13 GOOD AND BAD DETAILING

Many different detailing solutions can be used to connect one steel member to another. Furthermore, the differences in custom and practise between European countries, differences in labour costs, production and erection methods and site conditions can lead to a bewildering number of different solutions. All too often bad detailing is used leading to unsightly connections, connections which clearly do not fulfil their design function and connections which may introduced unwanted secondary effects into the structure. Poor detailing can also give rise to fabrication and/or erection difficulties and increase the cost of the structure.

The main aspects, which need to be considered during the design and detailing of a connection are summarised in Table 13.1. Figures 13.1 to 13.2 also give examples of good and bad detailing and are based on real completed project within the European Community. Table 13.2 at the end of this chapter assess each detail and summarise the good and bad aspects of each solution.

Table 13.1 Aspects to be considered during connection design

Calculation	Transfer of forces by connection Eccentricities in connection Codes Design [EN 1993-1-1] Connection design [EN 1993-1-8] Erection [EN 1090-1]
Appearance	Architectural shape Corrosiveness of environment
Drawing	Possibility of standardization Restriction on number of different elements Restriction on number of bolt types/lengths/grade
Production	Fabricator's experience and practice Restriction on handling Cutting Drilling Notching Welding Repair of redundant deformations Protection system Paint Galvanize Transport (damage) Replacement of parts
Erection	Erection difficulties Tolerances Sections dimensions Production and precision Site fittings Number of bolts Type Grade Length Length of threaded part Washers Method of tightening of bolts

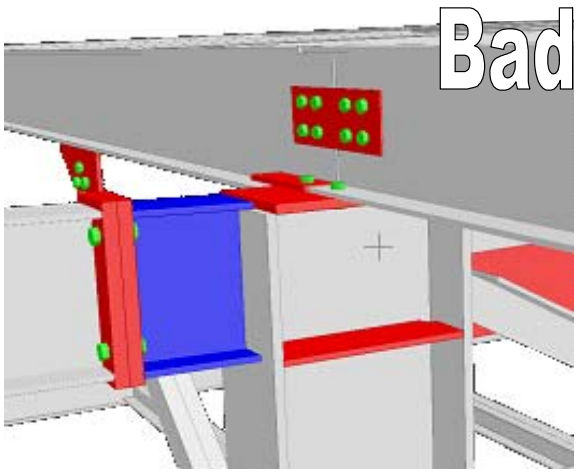

Figure 13.1 Beam to column joint,
moment connection to major axis of column,
simple connection to minor axis,
unsuccessful solution
because of instability during erection and
expensive solution
difficult to fabricate and erect;
beams IPE 330; bolts 4xM20;
moment connection: end plate resistance
$M_{j,Rd}$ *= 98,4 kNm; weld resistance*
$M_{j,Rd}$ *= 297,3 kNm*

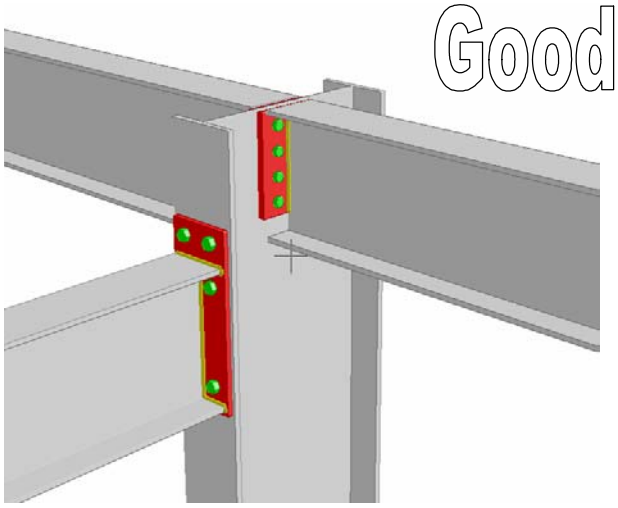

Figure 13.2 Beam to column joint,
moment connection to major axis of column,
simple connection to minor axis,
successful case
with extended end plate to major axis and
header plate to minor axis;
beams IPE 330; bolts 6xM20;
moment connection resistance $M_{j,Rd}$ *= 139,9 kNm*

