JORDAHL® Anchor Channel

Installation Tolerances

Contents

Case 1 - Anchor Channel Projecting Above the Concrete Surface

1.1 Description

Channels that have been installed and are projecting exposed from the surface of the concrete will have less support of the channel side walls; this will allow a possible increase of deflection at the channel lip when under load.

1.2 Acceptable Limits

Providing that no more than 3mm of the channel is projecting from the concrete then the channel will remain able to accommodate the full channel capacity without any requirement for remedial work (Figure 1). However the customer will need to ensure that the connection bracket bolted to the anchor channel is sufficiently supported to ensure adequate bearing for transfer of loads, and that any required shims are correctly installed (Figures 2 and 3).

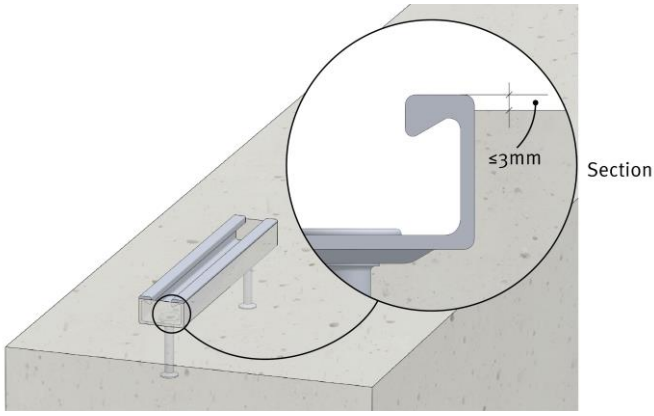

Figure 1

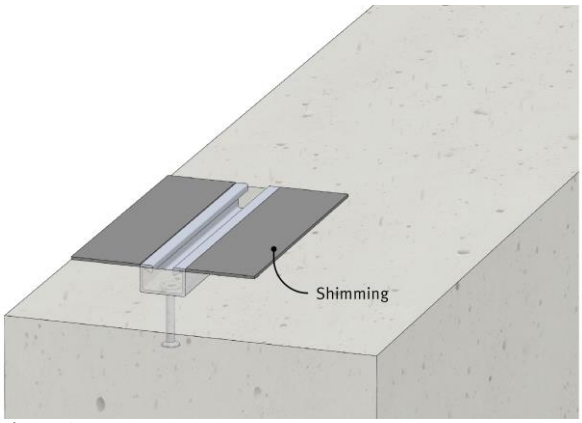

Figure 2

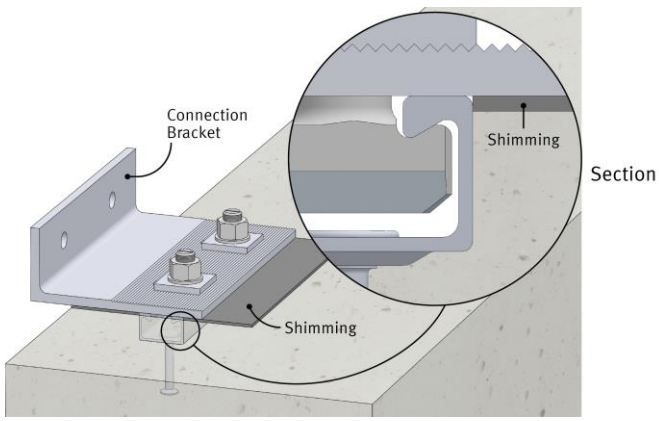

Figure 3

1.3 Out of Tolerance

If the channel projects more than 3mm from the concrete but no more than 2/3 the overall depth of the channel then the following remedial work must be undertaken (Figure 4):

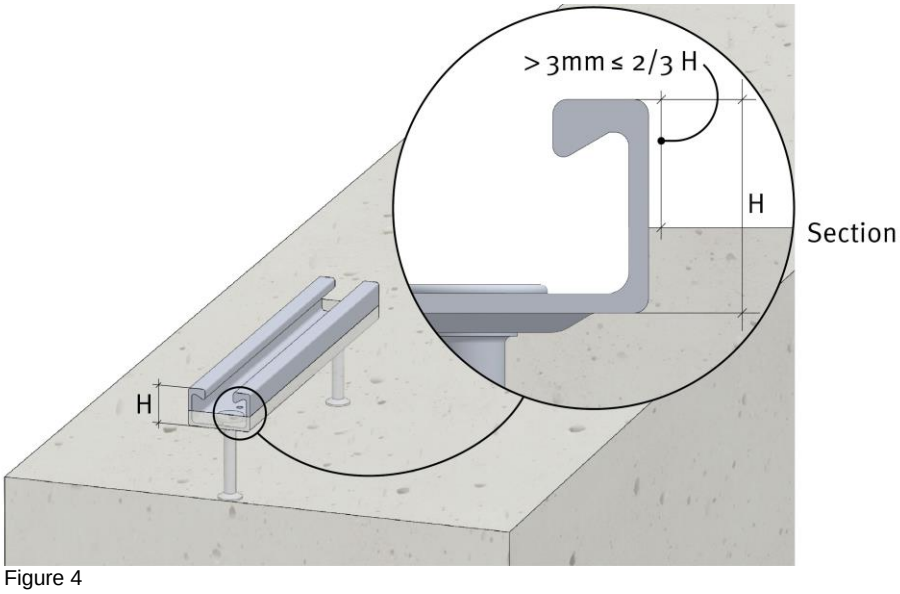

Figure 4

1.3.1 Standard Method of Remedial Work

High strength non-shrink grout must be applied around the channel to a level that is flush with the top edge of the channel lips. The applied grout must extend a minimum of 100mm to either side of the channel (or to the edge of the concrete if this is closer) and 50mm from each end of the channel (Figure 5).

