

Plaza Tower, Costa Mesa, USA



Chicago Title and Trust, Chicago USA



Capital One, Nottingham, England



BT, Sevenoaks, England



# **What Bracket Types are Already Used By Curtain Wall Companies?**



## General Types of Curtain Wall Fixing Using Halfen Channel

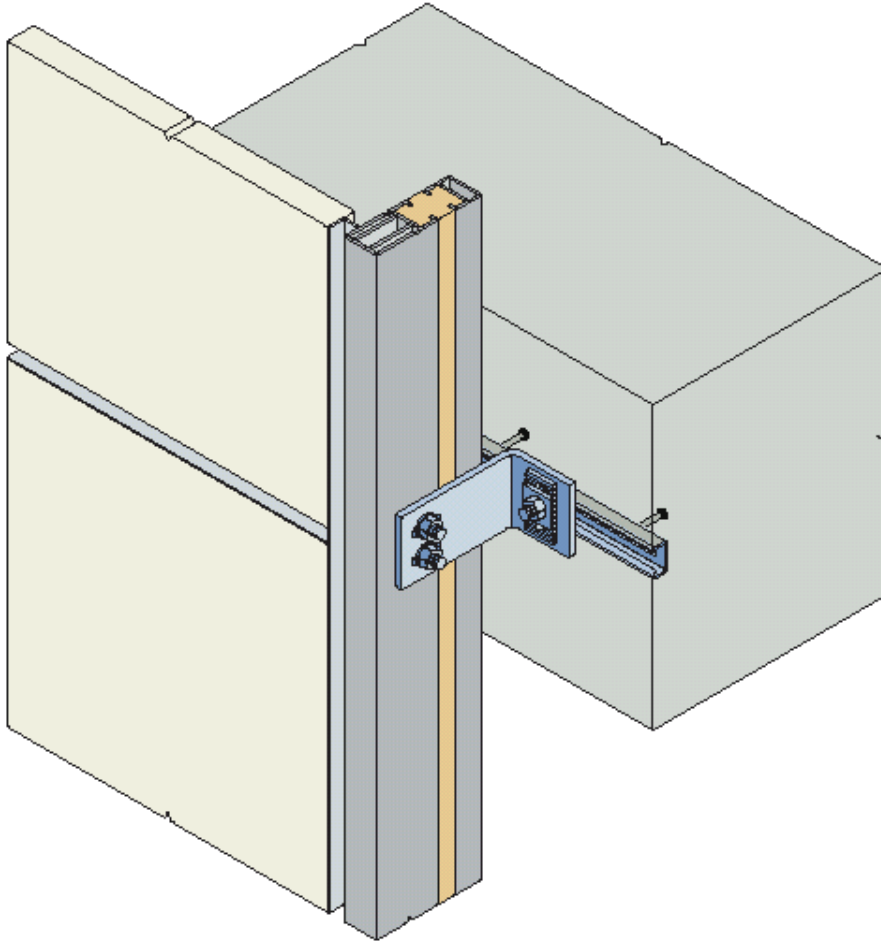
**Curtain Wall  
Edge of Slab**

**Curtain Wall  
Top of Slab**

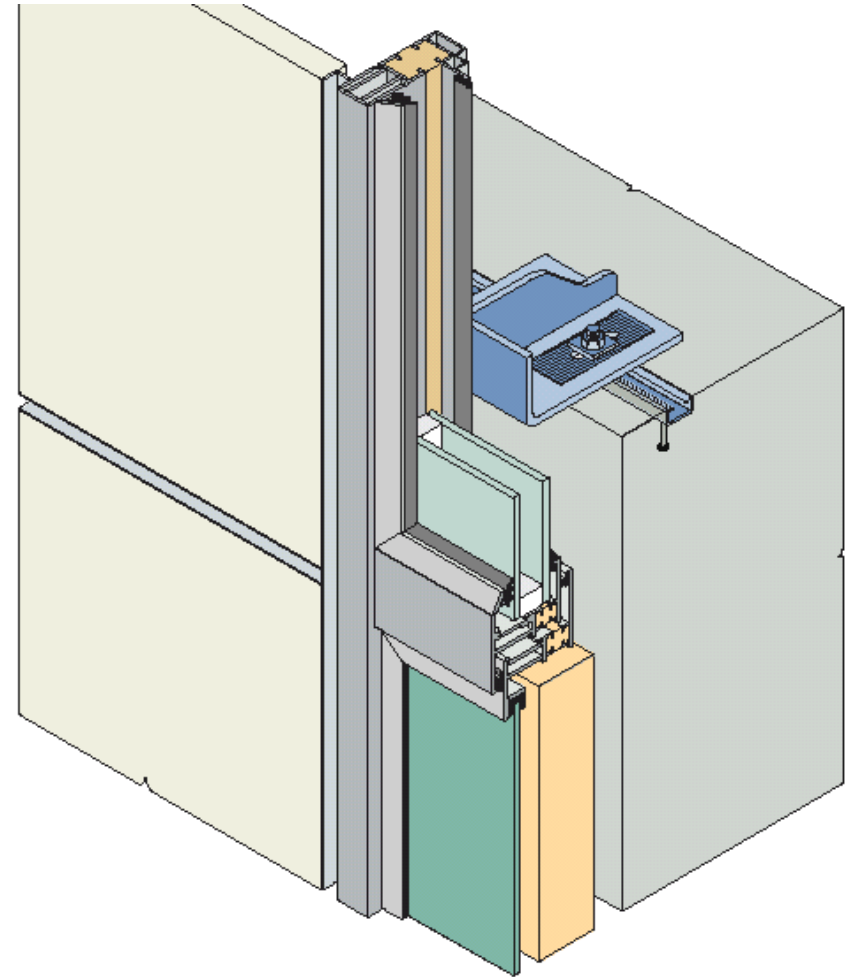
**Window to  
Precast**



Edge of Slab



Top of Slab



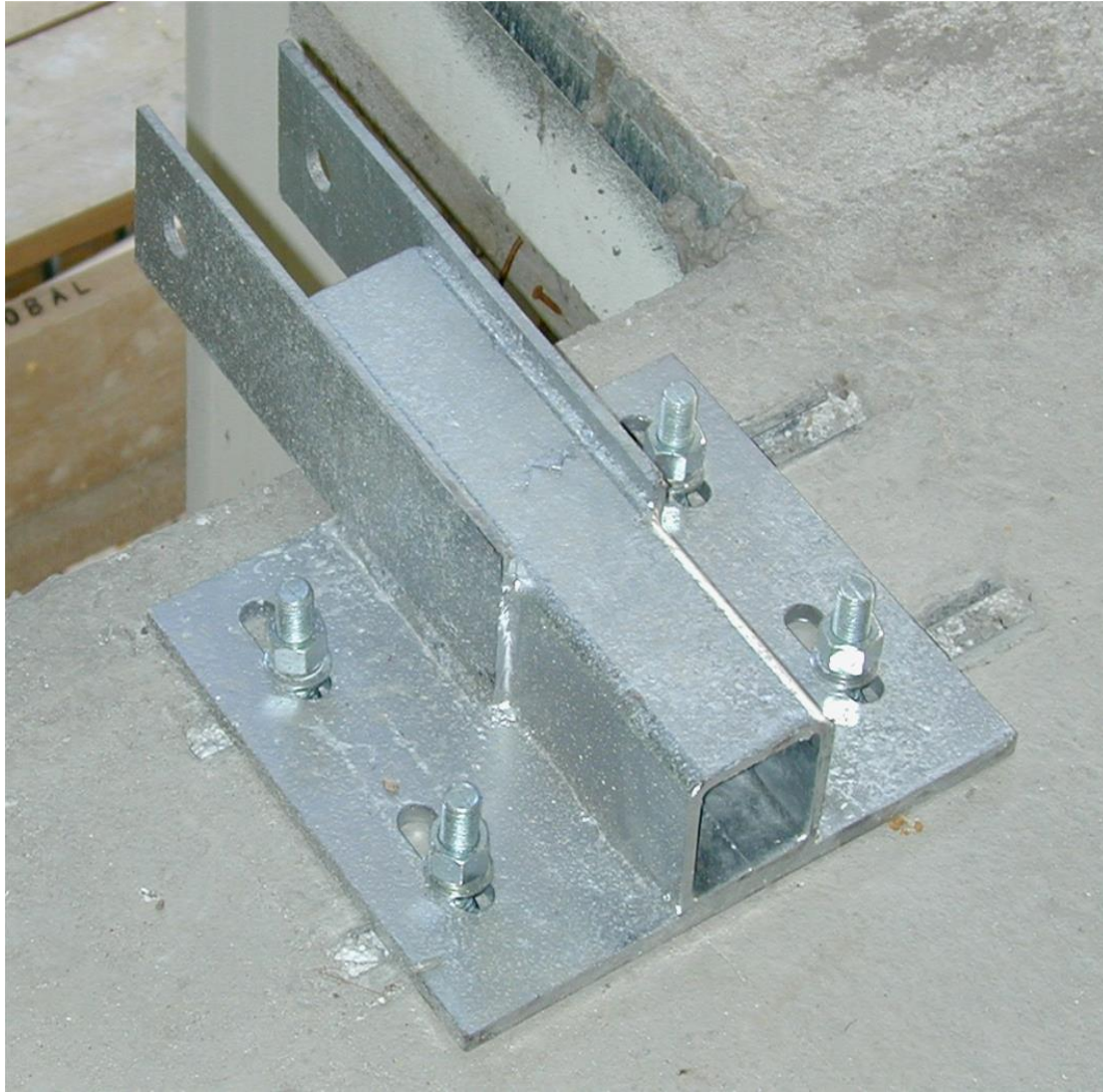
# Examples of Top of Slab Brackets Currently Used

