



BSF
Beam-column
Beam-beam
Beam-wall

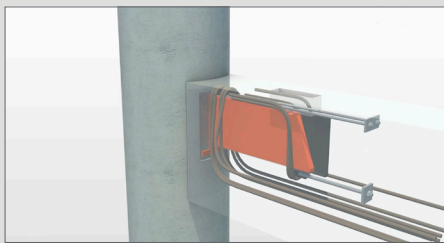


BSF connections

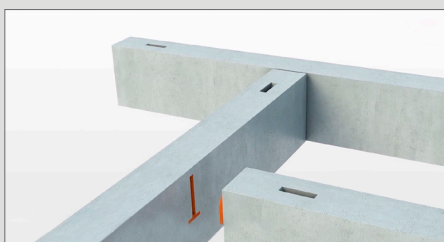
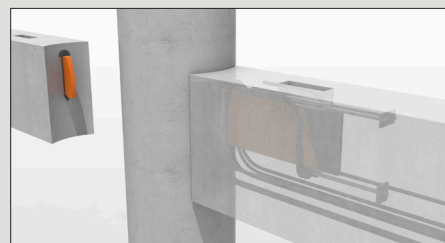
IC Beam-column connections; BSF provides clean and elegant solutions.

Benefits of using BSF:

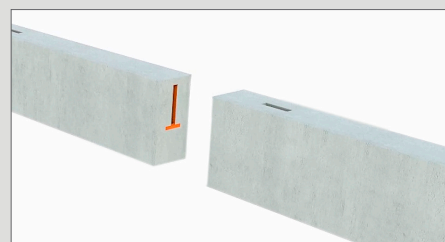
- Columns without corbels/supports, freedom to design.
- Economical by beam-beam connections and Gerber connections.
- Simple form works by multiple beams onto a column.
- Adaptable angles.
- Can use double connections.
- Elegant solution for round columns.
- CE mark/ETA approval.
- Load from beam transmitted to the inside of the column.
- Simple and safe to erect on site.
- Simple fire protection.



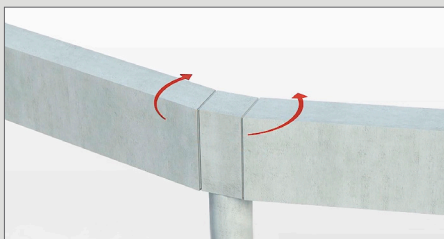
BSF provides an efficient and elegant solution to connect beams to circular columns.



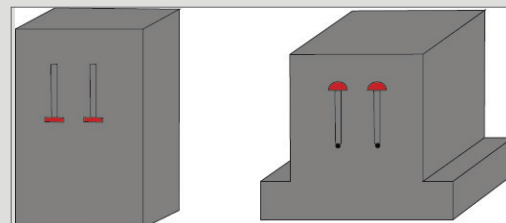
T-connection of the secondary beam to main beam.



Beam to beam; Gerber connection.



Adaptable angles.