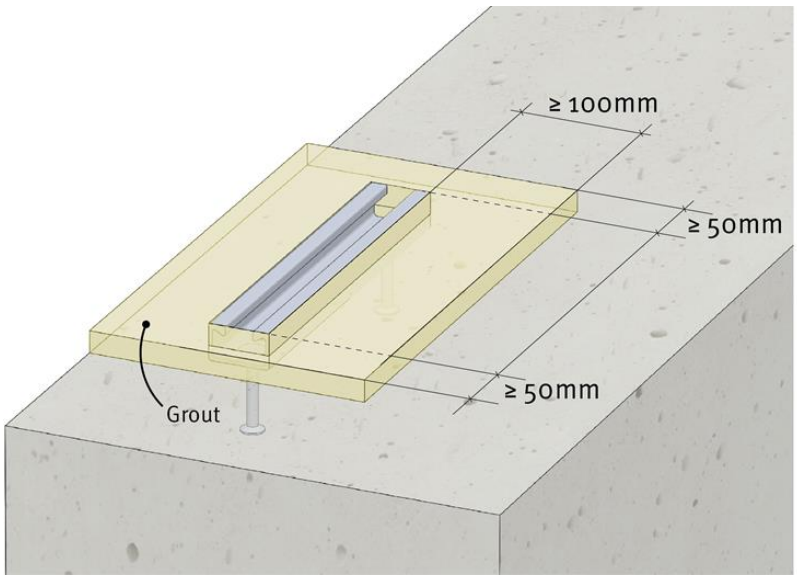

Figure 5

This new grout surface will need to be flat and level to accommodate the customer bracket configuration to provide full bearing to the underside of the bracket (Figure 6).

JORDAHL suggests the use of Pagel EH2 epoxy-mortar, but the customer may select a different manufacturer or type of grout providing that the grout meets the project engineer's requirements for bearing capacity and bond.

Grout to be applied to an area to provide suitable support and bearing capacity for bracket

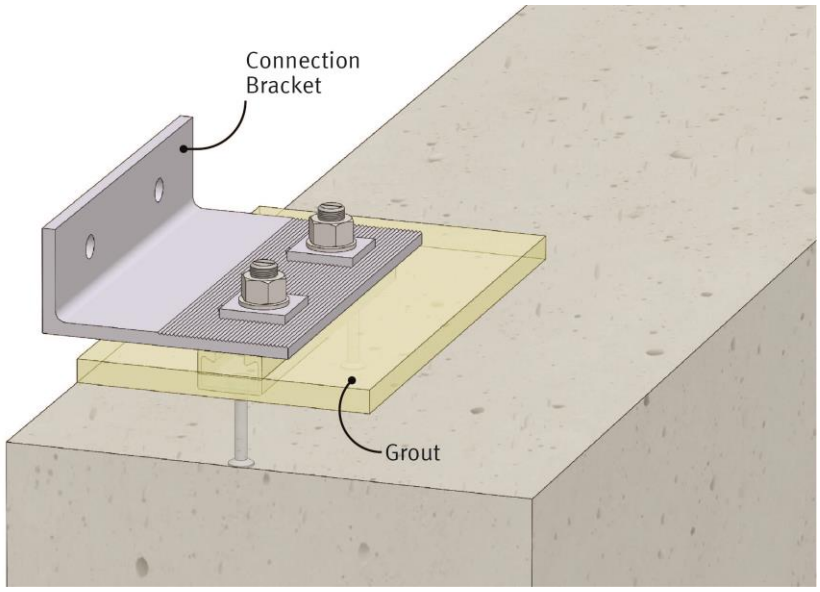

Figure 6

1.3.2 Further Consultation Required

If the channel body projects more than 2/3 of its depth (dimension H shown in Section 1.3), or there are visible voids below or around the channel then it will be necessary to contact JORDAHL for specific assistance.
Depending on the condition and load requirement JORDAHL will confirm the suitability or otherwise of the channel and make commensurate recommendations.

Case 2 - Anchor Channel Recessed Below the Concrete Surface

2.1 Description

Channels that have been installed below the surface of the concrete will not suffer any direct reduction in performance. However, in this condition the connecting T-bolts will have to span a greater unsupported distance, and this will increase the bending moment seen in the shank of the bolt. The allowable bending moment will vary according to the material grade and diameter of the bolt. In some conditions, special washers may have to be used to support the shank, or larger diameter/higher material grade T-bolts may have to be substituted. The new loading condition can be re-checked by the responsible engineer by using the information available in the JORDAHL catalogue, or by using the JORDAHL® Expert design software.

2.2 Acceptable Limits

Providing the gap between the top of channel lips and the underside of the bracket is no more than 3mm (Figure 7), the connecting T-bolts will normally be able to accommodate the full load capacity without any requirement for remedial work (Figure 8).

