Advanced Cold-Formed Sections

Stud and Track

Technical Manual

1. Introduction

ACFS uses cold rolled galvanized C sections as its basic components. They are of 100 to 300 mm depth in 1.2 to 3.0 mm thick steel, depending on the application. The ACFS machinery cuts the sections to precise length.

The system of construction is based on the 'warm frame' principle, where all the insulation is placed outside the structural frame. In this way, the risk of condensation is avoided. The technology reflects existing practice in the UK. Similarly, acoustic insulation is achieved by multiple layers of board and quilt. Performance data for board materials may be obtained from British Gypsum and Lafarge Plasterboard.

This technical documentation reviews the existing structural performance data on the ACFS system and demonstrates its range of application by simple design tables. Details for acoustic and thermal insulation are presented, based on generic light steel framing technology given in various Steel Construction Institute publications and in the Building Research Establishment 'Robust Details' (see References). These details are relevant to the general use of the ACFS system in buildings, but precise details used for particular applications should be specified by ACFS.

2. Stud & Track

2.1 Range of Application

The ACFS Stud & Track system is aimed at secondary components in medium to high-rise buildings. The current range of applications are:

Infill or separating walls used in primary steel or concrete frames.

Over-cladding or recladding sub-frames for existing buildings.

2.2 Application – Infill Walls

Infill walls are fitted between floors in multi-storey buildings either as:

Separating walls for acoustic insulation and fire compartmentation.

External walls as a 'rapid dry envelope'.

They are not subject to significant vertical load, but may be exposed to high wind loads, dependent on the building location and height.

Generally, 75 mm deep C sections are used for floor-ceiling heights of up to 3 m in low or medium rise buildings, but 100 or 150 mm deep C sections are required for taller walls or high-rise buildings where wind loads are greater. **Error! Reference source not found.** shows a typical infill wall located between floors. The spacing of the wall ties to attach to brickwork depends on the wind load (i.e. building elevation and exposure). Brickwork should generally be independently supported. Guidance on infill walls is given in Section 7.

2.3 Application – Overcladding of existing buildings

In renovation, new cladding can be attached to existing buildings using sub-frames manufactured as wall panels and attached to the existing floor slab or façade (where it is sufficiently strong). The sub-frame is designed to resist wind loading and to support the weight of the new façade.

Over-cladding is a specialist activity and the quality of the fixings to the existing building is very important to the adequacy of the system. Light steel sub-frames may be used with most types of over-cladding materials, such as:

profiled sheeting

steel or aluminium cassettes

composite panels

impregnated boards

Sub-frames should generally be designed as storey-height in order to avoid fixing into the existing often poor quality façade materials. More robust fixings can be made to the concrete floor slab or columns.

The environmental conditions behind the new over-cladding may be considered as to be 'mild', provided pressure equalisation can occur in the cavity. Previous studies have shown that a design life of 30 years can be achieved (refer to SCI publication 262).

3. Structural Design of Members

3.1 Loading and Standards

Loading on building structures is defined in BS 6399 Parts 1 to 3. The normal range of floor loading envisaged for ACFS structures is 0.5 to 2.0 kN/m^2 (i.e. residential to commercial buildings).

The wind loading depends on the geographical location and exposure conditions as in BS 6399 Part 2. ACFS building structures will be located in England and Wales and will be such that they are:

in a region with a basic (mean) wind speed less than 24 m/s

at an altitude of less than 300 m above sea level

Guidance on more exposed locations or in Scotland or Ireland can be given for particular projects.

Structural design is carried to BS 5950 Part 5 as explained in SCI publication P 276 – *Structural Design to BS 5950-5: 1998: Section Properties and Load Tables.*

3.2 Structural Components

The system uses a range of C and U sections which are produced by machines in ACFS's Llanwern factory.

The ACFS C sections are produced in the following size ranges (see Table 1.1). ACFS should be consulted about the most efficient selection of sizes and thicknesses for a particular application.

Table 3.1 *Size range of ACFS sections and steel thicknesses*

Depth (mm)	Width (mm)	Thickness (mm)
100	50	1.2, 1.5, 2.0
150	50	1.2, 1.5, 2.0
200	50	1.2, 1.4, 1.6, 2.0
225	70	1.4, 1.6, 2.0
255	70	1.4, 1.6, 2.0
300	70	1.4, 2.0, 3.0

3.2.1 Strip Steel

All the strip steel is produced to BS EN 10140 in S390 grade (yield strength = 390 N/mm^2). It is galvanised to G275 grade (275 grams of zinc per m^2). The strip steel is obtained in the correct widths for rolling from Corus Strip UK.

It is maybe possible to roll steel thicknesses outside the range given in Table 1.1 for each section size subject to quantity.

3.2.2 Accuracy and Tolerances

The accuracy of the section shape is within 1 mm.
It is important that the foundation level is accurately measured before commencing installation of the wall frames, as even a 5 mm out of level will lead to an equivalent out of verticality of the wall frame.

3.2.3 Section Properties

The section properties of the ACFS C sections are obtained by calculation to BS 5950 Part 5, taking account of the effective width of the elements in compression. All flanges are stiffened by an edge lip which is considered to be sufficient to restrain local buckling of the edge when fastened to plasterboard or floorboard.

The principal section properties used for design are presented below, together with their definitions.