Top of Slab Connection Used in UK - German Contractor



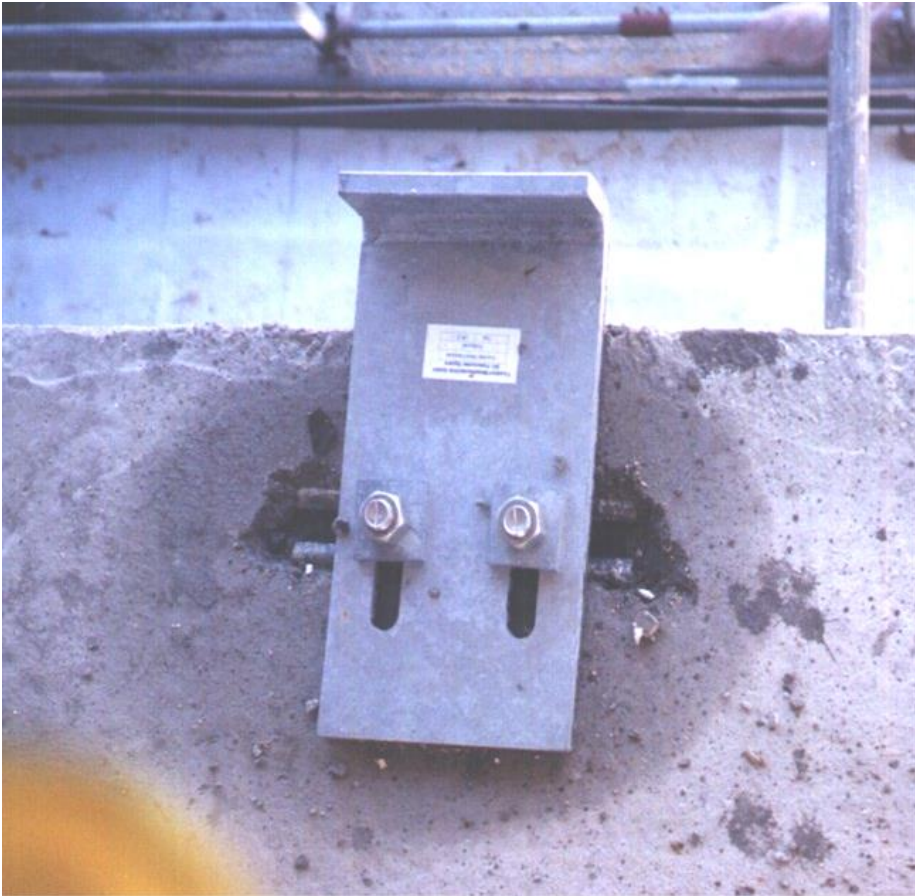


**Curtain Wall Connection to the Top of Slab In UK By Italian Contractor**

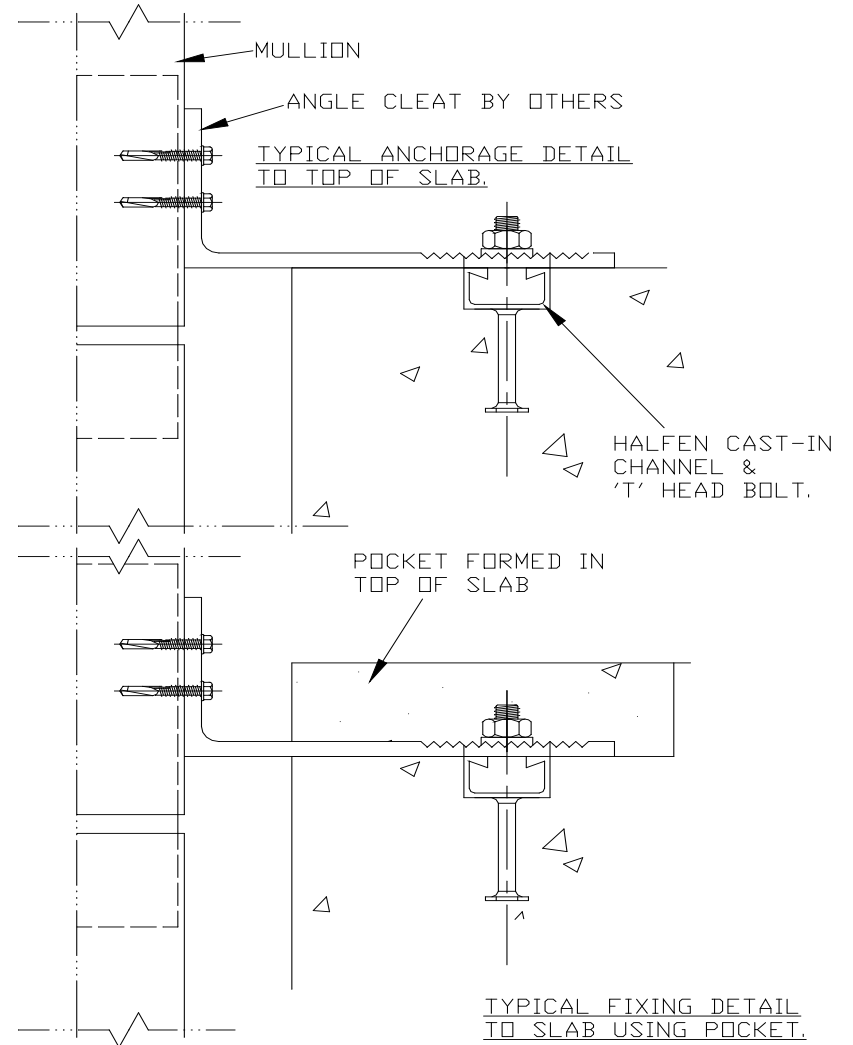




**Curtain Wall Connection to the Top of Slab In UK - German contractor**

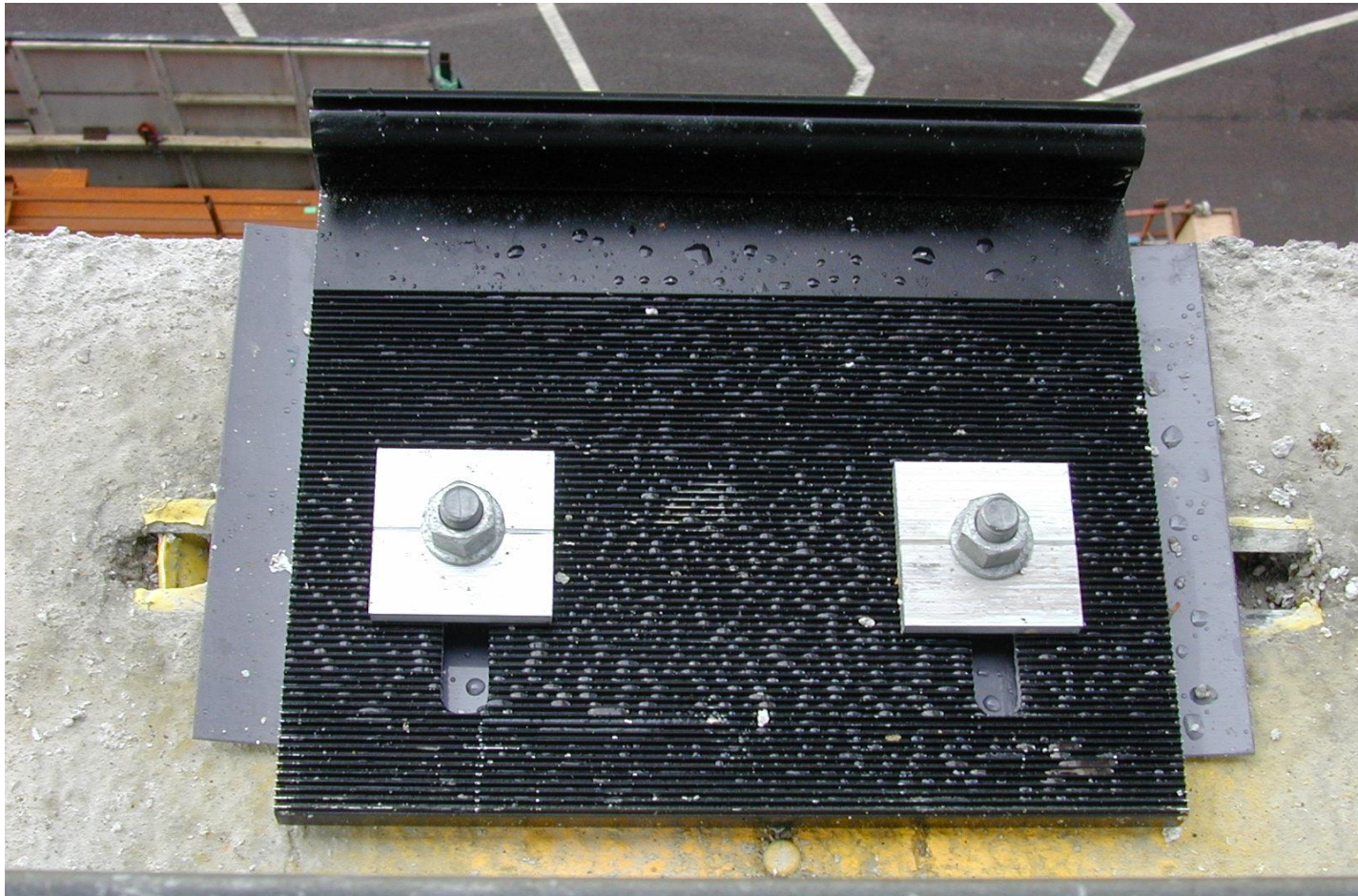


Typical Top of Slab Connection in USA





Curtain Wall Connection to the Top of Slab In UK - American contractor



**Curtain Wall Connection to the Top of Slab In UK**

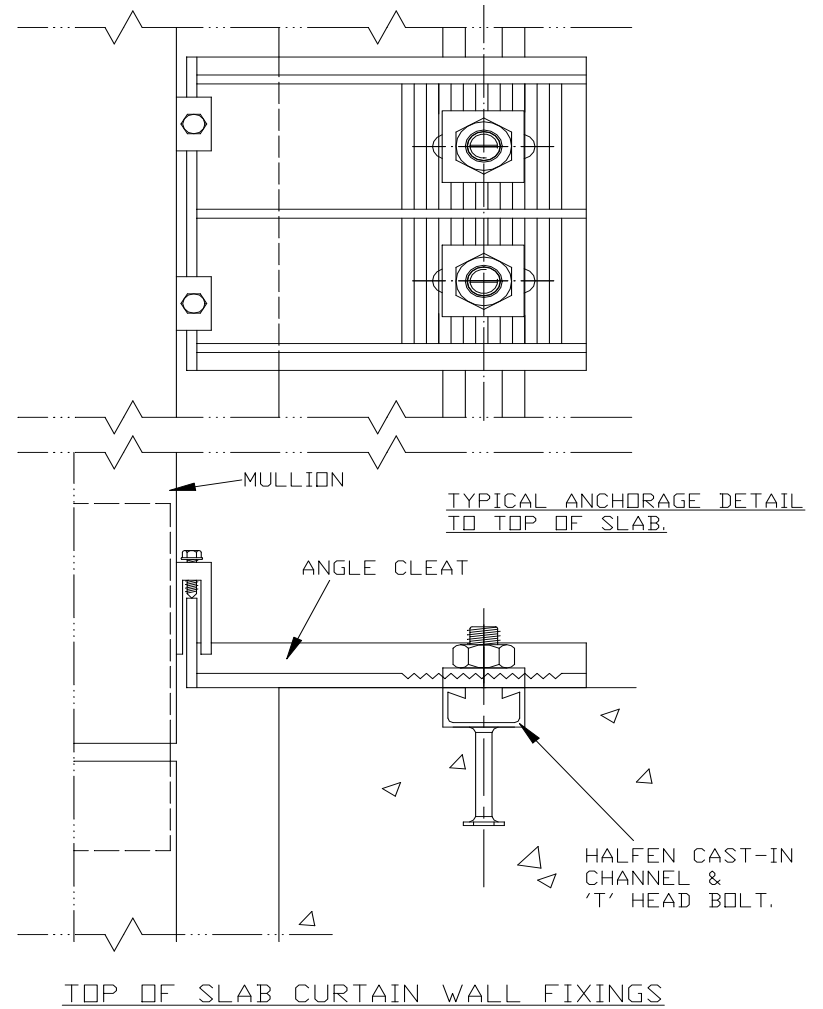




Top of Slab Connection - Germany - French Contractor



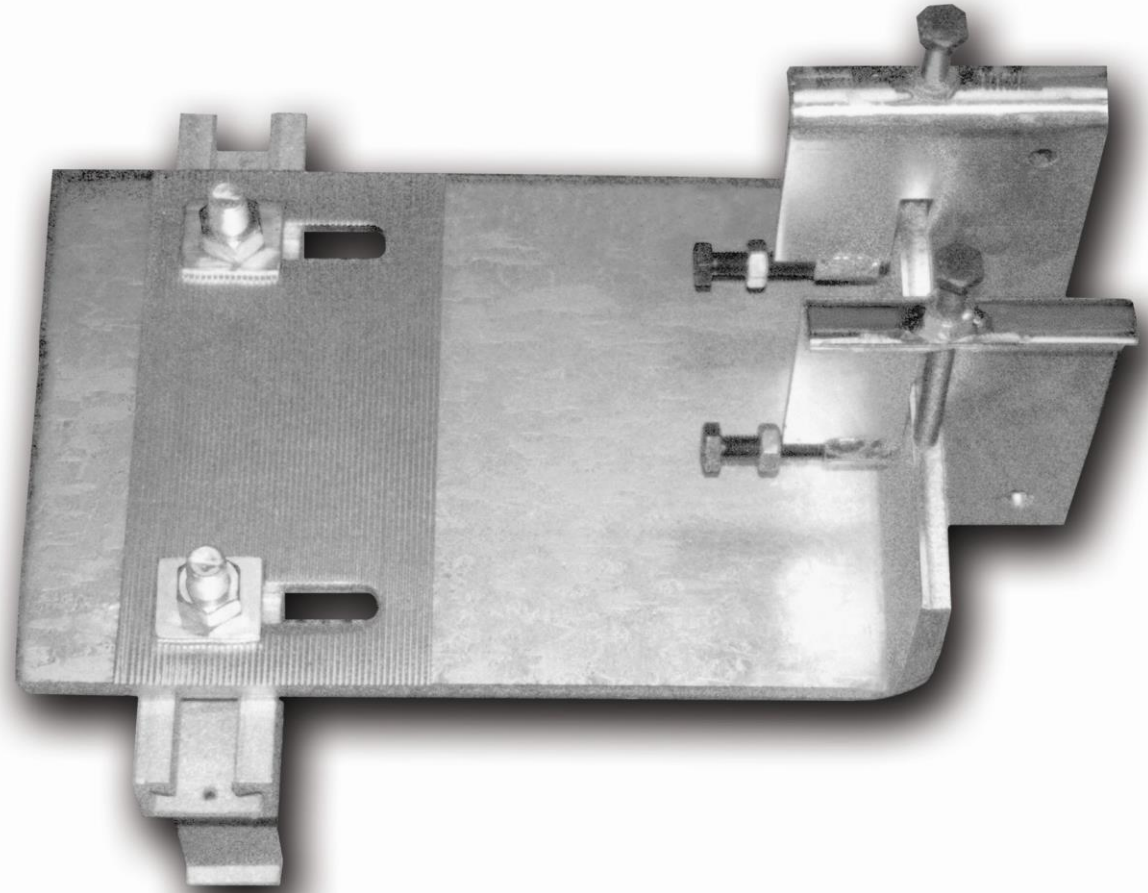
Possible Improved Halfen Solution Using Serrations on Bracket



