

Design Alternatives

Using deep beam proportion guidelines from Appendix A and section 11.7 of Concrete Code ACI-318, a width, depth, and length were selected for a basic deep beam design. Also based on this code, the amount of minimum reinforcement was calculated for each beam design and the sizes of the rebar diameters were chosen. 3 different deep beam designs were developed in order to ensure that there were enough specimens for 9 different variables. 3 beams of each design (9 beams total) was enough to have one beam of each variable design (discussed further in section 4.0 of this report). These were chosen to be approximately 12 inches wide, 18 inches deep, and 6 feet long. These dimensions were selected using a depth to span ratio of less than 2, and using tables from the concrete ACI-318: Appendix A code book. With a minimum area of reinforcement required by the code, a bar diameter was selected and the amount of bars could be determined. There were 4 #5 bars for compression steel at the top, and 4 #8 bars for tension steel at the bottom. The number of the bar refers to the diameter of the bar. For example, a #5 bar means it's 5/8 in. in diameter and a #3 means it's 3/8 in. in diameter. The three designs selected involve a minimally reinforced beam and two beams with slightly more reinforcement. The purpose of this extra rebar in the second and third designs is to provide more tensile strength in the test regions of the beam, shown in Figure 2. A detailed image of the 3 different beam designs can be seen in Figure 3.1. This figure shows the 3 final designs that were selected for this project and their test regions. The test regions are the areas of the beam that were analyzed for crack widths. The first design includes 0.0% additional reinforcement in the test region (labeled in the figure). The cross sectional view shows details of the dimensions of the beams. These dimensions are the same for all 9 beams. The second design shows slightly more rebar, about 0.2% more, in the test region of the beam. The diameter of the additional rebar for design 2 is 3/8 in. The final design shows 0.3% more conventional reinforcement in the test region. The diameters of these bars are 1/2 in; slightly larger than the bars used in design 2.

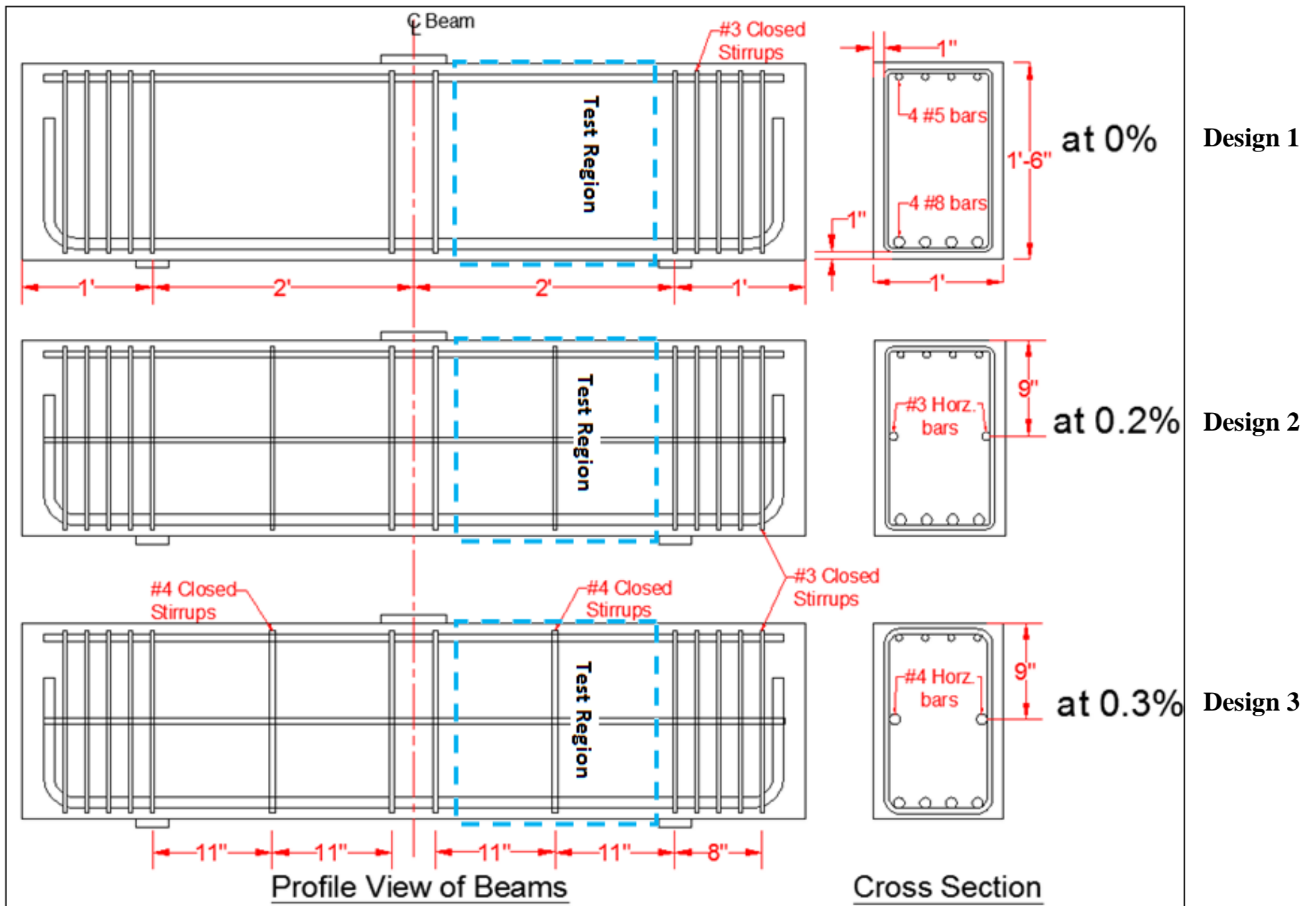


Figure 3.1: Design Alternatives