray primer (@ $9.87)—
Cost per application: $.11
6 cans X-O Rust Bright Red spray paint (@ $19.74)—
Cost per application: $.22
Total Cost: $13.67 per spreader