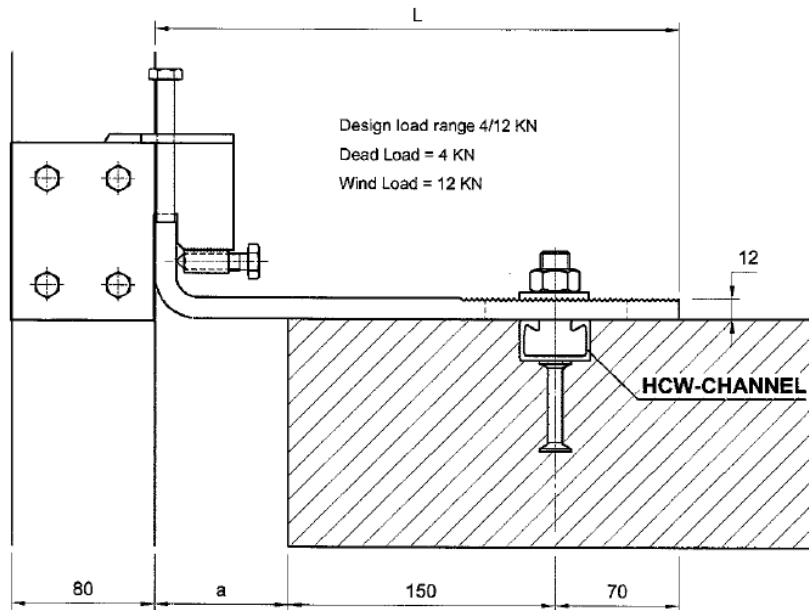
# Halfen Top of Slab Brackets

**Provide 3-Way Adjustment  
When used with HTA Channel**

- **Steel Zinc Plated**
- **M16 T-bolts Only**



**Halfen Top of Slab Brackets +/- 10mm Vertical Adjustment**



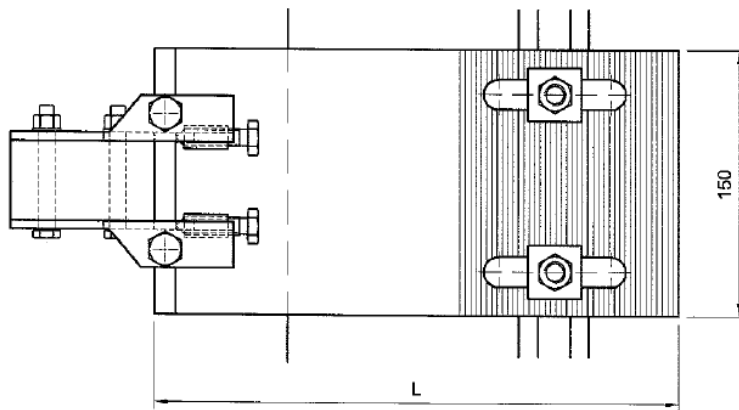
HCW Bracket Type 1

Design load range (kN)	a (mm)	L (mm)
4/12	50	270
	75	295
	100	320

**Design Load Capacity**  
4 kN – Deadload  
12 kN - Wind Load

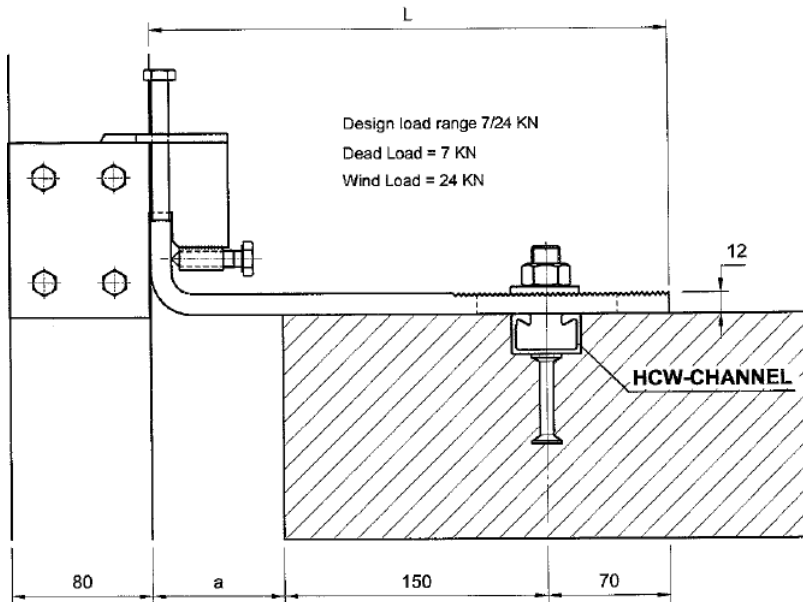
**Channel**  
HTA 40/22, HTA 40/25

**T-bolt**  
M16





**Halfen Top of Slab Brackets +/- 10mm Vertical Adjustment**



HCW Bracket Type 1

Design load range (KN)	a (mm)	L (mm)	w (mm)
7/24	50	270	175
	75	295	175
	100	320	200

