

Remedial action for incorrectly cast-in channels

Published Date: 10/12/2009

The following guidance has been developed by J&P together with channel supplier Jordahl®, and is based on extensive experience and testing on their own channel systems. Whilst the general principles are applicable to channel from other suppliers, the specific supplier should always be consulted for their own recommendations in the event of remedial work being required.

References to ‘the Contractor’ refer to the party responsible for creating/installing the connection on site.

Case 1

Description:

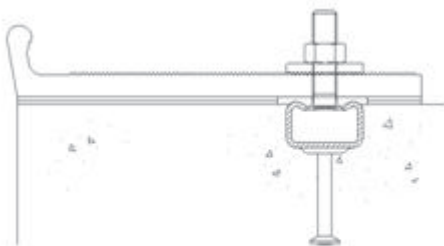
Channels that have been installed and are raised from the surface of the concrete will have an unsupported section of the channel side walls. This will allow a possible increase of deflection at the channel lip when under load.



SECTION

Acceptable Limits

Provided that the projection is no more than 5mm then the channel will still be able to take the full channel load without any requirement for remedial work. However it will be necessary to check that the fixing bracket still has the required bearing area and that any shims required are installed in an acceptable method



SECTION

Beyond Limits

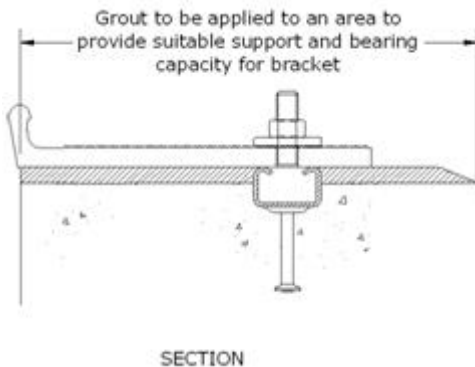
If the channel is projecting more than 5mm but no more than 2/3 the overall depth of the channel then the following remedial work must be undertaken:

High strength, non shrink grout must be applied to and built up around the channel from the front edge of the slab deck extending back to a distance of 100mm minimum beyond the bracket to the rear of the channel and a minimum of 50mm beyond the ends of the channel, up to the depth required to fully embed the channel. This new grout surface will need to be flat and level to allow the bracket to have full bearing to the underside of the bracket.

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J&P Building Systems / Jordahl® recommend the use of Pagel EH2 or Hilti CM 510-1 epoxy mortar. It is possible to use a different manufacturer and type of grout but users should satisfy themselves that the grout to be used gives the same performance as the recommended types. The grout manufacturer's recommendations must be followed.



Further Consultation Required

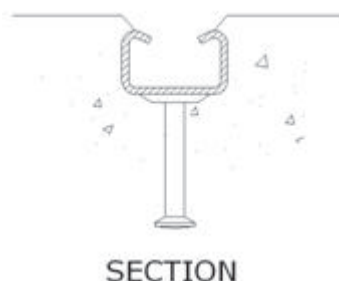
If the channel is exposed more than 2/3 depth, or there are visible voids below or around the channel then it will be necessary to contact the channel supplier for further assistance on a location specific basis. Depending on the condition and load requirement they should confirm the suitability or otherwise of the channel and make appropriate recommendations.

Case 2

Description

Channels that have been installed and are sunken below the surface of the concrete will not suffer any direct performance penalties, however as there is an area of unsupported bolt shank it may introduce bending in the bolt that may not have been allowed for within the initial design.

Tee Bolts are able to accommodate a degree of bending moment and this information will be available in the supplier's catalogue.

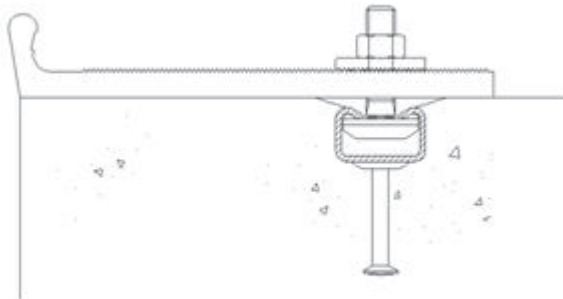


Acceptable Limits

Provided that the gap between the top of the channel lips and the underside of the bracket is no more than 5mm, the channel and bolts will remain able to take the full load without any need for remedial work.