	GROSS PROPERTIES																		
Section	Thickness (mm)	Area (cm^2)	Weight kg/m	Ex mm	Ex mm	Ixx cm^4	Iyy cm^4	rxx cm^4	ryy cm^4	Zxx cm^3	Zyy cm^3	Max (X) mm	Max(Y) mm	CG (X) mm	Cw cm^6	J cm^4	Shear Centre (X)	Shear Centre (Y)	Es cm
S10012	**1.20**	**2.48**	**1.95**	-38.00	-33.06	**40.60**	**8.40**	**4.04**	**1.84**	**8.11**	**2.50**	33.64	49.98	16.32	172	0.0111	-39.04	0.00	-2.27
S10015	**1.50**	**3.09**	**2.42**	-38.00	-32.96	**49.90**	**10.20**	**4.02**	**1.82**	**9.99**	**3.04**	33.69	49.98	16.27	206	0.0219	-38.60	0.00	-2.23
S10020	**2.00**	**4.07**	**3.19**	-38.00	-32.79	**64.60**	**13.00**	**3.99**	**1.79**	**12.93**	**3.85**	33.77	49.98	16.19	256	0.0521	-37.84	0.00	-2.17
S15012	**1.20**	**3.06**	**2.40**	-63.00	-36.04	**103.70**	**9.60**	**5.82**	**1.77**	**13.83**	**2.62**	36.62	74.98	13.34	413	0.0137	-33.52	0.00	-2.02
S15015	**1.50**	**3.82**	**3.00**	-63.00	-35.93	**128.20**	**11.70**	**5.79**	**1.75**	**17.09**	**3.18**	36.66	74.98	13.30	499	0.0271	-33.09	0.00	-1.98
S15020	**2.00**	**5.05**	**3.96**	-63.00	-35.75	**166.90**	**14.80**	**5.75**	**1.71**	**22.26**	**4.04**	36.73	74.98	13.23	624	0.0646	-32.36	0.00	-1.91
S20012	**1.20**	**3.94**	**3.10**	-88.00	-46.89	**234.90**	**18.40**	**7.72**	**2.16**	**23.50**	**3.88**	47.47	99.98	15.49	1371	0.0177	-39.58	0.00	-2.41
S20014	**1.40**	**4.60**	**3.61**	-88.00	-46.82	**272.80**	**21.20**	**7.70**	**2.15**	**27.29**	**4.47**	47.50	99.98	15.46	1573	0.0284	-39.29	0.00	-2.38
S20016	**1.60**	**5.25**	**4.12**	-88.00	-46.75	**310.00**	**23.90**	**7.68**	**2.13**	**31.01**	**5.03**	47.53	99.98	15.43	1765	0.0426	-39.00	0.00	-2.36
S20020	**2.00**	**6.53**	**5.13**	-88.00	-46.60	**382.20**	**29.00**	**7.65**	**2.11**	**38.23**	**6.09**	47.58	99.98	15.38	2119	0.0837	-38.42	0.00	-2.30
S22514	**1.40**	**4.94**	**3.88**	-100.50	-47.84	**360.50**	**21.90**	**8.54**	**2.11**	**32.05**	**4.52**	48.52	112.48	14.44	2058	0.0305	-37.29	0.00	-2.28
S22516	**1.60**	**5.64**	**4.43**	-100.50	-47.76	**409.80**	**24.70**	**8.52**	**2.09**	**36.44**	**5.09**	48.54	112.48	14.42	2310	0.0458	-37.01	0.00	-2.26
S22520	**2.00**	**7.02**	**5.51**	-100.50	-47.60	**505.70**	**29.90**	**8.48**	**2.06**	**44.96**	**6.16**	48.58	112.48	14.38	2779	0.0900	-36.43	0.00	-2.21
S25520	**2.00**	**7.89**	**6.19**	-115.50	-53.52	**727.00**	**40.50**	**9.60**	**2.27**	**57.03**	**7.44**	54.50	127.48	15.46	4815	0.1010	-39.55	0.00	-2.41
S25514	**1.40**	**5.68**	**4.46**	-115.50	-57.17	**538.60**	**35.20**	**9.74**	**2.49**	**42.25**	**6.09**	57.85	127.48	17.11	4199	0.0350	-44.23	0.00	-2.71
S25516	**1.60**	**6.49**	**5.09**	-115.50	-57.09	**613.10**	**39.80**	**9.72**	**2.48**	**48.09**	**6.87**	57.87	127.48	17.09	4727	0.0526	-43.94	0.00	-2.69
S30014	**1.40**	**6.29**	**4.94**	-138.00	-58.77	**793.10**	**36.70**	**11.23**	**2.42**	**52.88**	**6.18**	59.45	149.98	15.51	6105	0.0388	-41.02	0.00	-2.55
S30020	**2.00**	**8.97**	**7.04**	-138.00	-58.52	**1118.70**	**50.50**	**11.17**	**2.37**	**74.59**	**8.48**	59.50	149.98	15.46	8328	0.1148	-40.17	0.00	-2.47
S30030	**3.00**	**13.29**	**10.44**	-138.00	-58.12	**1628.60**	**70.20**	**11.07**	**2.30**	**108.59**	**11.78**	59.60	149.98	15.36	11419	0.3883	-38.73	0.00	-2.34

	REDUCED PROPERTIES (BENDING)																
Section	Thickness (mm)	Area (cm2)		Ex mm	Ex mm	Ixx cm^4	Iyy cm^4	rxx cm^4	ryy cm^4	Zxx cm^3	Zyy cm^3	Max (X) mm	Max(Y) mm	CG (X) mm	Ixr cm^4	Zxr cm^3	Mcx (kNm)
S10012	1.20	2.45		-38.67	-33.18	39.70	8.40	4.03	1.85	7.84	2.49	33.76	50.65	16.20	**37.60**	**7.43**	**2.60**
S10015	1.50	3.08		-38.09	-32.98	49.80	10.20	4.02	1.82	9.95	3.04	33.71	50.07	16.25	**49.00**	**9.79**	**3.43**
S10020	2.00	4.07		-38.00	-32.79	64.60	13.00	3.99	1.79	12.93	3.85	33.77	49.98	16.19	**64.60**	**12.93**	**4.52**
S15012	1.20	3.04		-63.67	-36.15	102.20	9.50	5.80	1.77	13.50	2.60	36.73	75.65	13.23	**87.40**	**11.55**	**4.04**
S15015	1.50	3.81		-63.09	-35.95	127.90	11.70	5.79	1.75	17.04	3.18	36.68	75.07	13.28	**116.60**	**15.53**	**5.44**
S15020	2.00	5.05		-63.00	-35.75	166.90	14.80	5.75	1.71	22.26	4.04	36.73	74.98	13.23	**161.50**	**21.53**	**7.54**
S20012	1.20	3.84		-90.71	-47.33	224.30	18.20	7.64	2.17	21.84	3.79	47.91	102.69	15.05	**171.30**	**16.68**	**5.84**
S20014	1.40	4.54		-89.30	-47.03	266.90	21.10	7.67	2.15	26.35	4.42	47.71	101.28	15.25	**218.20**	**21.54**	**7.54**
S20016	1.60	5.23		-88.53	-46.83	307.30	23.80	7.67	2.14	30.57	5.01	47.61	100.51	15.35	**263.50**	**26.22**	**9.18**
S20020	2.00	6.53		-88.06	-46.61	381.80	29.00	7.65	2.11	38.17	6.09	47.59	100.04	15.37	**348.70**	**34.86**	**12.20**
S22514	1.40	4.89		-101.68	-48.02	354.00	21.80	8.51	2.11	31.14	4.47	48.70	113.66	14.26	**275.60**	**24.25**	**8.49**
S22516	1.60	5.62		-100.97	-47.83	406.90	24.60	8.51	2.09	36.02	5.07	48.61	112.95	14.35	**335.10**	**29.67**	**10.38**
S22520	2.00	7.02		-100.55	-47.61	505.40	29.90	8.48	2.06	44.91	6.15	48.59	112.53	14.37	**447.80**	**39.80**	**13.93**
S25520	2.00	7.88		-115.68	-53.54	725.30	40.50	9.60	2.27	56.81	7.43	54.52	127.66	15.44	**619.10**	**48.50**	**16.97**
S25514	1.40	5.53		-118.80	-57.70	514.80	34.60	9.65	2.50	39.37	5.93	58.38	130.78	16.58	**376.70**	**28.80**	**10.08**
S25516	1.60	6.39		-117.33	-57.39	598.10	39.40	9.67	2.48	46.25	6.77	58.17	129.31	16.79	**468.20**	**36.21**	**12.67**
S30014	1.40	6.17		-140.81	-59.18	766.70	36.10	11.15	2.42	50.18	6.04	50.86	152.79	15.10	**507.10**	**33.19**	**11.62**
S30020	2.00	8.95		-138.32	-58.57	1114.40	50.40	11.16	2.37	74.14	8.46	59.55	150.30	15.41	**896.90**	**59.68**	**20.89**
S30030	3.00	13.29		-138.00	-58.12	1628.60	70.20	11.07	2.30	108.59	11.78	59.60	149.98	15.36	**1489.70**	**99.33**	**34.76**

3.2.4 Durability and Design Life

The design life of galvanised steel in dry environments is at least 100 years, which applies to 'warm frame' construction. Studies have shown that the design life of galvanised steel in roofs is at least 60 years. SCI publication P262 presents guidance on durability (see References).