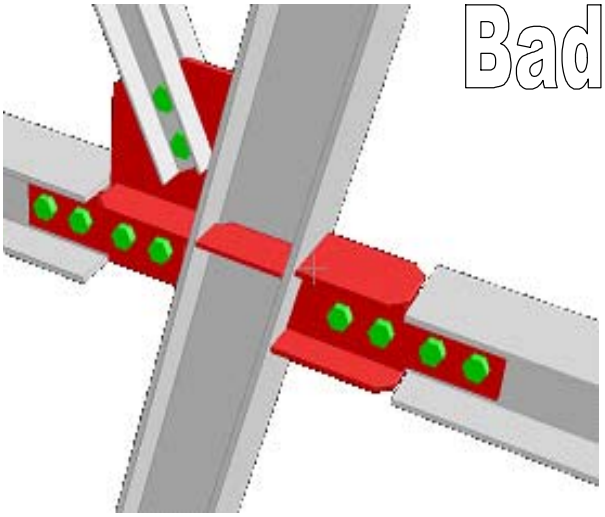

Figure 13.3 Simple beam to column joint
of open hot rolled sections with diagonal bracing,
unsuccessful case
because of difficult to fabricate and erect,
expensive solution;
column HE180B; beam HE180B; bolts 4xM20

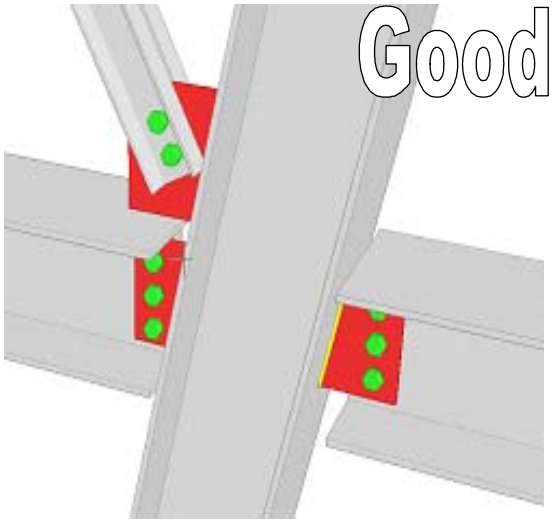

Figure 13.4 Simple beam to column joint
of open hot rolled sections with diagonal bracing,
successful case
with fin plates,
column HE180B; beam HE180B; bolts 3xM20

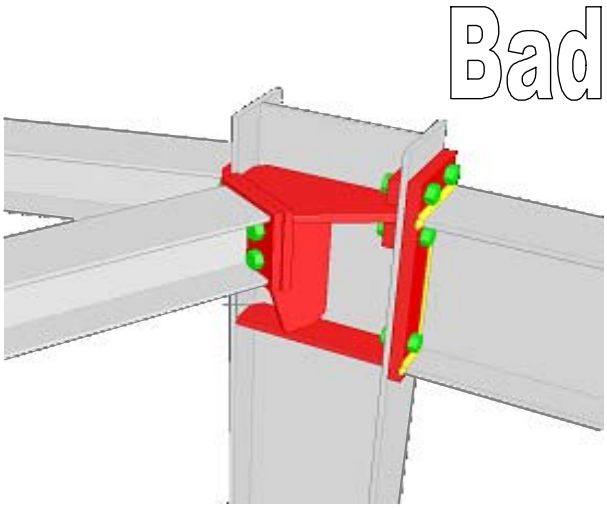

Figure 13.5 Beam to column joint with moment connection to major axis and simple connection to minor axis, unsuccessful case because of unclear transfer of forces, an expensive solution; secondary beams HE120A; moment connection: beam IPE270; bolts 6xM16