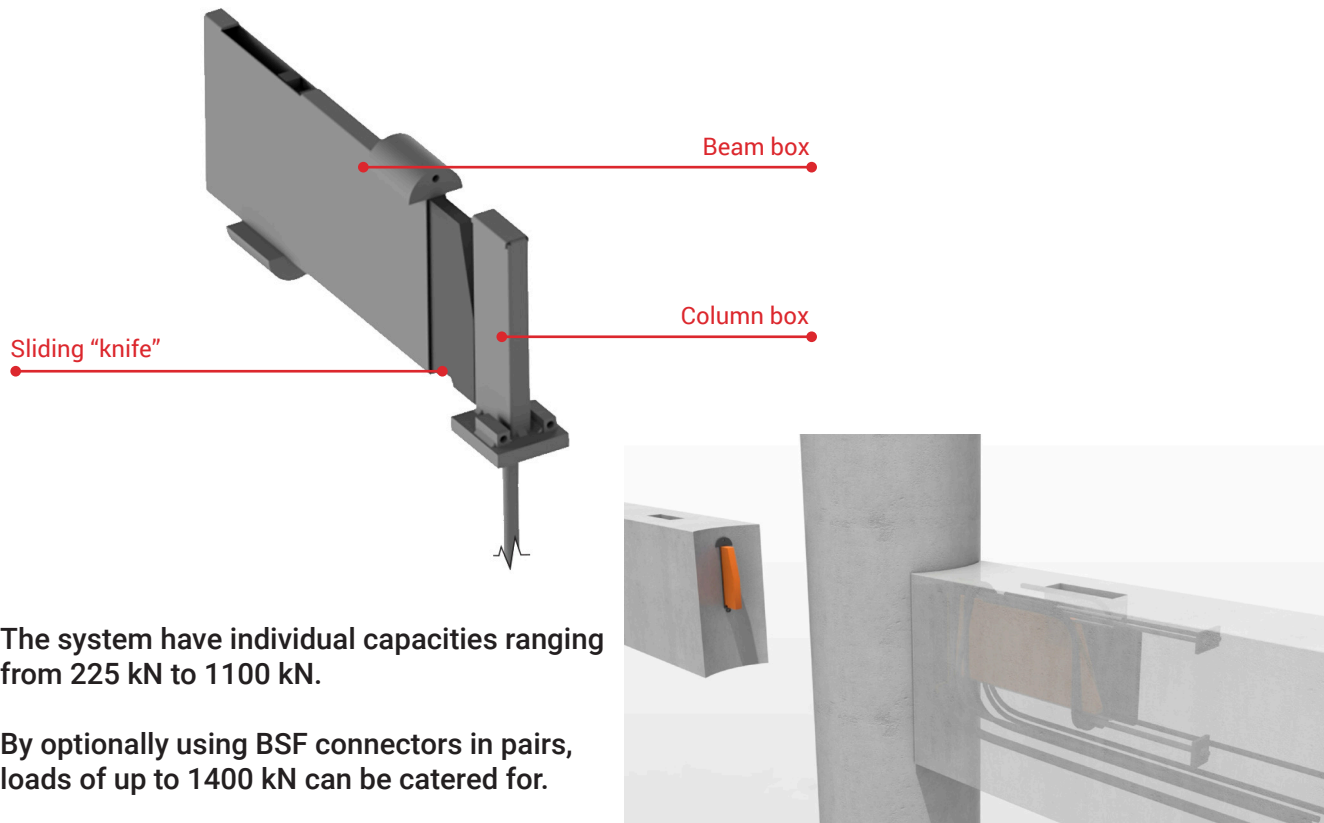
As an alternative to one large connection, BSF also can be used in pairs to achieve great vertical load capacity.

BSF Connections

Beam box ; This is cast into the beam which is being supported.

Column box; This is cast into the column, or secondary beam.

Sliding "knife"; This solid steel member actually carries the load from one member to another.

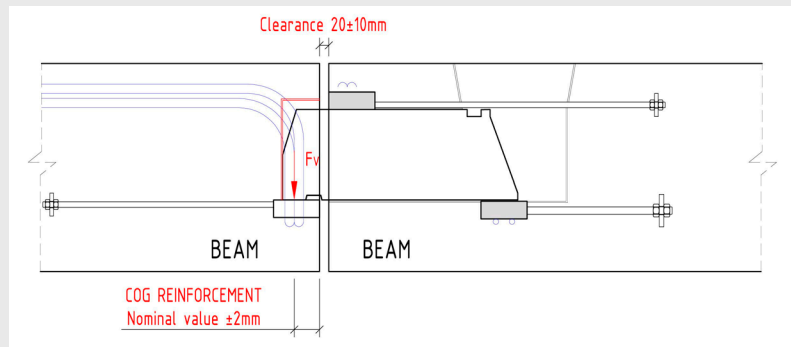


The system have individual capacities ranging from 225 kN to 1100 kN.

