



PARIC CORPORATION
77 Westport Plaza Suite 250
St. Louis, MO 63146
TEL: 636-561-9500
FAX: 636-561-9501

REQUEST FOR INFORMATION **DATE:** January 06, 2017 **NO.:** RFI-397

To: Cannon Design

Attn: Kelvin Patel

From: Paric Corporation

Requested By: Devin Gates

Project Name: 15051-Webster University Interdisciplinary Science Building Project No.: 15051

Subject: Dowels for CMU walls at level 0

Response Required By: January 13, 2017

Drawing / Spec Reference:

Information Requested:

Please confirm if dowels are needed for the CMU walls at the floor line. If needed please provide requirements and advise if attached epoxy will be acceptable.

Response:

DOWELS TO FLOOR SLAB ARE TO BE PROVIDED TO MATCH VERTICAL REINFORCING IN WALL - TYPICAL #4@48"OC. HORIZONTAL REINF SHOULD ALSO BE DOWELED TO MATCH INTO ADJACENT CONCRETE WALLS. PRODUCT IS ACCEPTABLE. USE 3-1/2" EMBEDMENT AND MATCH LOCATIONS OF REINFORCING IN WALL. SEE A1002 FOR ADD'L INFO, LOWER LEFT CORNER. DOWELS SHALL BE 18" LONG UNLESS LIMITED BY OTHER FACTORS.

ARCHITECT'S RESPONSE:

This information is provided as an interpretation of the Contract Documents for implementation. It is not an authorization for change to the Contract Sum or Contract Time. If this information results in a claim for a change to the Contract, the Contractor shall notify the [Construction Manager][Architect] of a change through the change process.

Answered By: JILL WALKER / DMA

Date: 01.09.2017

DESCRIPTION Ultrabond HS200 is a non-sag, high modulus structural epoxy gel with exceptional strength for both long and short term tensile load anchors in temperatures between 35° and 110°F.

PROPERTIES Tension Load (2000 psi concrete, ½" rod): 18,374 lbs.
Gel Time: 10 minutes @ 75°F
Load Time: 4 hours @ 75°F

COLOR	
Part A	White
Part B	Black
Mixed	Concrete Gray
Mix Ratio	2 : 1

GENERAL USES and APPLICATIONS

- ❖ Seismic anchoring and bracing for long term sustained loads in accordance to ICC AC-58
- ❖ Anchoring threaded rod and rebar doweling where dynamic, vibratory or intermittent loads exist
- ❖ Grouting dowel bars and tie bars for full depth pavement repair
- ❖ Moisture insensitive and may be used in damp holes

ADVANTAGES and FEATURES Ultrabond HS200 is recognized for long term creep at elevated temperatures, freeze-thaw conditions, damp holes, static loads, seismic / wind loading. A solvent free system means low VOC content.

PACKAGING

Cartridge or Bulk	Part #'s
16 oz. cartridge	A16-HS200
33 oz cartridge	A33-HS200
1 gallon kit (102 fl. oz.)	BUG-HS200
15 gallon kit	B15GM-HS200

AVAILABILITY ATC Ultrabond epoxy is available through select distributors who can provide you with all your construction needs. Please contact ATC at (800) 892-1880 for a distributor near you.

WEBSITE www.ATC.ws

SHELF LIFE / STORAGE 28 month shelf life when stored in unopened containers in dry conditions. Store between 40°F and 95°F.

Independent ASTM C881-99 Technical Data					
Properties	ASTM	35°	50°	75°F	110°F
Gel Time (60 gm sample)	minutes	22	22	10	5
Working Time	minutes	35	30	10	3
Load Time-Load can be applied	hours	48	24	4	3
Pot Life (bulk only) 1 gallon		---	---	---	---
Compressive Yield Strength - psi	D695	14,160	15,500	13,860	12,520
Compressive Modulus - psi	D695	233,800	289,200	218,200	232,250
Tensile Strength psi	D638	7,130	7,490	7,080	7,330
Tensile Elongation - %	D638	3.0	2.0	2.2	2.6
Bond Strength - psi 2 day	C882	3,730	3,930	3,880	3,660
Bond Strength - psi 14 day	C882	4,060	3,970	4,230	3,760
Consistency	C881	Non-Sag Gel			
Heat Deflection Temperature °F	D648	128	128	132	152
Water Absorption - %	D570	0.28	0.21	0.22	0.28
Linear Coefficient of Shrinkage %	D2566	0.002			
Volatile Organic Compounds (VOC)		11.02 g / l			