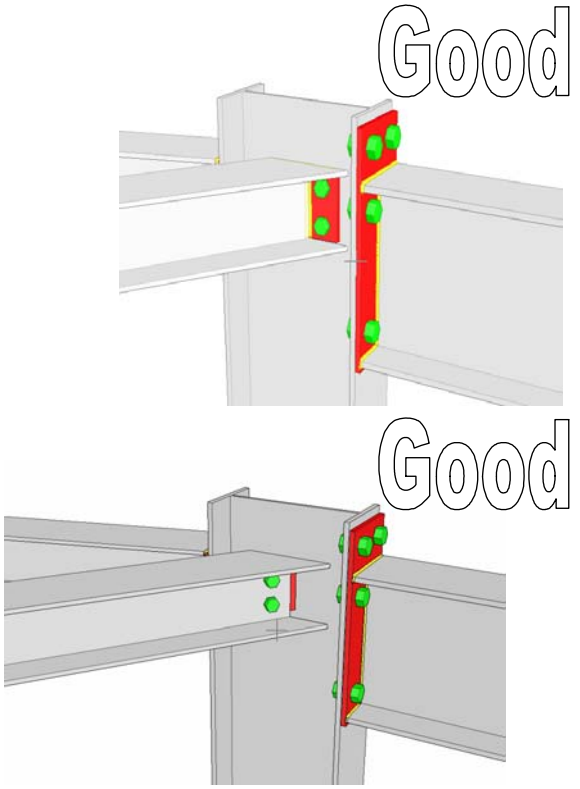

Figure 13.6 Beam to column joint with moment connection to major axis, simple connection to minor axis, successful case with extended end plate to major axis and header plate/ beam splices to minor axis; secondary beams HE120A; moment connection: beam IPE270; bolts 6xM16

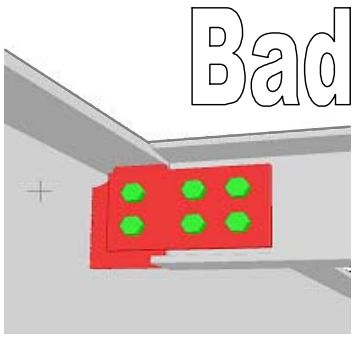

Figure 13.7 Beam to beam joint of open sections, simple connection in global analyses; unsuccessful case because of introduction of eccentricity, difficult to erect; beam HE 1000A, secondary beam IPE 240; bolts 6xM16

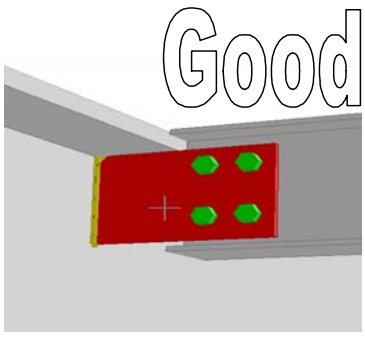

Figure 13.8 Beam to beam joint of open sections, simple connection in global analyses; successful case with long fin plate; beam HE 1000A, secondary beam IPE 240; bolts 4xM16

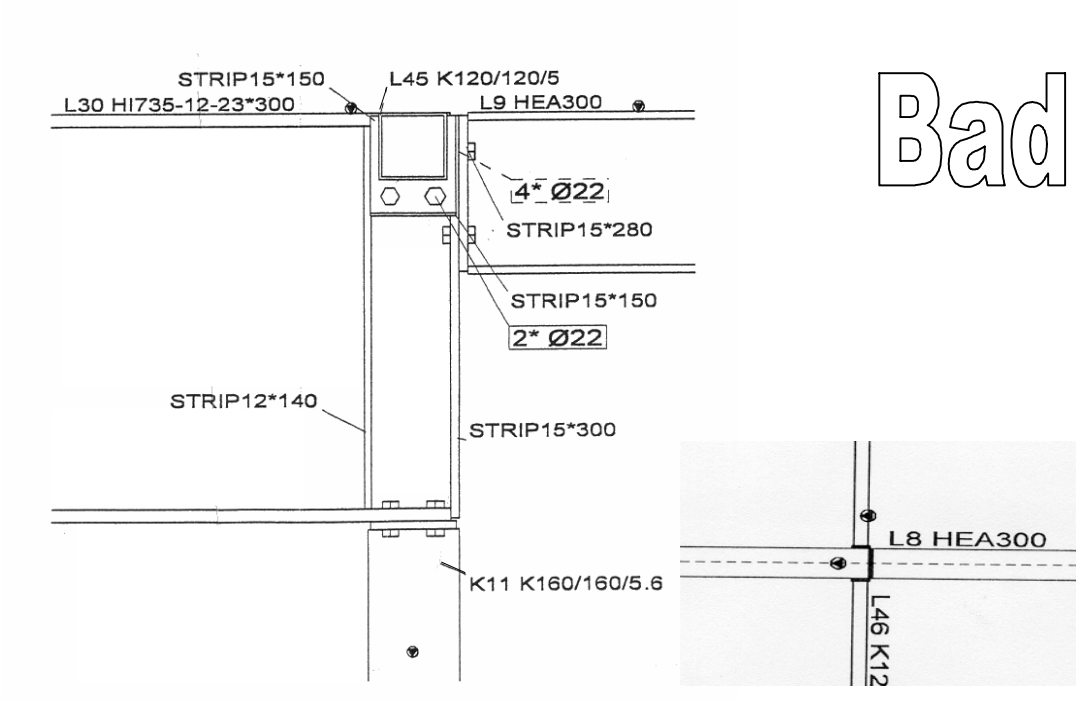

Figure 13.9 Simple beam to column joint, beams of open cross sections, column RHS tube; unsuccessful case - danger of instability during erection and an expensive solution