3.3 Design Tables

Design Tables are presented for the following standard design cases using the range of ACFS C sections given in Table 1:

Infill wall panels in compression.

Wall panels in bending due to wind action.

The Design Tables are presented in Section 6. They should be used for scheme design only. ACFS should be consulted for detailed design.

4. Thermal Performance

The thermal performance of light steel framed buildings depends on the cladding system that is employed and on the positioning of the insulation. The requirements for conservation of fuel and power (i.e. energy efficiency) are covered by Part L of the Building Regulations.

4.1 Thermal Performance

The various methods of establishing thermal performance of buildings are based either on the elemental method (i.e. U values) or on a whole building assessment (e.g. SAP, or NHER). The relevant U values (heat transmittance) of the Building Regulations and good practice in light steel framing are presented in Table 4.1. Parts L1 and L2 of the 2002 Building Regulations reduce the U value for walls to 0.35 W/m^{2}C, which can be achieved easily by light steel framing.

Table 4.1 *Review of typical and best practice U-values (W/m^{2}K) achieved in the UK*

U-values in W/m^{2}K	Walls	Floor	Roof	Windows
Building Regs 1995				
For SAP energy rating of 60 or less	# 0.45	# 0.35	# 0.2	# 3.0
For SAP energy rating of over 60	# 0.45	# 0.45	# 0.25	# 3.3
Building Regs 2002	# 0.35	# 0.25	# 0.2	# 2.2
U-values used in the UK				
Good practice	0.35	0.32	0.2	2.8
Ultra-low energy homes	0.2	0.2	0.15	2.0
Light steel-framed – typical	0.35	0.35	0.25	3.0
Light steel-framed – best practice	0.2	0.35	0.2	1.8

4.2 'Warm frame' construction

Light steel framing is constructed with 'warm frame' technology in which all or most of the insulation is external to the structure, so that the risk of 'cold bridging' and condensation is negligible. This form of construction is illustrated in Figure 4.1.

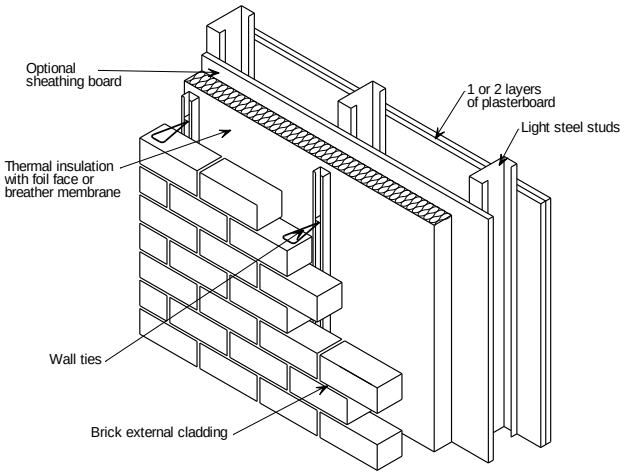


Figure 4.1 *'Warm frame' construction*

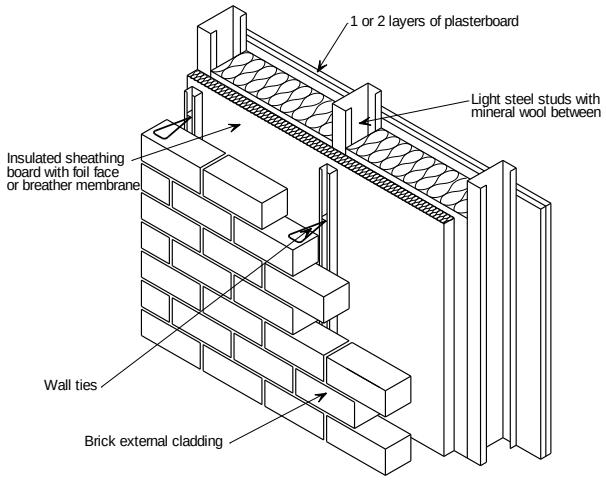


Figure 4.2 *Additional insulation between the studs*

Additional insulation can be placed between the studs to enhance the total insulation, but a recommended rule is that no more than 50% of the total U vale of the wall should be provided by insulation between the studs, as illustrated in Figure 4.2.

Brickwork is connected by wall ties located in framing runners which do not provide a cold bridge except by the through fixings. The density of wall tie fixings varies from 2.5 to 4 ties/m^2, depending on the wind suction pressure that is resisted.

4.3 Other cladding systems

A variety of cladding systems may be used such as insulated renders. Two alternative systems may be specified; non-cavity and cavity construction, the difference being illustrated in **Error! Reference source not found.** and **Error! Reference source not found.**.

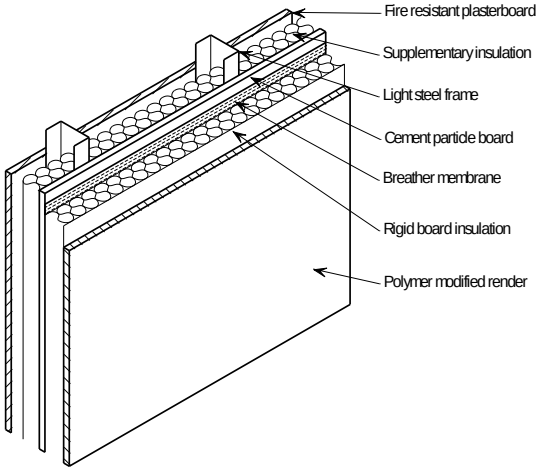


Figure 4.3 *Non-cavity construction using insulated render*

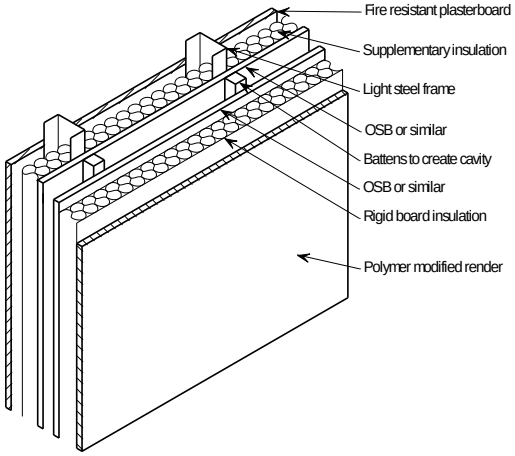


Figure 4.4 *Cavity construction using insulated render*

5. Fire Resistance

Fire resistance is covered by Part B of the Building Regulations. The primary requirements concern walls and floors between dwellings, which should generally achieve 60 minutes fire resistance. This is achieved using double layers of fire resisting board, and insulating quilt between the studs or joists to provide the acoustic and fire separating function.

