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# CHARA TECHNICAL REPORT

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## The OPLE ‘T’ Support System

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### 1. INTRODUCTION

In order to keep all beams from the five telescopes of the CHARA Array phased, an Optical Pathlength Equalizer (OPLE) is required. The OPLE consists of retro-reflecting ‘cats-eyes’ on moving carts under computer control. These carts run along lengths of precisely machined and aligned rails. This document is a collection of the design drawings prepared by CHARA for the various components of the rail support system.

These drawings include an overview of the OPLE/BCL Building (Figure 1) within which the rail system is housed. Four lengths of concrete support walls, each consisting of eight 20-ft concrete beams supported at their ends on the inertia piers in the OPLE area, provide the basic alignment and support for the rails. Two OPLE cart systems are supported by each of these beam systems, so the OPLE building provides for up to eight delay lines. Figure 2 shows a cross section of the OPLE building through an inertial pier indicating the support means for the concrete beams at their eastern end and their placement within the interior enclosure of the OPLE area. The eastern support of each beam provides for thermal expansion, while the western end, shown in close-up for a single beam in Figure 3, is dowelled into the inertia pier. Figure 3 also shows details of the next level of support and alignment provided by a 34-in box beam connected to the concrete beam by four J bolts to provide rough alignment. Bolts at each end of the box beams provide the means for coupling to “sleepers” to which Thomson rails are attached. A close-up of the eastern end of the beam is shown in Figure 4 indicating the flexible support for relief of expansion. Figure 5 shows in plan view the arrangement on an inertia pier of the concrete beams and the box beams. Bolt holes have been drilled into the inertia piers to provide for attachment of the fixed delay line (PoP’s) vacuum pipes. The terminus of the OPLE area at the east end of the building is shown in Figure 6 and provides for anchoring of the PoP systems against the imbalance of atmospheric pressure forces. The western terminus pier, shown in Figure 7, must provide for the insertion of beams from the telescopes as well as placement of optical tables housing the Beam Reducing Telescopes and other optical components including the metrology system for the OPLE’s.

The final coupling of the support system to the rails is accomplished via steel sleepers, not shown in this TR, mounted atop the bolts extending from the ends of the box beams. The alignment of these sleepers is achieved through a system of nuts and spherical washers

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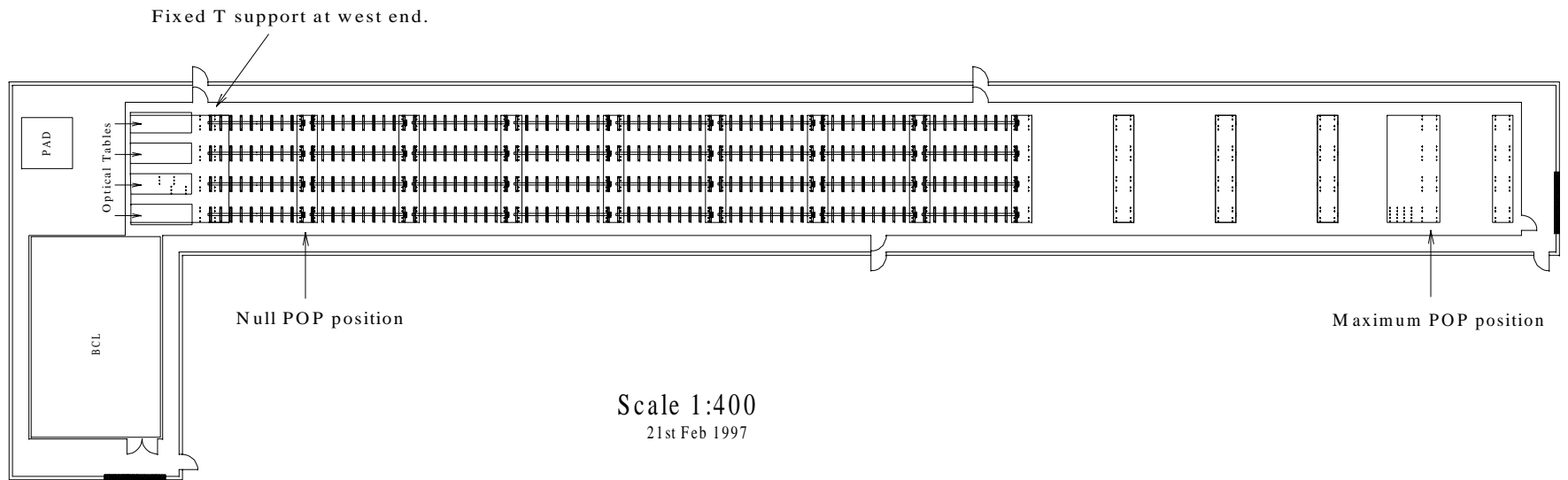
that will enable us to attain linearity to  $\pm 0.5$  mm to meet the JPL requirement for rail alignment.