**Design Load Capacity**

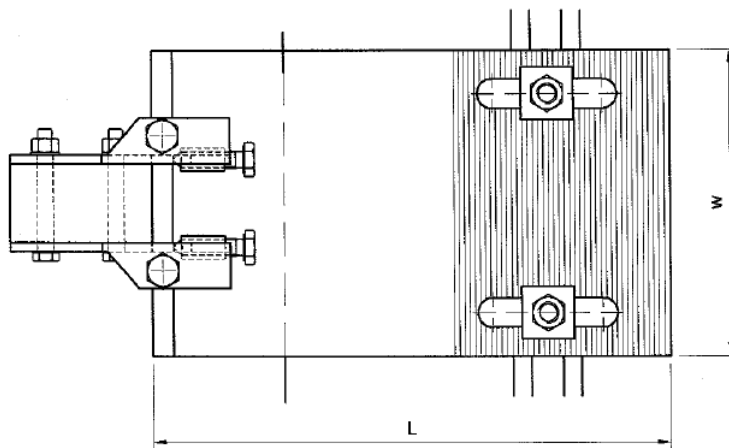
**7 kN – Deadload  
24 kN - Wind Load**

**Channels**

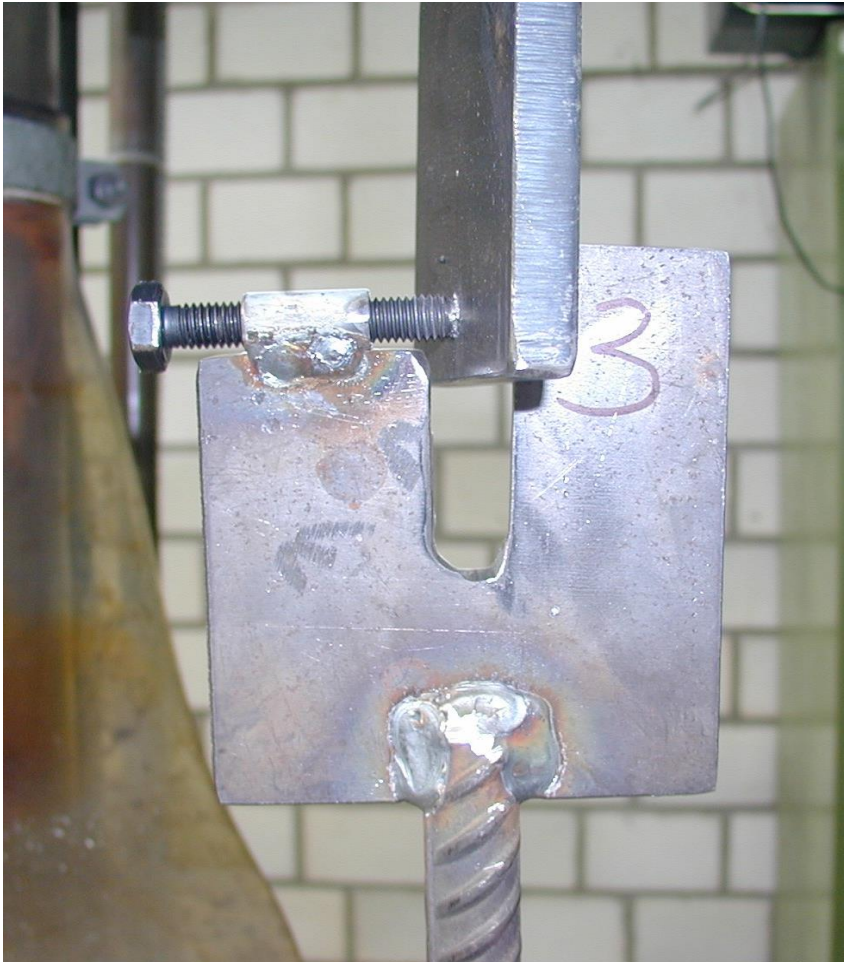
**HTA 49/30, HTA 50/30  
300mm/350mm, 3 Anchor**

**T-bolt**

**M16 (8.8)**

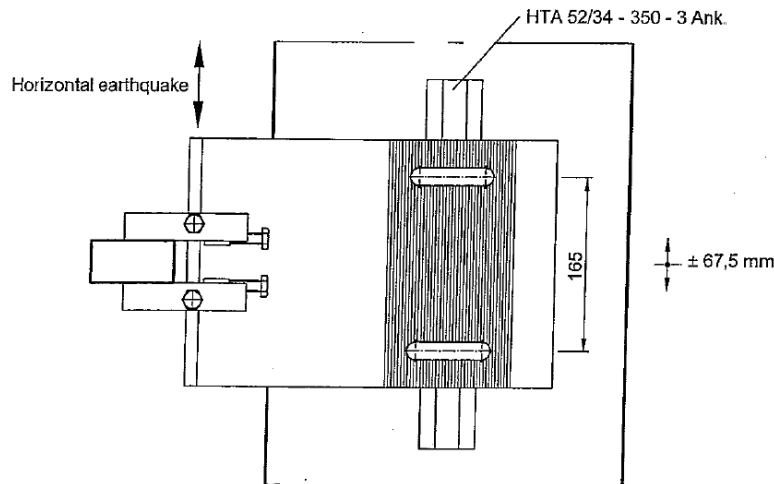
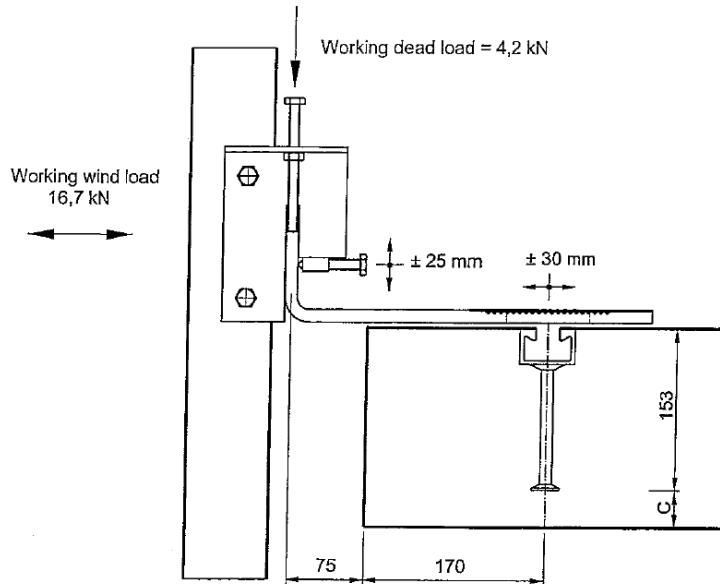






**Testing Pointed (Fixed) Bolts – 50Nm Torque – Average Failure Load 8.8 kN**

**Halfen Top of Slab Brackets +/- 20mm Vertical Adjustment**



**Designed for USA**  
**Greater Vertical Adjustment**  
**= Bigger Loads on Channel**

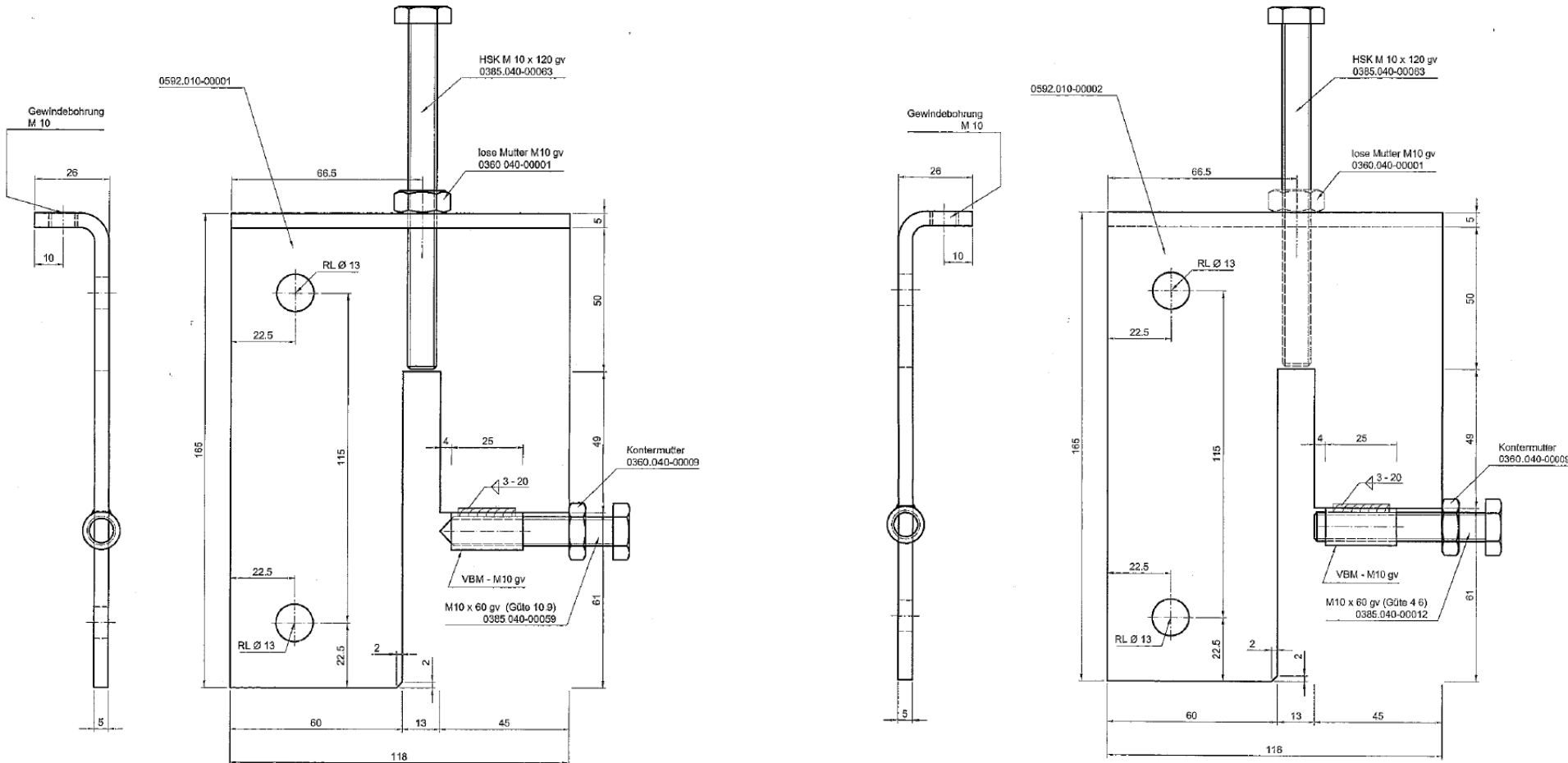
**Design Load Capacity**  
**5.7 kN – Deadload**  
**5.7 kN - Seismic**  
**25 kN - Wind Load**

**Channel**  
**HTA 52/34**

**T-bolt**  
**M16 (8.8)**



Curtain Wall Halfen Top of Slab Brackets +/- 20mm Vertical Adjustment Brackets



Left and Right Mounting Links

Option Of Pointed Bolts (Fixed) @ 50Nm or Flat Bolts (Sliding) @ 0NM

## Halfen Top of Slab Brackets

### Serrated Angles

0059.010-00001	HCW-Winkel 235x205x12, GV
0059.010-00002	HCW-Winkel 235x255x12, GV
0059.010-00003	HCW-Winkel 235x305x12, GV
0059.010-00004	HCW-Winkel 235x355x12, GV