STANDARDS and APPROVALS

**ASTM C881-99 Type I, II, IV & V
Grade 3 Class A, B & C
AASHTO M235**

D.O.T Approvals:

Alabama•Arizona•Arkansas•California•Colorado•Connecticut•Florida•Georgia•Indiana•Iowa•Kentucky•Maine•Michigan•Minnesota•Nebraska•Nevada•New Hampshire•New Mexico•New York•North Carolina•Oklahoma•Oregon•Pennsylvania•Tennessee•Texas•Utah•Virginia•Washington

LEED: Certificate is available upon request

Manufactured In The U.S.A.



by Adhesives Technology Corp.

APPLICATION TEMPERATURE Substrate and ambient air temperature between 35°F and 110°F

CONDITION PRODUCT Product should be conditioned to at least 75°F prior to application as per C881

COVERAGE A 16 oz cartridge will fill 60 holes (1/2" rod x 9/16" hole x 4" embedment) See the separate Installation Instructions for the Estimating and Usage Guide for anchoring/doweling.

CHEMICAL RESISTANCE A Chemical Resistance Chart for our Ultrabond, Miraclebond and Crackbond products is available upon request. Contact a Technical Service Representative for details.

LIMITATIONS & WARNINGS

- ❖ Do not thin with solvents, as this will prevent cure
- ❖ Not recommended for overhead applications

SPECIFICATION Adhesive shall be a two component, 2:1 ratio, 100% solids, epoxy system supplied in pre-measured containers. The adhesive material must meet the requirements of ASTM C881-10 specification for Type I, II, IV & V, Grade 3, Class A, B & C. Epoxy must have a minimum heat deflection temperature of 152°F per ASTM D648 and maintain a minimum of 94% of the tension load at 150°F. Adhesive shall have an average minimum ultimate tension load value of 22,224 lbs. when tested using 1/2" diameter threaded rod at a minimum embedment depth of 6" in 2000 psi normal weight concrete. Testing must be in accordance to ASTM E488. Shelf life must be a minimum of 28 months. Adhesive shall be Ultrabond HS200 manufactured by ATC, Pompano Beach, Florida.

INSTALLATION INSTRUCTIONS For complete Installation Instructions for Ultrabond HS200 refer to our Website, www.atc.ws or call ATC for more information at 1-800-892-1880.

SURFACE PREPARATION All surfaces must be sound and clean before epoxy application. All dust, dirt, oil, wax, grease or any other contaminant must be removed with solvent or other means. Unsound and loose concrete must also be removed by grinding or sanding. Smooth surface must be roughened with sand paper or wire brush before application. Use pressurized air to blow away dust and dirt and evaporate solvents.

CLEAN UP Clean tools and equipment with an approved solvent before product hardens.

SAFETY Please refer to the MSDS for Ultrabond HS200 published on our Website, www.atc.ws

WARRANTY All warranties of the product listed herein, in the corresponding ATC catalog, and in any other current literature, expressed or implied, including warranties of merchantability and fitness for a particular purpose are specifically and expressly excluded with the following exception: At its sole discretion, ATC will repair or replace any product which it considers to be defective in material or workmanship, excepting normal wear and tear within sixty (60) days from the date of purchase from ATC. ATC shall not be liable for any injury, loss or damage, direct, indirect, incidental or consequential or arising out of misuse of, negligence, accident or inability to use any ATC product.

