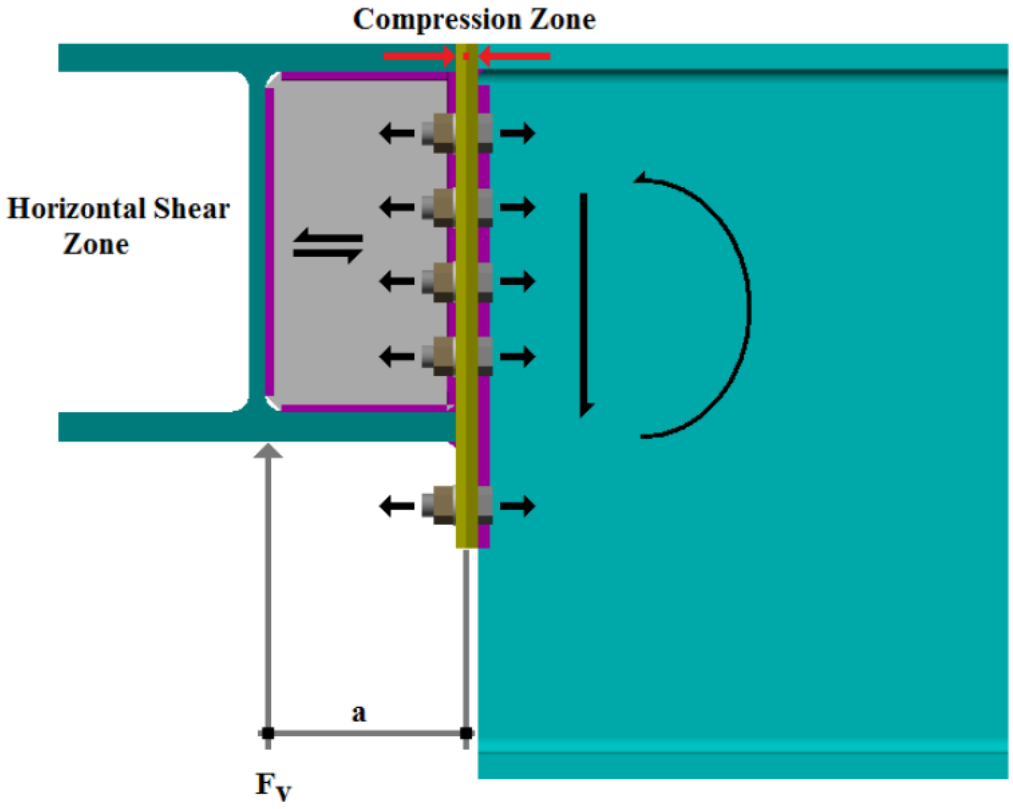
1.0 Toe plate connection

1.1 A Toe Plate connection comprises:

- a partial or full depth flexible end plate welded to the end of the supported beam
- a pre-formed fitting comprising a fin plate welded with a full strength weld to a further flexible end plate (the toe plate)
- the pre-formed fitting is then welded in place with a full strength weld to the supporting beam web with placement welds to the inside face of the flanges
- the connection can be single sided or can be on both sides of the supporting beam.

To keep the connection parameters within the scope of the simple connection design philosophy, the component parts are chosen so as to comply with the recommendations given in the BCSA publication *"Joints in Steel Construction - Simple Connections"*.
The design model for the Fin Plate is based on that given by the BCSA publication *"Joints in Steel Construction - Simple Connections"*.
The design model for the Flexible End Plate and the Toe Plate is based on that given by the BCSA publication *"Joints in Steel Construction - Moment Connections"*.

1.1.1 Typical Toe Plate Connection



1.2 Force transfer mechanism

In the *Fastrak Building Designer* Toe Plate Connection model, the force transfer mechanism is taken as:

- The line of shear transfer (supported beam end reaction) is taken to be at the face of the web of the supporting beam. This is equivalent to the flexible support method used in the design of fin plates.
- There is no torsion in the supporting beam.
- The fin plate, toe plate and the end plate are all designed for the resulting moment Fv*a where a = the distance from the face of the web to the junction between the toe plate and the end plate.
- To ensure that there is sufficient rotational capacity in the connection for it to be considered as "simple", only Mode 1 failure [Complete End Plate Yielding] will be allowed. If other failure modes become critical the following parameters can be adjusted so that Mode 1 becomes the critical failure mechanism:

    - Bolt gauge
    - Bolt pitch
    - Bolt diameter
    - Bolt end distances
    - Toe plate/end plate thickness

- All of the bolts are used in both tension and shear – there are no dedicated shear bolts.
- The compression zone is limited to the beam flanges with the centre of rotation taken as the mid thickness of the thinner flange.
- No plate stiffeners are allowed to the toe plate or to the beam end plate since these would be counterproductive as the model "forces" Mode 1 failure in these plates.
- The only stiffener allowed in the model is in the extension of an extended toe plate.

1.3 LIMITATIONS and ASSUMPTIONS

Fastrak Building Designer will impose the following limitations additional to those implicit in the documents referred to above.

- The top of the top flange of the supporting beam is to be flush and level with the top of the top flange of the supported beam.
- Only 2 bolts will be allowed in each row.
- Only one row of bolts can be placed in the toe plate extension.
- The toe plate, fin plate and flexible end plate are to be the same steel grade.
- The minimum depth of the toe plate is equal to the depth of the supporting beam + the leg length of the weld between the outside flange of the beam and the toe plate.
- The minimum depth of the end plate is equal to 0.6 x the depth of the supported beam.
- The maximum depth of the supported beam that can be used is 2 x the depth of the supporting beam.
- The minimum depth of the supported beam than can be used is 0.5 x the depth of the supporting beam.
- The connection can only accept positive bending moments and the associated shears.
- The minimum bolt clearance dimension from centre-line of the bolt to the nearest steel face that is used in the software is 1.25*bolt hole diameter.