### Mounting Links

0592.010-00001	HCW-PB-R-GV, 165x118x5, GV
0592.010-00002	HCW-PB-L-GV, 165x118x5, GV

### Serrated Washer

0404.000-00012	RP-17 35x40x5 RL=17-GV
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### Pointed Bolt

0385.040-00059	HSK M10 x 60 GV10.9 m. Spitze
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### Flat Bolts

0385.040-00012	HSK M10 x 60 GV8.8 DIN 933
0385.040-00063	HSK M10 x 120 GV8.8 DIN 933

### Nut

0360.040-00001	MU M10 GV DIN 934 FK8
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**& More to Come!**

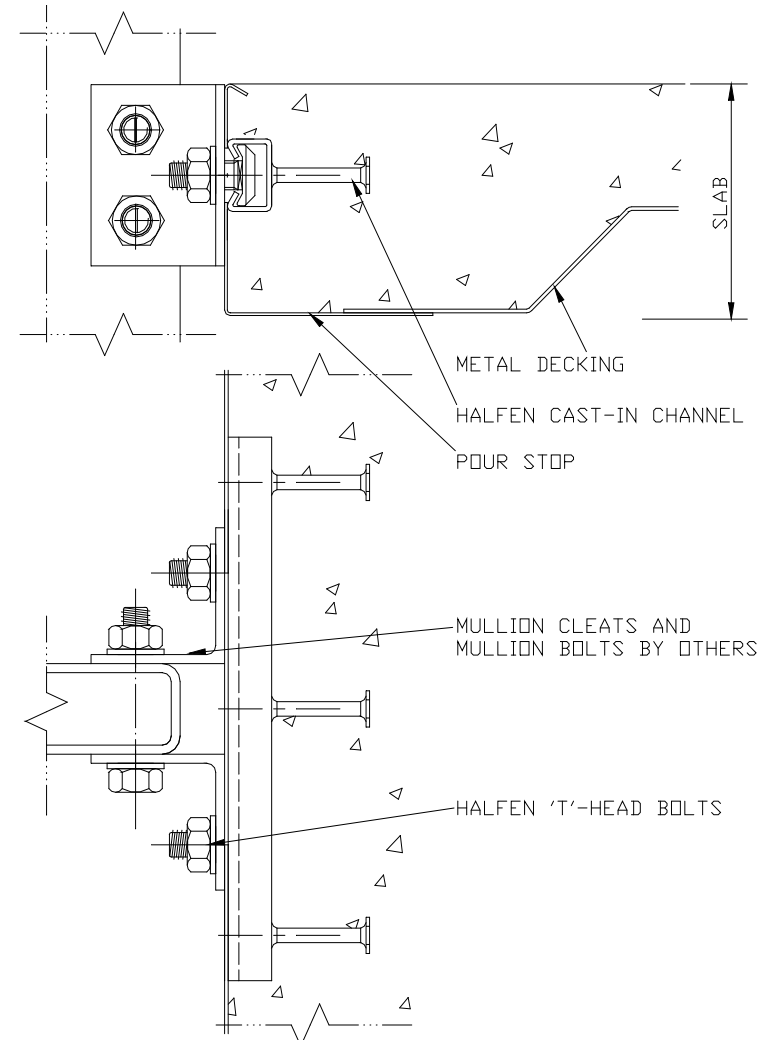
# Examples of Edge of Slab Brackets Currently Used

**Steel Brackets Used Welded to Steel in UK**





Typical Edge of Slab Connection in USA



**Steel and Aluminium Brackets Used with Halfen Pourstop in Ireland**





**Steel Brackets Used with Halfen Pourstop in Ireland**



Edge of Slab Connection in UK

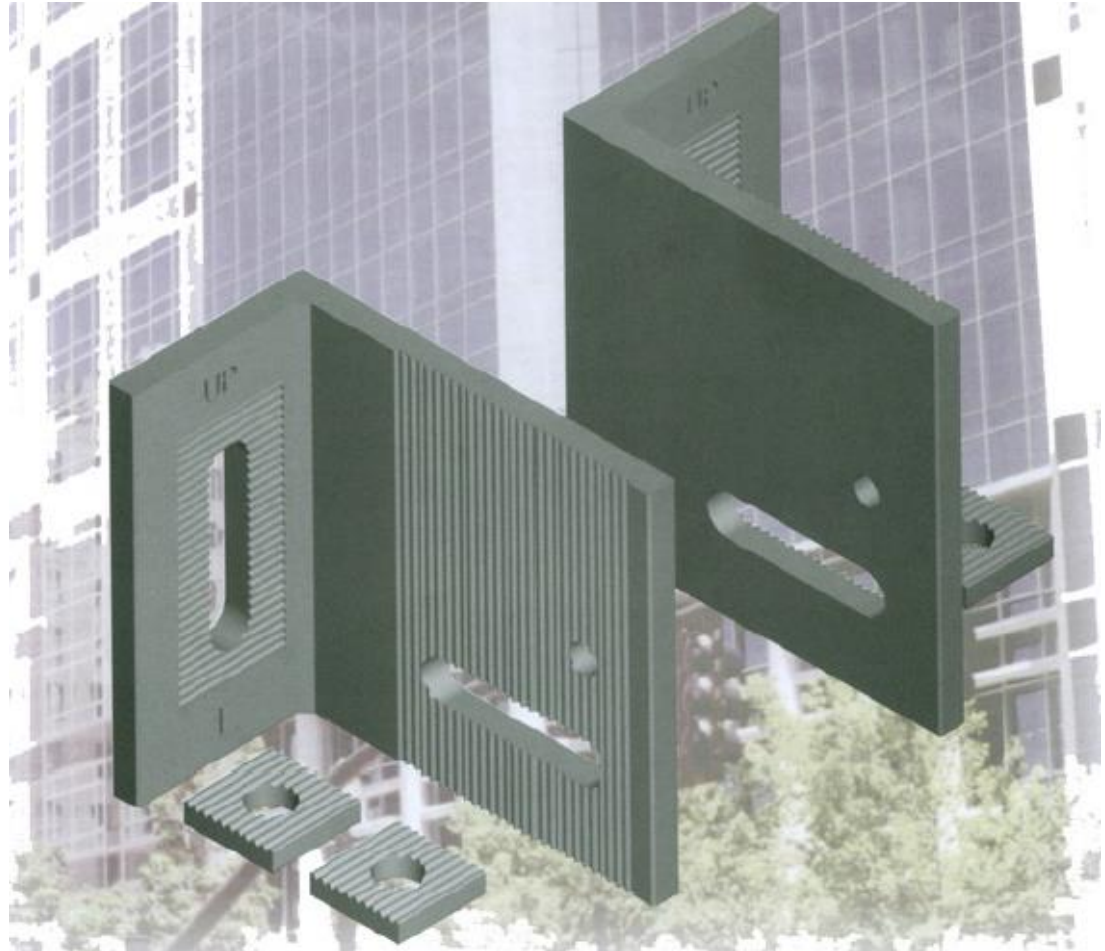




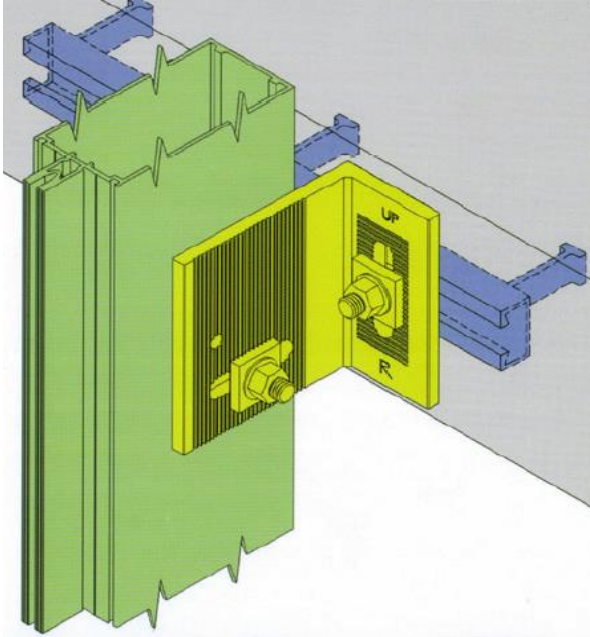
**Halfen Edge of Slab Brackets**

**Provide 3-Way Adjustment  
When used with HTA Channel**

- Aluminium
- M12 T-bolts Only



## Halfen Edge of Slab Brackets



**2 Versions:**

- Deadload and Windload
- Windload Only
- 3 sizes

Bracket Dimensions											
HCW – ED Brackets						HCW - EW Brackets					
Bracket Code	A	B	C	D	E	F	G	H	J	L	M
HCW – ED1 HCW - EW1	108	70	114	10	57	64	25	51	36	40	57
HCW – ED2 HCW – EW2	133	70	127	10	64	64	51	51	36	40	83
HCW – ED3 HCW – EW2	159	70	140	10	70	64	76	51	36	40	108

**Halfen Edge of Slab Brackets****Deadload/Windload Brackets**

<b>0059.030-00001</b>	<b>HCW-ED1-R Winkel 108x70x114 AL</b>
<b>0059.030-00002</b>	<b>HCW-ED1-L Winkel 108x70x114 AL</b>
<b>0059.030-00003</b>	<b>HCW-ED2-R Winkel 133x70x127 AL</b>
<b>0059.030-00004</b>	<b>HCW-ED2-L Winkel 133x70x127 AL</b>
<b>0059.030-00005</b>	<b>HCW-ED3-R Winkel 159x70x140 AL</b>
<b>0059.030-00006</b>	<b>HCW-ED3-L Winkel 159x70x140 AL</b>

**Windload Brackets**

<b>0059.040-00001</b>	<b>HCW-EW1 Winkel 108x70x114 AL</b>
<b>0059.040-00002</b>	<b>HCW-EW2 Winkel 133x70x127 AL</b>
<b>0059.040-00003</b>	<b>HCW-EW3 Winkel 159x70x140 AL</b>