Ordering Information for Ultrabond HS200

Package Size	16 oz	33 oz	BUG	B15G
Part #:	A16-HS200	A33-HS200	BUG-HS200	B15GM-HS200
Manual Dispensing Tool	TM16HD	TM33HD	N/A	N/A
Pneumatic Dispensing Tool	TA16HD-N	TA33HD-N	N/A	N/A
Case Qty	20	10	1	1
Pallet Qty	720	360	75	12
Recommended Mixer Nozzle	T3438C	T3438C	N/A	N/A

TENSION LOADS FOR THREADED RODS - Safety Factor "Allowable" equals 25% of Ultimate Load, 32% for steel

Threaded Rod Diameter (in.)	Based on Bond Strength, 2000 psi Normal Weight Concrete				Allowable, Based on Steel Strength			
	Hole Diameter (in.)	Minimum Embedment Depth (in.)	Ultimate Tension Load (lbs.)	Allowable Tension Load (lbs.)	ASTM A36 (lbs.)	ASTM A307 GRADE C (lbs.)	ASTM A193 GRADE B7 (lbs.)	304/316 SS (lbs.)
3/8	7/16	1 11/16 3 3/8 4 1/2	3,037 8,214 9,277	759 2,054 2,319	2,115	2,185	4,555	3,645
1/2	9/16	2 1/4 4 1/2 6	5,696 18,374 22,224	1,424 4,594 5,556	3,775	3,885	8,100	6,480
5/8	3/4	2 13/16 5 5/8 7 1/2	9,680 26,581 34,819	2,420 6,645 8,705	5,870	6,075	12,655	10,125
3/4	7/8	3 3/8 6 3/4 9	12,388 38,414 44,725	3,097 9,604 11,181	8,455	8,750	18,225	12,390
7/8	1	3 15/16 7 7/8 10 1/2	16,107 52,393 66,130	4,027 13,098 16,533	11,510	11,905	24,805	16,865
1	1 1/8	4 1/2 9 12	21,606 60,837 72,540	5,402 15,209 18,135	15,030	15,550	32,400	22,030
1 1/4	1 3/8	5 5/8 11 1/4 15	31,142 82,281 106,186	7,786 20,570 26,547	23,490	24,295	50,620	34,425

TENSION AND SHEAR LOADS FOR REBAR - Safety Factor "Allowable" equals 25% of Ultimate Load, 32% for steel

Rebar Size	Based on Bond Strength, 2000 psi Normal Weight Concrete						Allowable, Based on Steel Strength, Grade 60	
	Hole Diameter (in.)	Minimum Embedment Depth (in.)	Ultimate Tension Load (lbs.)	Allowable Tension Load (lbs.)	Ultimate Shear Load (lbs.)	Allowable Shear Load (lbs.)	Tension Load (lbs.)	Shear Load (lbs.)
#4	5/8	4 1/2	18,975	4,744	12,121	3,030	4,710	3,060
#5	3/4	5 5/8	31,555	7,889	20,597	5,149	7,365	4,740
#6	7/8	6 3/4	39,109	9,777	30,114	7,529	10,605	6,730
#7	1	7 7/8	47,523	11,881	34,302	8,575	14,430	9,180
#8	1 1/8	9	55,937	13,984	38,489	9,622	18,850	12,085

SHEAR LOADS FOR THREADED RODS - Safety Factor "Allowable" equals 25% of Ultimate Load, 32% for steel

Threaded Rod Diameter (in.)	Based on Bond Strength, 2000 psi Normal Weight Concrete				Allowable, Based on Steel Strength			
	Hole Diameter (in.)	Minimum Embedment Depth (in.)	Ultimate Shear Load (lbs.)	Allowable Shear Load (lbs.)	ASTM A36 (lbs.)	ASTM A307 GRADE C (lbs.)	ASTM A193 GRADE B7 (lbs.)	304/316 SS (lbs.)
3/8	7/16	3 3/8	7,072	1,768	1,090	1,125	2,345	1,870
1/2	9/16	4 1/2	12,230	3,058	1,935	2,000	4,170	3,330
5/8	3/4	5 5/8	23,190	5,798	3,025	3,130	6,520	5,210
3/4	7/8	6 3/4	31,853	7,963	4,355	4,505	9,390	6,390
7/8	1	7 7/8	34,953	8,738	5,930	6,135	12,780	8,680
1	1 1/8	9	54,924	13,731	7,745	8,010	16,690	11,340
1 1/4	1 3/8	11 1/4	73,427	18,357	12,100	12,515	26,075	17,730

Ultrabond HS200 Cure Schedule			
Temperature		Working Time	Load Time
°C	°F		
46.1° C.	115° F.	2.5 min	3 hrs
35.0° C.	95° F.	5 min	3 hrs
30.0° C.	85° F.	8 min	4 hrs
23.8° C.	75° F.	10 min	4 hrs
18.3° C.	65° F.	15 min	8 hrs
10.0° C.	50° F.	30 min	24 hrs
4.4° C.	40° F.	33 min	24 hrs
1.7° C.	35° F.	35 min	48 hrs

The chart above indicates the temperature versus Load Time (Bolt up time) for Ultrabond HS200.