By optionally using BSF connectors in pairs, loads of up to 1400 kN can be catered for.

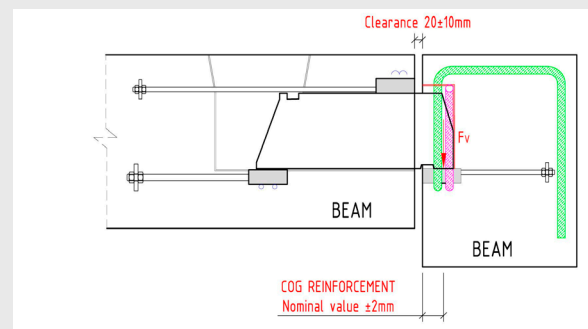
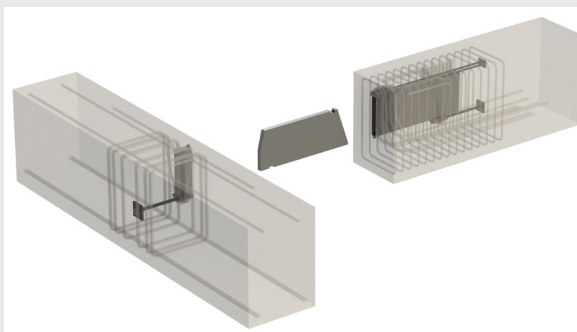
| Unit | Description | Capacity | Min Beam dimension |
|-------------|------------------------|----------|--------------------|
| BSF 225 | Beam Column Connection | 225 | 190 x 370 |
| BSF 300 | Beam Column Connection | 300 | 190 x 420 |
| BSF 450 | Beam Column Connection | 450 | 190 x 440 |
| BSF 700 | Beam Column Connection | 700 | 310 x 500 |
| BSF 450 x 2 | Beam Column Connection | 900 | 350 x 440 |
| BSF 1100 | Beam Column Connection | 1100 | 310 x 590 |
| BSF 700 x 2 | Beam Column Connection | 1400 | 600 x 500 |

Beam - beam, cantilever



For more information, see memo 525 at WWW.INVISIBLECONNECTIONS.NO

Beam - beam and T-connections



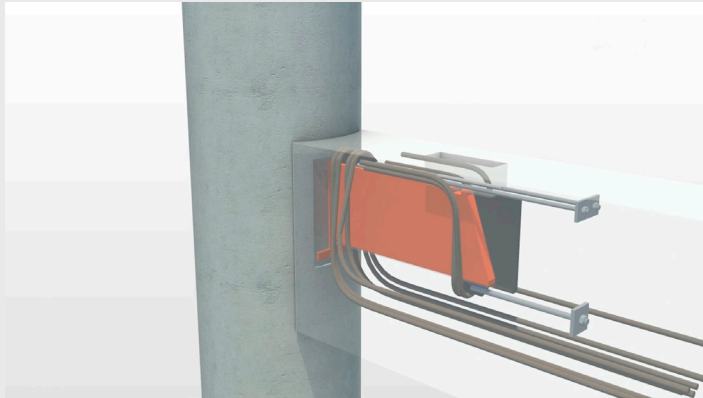
For more information, see memo 526 at WWW.INVISIBLECONNECTIONS.NO

CE Mark / ETA approved product



The BSF connections are CE marked and ETA approved

Standard reinforcement



Standard reinforcement, see MEMO 521-527 at WWW.INVISIBLECONNECTIONS.NO

Design
MEMO 521

| | | |
|---------------|------------|---------|
| EN 101 | 17/06/2013 | EN 101 |
| Last Rev: | 28/03/2013 | EN 101 |
| Doc. No: | EN-101-11 | General |
| Page 11 of 61 | | |

BSF UNITS - DESIGN OF REINFORCEMENT

Bending of anchoring reinforcement: EC2, clause 6.5.4(6) 2 and 10 Bulletin 52 "Structural concrete: Testbed for behaviour, design and performance", vol.2, section 3.2.2.