The construction of the concrete beams and the fabrication of the box beams and sleepers was carried out by CHARA's primary contractor, Sea West Enterprises. Installation of sleepers and rails by CHARA staff will occur during the fall of 1997 in anticipation of the delivery of the first OPLE cart at the end of the calendar year.

### OPLE/BCL Overview including rail supports

Maximum optical length in POP =  $11 \times 20 \times 2 = 440' = 134\text{m}$

Maximum optical length in OPLE =  $8 \times 20 \times 2 = 320' = 97\text{m}$



Scale 1:400

21st Feb 1997

**FIGURE 1.** Overview of the OPLE/BCL building.  
*TR 50 - 3*

Looking from East towards West

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Scale 1:50

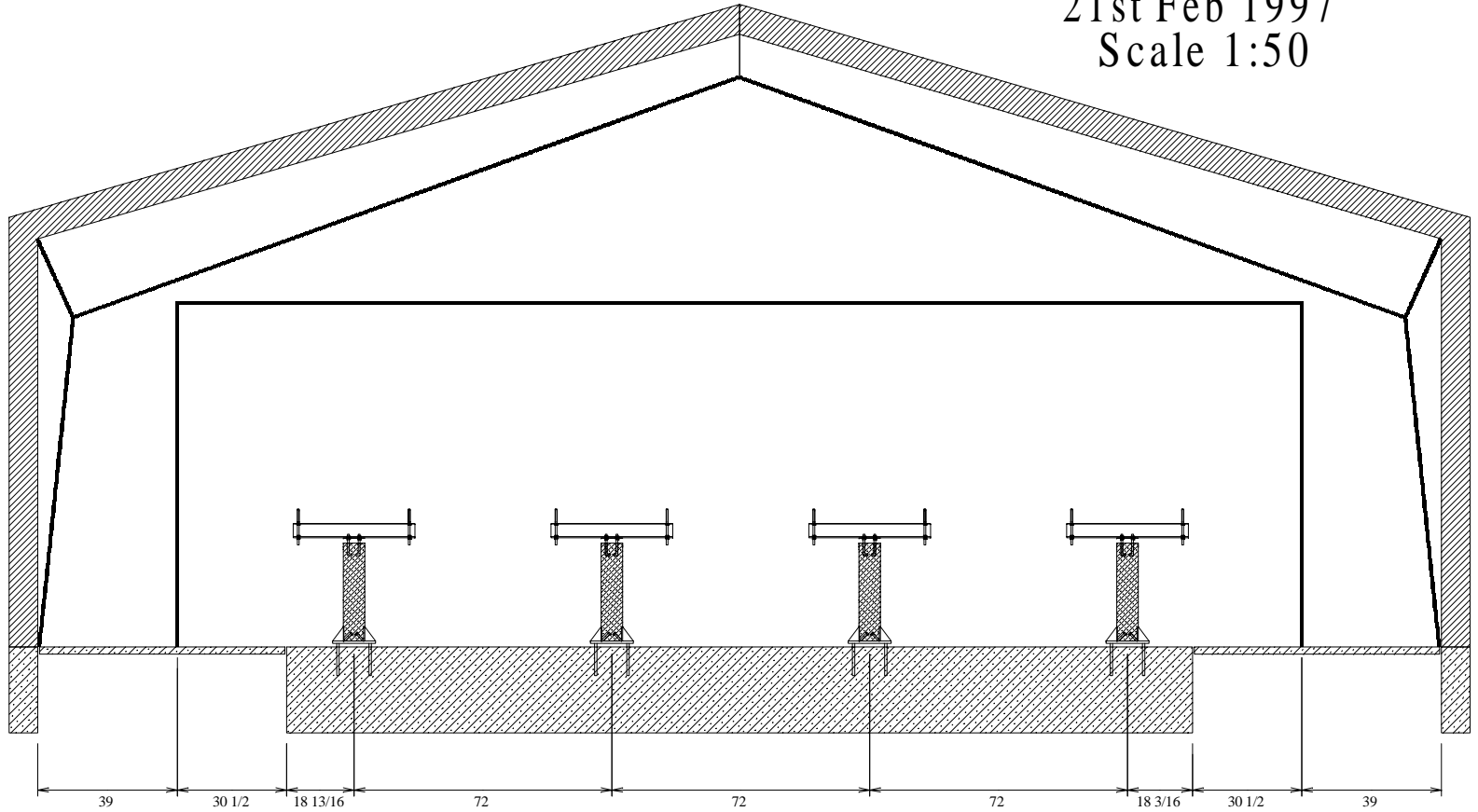
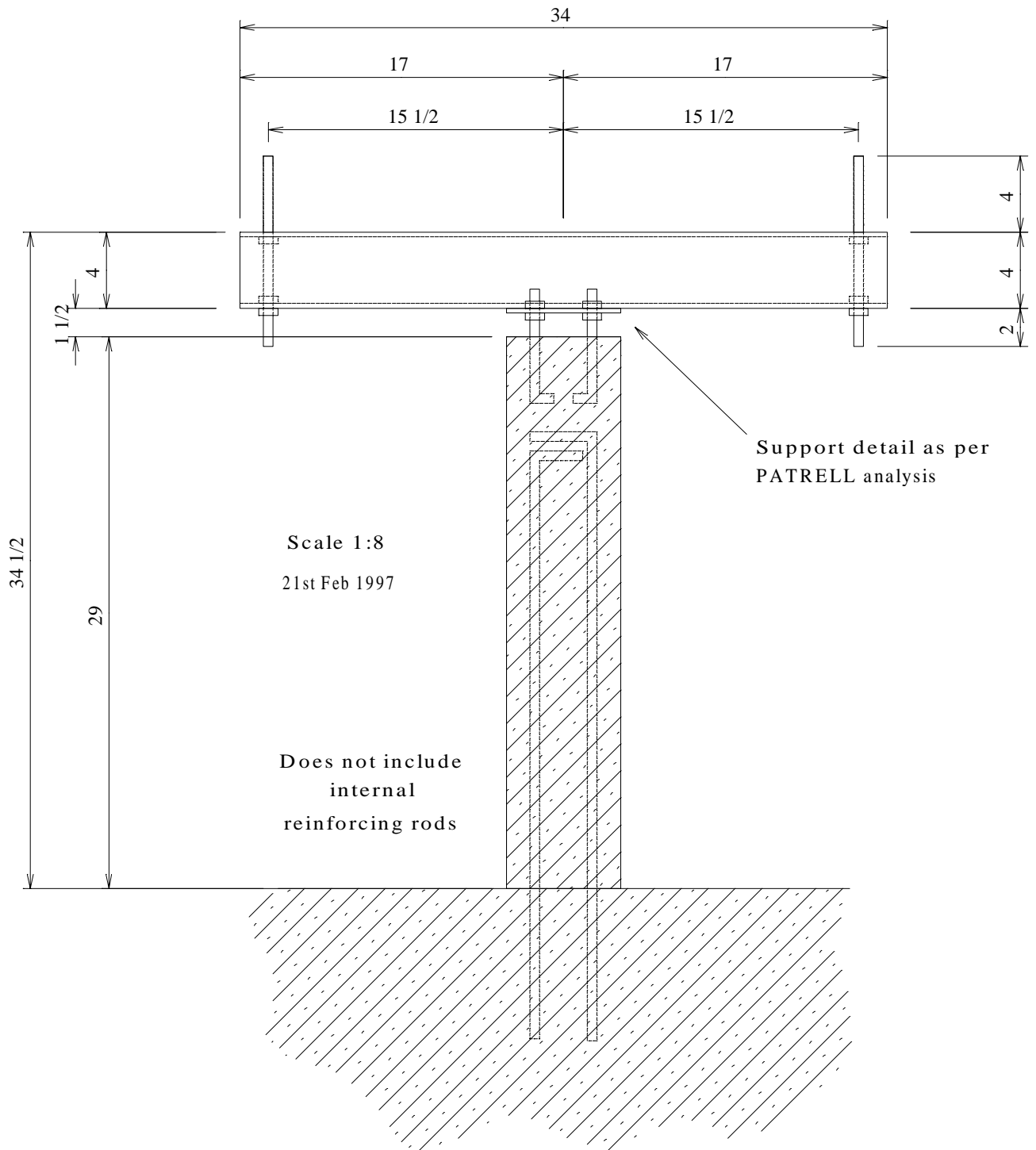


FIGURE 2. Cross section of building showing support positions.