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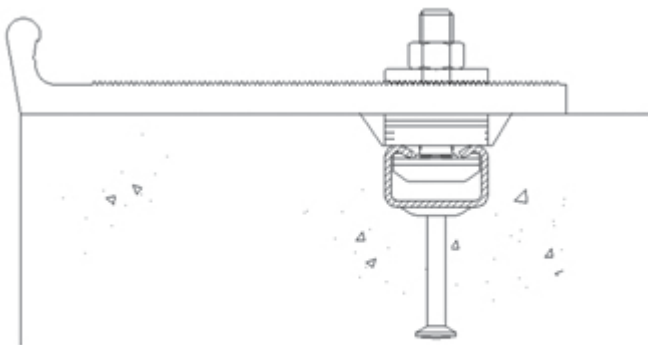
SECTION

Beyond Limits

If the channel is more than 5mm below the concrete surface then the following remedial work must be undertaken:

Rectangular plate washers must be placed 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 bolt locations to ensure that the washers sit directly on the channel lips. The washers should not project above the concrete surface level.

It is recommended that only one washer is used, or alternatively a maximum of 3 washers welded together to a maximum recess depth of 15mm. It has to be ensured that the washers are a tight fit between the side faces of the recess to prevent transverse movement.



SECTION

There is no upper limit for the distance the channel can be sunken into the concrete, however if the distance exceeds 15mm then further measures must be taken.

This will consist of the use of a free-flowing, pourable, high strength, non shrink grout backfill around the channel and the bolts once the brackets are in their final position. When complete the grout must fill the entire void up to the top surface of the concrete slab / underside of the bracket.

Some minor modification may be required to the brackets such as grouting holes to ensure full penetration of the grout below the bracket and into the channel void.

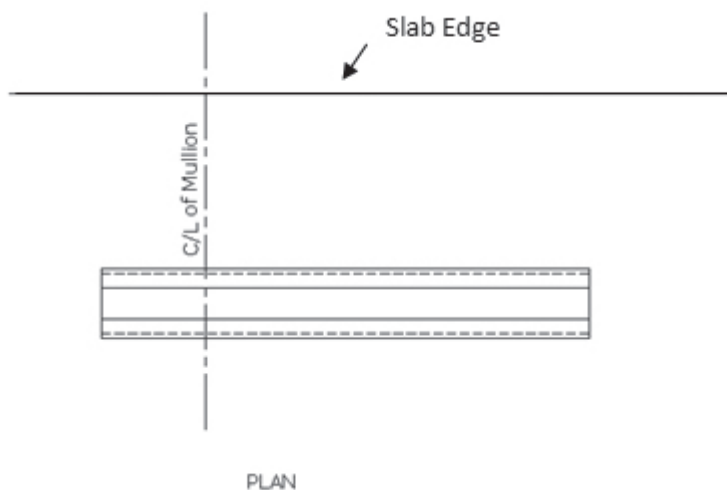
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Case 3

Description

Channels installed out of alignment to the intended position in the horizontal plane, so that the centre line of the load is no longer central on the channel. When the bracket is installed one, or in extreme circumstances both, bolts miss the channel.



Acceptable Limits

This tolerance issue does not directly affect the performance of the channel unless one or more of the other described cases is also present. It is therefore the decision of the Contractor how to approach and resolve this situation. However it is recommended that, if additional bolts are required, then it is best to drill right through the slab and fix with a plate on the underside. This will negate the effect of additional forces due to post drilled expansion / resin fix bolts disrupting the cast in channel.

Beyond Limits

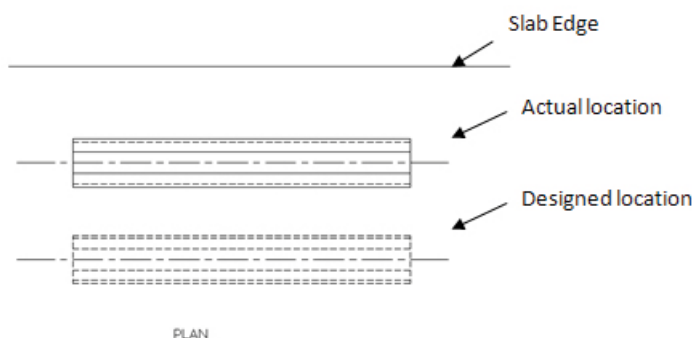
In the case of both bolts falling outside the cast in channel then it is recommended that the fixing bolt manufacture is made aware of the channel location as this may affect the performance of any specified bolts.

Case 4

Description

Channels installed too close to slab edge, reducing the design edge dimension below the minimum recommended. Channels that are cast too close to the slab edge may have reduced load capacity.

Acceptable Limits



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The reduced edge dimension may still be acceptable relative to the design loads, provided that the individual application load still falls within the reduced edge distance concrete capacity. The channel supplier can provide substantiation in these individual situations.