**Serrated Washers**

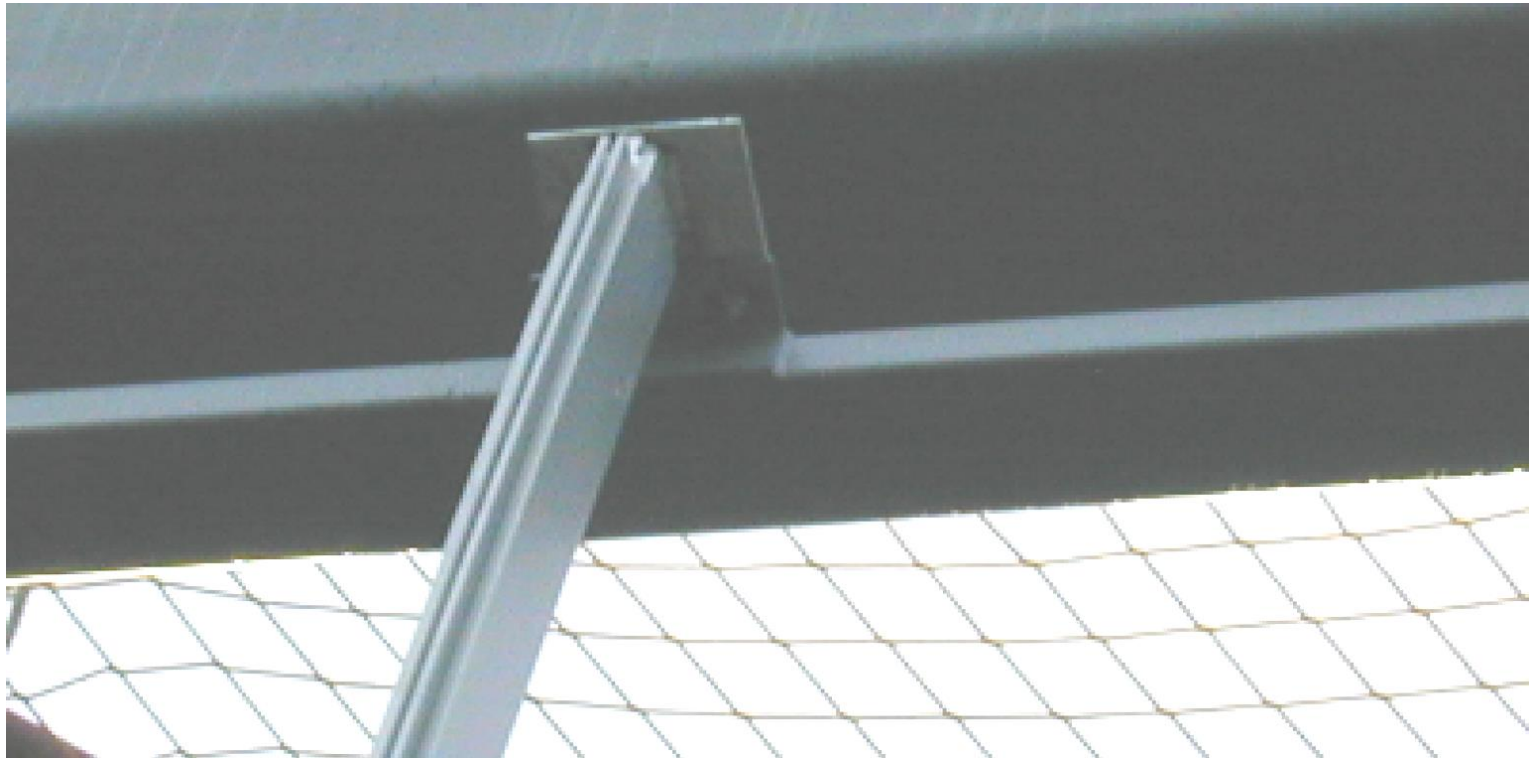
<b>0059.050-00001</b>	<b>HCW RP 30x30x7 RL=14-AL 20</b>
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**Separation Shim**

<b>0059.050-00002</b>	<b>HCW Shim 75x75x1,6 RL=14-KS 20</b>
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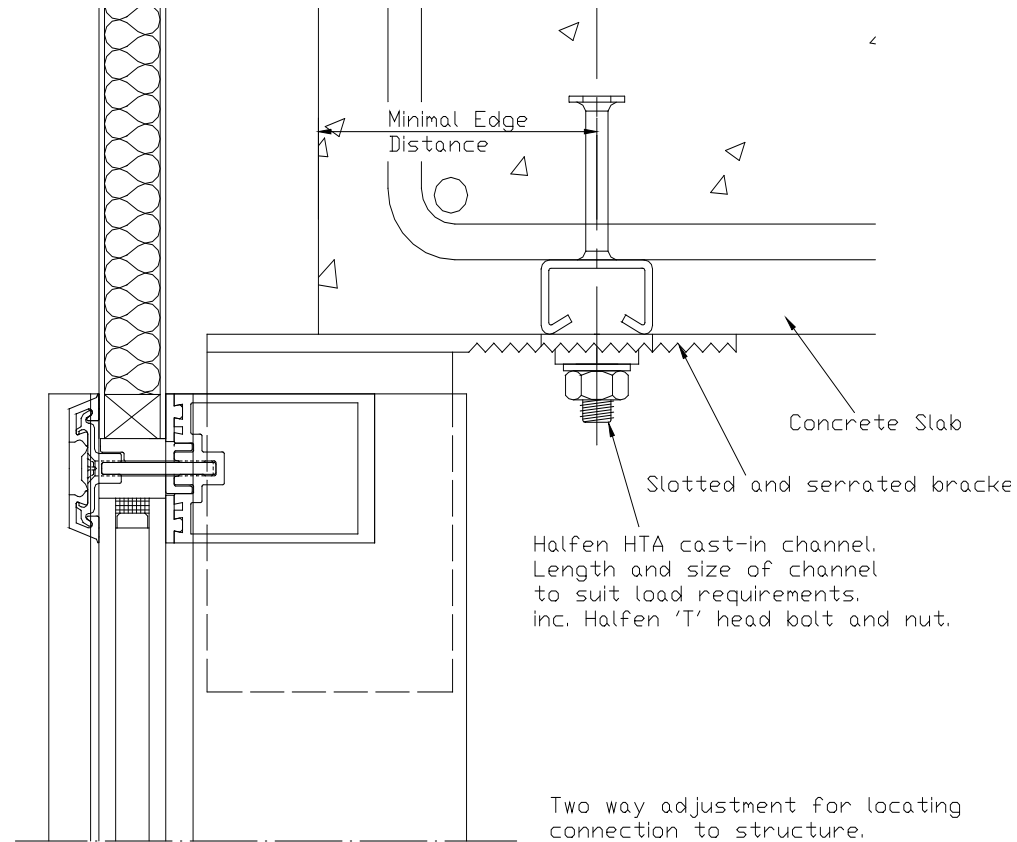
# Examples of Other Brackets Currently Used

**Head Connection in UK**



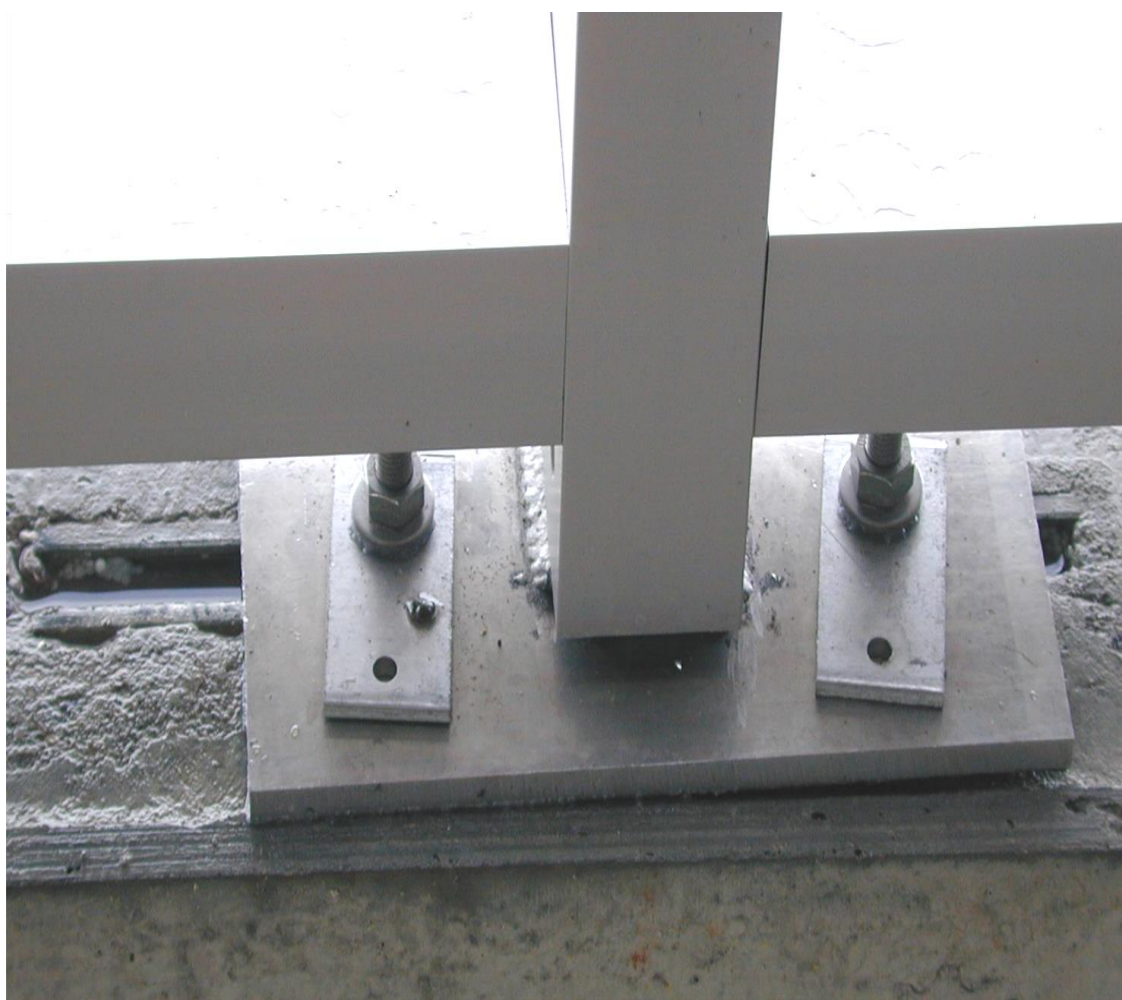


Typical Schueco Bracket



Sliding Head Connection  
For Curtain Wall.