The same detailing also ensures excellent acoustic insulation. For more guidance, refer to the British Gypsum '*Whitebook*' or the Lafarge '*Drywall Manual*'.

6. Design Tables

6.1 Infill walls providing lateral support to robust cladding materials

Stud centres 0.6m

Deflection limit: height / 250

		Wind pressure (kN/m^2)															
Section	Ixx (cm^4)	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
S10012	40.60	4.39	4.14	3.93	3.76	3.61	3.49	3.38	3.28	3.20	3.12	3.05	2.98	2.92	2.87	2.82	2.77
S10015	49.90	4.71	4.43	4.21	4.02	3.87	3.74	3.62	3.52	3.42	3.34	3.26	3.20	3.13	3.07	3.02	2.97
S10020	64.60	5.13	4.83	4.59	4.39	4.22	4.07	3.94	3.83	3.73	3.64	3.56	3.48	3.41	3.35	3.29	3.23
S15012	103.70	6.00	5.65	5.37	5.13	4.94	4.77	4.62	4.49	4.37	4.26	4.16	4.08	3.99	3.92	3.85	3.78
S15015	128.20	6.44	6.06	5.76	5.51	5.30	5.12	4.96	4.81	4.69	4.57	4.47	4.37	4.29	4.21	4.13	4.06
S15020	166.90	7.04	6.62	6.29	6.02	5.78	5.59	5.41	5.26	5.12	4.99	4.88	4.78	4.68	4.59	4.51	4.43
S20012	234.90	7.88	7.42	7.05	6.74	6.48	6.26	6.06	5.89	5.74	5.60	5.47	5.35	5.25	5.15	5.05	4.97
S20014	272.80	8.29	7.80	7.41	7.09	6.81	6.58	6.37	6.19	6.03	5.88	5.75	5.63	5.51	5.41	5.31	5.22
S20016	310.00	8.65	8.14	7.73	7.39	7.11	6.86	6.65	6.46	6.29	6.14	6.00	5.87	5.75	5.64	5.54	5.45
S20020	382.20	9.27	8.73	8.29	7.93	7.62	7.36	7.13	6.93	6.74	6.58	6.43	6.29	6.17	6.05	5.94	5.84
S22514	360.50	9.09	8.56	8.13	7.78	7.48	7.22	6.99	6.79	6.61	6.45	6.31	6.17	6.05	5.94	5.83	5.73
S22516	409.80	9.49	8.93	8.48	8.11	7.80	7.53	7.30	7.09	6.90	6.73	6.58	6.44	6.31	6.19	6.08	5.98
S22520	505.70	10.18	9.58	9.10	8.70	8.37	8.08	7.83	7.60	7.40	7.22	7.06	6.91	6.77	6.64	6.52	6.41
S25520	727.00	10.39	9.78	9.29	8.89	8.55	8.25	7.99	7.76	7.56	7.38	7.21	7.06	6.91	6.78	6.66	6.55
S25514	538.60	10.85	10.21	9.70	9.28	8.92	8.61	8.35	8.11	7.89	7.70	7.53	7.37	7.22	7.08	6.96	6.84
S25516	613.10	11.82	11.13	10.57	10.11	9.72	9.39	9.09	8.83	8.60	8.39	8.20	8.03	7.87	7.72	7.58	7.45
S30014	793.10	13.26	12.48	11.85	11.34	10.90	10.52	10.20	9.90	9.64	9.41	9.20	9.00	8.82	8.65	8.50	8.36
S30020	1118.70	15.02	14.14	13.43	12.85	12.35	11.93	11.55	11.22	10.93	10.66	10.42	10.20	9.99	9.81	9.63	9.47
S30030	1628.60	4.39	4.14	3.93	3.76	3.61	3.49	3.38	3.28	3.20	3.12	3.05	2.98	2.92	2.87	2.82	2.77

Stud centres 0.4m

Deflection limit: height / 250

		Wind pressure (kN/m^2)															
Section	Ixx (cm^4)	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
S10012	40.60	5.03	4.73	4.50	4.30	4.14	3.99	3.87	3.76	3.66	3.57	3.49	3.41	3.35	3.28	3.22	3.17
S10015	49.90	5.39	5.07	4.82	4.61	4.43	4.28	4.14	4.02	3.92	3.82	3.74	3.66	3.58	3.52	3.45	3.40
S10020	64.60	5.87	5.52	5.25	5.02	4.83	4.66	4.51	4.39	4.27	4.17	4.07	3.99	3.91	3.83	3.76	3.70
S15012	103.70	6.87	6.47	6.14	5.88	5.65	5.46	5.29	5.13	5.00	4.88	4.77	4.67	4.57	4.49	4.41	4.33
S15015	128.20	7.38	6.94	6.59	6.31	6.06	5.86	5.67	5.51	5.37	5.23	5.12	5.01	4.91	4.81	4.73	4.65
S15020	166.90	8.05	7.58	7.20	6.89	6.62	6.39	6.19	6.02	5.86	5.72	5.59	5.47	5.36	5.26	5.16	5.08
S20012	234.90	9.02	8.49	8.07	7.72	7.42	7.16	6.94	6.74	6.56	6.40	6.26	6.13	6.00	5.89	5.79	5.69
S20014	272.80	9.48	8.93	8.48	8.11	7.80	7.53	7.29	7.09	6.90	6.73	6.58	6.44	6.31	6.19	6.08	5.98
S20016	310.00	9.90	9.31	8.85	8.46	8.14	7.86	7.61	7.39	7.20	7.02	6.86	6.72	6.58	6.46	6.34	6.24
S20020	382.20	10.61	9.99	9.49	9.07	8.73	8.42	8.16	7.93	7.72	7.53	7.36	7.20	7.06	6.93	6.80	6.69
S22514	360.50	10.41	9.79	9.30	8.90	8.56	8.26	8.00	7.78	7.57	7.39	7.22	7.06	6.92	6.79	6.67	6.56
S22516	409.80	10.86	10.22	9.71	9.29	8.93	8.62	8.35	8.11	7.90	7.71	7.53	7.37	7.23	7.09	6.96	6.84
S22520	505.70	11.65	10.96	10.41	9.96	9.58	9.25	8.96	8.70	8.47	8.27	8.08	7.91	7.75	7.60	7.47	7.34
S25520	727.00	11.90	11.19	10.63	10.17	9.78	9.44	9.15	8.89	8.65	8.44	8.25	8.08	7.91	7.76	7.63	7.50
S25514	538.60	12.42	11.69	11.10	10.62	10.21	9.86	9.55	9.28	9.04	8.81	8.61	8.43	8.26	8.11	7.96	7.83
S25516	613.10	13.53	12.73	12.10	11.57	11.13	10.74	10.41	10.11	9.84	9.60	9.39	9.19	9.00	8.83	8.68	8.53
S30014	793.10	15.17	14.28	13.57	12.98	12.48	12.05	11.67	11.34	11.04	10.77	10.52	10.30	10.10	9.90	9.73	9.56
S30020	1118.70	17.20	16.18	15.37	14.70	14.14	13.65	13.22	12.85	12.51	12.20	11.93	11.67	11.44	11.22	11.02	10.84
S30030	1628.60	5.03	4.73	4.50	4.30	4.14	3.99	3.87	3.76	3.66	3.57	3.49	3.41	3.35	3.28	3.22	3.17