***Load time** is the amount of time required before applying an allowable load (bolt-up time). Load-time and final cure time is based on the lowest temperature experienced during the cure schedule. Therefore, if the lowest temperature experienced by the anchor is 35°F, it will take 48 hours until anchor can be bolted up.

Working Time is the elapsed time in which the adhesive in the nozzle begins to increase in viscosity from a flowable material to a non-movable semi-solid.

Ultrabond HS200 has been tested in accordance with ICC - AC58 (Acceptance Criteria for Adhesive Anchors in concrete and masonry elements) and is recognized for the following uses:

- ❖ Static loads
- ❖ Seismic / wind loading for threaded rod and rebar
- ❖ Long term creep at elevated temperature
- ❖ Static loading at elevated temperature
- ❖ Damp holes
- ❖ Freeze thaw conditions
- ❖ Critical and minimum edge and spacing distances.

TENSION - EDGE DISTANCE - 4.5D* EMBEDMENTS

Edge Distance	Anchor Diameter						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Ultimate Load	3,037	5,969	9,680	12,388	6,107	21,606	31,142
Reduction Multiplier Table							
3/4"	0.57						
1"	0.63						
1 1/4"	0.69	0.59					
1 1/2"	0.75	0.64	0.57				
1 3/4"	0.82	0.69	0.61	0.57			
2"	0.88	0.74	0.65	0.60	0.57		
2 1/4"	0.94	0.79	0.69	0.63	0.60	0.57	
2 1/2"	1.00	0.83	0.73	0.67	0.62	0.59	
2 3/4"		0.88	0.77	0.70	0.65	0.62	
3"		0.93	0.80	0.73	0.68	0.64	0.58
3 1/4"		0.98	0.84	0.76	0.70	0.67	0.60
3 1/2"		1.00	0.88	0.79	0.73	0.69	0.62
3 3/4"			0.92	0.82	0.76	0.71	0.64
4"			0.96	0.86	0.79	0.74	0.66
4 1/4"			1.00	0.89	0.81	0.76	0.68
4 1/2"				0.92	0.84	0.79	0.69
4 3/4"				0.95	0.87	0.81	0.71
5"				0.98	0.89	0.83	0.73
5 1/4"				1.00	0.92	0.86	0.75
5 1/2"					0.95	0.88	0.77
5 3/4"					0.97	0.90	0.79
6"					1.00	0.93	0.81
6 1/4"						0.95	0.83
6 1/2"						0.98	0.85
6 3/4"						1.00	0.87
7"							0.89
7 1/2"							0.92
8"							0.96
8 1/2"							1.00

* D = Bolt/Rod Diameter

TENSION - EDGE DISTANCE - 9D* EMBEDMENTS

Edge Distance	Anchor Diameter						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Ultimate Load	8,214	18,374	26,581	38,414	52,393	60,837	82,281
Reduction Multiplier Table							
1 3/4"	0.73						
2"	0.75						
2 1/2"	0.79	0.74					
3"	0.83	0.77	0.73				
3 1/2"	0.87	0.80	0.75	0.73			
4"	0.91	0.83	0.78	0.75	0.72		
4 1/2"	0.95	0.86	0.80	0.77	0.74	0.72	
5"	0.99	0.89	0.83	0.79	0.76	0.74	
5 1/2"	1.00	0.92	0.85	0.81	0.78	0.75	
6"		0.95	0.88	0.83	0.79	0.77	0.73
6 1/2"		0.98	0.90	0.85	0.81	0.78	0.74
7"		1.00	0.93	0.87	0.83	0.80	0.75
7 1/2"			0.95	0.89	0.85	0.81	0.77
8"			0.98	0.91	0.86	0.83	0.78
9"			1.00	0.95	0.90	0.86	0.80
10"				0.99	0.94	0.89	0.83
11"				1.00	0.97	0.92	0.85
12"					1.00	0.95	0.88
13"						0.98	0.90
14"						1.00	0.93
15"							0.95
16"							1.00