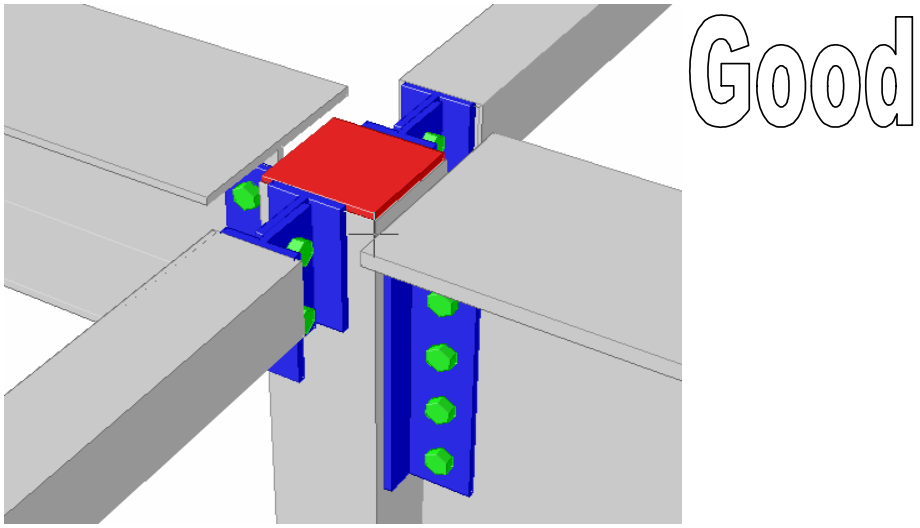

Figure 13.10 Simple beam to column joint, successful case by web angles

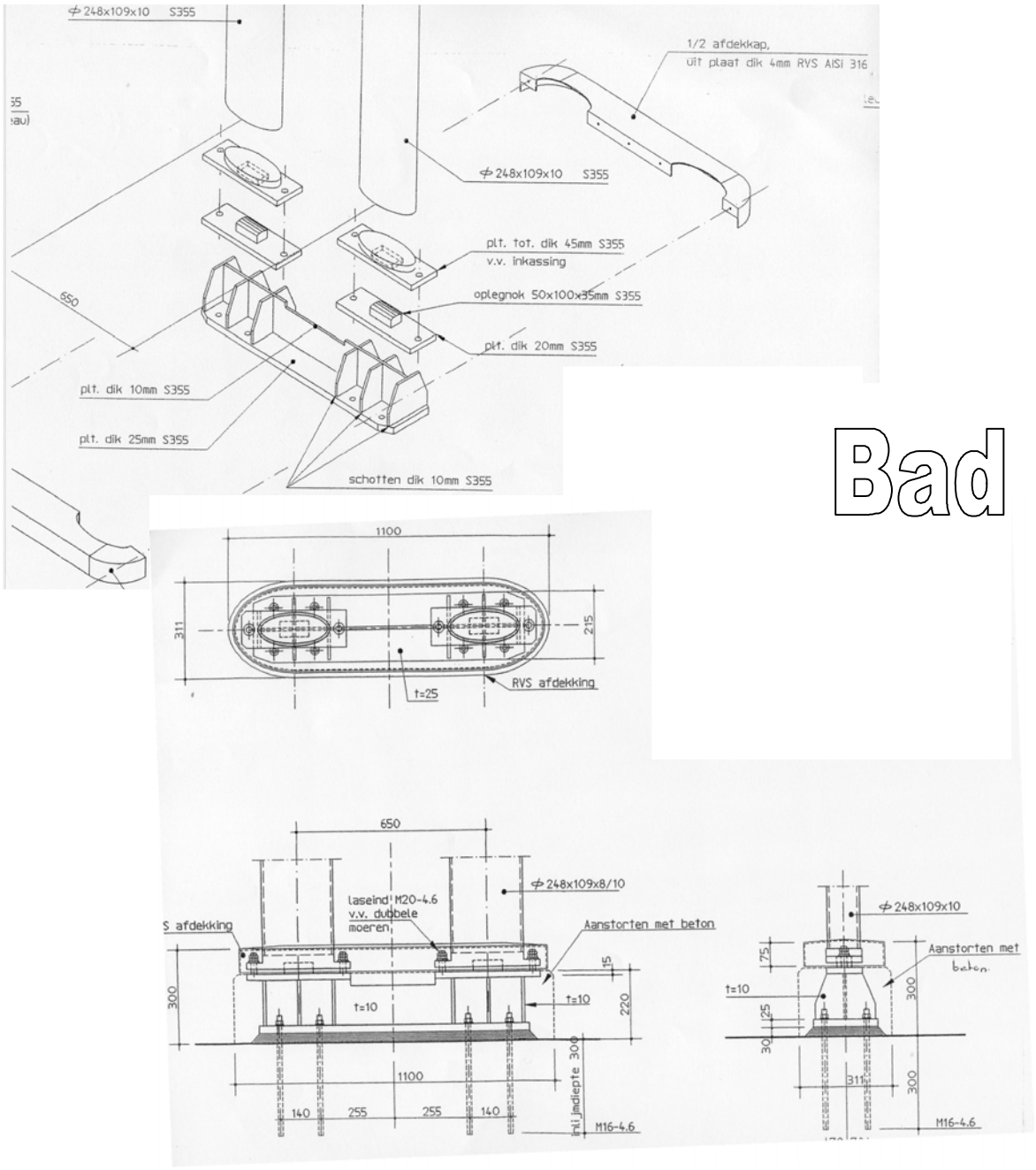

Figure 13.11 Base plate, in global analyses represented in direction of major axis of column as rigid and in minor axis as simple; unsuccessful case because of very high complexity/price

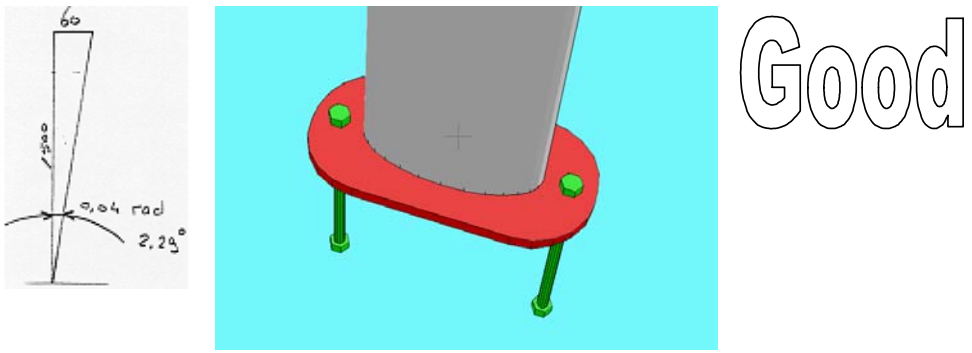

Figure 13.12 Base plate, successful case with simple base plate, in global analyses the stiffness can be introduced

Table 13.2 Assessment of good and bad detailing examples in Fig. 13.1 - 13.12

Example		Fig. 13.1-2	Fig. 13.3-4	Fig. 13.5-6	Fig. 13.7-8	Fig. 13.9-10	Fig. 13.11-12
Observed parameter		Column + 2 continuous top beams	Column + 2 girders	Column + 2 girders + 1 sleeper	Main girder + 1 sleeper	Column + 4 girders	Column foot with rotating possibility