6.2 Infill walls providing lateral support to masonry or more brittle cladding materials

Stud centres 0.6m

Deflection limit: height / 360

		Wind pressure (kN/m^2)															
Section	Ixx (cm^4)	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
S10012	40.60	3.89	3.66	3.48	3.33	3.20	3.09	2.99	2.91	2.83	2.76	2.70	2.64	2.59	2.54	2.50	2.45
S10015	49.90	4.17	3.92	3.73	3.56	3.43	3.31	3.21	3.11	3.03	2.96	2.89	2.83	2.77	2.72	2.67	2.63
S10020	64.60	4.54	4.28	4.06	3.88	3.74	3.61	3.49	3.39	3.31	3.22	3.15	3.08	3.02	2.97	2.91	2.86
S15012	103.70	5.32	5.01	4.75	4.55	4.37	4.22	4.09	3.97	3.87	3.77	3.69	3.61	3.54	3.47	3.41	3.35
S15015	128.20	5.71	5.37	5.10	4.88	4.69	4.53	4.39	4.26	4.15	4.05	3.96	3.87	3.80	3.73	3.66	3.60
S15020	166.90	6.23	5.86	5.57	5.33	5.12	4.95	4.79	4.66	4.53	4.42	4.32	4.23	4.15	4.07	4.00	3.93
S20012	234.90	6.98	6.57	6.24	5.97	5.74	5.54	5.37	5.22	5.08	4.96	4.84	4.74	4.65	4.56	4.48	4.40
S20014	272.80	7.34	6.91	6.56	6.28	6.03	5.83	5.64	5.48	5.34	5.21	5.09	4.98	4.88	4.79	4.71	4.63
S20016	310.00	7.66	7.21	6.85	6.55	6.30	6.08	5.89	5.72	5.57	5.44	5.31	5.20	5.10	5.00	4.91	4.83
S20020	382.20	8.21	7.73	7.34	7.02	6.75	6.52	6.32	6.14	5.97	5.83	5.70	5.57	5.46	5.36	5.26	5.18
S22514	360.50	8.05	7.58	7.20	6.89	6.62	6.39	6.19	6.02	5.86	5.72	5.59	5.47	5.36	5.26	5.16	5.08
S22516	409.80	8.40	7.91	7.51	7.19	6.91	6.67	6.46	6.28	6.11	5.97	5.83	5.71	5.59	5.49	5.39	5.30
S22520	505.70	9.01	8.48	8.06	7.71	7.41	7.16	6.93	6.73	6.56	6.40	6.25	6.12	6.00	5.88	5.78	5.68
S25520	538.60	9.21	8.66	8.23	7.87	7.57	7.31	7.08	6.88	6.70	6.53	6.39	6.25	6.12	6.01	5.90	5.80
S25514	613.10	9.61	9.04	8.59	8.22	7.90	7.63	7.39	7.18	6.99	6.82	6.67	6.52	6.39	6.27	6.16	6.06
S25516	793.10	10.47	9.85	9.36	8.95	8.61	8.31	8.05	7.82	7.62	7.43	7.26	7.11	6.97	6.84	6.71	6.60
S30014	1118.70	11.74	11.05	10.50	10.04	9.65	9.32	9.03	8.77	8.54	8.33	8.14	7.97	7.81	7.66	7.53	7.40
S30020	1628.60	13.31	12.52	11.90	11.38	10.94	10.56	10.23	9.94	9.68	9.44	9.23	9.03	8.85	8.69	8.53	8.39
S30030	40.60	3.89	3.66	3.48	3.33	3.20	3.09	2.99	2.91	2.83	2.76	2.70	2.64	2.59	2.54	2.50	2.45

Stud centres 0.4m

Deflection limit: height / 360

		Wind pressure (kN/m^2)															
Section	Ixx (cm^4)	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
S10012	40.60	4.45	4.19	3.98	3.81	3.66	3.54	3.43	3.33	3.24	3.16	3.09	3.02	2.96	2.91	2.86	2.81
S10015	49.90	4.77	4.49	4.27	4.08	3.92	3.79	3.67	3.56	3.47	3.39	3.31	3.24	3.17	3.11	3.06	3.01
S10020	64.60	5.20	4.89	4.65	4.45	4.28	4.13	4.00	3.88	3.78	3.69	3.61	3.53	3.46	3.39	3.33	3.28
S15012	103.70	6.09	5.73	5.44	5.20	5.00	4.83	4.68	4.55	4.43	4.32	4.22	4.13	4.05	3.97	3.90	3.84
S15015	128.20	6.53	6.15	5.84	5.59	5.37	5.19	5.02	4.88	4.75	4.64	4.53	4.43	4.35	4.26	4.19	4.12
S15020	166.90	7.13	6.71	6.38	6.10	5.86	5.66	5.49	5.33	5.19	5.06	4.95	4.84	4.74	4.66	4.57	4.49
S20012	234.90	7.99	7.52	7.14	6.83	6.57	6.34	6.15	5.97	5.81	5.67	5.54	5.43	5.32	5.22	5.12	5.04
S20014	272.80	8.40	7.91	7.51	7.18	6.91	6.67	6.46	6.28	6.11	5.96	5.83	5.70	5.59	5.48	5.39	5.29
S20016	310.00	8.77	8.25	7.84	7.50	7.21	6.96	6.74	6.55	6.38	6.22	6.08	5.95	5.83	5.72	5.62	5.52
S20020	382.20	9.40	8.84	8.40	8.04	7.73	7.46	7.23	7.02	6.84	6.67	6.52	6.38	6.25	6.13	6.03	5.92
S22514	360.50	9.22	8.67	8.24	7.88	7.58	7.32	7.09	6.89	6.71	6.54	6.39	6.26	6.13	6.02	5.91	5.81
S22516	409.80	9.62	9.05	8.60	8.23	7.91	7.64	7.40	7.19	7.00	6.83	6.67	6.53	6.40	6.28	6.17	6.06
S22520	505.70	10.32	9.71	9.22	8.82	8.48	8.19	7.93	7.71	7.50	7.32	7.16	7.00	6.86	6.73	6.61	6.50
S25520	538.60	10.54	9.91	9.42	9.01	8.66	8.36	8.10	7.87	7.66	7.48	7.31	7.15	7.01	6.88	6.75	6.64
S25514	613.10	11.00	10.35	9.83	9.41	9.04	8.73	8.46	8.22	8.00	7.81	7.63	7.47	7.32	7.18	7.05	6.93
S25516	793.10	11.98	11.28	10.71	10.25	9.85	9.51	9.22	8.95	8.72	8.51	8.31	8.14	7.97	7.82	7.68	7.55
S30014	1118.70	13.44	12.65	12.01	11.49	11.05	10.67	10.34	10.04	9.78	9.54	9.32	9.12	8.94	8.77	8.62	8.47
S30020	1628.60	15.23	14.33	13.61	13.02	12.52	12.09	11.71	11.38	11.08	10.81	10.56	10.34	10.13	9.94	9.76	9.60
S30030	40.60	4.45	4.19	3.98	3.81	3.66	3.54	3.43	3.33	3.24	3.16	3.09	3.02	2.96	2.91	2.86	2.81