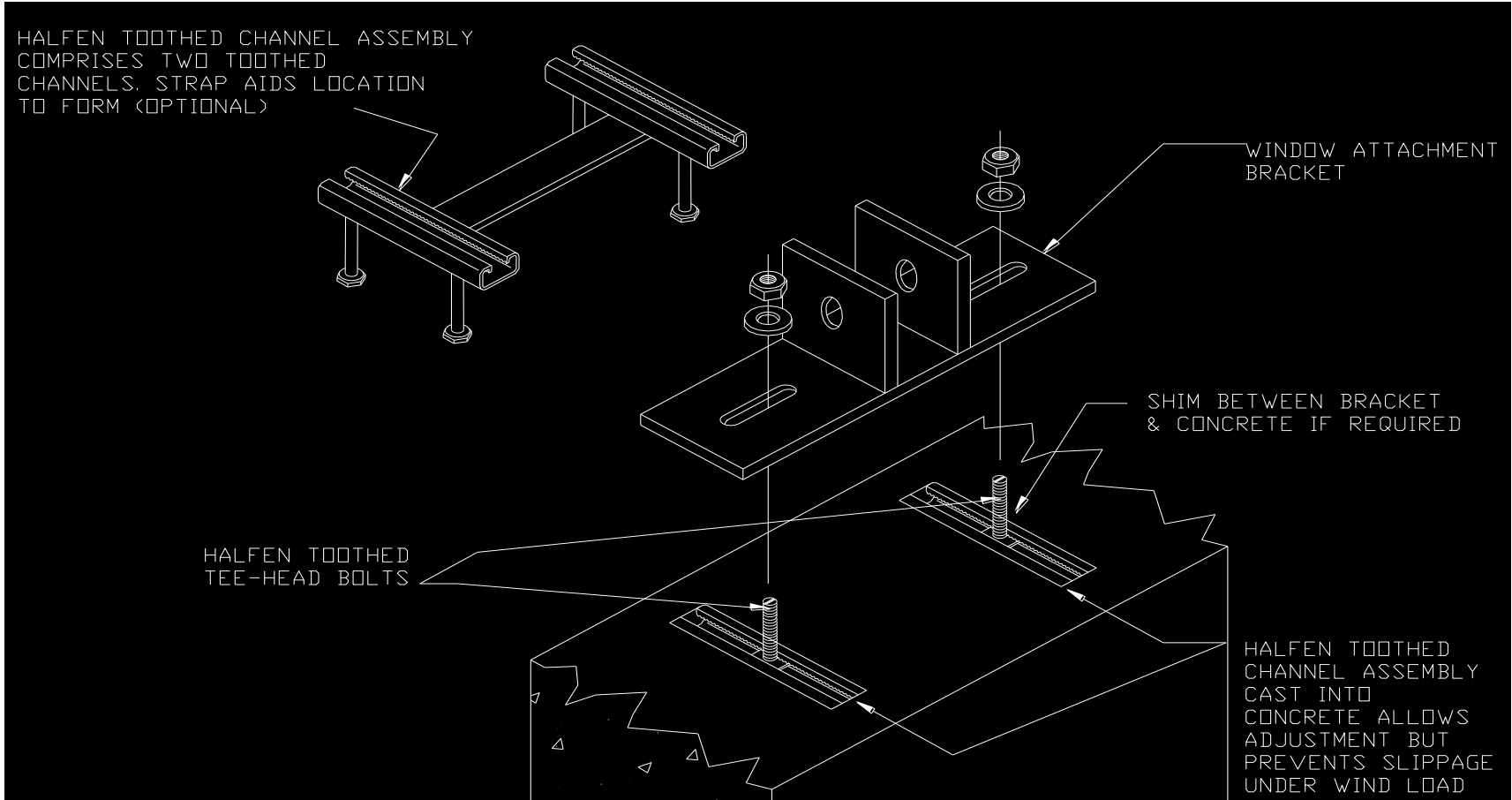
Connection to the Top of Concrete Upstand In UK - Base Connection for Curtain Wall



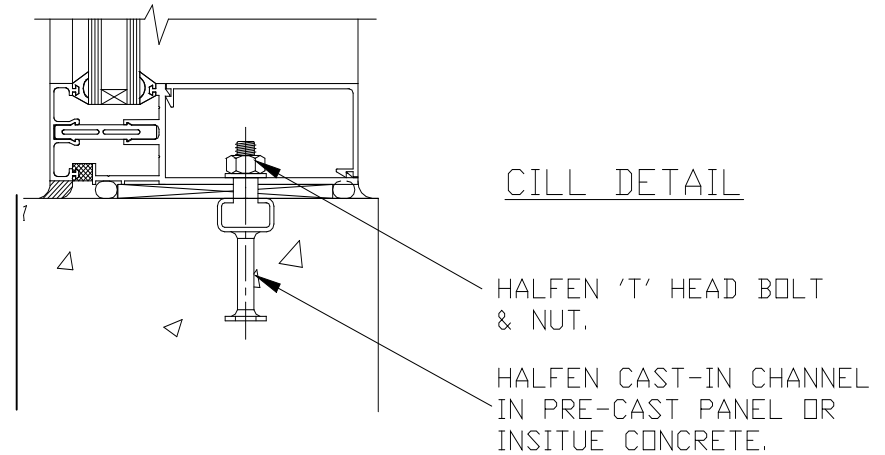
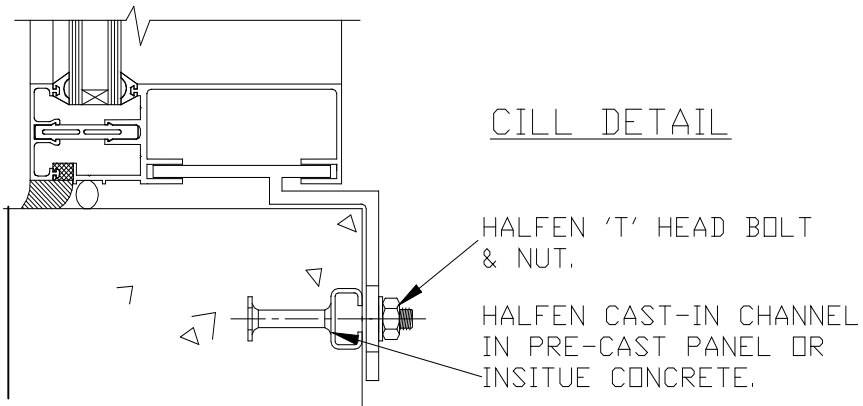
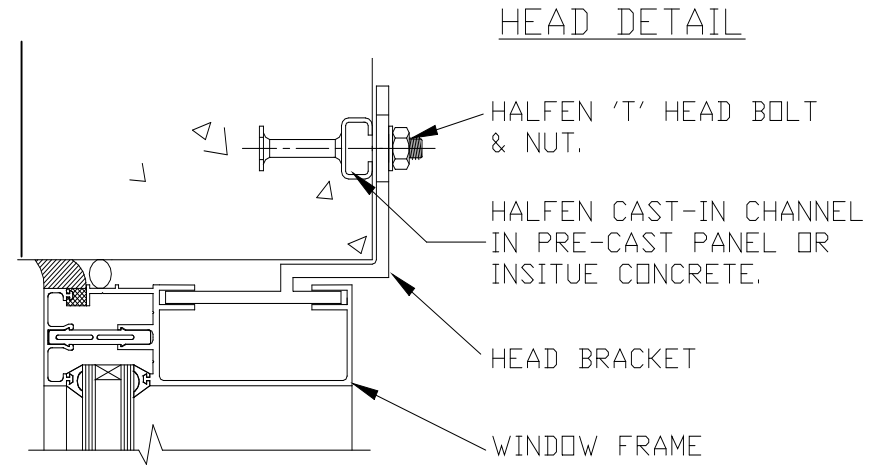
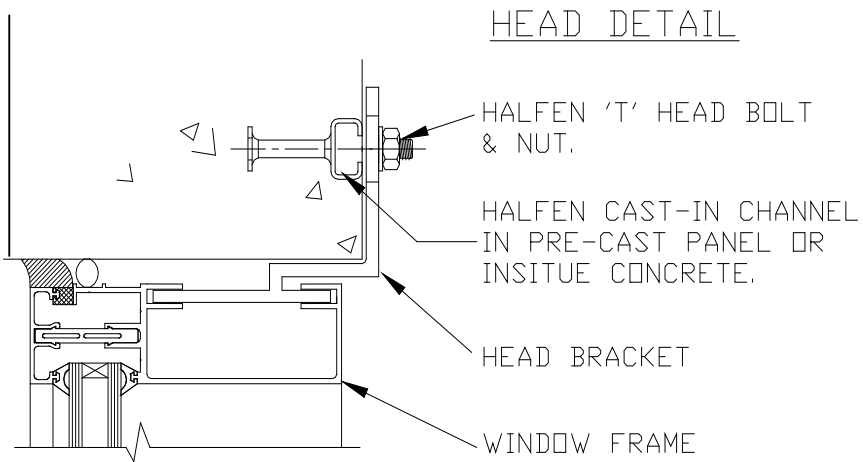
**Connection to the Top of Concrete Upstand In UK - Base Connection for Curtain Wall**