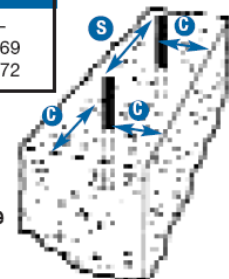
* D = Bolt/Rod Diameter

REDUCTION FACTOR FOR REDUCED SPACING AND EDGE DISTANCES FOR THREADED ROD

Embedment Depth	Edge Distance Factor, Tension Only			Edge Distance Factor, Shear Only			Spacing Factor, Tension Only		
	C _{CR}	C _{MIN}	f _{RN}	C _{CR}	C _{MIN}	f _{RV}	S _{CR}	S _{MIN}	f _A
4.5 x D	1.5 x h _{ef}	.5 x h _{ef}	0.57	1.5 x h _{ef}	-	-	2 x h _{ef}	-	-
9 x D	1.5 x h _{ef}	.5 x h _{ef}	0.72	1.5 x h _{ef}	.5 x h _{ef}	0.29	1.75 x h _{ef}	.5 x h _{ef}	0.69
12 x D	1.5 x h _{ef}	.5 x h _{ef}	0.75	1.5 x h _{ef}	.5 x h _{ef}	0.29	1.75 x h _{ef}	.5 x h _{ef}	0.72

h_{ef} = The anchor embedment depth D = The diameter of the rod C = The measure between the anchor center line and the free edge
C_{CR} = The least edge distance where no reduction would be applied C_{MIN} = The least edge distance for which recognition is desired
S = The measure between anchors from center line to center line
S_{CR} = The least spacing between anchors where no reduction would be applied
S_{MIN} = The least spacing between anchors for which recognition is desired
f_{RN}, f_{RV} = Load reduction factors to be applied when: C_{MIN} ≤ C < C_{CR}
f_A = Load reduction factors to be applied when: S_{MIN} ≤ S < S_{CR}

C = Edge Distance
S = Spacing Distance



TENSION - SPACING DISTANCE - 9D* EMBEDMENTS

	Anchor Diameter						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Ultimate Load	8,214	18,374	26,581	38,414	52,393	60,837	82,281
Spacing Distance	Reduction Multiplier Table						
1 3/4"	0.73						
2"	0.75						
2 1/2"	0.78	0.74					
3"	0.81	0.77	0.74				
3 1/2"	0.85	0.79	0.76	0.73			
4"	0.88	0.81	0.78	0.75	0.73		
4 1/2"	0.91	0.84	0.79	0.77	0.75	0.73	
5"	0.94	0.86	0.81	0.78	0.76	0.74	
5 1/2"	0.97	0.89	0.83	0.80	0.77	0.75	
6"	1.00	0.91	0.85	0.81	0.79	0.77	0.74
6 1/2"		0.93	0.87	0.83	0.80	0.78	0.75
7"		0.96	0.89	0.85	0.81	0.79	0.76
7 1/2"		0.98	0.91	0.86	0.83	0.80	0.77
8"		1.00	0.93	0.88	0.84	0.81	0.78
9"			0.97	0.91	0.87	0.84	0.79
10"			1.00	0.94	0.90	0.86	0.81
11"				0.97	0.92	0.89	0.83
12"				1.00	0.95	0.91	0.85
13"					0.98	0.93	0.87
14"					1.00	0.96	0.89
15"						0.98	0.91
16"						1.00	0.93
17"							0.95
18"							0.97
19"							0.99
20"							1.00

