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|------------------------|---------------------------|----------------------|---|
| Company Name | Vasudev Raghunath Upadhye | Project Title | Numerical 4 |
| Group/Team Name | MIT | Subtitle | |
| Designer | VRU | Job Number | Numerical 4 |
| Date | 05 /06 /2016 | Method | Limit State Design (No Earthquake Load) |

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|--------------------------------|------------------------|
| Design Conclusion | |
| Finplate | Pass |
| Finplate | |
| Connection Properties | |
| Connection | |
| Connection Title | Single Finplate |
| Connection Type | Shear Connection |
| Connection Category | |
| Connectivity | Column flange-Beam web |
| Beam Connection | Bolted |
| Column Connection | Welded |
| Loading (Factored Load) | |
| Shear Force (kN) | 200 |
| Components | |
| Column Section | ISSC 200 |
| Material | Fe 410 |
| Beam Section | ISMB 400 |
| Material | Fe 410 |
| Hole | STD |
| Plate Section | 285X80X14 |
| Thickness (mm) | 14 |
| Width (mm) | 80 |
| Depth (mm) | 285 |
| Hole | STD |
| Weld | |
| Type | Double Fillet |
| Size (mm) | 12 |
| Bolts | |
| Type | HSFG |
| Grade | 8.8 |
| Diameter (mm) | 12 |

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|-----------------------------------|----|
| Bolt Numbers | 7 |
| Columns (Vertical Lines) | 1 |
| Bolts Per Column | 7 |
| Gauge (mm) | 0 |
| Pitch (mm) | 37 |
| End Distance (mm) | 30 |
| Edge Distance (mm) | 30 |
| Assembly | |
| Column-Beam Clearance (mm) | 20 |