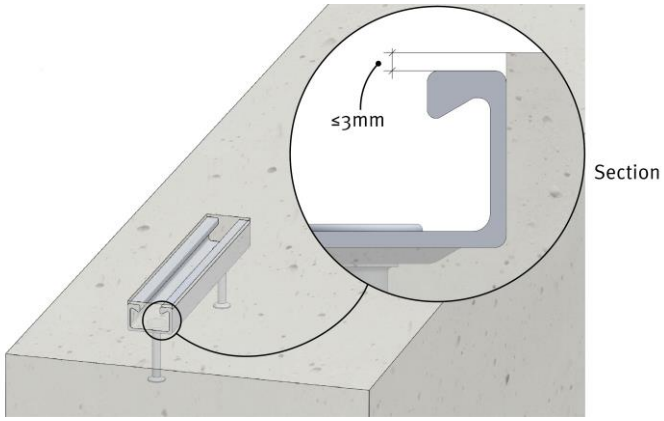

Figure 7

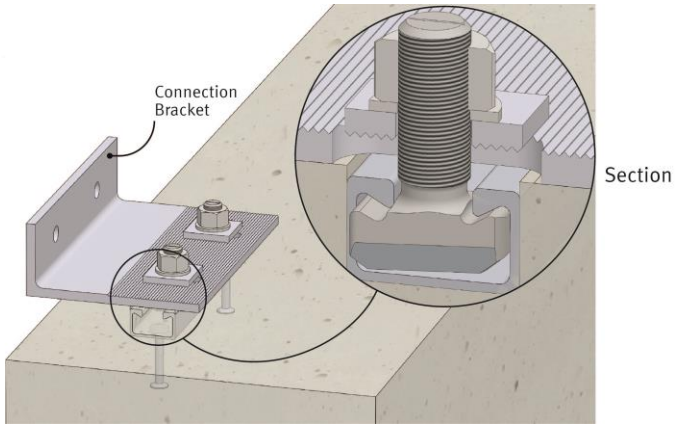

Figure 8

2.3 Out of Tolerance

If the channel is more than 3mm below the concrete surface, but no more than 15mm (Figure 9), then the following remedial work must be undertaken:

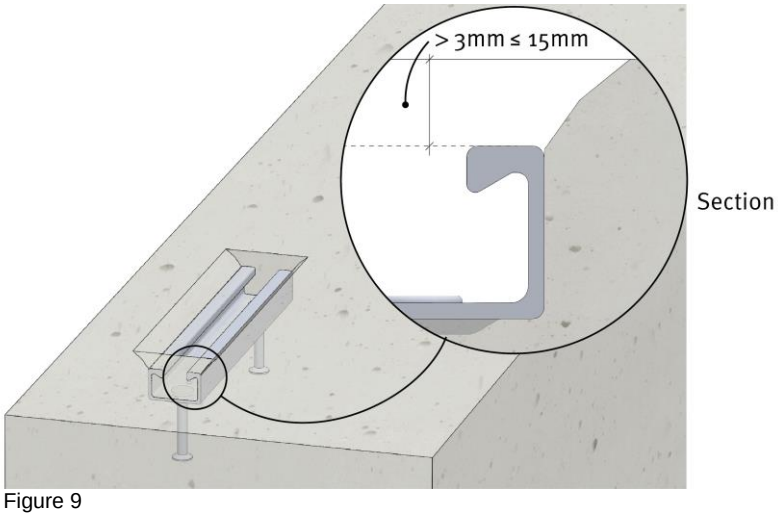

Figure 9

2.3.1 Standard Method of Remedial Work

Rectangular plate washers must be placed of over the bolts to fill the gap between the surface of the channel lips and the underside of the bracket. This is to provide support to the bolt shank to prevent bending. Before washers are introduced the channel lips must be fully exposed in the area of the bolt locations to ensure that the washers sit directly on the channel lips (Figure 10).

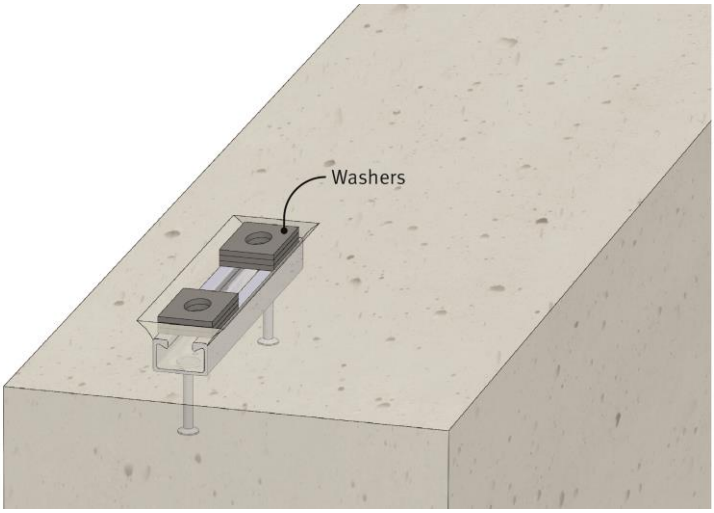

Figure 10

For recess conditions up to 15mm deep JORDAHL recommends that only one correctly dimensioned washer is used per bolt, or a maximum of 3 numbers welded together. Transverse movement must be prevented by ensuring close contact between the washers and the sides of the concrete recess. In some cases high strength grout may be need to achieve this (Figure 11).