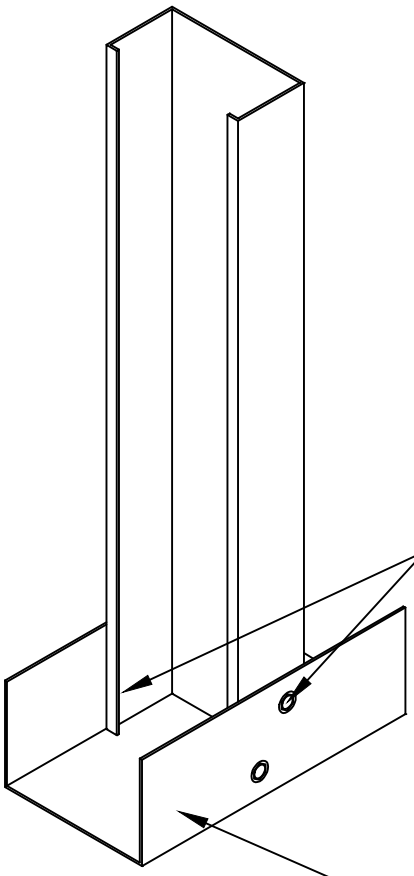
6.3 Infill walls providing lateral support to brittle cladding materials

Stud centres 0.6m — Deflection limit: height / 500

		Wind pressure (kN/m^q)															
Section	Ixx (cm^4)	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
S10012	40.60	3.49	3.28	3.12	2.98	2.87	2.77	2.68	2.61	2.54	2.48	2.42	2.37	2.32	2.28	2.24	2.20
S10015	49.90	3.74	3.52	3.34	3.20	3.07	2.97	2.87	2.79	2.72	2.65	2.59	2.54	2.49	2.44	2.40	2.36
S10020	64.60	4.07	3.83	3.64	3.48	3.35	3.23	3.13	3.04	2.96	2.89	2.82	2.76	2.71	2.66	2.61	2.57
S15012	103.70	4.77	4.49	4.26	4.08	3.92	3.78	3.67	3.56	3.47	3.38	3.31	3.24	3.17	3.11	3.06	3.00
S15015	128.20	5.12	4.81	4.57	4.37	4.21	4.06	3.93	3.82	3.72	3.63	3.55	3.47	3.40	3.34	3.28	3.22
S15020	166.90	5.59	5.26	4.99	4.78	4.59	4.43	4.30	4.17	4.06	3.96	3.87	3.79	3.72	3.65	3.58	3.52
S20012	234.90	6.26	5.89	5.60	5.35	5.15	4.97	4.81	4.68	4.55	4.44	4.34	4.25	4.16	4.09	4.01	3.94
S20014	272.80	6.58	6.19	5.88	5.63	5.41	5.22	5.06	4.92	4.79	4.67	4.56	4.47	4.38	4.29	4.22	4.15
S20016	310.00	6.86	6.46	6.14	5.87	5.64	5.45	5.28	5.13	4.99	4.87	4.76	4.66	4.57	4.48	4.40	4.33
S20020	382.20	7.36	6.93	6.58	6.29	6.05	5.84	5.66	5.50	5.35	5.22	5.11	5.00	4.90	4.80	4.72	4.64
S22514	360.50	7.22	6.79	6.45	6.17	5.94	5.73	5.55	5.39	5.25	5.12	5.01	4.90	4.80	4.71	4.63	4.55
S22516	409.80	7.53	7.09	6.73	6.44	6.19	5.98	5.79	5.63	5.48	5.35	5.23	5.11	5.01	4.92	4.83	4.75
S22520	505.70	8.08	7.60	7.22	6.91	6.64	6.41	6.21	6.04	5.88	5.73	5.60	5.49	5.38	5.27	5.18	5.09
S25520	727.00	9.12	8.58	8.15	7.80	7.50	7.24	7.01	6.81	6.63	6.47	6.32	6.19	6.07	5.95	5.85	5.75
S25514	538.60	8.25	7.77	7.38	7.06	6.78	6.55	6.35	6.16	6.00	5.86	5.72	5.60	5.49	5.39	5.29	5.20
S25516	613.10	8.62	8.11	7.70	7.37	7.08	6.84	6.63	6.44	6.27	6.11	5.98	5.85	5.73	5.62	5.52	5.43
S30014	793.10	9.39	8.83	8.39	8.03	7.72	7.45	7.22	7.01	6.83	6.66	6.51	6.37	6.24	6.13	6.02	5.92
S30020	1118.70	10.53	9.91	9.41	9.00	8.65	8.36	8.09	7.86	7.66	7.47	7.30	7.15	7.00	6.87	6.75	6.63
S30030	1628.60	11.93	11.22	10.66	10.20	9.81	9.47	9.17	8.91	8.68	8.47	8.27	8.10	7.94	7.79	7.65	7.52