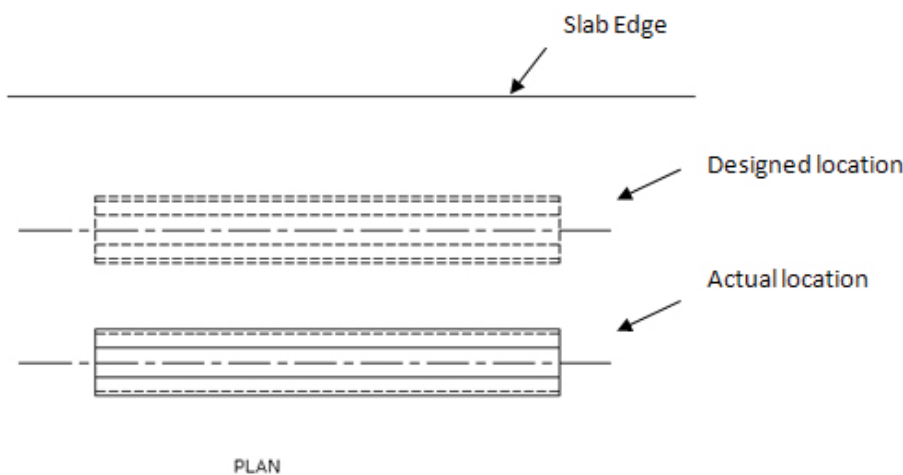
Beyond Limits

If the design parameters from the channel supplier show that the edge dimension is below the minimum required dimension to achieve the required load capacity, then other remedial post drilled measures will be necessary.

Case 5

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.



Acceptable Limits

This tolerance issue does not directly affect the performance of the Jordahl® channel unless one or more of the other described cases is also present. It is therefore the decision of the Contractor how to approach and resolve this situation.

Beyond Limits

The tolerance within the bracket arrangement will have a limited capacity. Once this has been exceeded then it may be considered similar to Case 3 and therefore the recommendations made for Case 3 should be followed.

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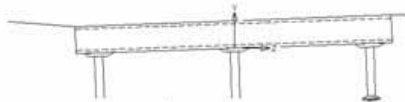
Case 6

Description

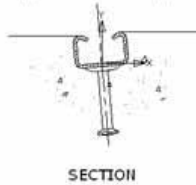
Channels installed out of vertical alignment with the surface of the concrete. There are two possible ways that this can happen:

If the anchor channel is sunken into the concrete on one side only, shims can be used in as with Case 2. The channel is rotated about the longitudinal (x) axis.

a)



b)



Acceptable Limits

Condition a)

The maximum amount the channel can be out of alignment is 5mm from highest to lowest points on the channel.

Condition b)

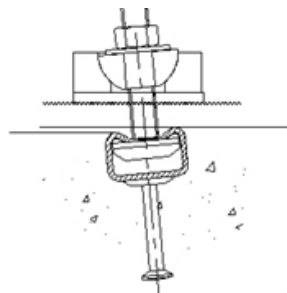
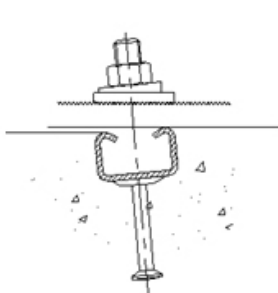
The maximum limit the channel can be out of alignment is 3mm from highest to lowest points on the channel.

It should be remembered that there is also a likelihood of either or both conditions described in Case 1 and Case 2 being present and therefore the recommendations for these cases should also be observed.

Beyond Limits

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 tee bolt must be perpendicular to the channel while being tightened against the level bracket surface. As in this situation the nut and plate washers will not sit correctly on the bracket, it will be necessary to introduce a form of wedged component or alternatively an adjustable ball joint washer to accommodate the required angle of bolt. Both examples are shown in the sketch below.



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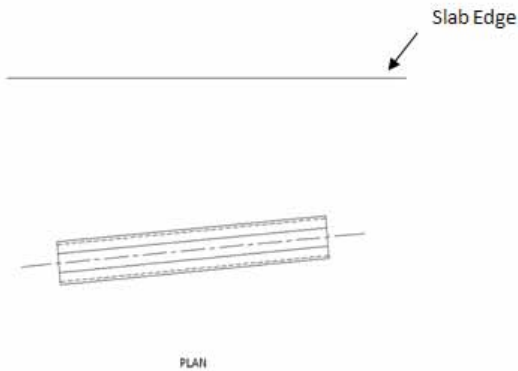
Possible remedial measures

The left hand sketch shows the use of a spherical washer (DIN 6319) which would be acceptable for small angular requirements (max 30). The right hand sketch shows the alternative solution using a special adjustable ball joint washer providing for higher degree of bolt angulations. These washers available from good channel suppliers

Case 7

Description

Channels are installed out of horizontal alignment with the slab edge, and therefore no longer parallel with the slab edge. If no measures are taken, the connecting bolts or studding can be put into a bending condition.



Acceptable Limits

Provided that the closest edge of the channel does not fall below that described in Case 4 then this tolerance issue does not directly affect the performance of the channels unless one or more of the other described cases is also present. It is therefore the decision of the Contractor how to approach and resolve this situation.

The distance between the slots in the bracket and the length of slots will determine the maximum angle the channel can be out of alignment.