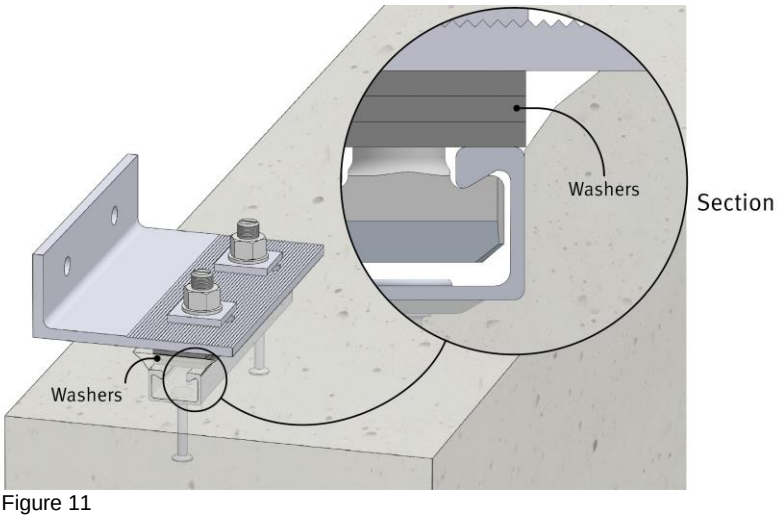

Figure 11

2.3.2 Aditional Remedial Methods

When the concrete depth above the channel is between 15mm and twice the depth of the channel, additional remedial methods are needed (Figure 12).

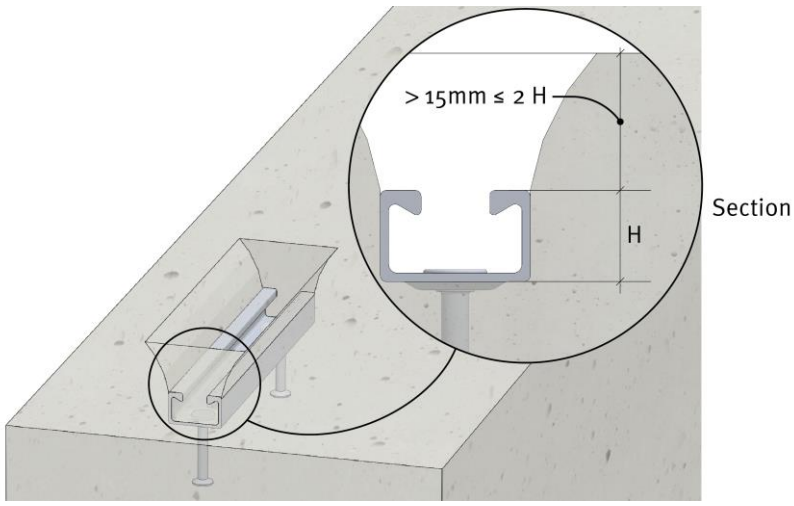

Figure 12

In these circumstances, and once the connection brackets have been placed in their final position, a free flowing pourable high strength non shrink grout backfill must be positioned above the channel and around the T-bolts. When this process is complete the grout must fill the entire void between the underside of the connection bracket and the lower face of the channel (Figure 13).

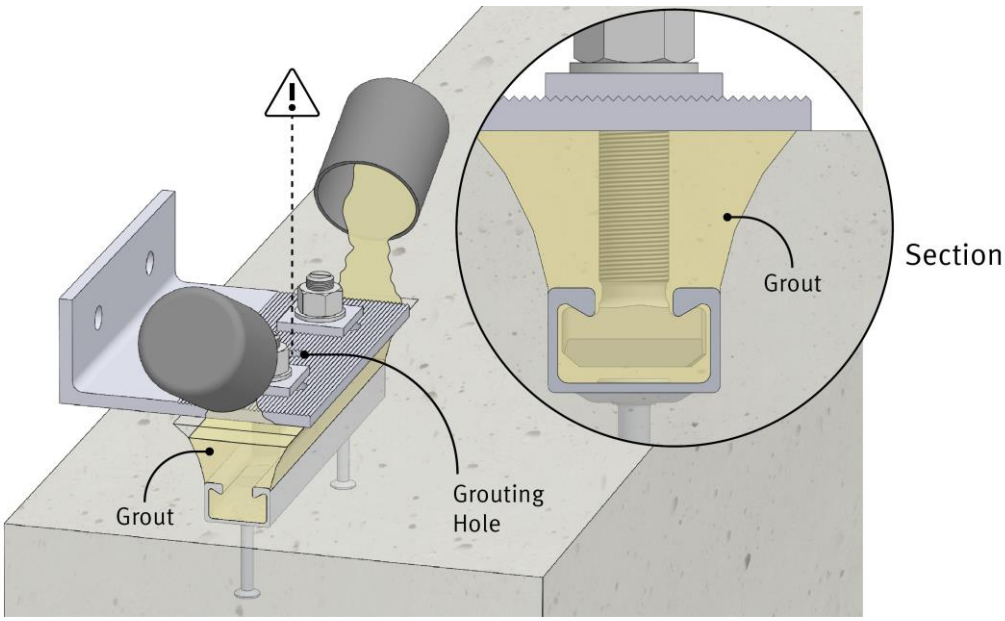

Figure 13

Some minor modification may be required to the brackets, such as the addition of grouting holes. These enable visual checking and the escape of trapped air to ensure full penetration of the grout below the bracket and into the channel void.