Stud centres 0.4m — Deflection limit: height / 500

		Wind pressure (kN/m^2)															
Section	Ixx (cm^4)	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
S10012	40.60	3.99	3.76	3.57	3.41	3.28	3.17	3.07	2.98	2.90	2.83	2.77	2.71	2.66	2.61	2.56	2.52
S10015	49.90	4.28	4.02	3.82	3.66	3.52	3.40	3.29	3.20	3.11	3.04	2.97	2.90	2.85	2.79	2.74	2.70
S10020	64.60	4.66	4.39	4.17	3.99	3.83	3.70	3.58	3.48	3.39	3.31	3.23	3.16	3.10	3.04	2.99	2.94
S15012	103.70	5.46	5.13	4.88	4.67	4.49	4.33	4.20	4.08	3.97	3.87	3.78	3.70	3.63	3.56	3.50	3.44
S15015	128.20	5.86	5.51	5.23	5.01	4.81	4.65	4.50	4.37	4.26	4.16	4.06	3.98	3.90	3.82	3.75	3.69
S15020	166.90	6.39	6.02	5.72	5.47	5.26	5.08	4.92	4.78	4.65	4.54	4.43	4.34	4.25	4.17	4.10	4.03
S20012	234.90	7.16	6.74	6.40	6.13	5.89	5.69	5.51	5.35	5.21	5.08	4.97	4.86	4.77	4.68	4.59	4.52
S20014	272.80	7.53	7.09	6.73	6.44	6.19	5.98	5.79	5.63	5.48	5.34	5.22	5.11	5.01	4.92	4.83	4.75
S20016	310.00	7.86	7.39	7.02	6.72	6.46	6.24	6.04	5.87	5.72	5.58	5.45	5.33	5.23	5.13	5.04	4.95
S20020	382.20	8.42	7.93	7.53	7.20	6.93	6.69	6.48	6.29	6.13	5.98	5.84	5.72	5.60	5.50	5.40	5.31
S22514	360.50	8.26	7.78	7.39	7.07	6.79	6.56	6.35	6.17	6.01	5.86	5.73	5.61	5.50	5.39	5.30	5.21
S22516	409.80	8.62	8.11	7.71	7.37	7.09	6.85	6.63	6.44	6.27	6.12	5.98	5.85	5.74	5.63	5.53	5.43
S22520	505.70	9.25	8.70	8.27	7.91	7.60	7.34	7.11	6.91	6.73	6.56	6.41	6.28	6.15	6.04	5.93	5.83
S25520	727.00	10.44	9.82	9.33	8.92	8.58	8.29	8.03	7.80	7.59	7.41	7.24	7.08	6.94	6.81	6.69	6.58
S25514	538.60	9.44	8.89	8.44	8.08	7.77	7.50	7.26	7.06	6.87	6.70	6.55	6.41	6.28	6.16	6.05	5.95
S25516	613.10	9.86	9.28	8.82	8.43	8.11	7.83	7.58	7.37	7.17	7.00	6.84	6.69	6.56	6.44	6.32	6.21
S30014	793.10	10.74	10.11	9.60	9.19	8.83	8.53	8.26	8.03	7.82	7.62	7.45	7.29	7.15	7.01	6.89	6.77
S30020	1118.70	12.05	11.34	10.77	10.30	9.91	9.56	9.26	9.00	8.76	8.55	8.36	8.18	8.01	7.86	7.72	7.59
S30030	1628.60	13.65	12.85	12.20	11.67	11.22	10.84	10.50	10.20	9.93	9.69	9.47	9.27	9.08	8.91	8.75	8.60



ACFS stud screwed to base track with 2No Low profile screws

ACFS base track fixed to substrate with suitable fixings, spacings as per structural calculations

Title:	Stud connection to base track				
Issue Date:	25/06/10	**Revision:**	0	**Detail Number:**	AC-001

Advanced Cold Formed Sections
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Old Heath Road, Wolverhampton
WV1 2RP

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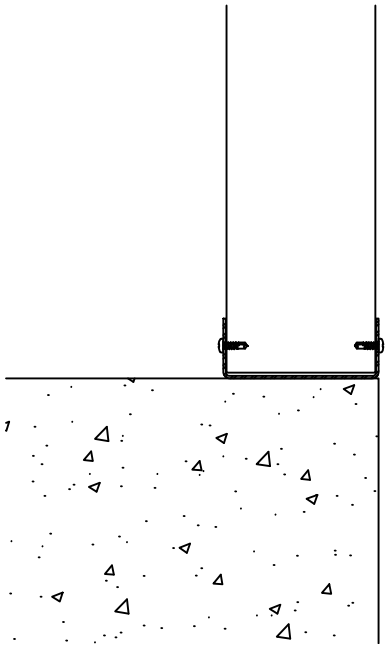

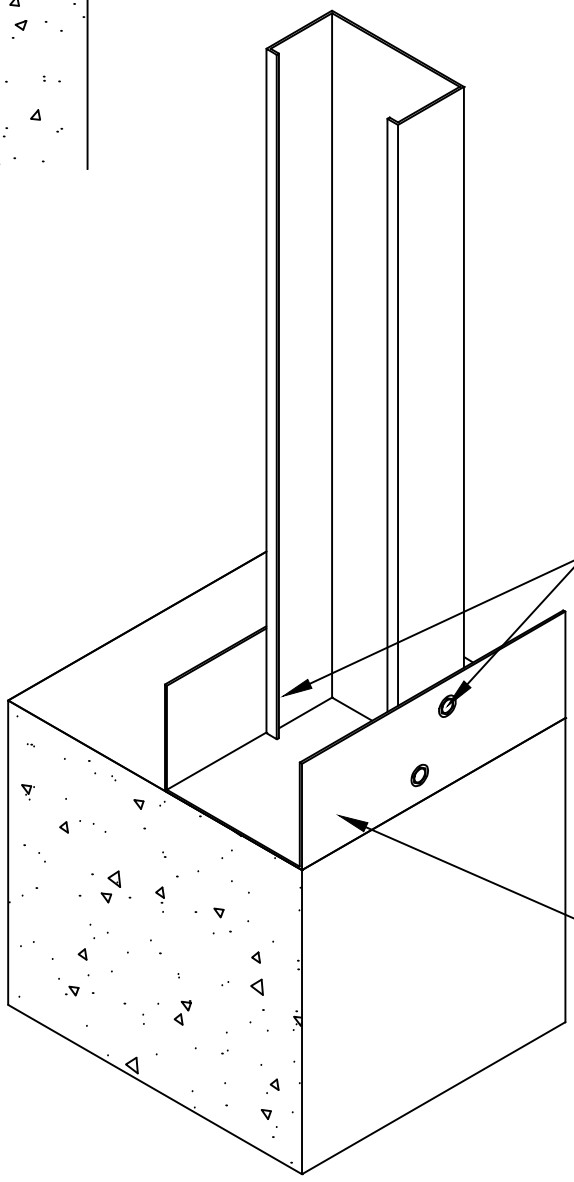

ACS stud screwed to base track with 2No Low profile screws

ACS base track fixed to substrate with suitable fixings, spacings as per structural calculations

Title:	Base track fixing to concrete				
Issue Date:	25/06/10	**Revision:**	0	**Detail Number:**	AC-002

Advanced Cold Formed Sections
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WV1 2RP