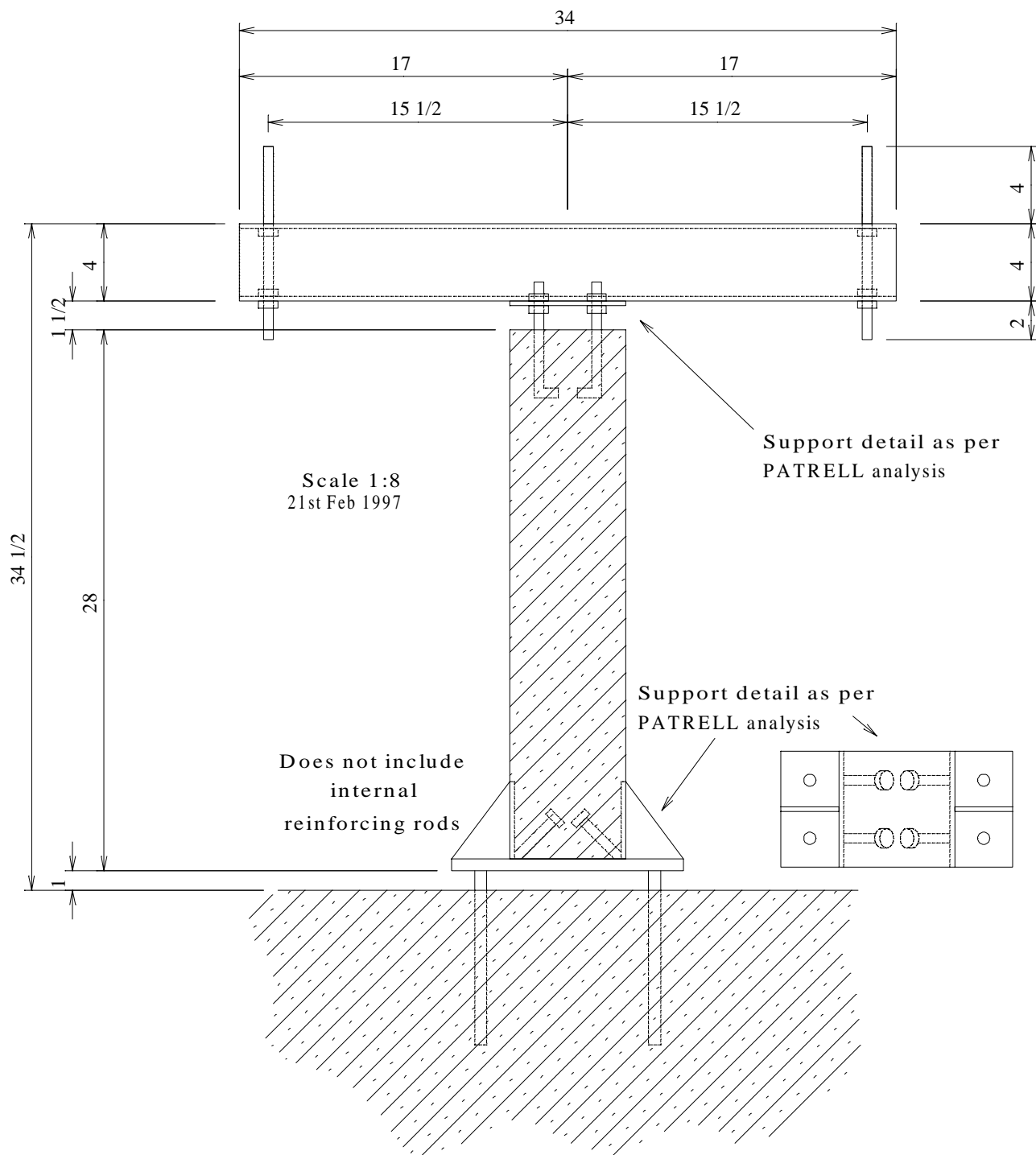
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Note that there is an offset.