Case 3 - Incorrectly Spaced Anchor Channels

3.1 Description

Anchor channels are available in many lengths to provide ample adjustment for bolted connections. However, short anchor channels must be positioned within tighter tolerances or the required locations for component connections may fall beyond the extremes of the channel length. In these cases one or more bolted connections may be impossible to connect to the anchor channel (Figures 14 and 15).

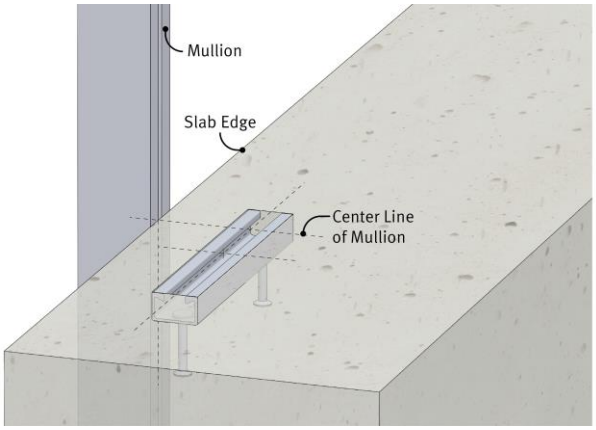

Figure 14

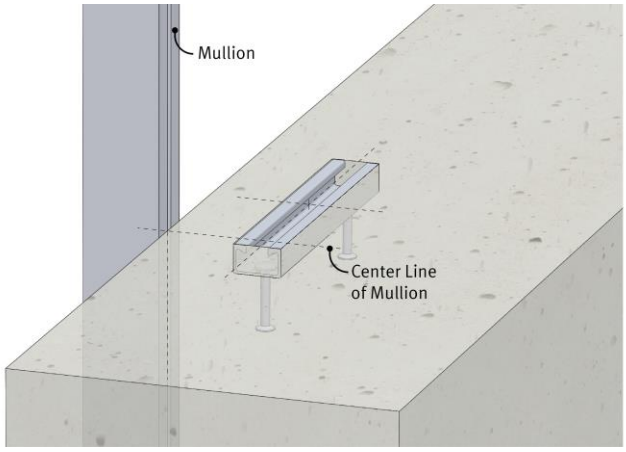

Figure 15

3.2 Acceptable Limits

Solutions to short channel positioning tolerances should be discussed with Jordahl. If the problem is noticed early in the project it is possible that installation accuracy might be improved by site personnel, or alternatively longer channels might be selected for the application.

When a tolerance problem is noticed after pouring the concrete additional drilled bolted connections may be required to replace the connections that are no longer possible to make to the anchor channel. Drilled expansion bolts or resin bonded anchors that are closely positioned to the anchor channel will reduce the load capacity of the anchor channel, and should be designed in consultation with JORDAHL and the drilled bolt manufacturer. Connections that are made by drilling through the slab and using a plate from the underside minimize the load reduction seen by the ancho channel.

Case 4 - Reduced Edge Distances

4.1 Description

Channels installed closer to the slab edge than designed (Figure 16).

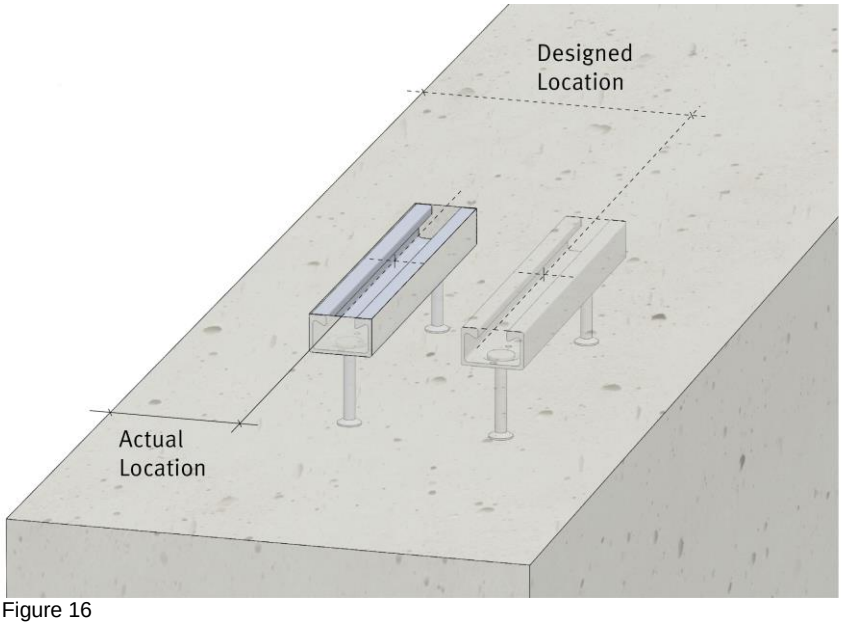

Figure 16

Channels that are cast in position with reduced edge distance will be subject to a reduction of load capacity.

4.2 Acceptable Limits

The reduced edge dimension may still be acceptable relative to the designed loads, providing the individual application load still falls within the reduced edge distance concrete capacity. JORDAHL can provide the substantiating information in these individual situations.

4.3 Out of Tolerance

If the check of concrete capacity shows that the reduced edge dimension is below the minimum to achieve the required load capacity; then other remedial post drilled measures will be necessary.