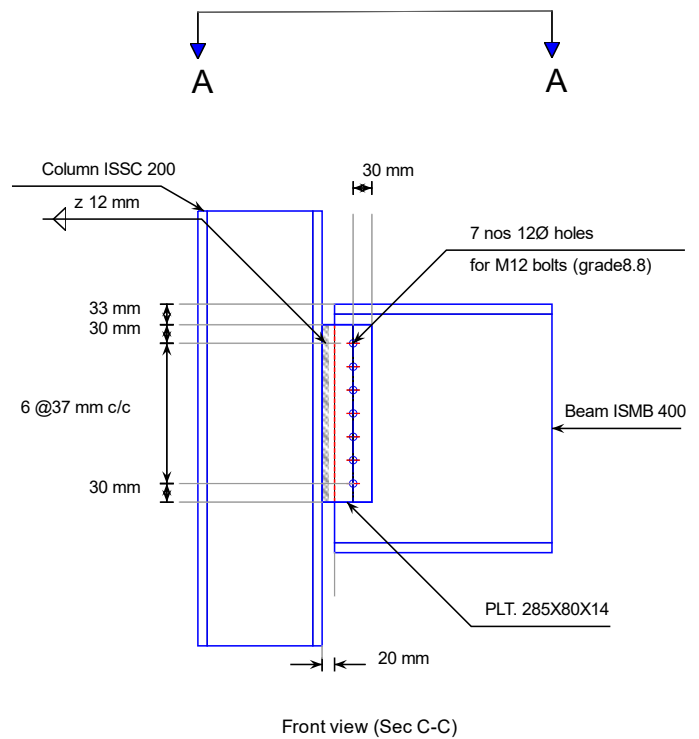
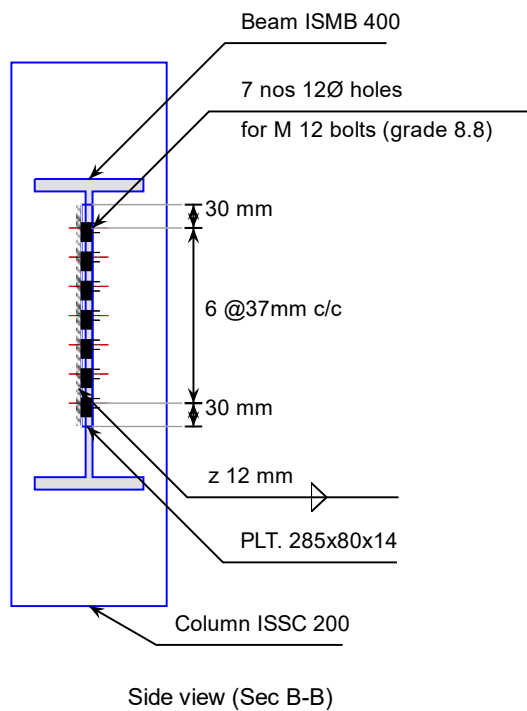
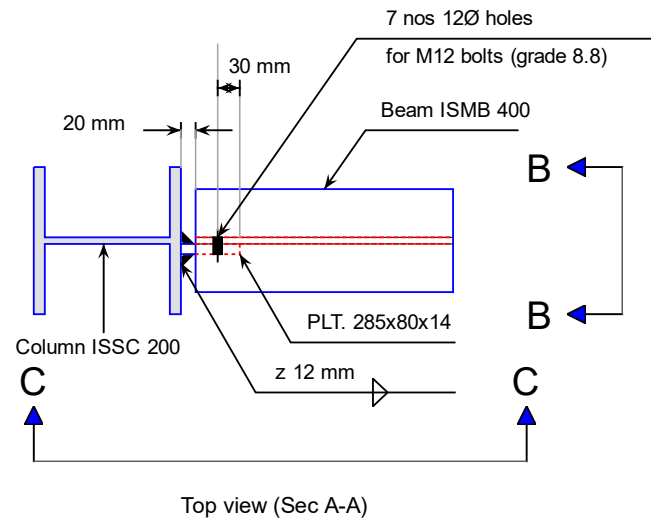
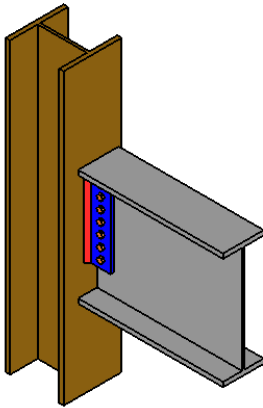
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| Design Check | | | |
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| Check | Required | Provided | Remark |
| Bolt shear capacity (kN) | | $V_{dsb} = (800 \times 0.6126 \times 12 \times 12) / (\sqrt{3} \times 1.25 \times 1000)$ = 31.223 [cl. 10.3.3] | |
| Bolt bearing capacity (kN) | | $V_{dpb} = (2.5 \times 0.519 \times 12 \times 8.9 \times 410) / (1.25 \times 1000)$ = 45.452 [cl. 10.3.4] | |
| Bolt capacity (kN) | | Min (31.223, 45.452) = 31.223 | |
| No. of bolts | $200 / 31.223 = 6.4$ | 7 | Pass |
| No. of column(s) | ≤ 2 | 1 | |
| No. of bolts per column | | 7 | |
| Bolt pitch (mm) | $\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 8.9, 300) = 285$ [cl. 10.2.2] | 37 | Pass |
| Bolt gauge (mm) | $\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 8.9, 300) = 285$ [cl. 10.2.2] | 0 | |
| End distance (mm) | $\geq 1.7 \times 13 = 22.1, \leq 12 \times 8.9 = 106.8$ [cl. 10.2.4] | 30 | Pass |
| Edge distance (mm) | $\geq 1.7 \times 13 = 22.1, \leq 12 \times 8.9 = 106.8$ [cl. 10.2.4] | 30 | Pass |
| Block shear capacity (kN) | ≥ 200 | $V_{db} = 504$ | Pass |
| Plate thickness (mm) | $(5 \times 200 \times 1000) / (285 \times 250) = 14.04$ [Owens and Cheal, 1989] | 14 | Pass |
| Plate height (mm) | $\geq 0.6 \times 400 = 240.0, \leq 400 - 16 - 14 - 10 = 330.0$ [cl. 10.2.4, Insdag Detailing Manual, 2002] | 285 | Pass |
| Plate width (mm) | | 100 | |
| Plate moment capacity (kNm) | $(2 \times 31.223 \times 37^2) / (37 \times 1000) = 11.24$ | $M_d = (1.2 \times 250 \times Z) / (1000 \times 1.1) = 51.69$ [cl. 8.2.1.2] | Pass |

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| Effective weld length (mm) | | $285 - 2 \times 12 = 261$ | |
| Weld strength (kN/mm) | $\sqrt{[(11240 \times 6) / (2 \times 261^2)]^2 + [200 / (2 \times 261)]^2}$ $= 0.626$ | $f_v = (0.7 \times 12 \times 410) / (\sqrt{3} \times 1.25)$ $= 1.591$ [cl. 10.5.7] | Pass |
| Weld thickness (mm) | $\text{Max}((0.626 \times 1000 \times \sqrt{3} \times 1.25) / (0.7 \times 410), 14 \times 0.8) = 11.2$ [cl. 10.5.7, Insdag Detailing Manual, 2002] | 12 | Pass |

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| Additional Comments | Initial design was not safe. Plate thickness and weld size was required to increase as length dimension of plate is restricted. |
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