Since we need the last element of $\hat{M}' = 1$ (bottom-right),
we can figure out the last column of $H_1 \cdot [0, 0, 0, \frac{1}{c_{34}}] = 1$

We can apply this method to derive the rest of H_1:

$$H_1 = \left[\begin{array}{ccc|c} & I & & 0 \\ \hline -\frac{c_{31}}{c_{34}} & -\frac{c_{32}}{c_{34}} & -\frac{c_{33}}{c_{34}} & \frac{1}{c_{34}} \end{array}\right]$$

Since H_1 must not alter $M \cdot H_0$ incorrectly, we know the top-left 3×3 is I, and the rightmost 3×1 is 0.

$M \cdot H_0 \cdot H_1 = \hat{M}$ and $M' \cdot H_0 \cdot H_1 = \hat{M}'$. $H = H_0 \cdot H_1$ (complete)
(The original transform $M \cdot H_0 = M \cdot H_0 \cdot H_1$. So we know H_1 is correct.)