Case 5 - Increased Edge Distances

5.1 Description

Channels installed too far back from the slab edge will not have a direct impact on the channel performance as the minimum edge distance will be maintained (Figure 17).

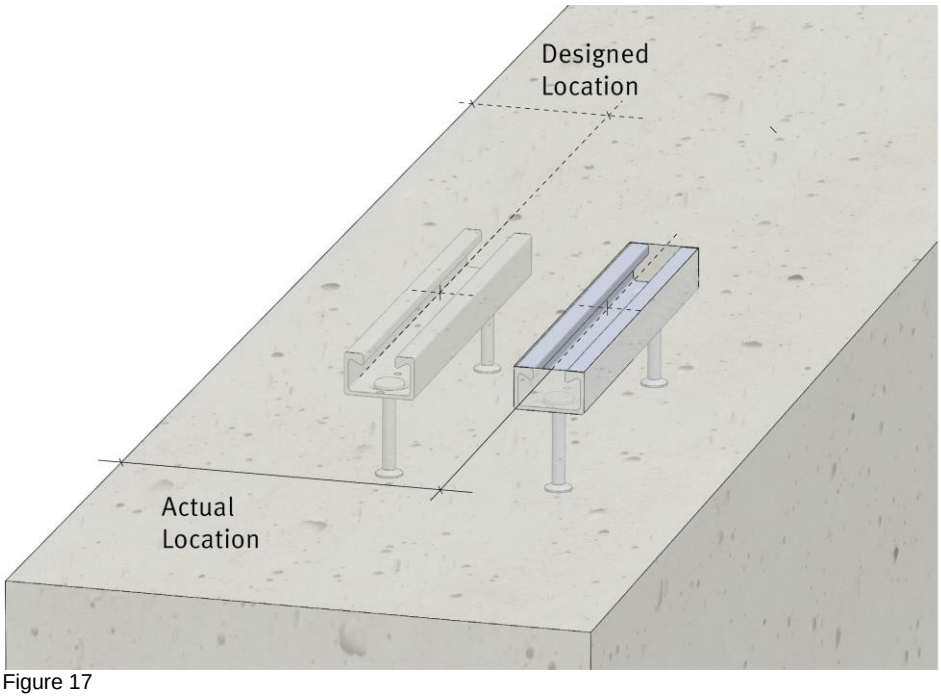

Figure 17

5.2 Acceptable Limits

This tolerance issue does not directly affect the performance of the JORDAHL® Channels unless one or more of the other described tolerance problems are also present. It is therefore the decision of the customer how to approach and resolve this situation. The position of the anchor channel may be within the tolerances allowed by the connection slots in the brackets used to anchor the attached component.

5.3 Out of Tolerance

Connection slots with the bracket arrangement will provide additional tolerance, but once this has been exceeded then the condition may be considered similar to Case 3 and therefore the recommendations made within Section 3.2 above should be followed.

Case 6 - Channels installed out of vertical alignment with the surface of the concrete

6.1 Description

There are two possible ways in which an anchor channel might be installed out of vertical alignment with the surface of the concrete:

a) If one end of the anchor channel has sunk below the concrete surface, shims can be used in accordance with case 2 (Figure 18).

b) The channel has rotated about its cross-sectional axis (Figure 19).

6.2 Acceptable Limits

a) When one end of the channel has sunk below the surface of the concrete the maximum limit it can be out of alignment is 3mm from highest to lowest points on the channel (Figure 18).

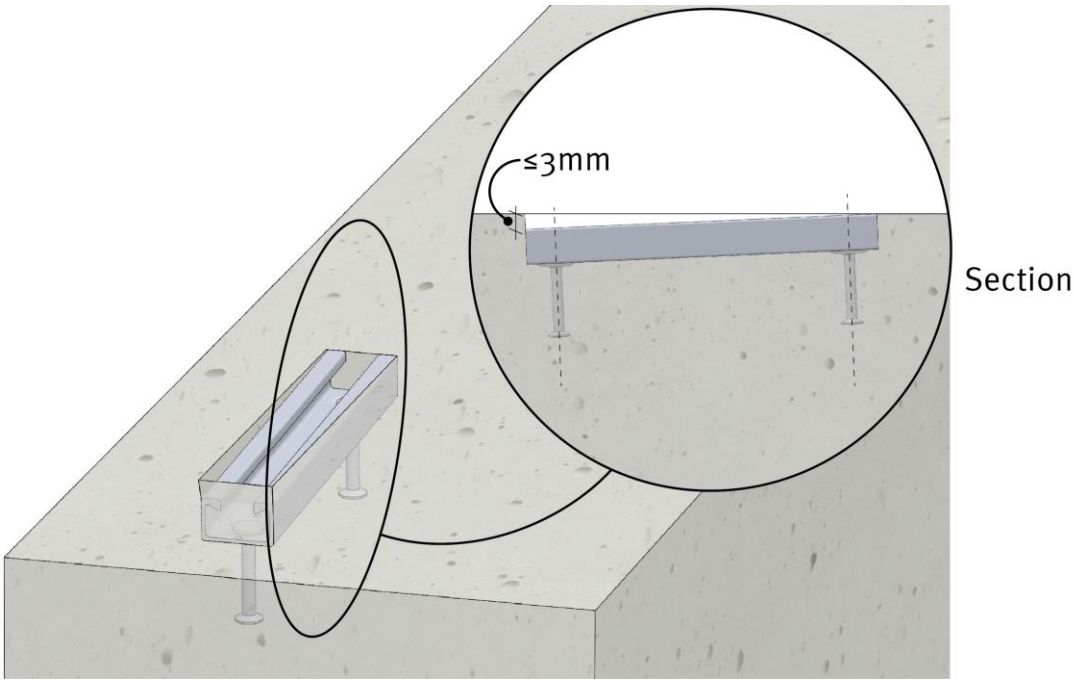

Figure 18

b) When the anchor channel is rotated about its cross sectional axis the maximum limit it can be out of alignment is 3mm from highest to lowest points on the channel (Figure 19).