# FIXED END

**FIGURE 3.** Cross section of fixed T support on western end of beam.



# FLEX END

**FIGURE 4.** Cross section of flex T support on eastern end of beam.

# Standard Pier Bolt hole Layout

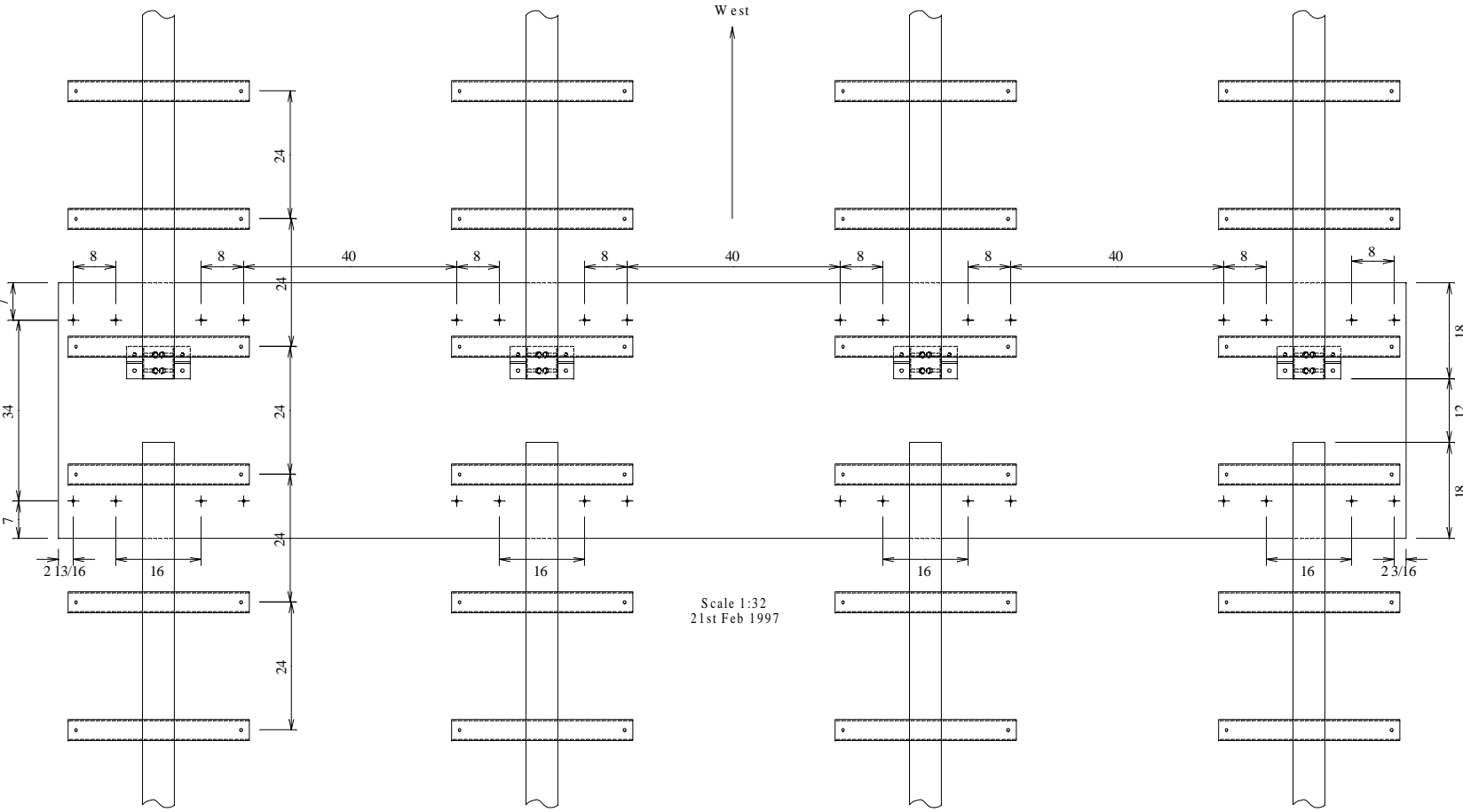


FIGURE 5. Bolt hole pattern for standard pier.