Figure 3: Bending of reinforcement.

Allowable concrete stress in node:
 $f_{ct} = 0.6 \cdot (1 - \frac{R_{ct}}{250}) \cdot f_{ct}$

Ad. ul. concrete stress in node:
 $\sigma_c = \frac{R_{ct}}{R_{ct} + 0.1 \cdot A_{s,eff} \cdot \cos^2 \theta}$

R_{ct} - effective beam width. If the compression strut crosses the unit, the width of the unit should be extracted.

- R_{ct} - Nominal diameter of reinforcement
 - $A_{s,eff}$ - Effective concrete area in 45 degrees. \Rightarrow EN 1992-1-1
 - θ - Angle of reinforcement.

Solving for R_{ct} , inserting σ_c and f_{ct} into (1):

$$R_{ct} = \frac{R_{ct}}{f_{ct} \cdot (1 - \frac{R_{ct}}{250}) \cdot \cos^2 \theta} \cdot \sigma_c \Rightarrow R_{ct} = 0.6 \cdot (1 - \frac{R_{ct}}{250}) \cdot f_{ct} \cdot 0.5$$

Minimum required diameter - bending of front reinforcement:
 $R_{ct} = 0.6 \cdot (1 - \frac{R_{ct}}{250}) \cdot f_{ct} \cdot 0.5$

Minimum required diameter - bending of reinforcement at base:
 $R_{ct} = 0.6 \cdot (1 - \frac{R_{ct}}{250}) \cdot f_{ct} \cdot 0.5$

\Rightarrow Select appropriate nominal diameter. The minimum nominal diameter shall comply with the requirements of EN 12512-2, 4, 6, 8.