It is possible that conditions a) and b) may occur in combination with the conditions described in case 1 and case 2, and consideration should be made of this in determining acceptable limits.

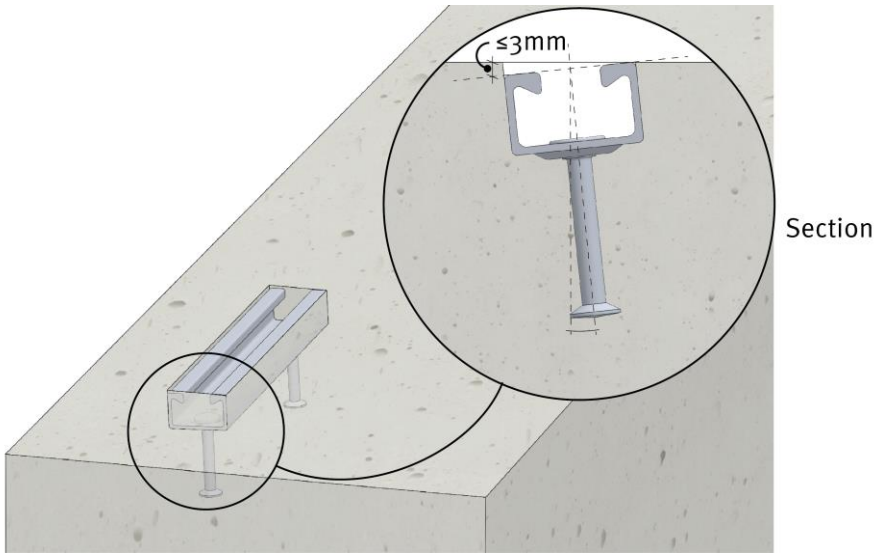

Figure 19

6.3 Out of Tolerance

If the channel installation falls outside the acceptable limits, measures will be necessary to maintain full engagement of the bolt with the channel lips.

The bolt installation will need to be perpendicular to the channel while being tightened against the level bracket surface. Therefore, the nut and plate washers will not sit correctly on the bracket. To correct this it will be necessary to introduce either a wedge or alternatively an adjustable ball joint washer under the nut to accommodate the angle of the bolt. Both examples are shown in the following drawings:

Figure 20 shows the use of a spherical washer (DIN 6319) which would be acceptable for small angular requirements (3 degrees).

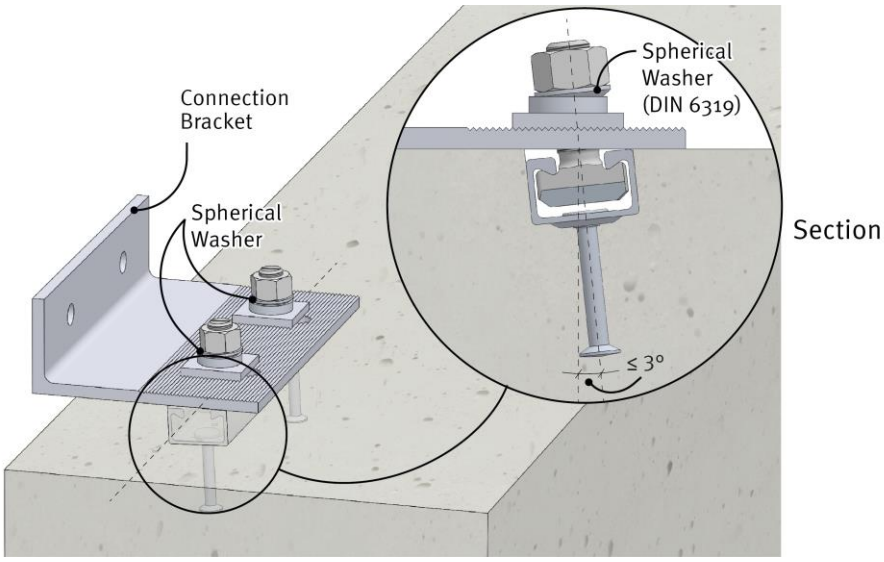

Figure 20

Figure 21 shows a solution for more severe rotation using a special adjustable ball joint washer. This compensates for rotation between 3 and 30 degrees.