		moment connection	pin connection	moment connection	pin connection	pin connection	pin connection
Design	B	00	000	0	0	000	00
	G	++	+++	++	++	+++	++
Drawings	B	00	000	00	0	00	000
	G	++	++	++	++	++	+++
Plates	B	8	7	9	3	8	20
	G	3	3	3	1	-	1
Profiles	B	-	2	-	-	-	2
	G	-	0	-	-	8	0
Measurement	B	00	000	00	+	00	00
	G	+	+++	++	+	+++	++
Holes	B	0	00	+	0		00
	G	++	++	+	+	00	+++
Welding	B	0	00	00	+	+	000
	G	++	++	+	+	12	++
Bolts	B	16	10	14	6	12	12
	G	14	8	12	4	00	2
Architecture	B	0	00	00	0	++	0
	G	+	++	+	+	000	++
Corrosion	B	00	0	00	0	++	000
	G	++	+	++	+	0	++
Transport	B	0	0	0	++	+	00
	G	+	+	+	0	+	++
Building Tolerances	B	0	++	00	++	00	000
	G	+	+0	+	+	++	++
Erection	B	+	0	0	0	0	000
	G	+	+	+	+	++	++

Note:

Bad cases	B
Number	Quantity required
000	very bad
00	bad
0	not good/doubtful

Good cases	G
Number	Quantity required
+	better
++	good
+++	very good