Window Bracket Design Used in USA



**Window Bracket Design Used By Harmon Inc. in USA**



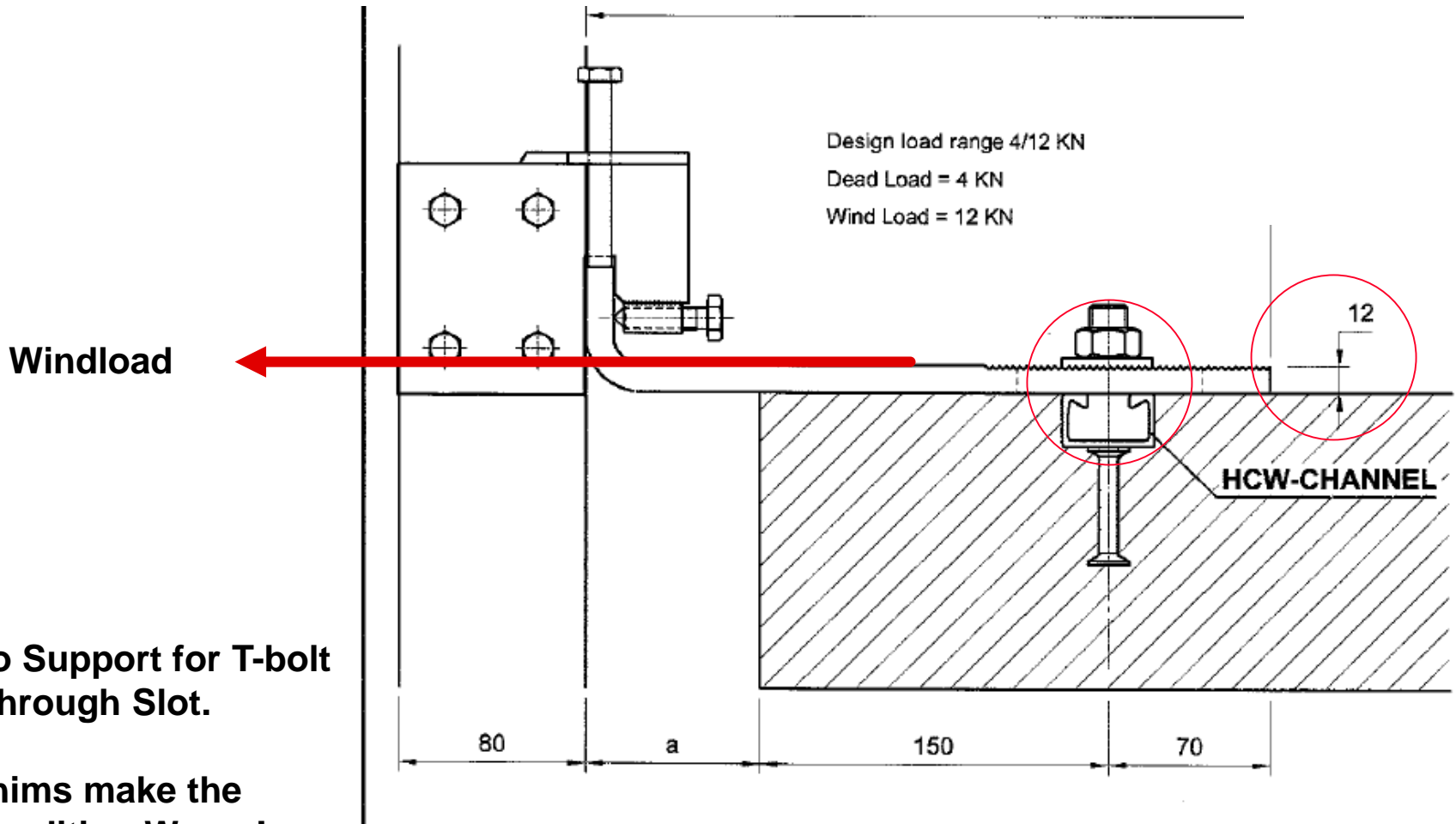


Window Bracket Design Used in UK

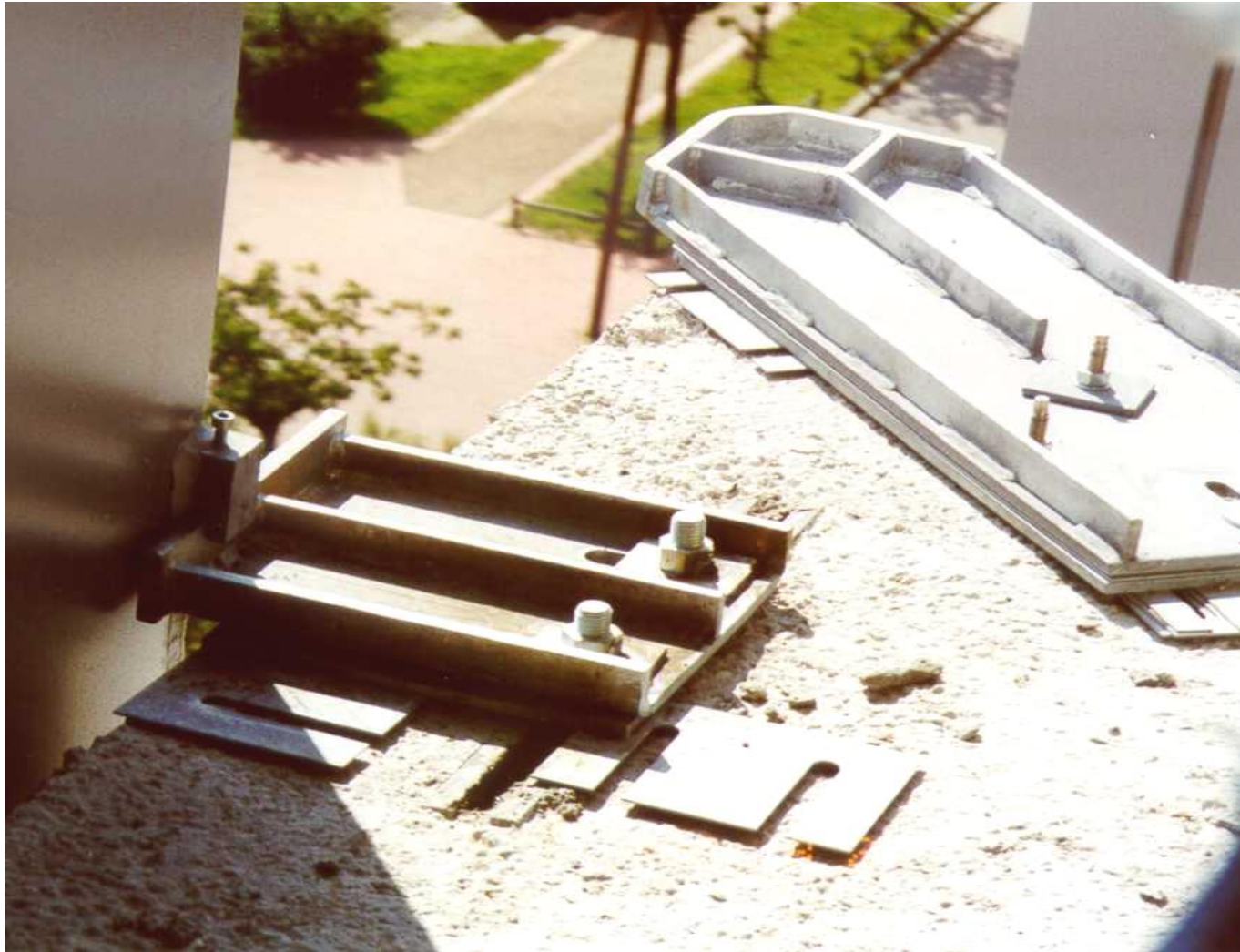


# **Design Considerations for T-bolts Used with Brackets**

**Slots and Shims Induce Bending in T-bolts**

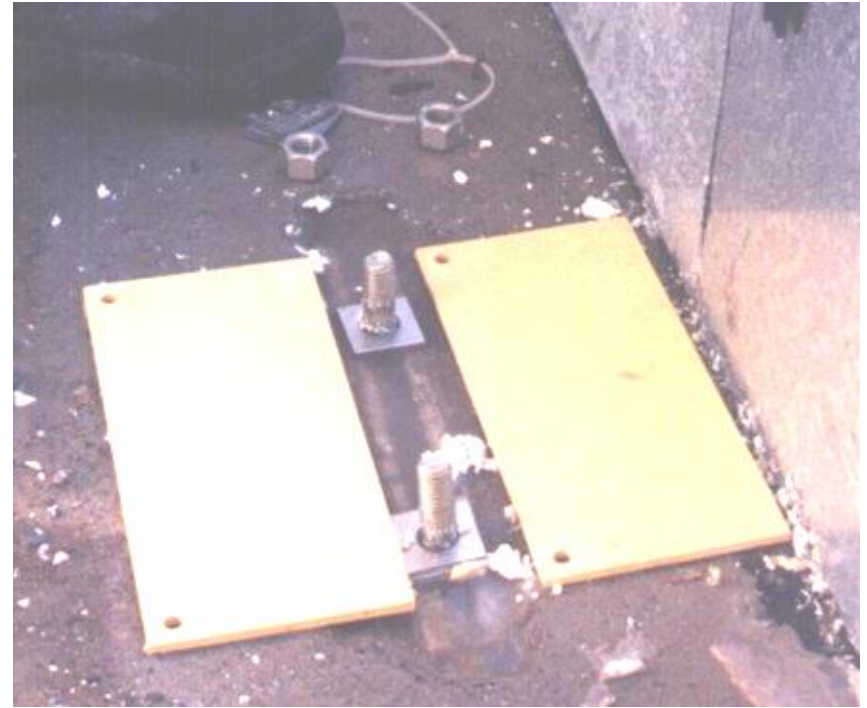


Top of Slab Connection - Germany - French Contractor





Curtain Wall Connection to the Top of Slab In UK - German contractor



Curtain Wall Connection to the Top of Slab In UK - German contractor



**Bolt Bending Problem**

Check Bolt Bending using 4.6 grade T-bolts for max 3mm Undercast & 10mm Bracket Situation					
Normal Allowable Pullout Capacity M16 Grade 4.6, (kN)	=	17.3	(p)		
Allowable Bending Moment M16 4.6 Grade, (Nm)	=	44.4	(M)		
Max. Combined Thickness of Bracket, & Undercast (m)	=	0.013	(t)		
Max. Applied Shear Load, (N)	=	4690	(s)		
Max. Applied Pull Out Load, (kN)	=	4.85			
Shimmed Pullout Capacity (kN)	=	Normal Allow.	X	1 -	<u>Bending Moment</u>
		Pullout			Allowable Bending Moment
	=	p	X	1 -	$\frac{t \times s \times 0.5}{M}$
	=	5.42	>	4.85	So OK
Check Bolt Bending using 8.8 grade T-bolts for max 20mm Undercast 10mm Bracket Situation					
Normal Allowable Pullout Capacity M16 Grade 8.8 (kN)	=	36.1	(p)		
Allowable Bending Moment M16 8.8 Grade, (Nm)	=	111	(M)		
Max. Combined Thickness of Bracket, & Undercast (m)	=	0.03	(t)		
Max. Applied Shear Load, (N)	=	4690	(s)		
Max. Applied Pull Out Load, (kN)	=	4.85			
Shimmed Pullout Capacity (kN)	=	Normal Allow.	X	1 -	<u>Bending Moment</u>
		Pullout			Allowable Bending Moment
	=	p	X	1 -	$\frac{t \times s \times 0.5}{M}$
	=	13.22	>	4.85	So OK

**Thank You**