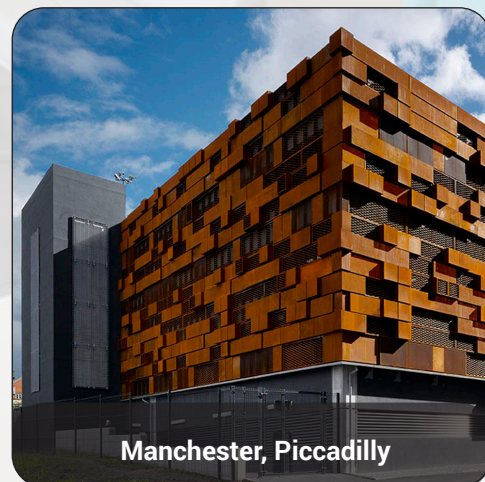
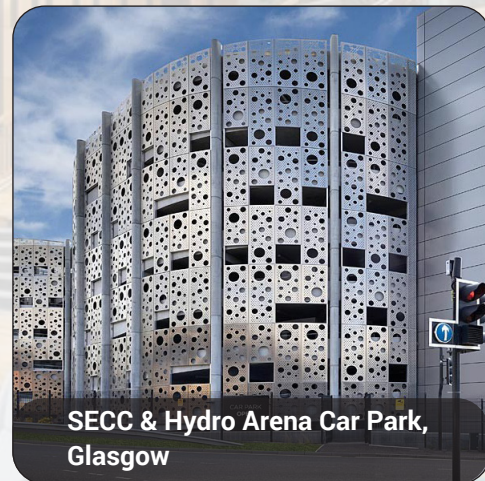
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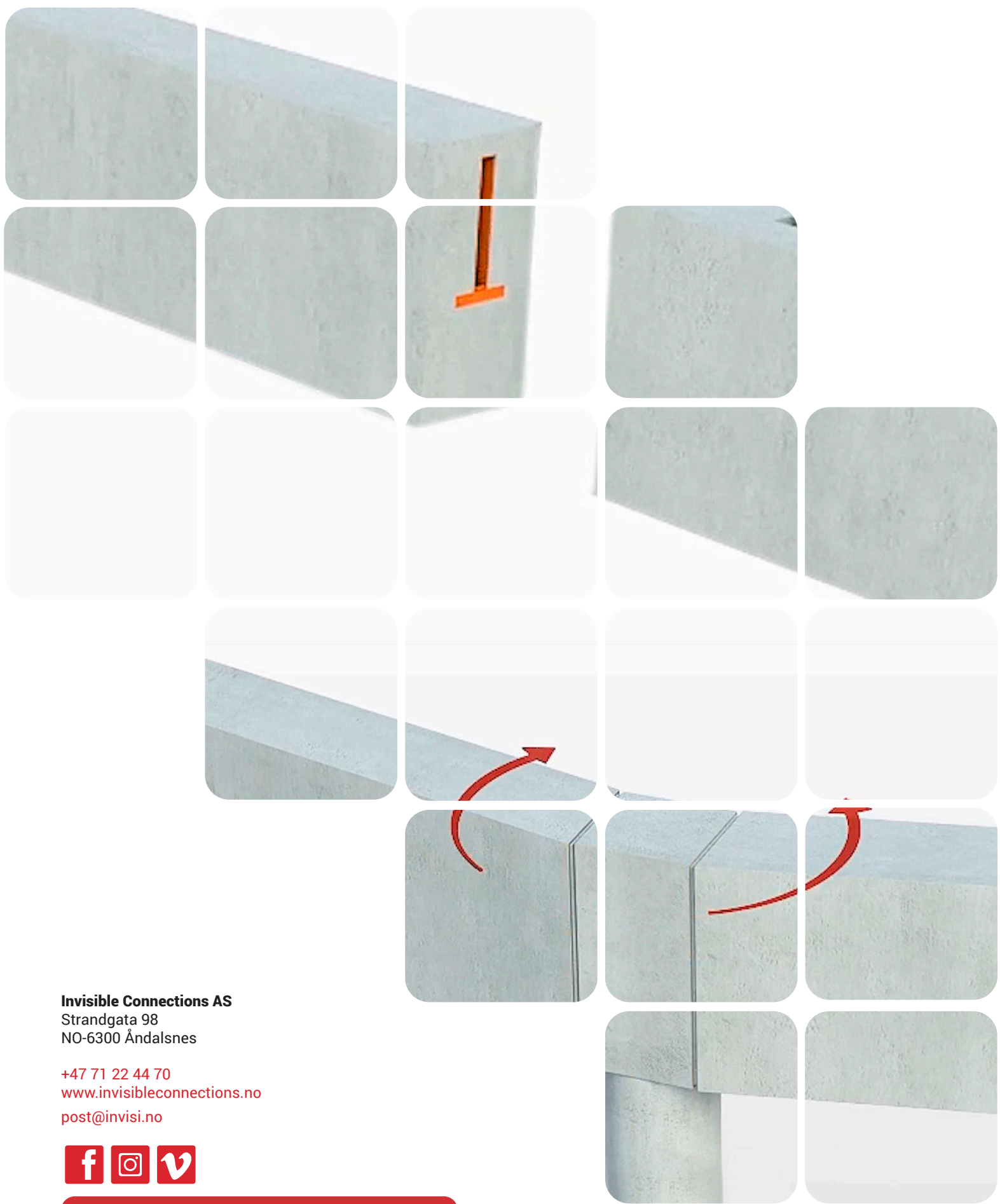
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| | | | | | | |
| Stairs | | | | | | |
| Stairs in seismic zones | | | | | | |
| Beam column | | | | | | |
| DT Connections | | | | | | |

References





Invisible Connections AS

Strandgata 98
NO-6300 Åndalsnes

+47 71 22 44 70
www.invisibleconnections.no
post@invisi.no