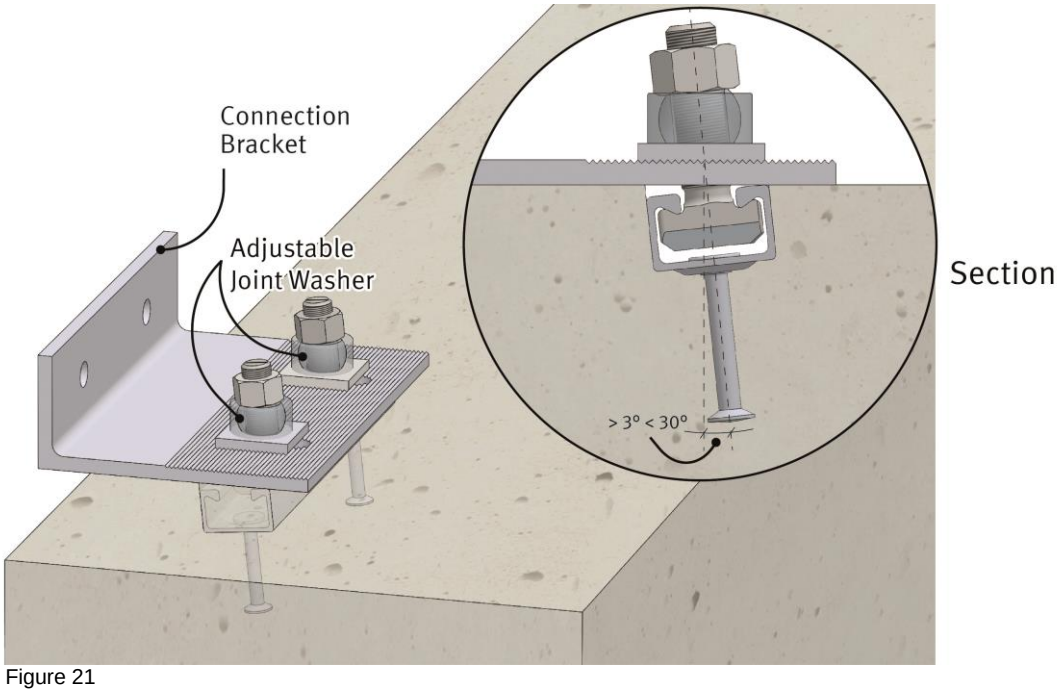

Figure 21

Case 7 - Channels Transversely Rotated Out of Alignment

7.1 Description

Channels designed to be positioned parallel to the slab edge but rotated out of position (Figure 22).

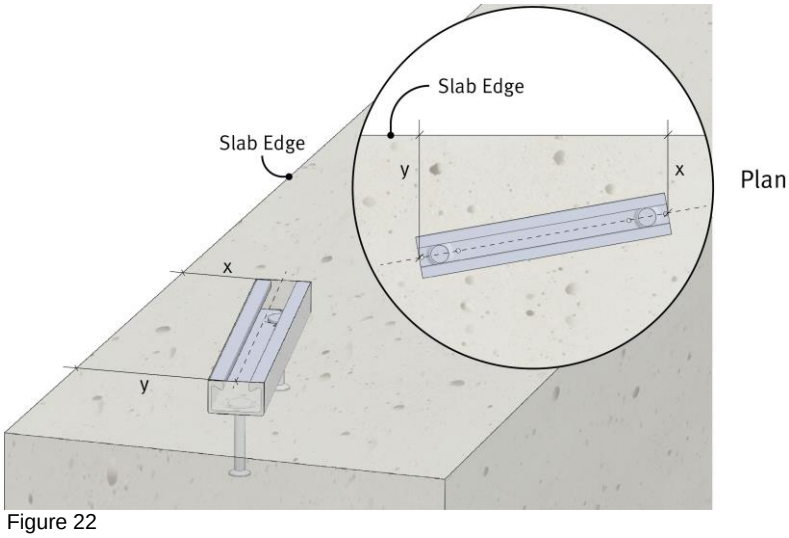

Figure 22

7.2 Acceptable Limits

If the closest edge of the channel does not fall below the designed edge distance (Case 4) then this tolerance issue does not directly affect the performance of the JORDAHL® Channels. Connection slots in the bracket bolted to the channel may also accommodate a significant tolerance in alignment (Figure 23).

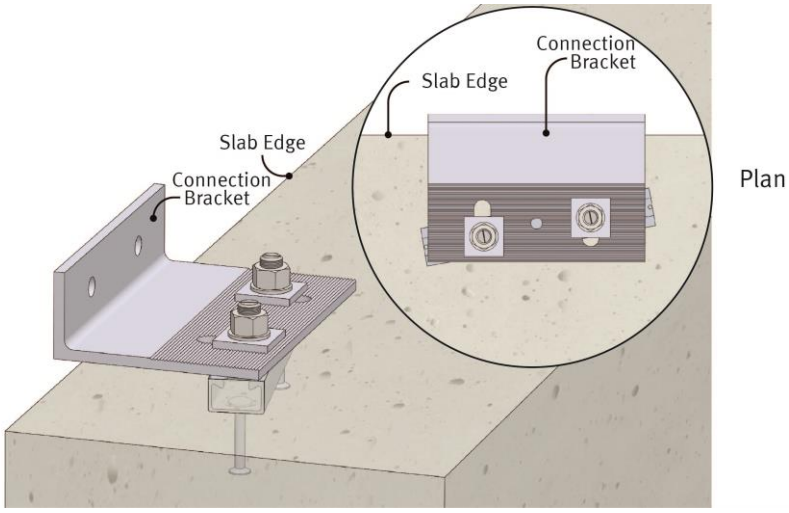

Figure 23

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All design parameters must be agreed with the responsible structural engineer of the construction project.

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