* D = Bolt/Rod Diameter

TENSION - EDGE DISTANCE - 12D* EMBEDMENTS

	Anchor Diameter						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Ultimate Load	9,277	22,224	34,819	44,725	66,130	72,540	106,186
Edge Distance	Reduction Multiplier Table						
1 3/4"	0.75						
2"	0.77						
2 1/2"	0.79	0.76					
3"	0.81	0.78	0.76				
3 1/2"	0.84	0.80	0.77	0.75			
4"	0.86	0.81	0.79	0.77	0.75		
4 1/2"	0.89	0.83	0.80	0.78	0.76	0.75	
5"	0.91	0.85	0.81	0.79	0.77	0.76	
5 1/2"	0.94	0.87	0.83	0.80	0.79	0.77	
6"	0.96	0.89	0.84	0.81	0.80	0.78	0.76
6 1/2"	0.99	0.91	0.86	0.83	0.81	0.79	0.76
7"	1.00	0.93	0.87	0.84	0.82	0.80	0.77
7 1/2"		0.94	0.89	0.85	0.83	0.81	0.78
8"		0.96	0.90	0.86	0.84	0.81	0.79
9"		1.00	0.93	0.89	0.86	0.83	0.80
10"			0.96	0.91	0.89	0.85	0.81
11"			0.99	0.94	0.91	0.87	0.83
12"			1.00	0.96	0.93	0.89	0.84
13"				0.99	0.95	0.91	0.86
14"				1.00	0.98	0.93	0.87
15"					1.00	0.94	0.89
16"						0.96	0.90
17"						0.98	0.92
18"						1.00	0.93
19"							0.95
20"							0.96
21"							0.98
22"							0.99
23"							1.00

* D = Bolt/Rod Diameter

TENSION - SPACING DISTANCE - 12D* EMBEDMENTS

	Anchor Diameter						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Ultimate Load	9,277	22,224	34,819	44,725	66,130	72,540	106,186
Spacing Distance	Reduction Multiplier Table						
1 3/4"	0.82						
2"	0.83						
2 1/2"	0.85	0.83					
3"	0.88	0.84	0.82				
3 1/2"	0.90	0.86	0.84	0.82			
4"	0.92	0.88	0.85	0.83	0.82		
4 1/2"	0.94	0.89	0.86	0.84	0.83	0.82	
5"	0.96	0.91	0.88	0.85	0.84	0.83	
5 1/2"	0.98	0.92	0.89	0.87	0.85	0.84	
6"	1.00	0.94	0.90	0.88	0.86	0.84	0.82
6 1/2"		0.96	0.91	0.89	0.87	0.85	0.83
7"		0.97	0.93	0.90	0.88	0.86	0.84
7 1/2"		0.99	0.94	0.91	0.89	0.87	0.84
8"		1.00	0.95	0.92	0.89	0.88	0.85
9"			0.98	0.94	0.91	0.89	0.86
10"			1.00	0.96	0.93	0.91	0.88
11"				0.98	0.95	0.92	0.89
12"				1.00	0.97	0.94	0.90
13"					0.99	0.96	0.91
14"					1.00	0.97	0.93
15"						0.99	0.94
16"						1.00	0.95
17"							0.97
18"							0.98
19"							0.99
20"							1.00

* D = Bolt/Rod Diameter

SHEAR - EDGE DISTANCE 9D* EMBEDMENTS

	Anchor Diameter						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Ultimate Load	9,277	22,224	34,819	44,725	66,130	72,540	106,186
Edge Distance	Reduction Multiplier Table						
1 3/4"	0.30						
2"	0.36						
2 1/2"	0.46	0.33					
3"	0.57	0.41	0.31				
3 1/2"	0.67	0.49	0.38	0.30			
4"	0.78	0.57	0.44	0.36	0.30		
4 1/2"	0.88	0.65	0.50	0.41	0.34	0.29	
5"	0.99	0.72	0.57	0.46	0.39	0.33	
5 1/2"	1.00	0.80	0.63	0.51	0.43	0.37	
6"		0.88	0.69	0.57	0.48	0.41	0.31
6 1/2"		0.96	0.76	0.62	0.52	0.45	0.35
7"		1.00	0.82	0.67	0.57	0.49	0.38
7 1/2"			0.88	0.72	0.61	0.53	0.41
8"			0.94	0.78	0.66	0.57	0.44
9"			1.00	0.88	0.75	0.65	0.50
10"				0.99	0.84	0.72	0.57
11"				1.00	0.93	0.80	0.63
12"					1.00	0.88	0.69
13"						0.96	0.76
14"						1.00	0.82
15"							0.88
16"							0.94
17"							1.00

* D = Bolt/Rod Diameter

For multiple spacing and/or edge distances, the total reduction factor (F) is the product of all spacing reduction factors (f_s) and all edge reduction factor (f_e):

$$F = x f_{s1} \times f_{s2} \dots f_{sn} \times f_{e1} \times f_{e2} \dots f_{en}$$