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Email: info@advancedcfs.co.uk
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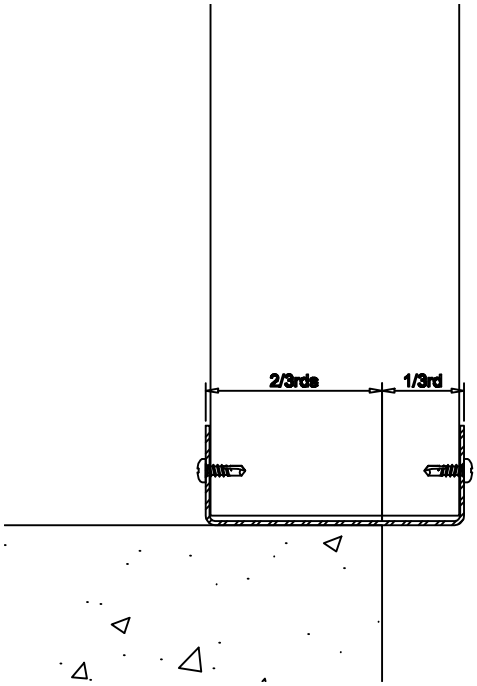

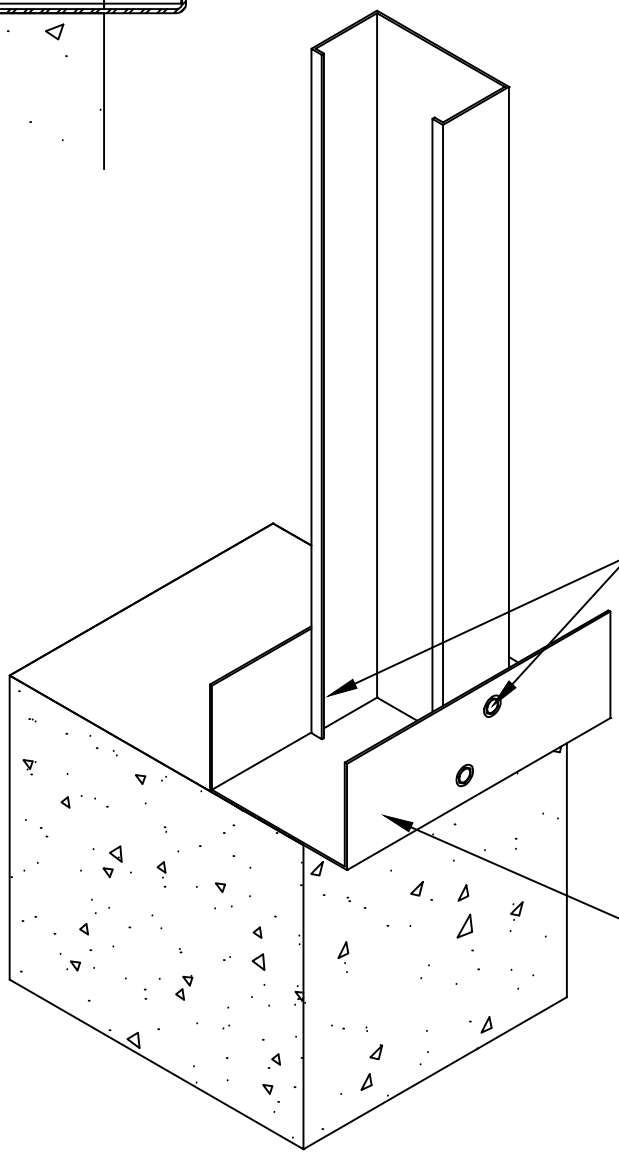

ACS stud screwed to base track with 2No Low profile screws

ACS base track fixed to substrate with suitable fixings, spacings as per structural calculations

Title:	Base track fixing to concrete, edge overhang				
Issue Date:	25/06/10	**Revision:**	0	**Detail Number:**	AC-003

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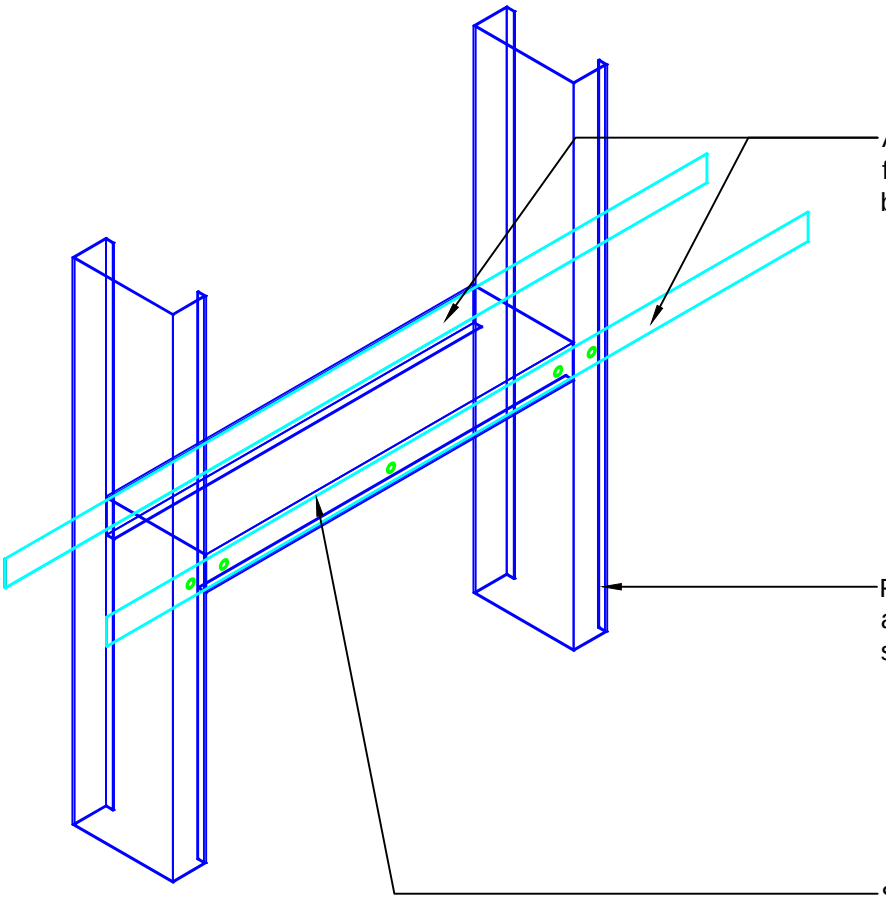

ACFS Lateral bracing on both sides fixed to every stud flange and solid blocking with low profile head screws.

Full height ACFS stud, size, guage and centres as determined by structural engineer

Solid blocking at every 3rd bay & end bays N.B.blocking or dwangs must be cut to fit snugly between stud and restained by ACFS Bracing on both flanges

Title:	Lateral restraint detail				
Issue Date:	25/06/10	**Revision:**	0	**Detail Number:**	AC-009

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Advanced Cold-Formed Sections

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